EASTERN SAN JOAQUIN GROUNDWATER AUTHORITY

Board of Directors

AGENDA

Wednesday, June 11th, 2025
10:30 a.m. – 12:00 p.m.
San Joaquin County Council of Governments
555 E. Weber Avenue, Stockton, CA 95202

I. **Call to Order/Pledge of Allegiance & Safety Announcement/Roll Call**

II. **Scheduled Items**

A. Discussion / Action Items:

1. Approval of the April 9th, 2025, Meeting Minutes - Page 3
2. Receive Financial Report
3. Presentation of Preliminary 2025-2026 Annual Work Plan and Budget - Page 5
4. Presentation of Preliminary ESJGWA SGMA Budget 2025-2026 - Page 6
5. GSA Spotlight - Lockford Community Services District & Oakdale Irrigation District

III. **Staff/DWR Reports**

A. Staff Reports

B. DWR Report

IV. **Communications**

A. Amended GSP and Periodic Evaluation Comment Letter - California Department of Fish and Wildlife, April 14, 2025 - Page 8

B. Amended GSP and Periodic Evaluation Comment Letter – Environmental Law Foundation, April 18, 2025 - Page 24

C. Amended GSP and Periodic Evaluation Comment Letter – Delta-Mendota Subbasin, April 28, 2025 (Received After DWR Public Comment Period) - Page 737

V. **Directors' Comments and Project Status Reports**

VI. **Public Comment (items not on the agenda)**

VII. **Future Agenda Items**

VIII. **Adjournment**

Next Regular Meeting
Wednesday, July 9th, 2025
10:30 a.m. – 12:00 p.m.
San Joaquin County Council of Governments

Action may be taken on any item

Agendas and Minutes may also be found at http://www.ESJGroundwater.org
Note: If you need disability-related modification or accommodation in order to participate in this meeting, please contact San Joaquin County Public Works Water Resources Staff at (209) 468-3089 at least 48 hours prior to the start of the meeting.

ZOOM LINK:

https://sjcog.zoom.us/s/82989811836

Phone One Tap:
+16694449171,,82989811836#
DIAL: +1 669 444 9171
Meeting ID: 829 8981 1836
Passcode: 903992

EASTERN SAN JOAQUIN GROUNDWATER AUTHORITY
Board of Directors Meeting
April 9th, 2025

I. CALL TO ORDER/PLEDGE OF ALLEGIANCE & SAFETY ANNOUNCEMENT/ROLL CALL

The Eastern San Joaquin Groundwater Authority (GWA) Board Meeting convened at the Council of Governments building at 555 E. Weber Ave. Stockton, CA 95202. At approximately 10:30 a.m., the meeting was called to order by Chairman, Robert Holmes.

In attendance were Directors and Alternates: Craig Stevens, Richard Wagner, Charlie Swimley, Michael Blower, Regina Lackey, Myron Blanton, Christy McKinnon, Mike Henry, Jason Colombini, John Herrick, Chairman Robert Holmes, Fritz Buchman, Keith Bussman, Mel Panizza, and Scot Moody.

II. SCHEDULED ITEMS

A. Discussion/Action Items

1. Approval of February 12th, 2025, Meeting Minutes

Motion: Mel Panizza
Second: Michael Blower
In Favor: Craig Stevens, Richard Wagner, Charlie Swimley, Michael Blower, Myron Blanton, Christy McKinnon, Mike Henry, Jason Colombini, John Herrick, Chairman Robert Holmes, Keith Bussman, Mel Panizza, and Scot Moody.
Abstain: Regina Lackey

2. Discussion and Possible Action to Dissolve the Steering Committee

The motion is to dissolve the ESJGWA Steering Committee. On February 12th, 2025, the Steering Committee was scheduled to meet during its regularly scheduled time of 8:30am, there were not enough GSA Members on the Roster to constitute a quorum to conduct Steering Committee Business. In lieu of Steering Committee meetings, staff recommends that the Board of Director hold workshops for topics requiring deliberation and significant technical and policy input. ESJGWA Board Members, their respective technical staff and legal counsel would be encouraged to attend these Board Workshops. The Board Chair will be responsible for keeping the meeting orderly and productive.

Motion: Michael Blower
Second: Jason Colombini
All in favor.

3. **Financial Report**

Hope Paulin, Management Analyst II from San Joaquin County Water Resources, presented the financial report thru February 2025.

4. **Presentation of Preliminary 2025-2026 Annual Work Plan and Budget**

Brandon Nakagawa presented a PowerPoint Presentation on the Annual 2025-26 Annual Work Plan and Budget.

5. **Discussion and Possible Action to Cancel the May 14th Board Meeting Due to the ACWA Spring Conference**

Motion to cancel the May 14th Board of Director's Meeting: Michael Blower
Second: John Herrick
All in favor.

6. **GSA Spotlight**

North San Joaquin Water Conservation Districts, Steve Schwabauer shared they are approximately 150K total acres and 75K irrigated acres within the NSJWCD, which was founded in 1948. The revenue from the annual Groundwater Charge to growers totaled $2.5 million last year, and in FY 2024-25 is projected at $3.5 million. NSJWCD's project for 2024 includes the Lakso recharge, half-mile replacement of the Acampo Road pipeline, purchase of a new portable pump, and installation of a temporary pump screen.

III. STAFF/DWR Report

A. Staff Report – None

B. DWR Report – Chelsea Spier, of DWR reviewed highlights of her DWR report.

IV. DIRECTORS' COMMENTS

Director John Herrick commented that Form 700's are to be filed soon, and the process has changed. Michael Blower shared his appreciation for the ESJGWA Board and looks forward to working together.

V. PUBLIC COMMENTS - None

VI. FUTURE AGENDA ITEMS – Chairman Robert Holmes commented if there were any volunteers for the GSA Spotlight for June, please contact him or Brandon Nakagawa.

VII. ADJOURNMENT at 11:42 am

Eastern San Joaquin Groundwater Authority

Line Items	FY 2024-25			YTD	FY2024-25	PROPOSED		
(Fund 21451)	APPROVED 6/12/2024			3/31/2025	Estimated	FY 2025-26		
Fund Balance				$ 939,646	$ 939,646	Est.		$ 2,467,247
Revenue			Total					Total
GWA GSAs Cost Allocation			373,000	352,045	373,000			
GWA GSAs Cost Allocation (2025 GSP Update)	650,000		650,000	61,269	162,951			
Reserve Fund-dedication	-		-					
Other Govt Aid from Zone 2	225,000		225,000	225,000	225,000			225,000
State (DWR) Sustainable GW Grant	-		-	242,980	242,980			
Prop. 1 Retention Reimbursement	-		-					
Reimbursement from GSAs for Grant Writing	-		-					
ARPA	2,104,000		2,104,000	2,104,000	2,104,000			
Carryover (use of reserve balance)	-		-					
Interest Income	-		-	57,285	65,000			
Rebates and Refunds								
TOTAL REVENUES	3,352,000		**3,352,000**	**$ 3,042,579**	**3,172,931**			**2,692,247**
Expense	**Contract**	**Staff**	**Total**			**Contract**	**Staff**	**Total**
General Office								
Supplies	500	-	500	0		500		500
Office Expense	500	-	500	0	150	500		500
Website Maintenance/Upgrades	10,000	-	10,000	945	8,100	10,000		10,000
Rents Structures & Grounds	5,000	-	5,000	562	750	5,000		5,000
Postage	1,000	-	1,000	10	50	1,000		1,000
Auditor's Payroll & A/P Charges	1,000	-	1,000	0	450	1,000		1,000
Miscellaneous Exp.	-	-	-	0				0
Subtotal	18,000		**18,000**	**1,517**	**9,500**	**18,000**		**18,000**
Management and Administration						**Contract**	**Staff**	**Total**
Meetings (Clerk and Records)	-	20,000	20,000	13,461	20,000		35,000	35,000
Budget, Contract Admin and Accounting	-	60,000	60,000	73,778	110,000		65,000	65,000
Professional Services Executive Dir				24,429	30,000	350,000	0	324,000
Professional Services PW Admin	-	20,000	20,000	7,642	10,000			0
Professional Services GWA Legal	15,000	-	15,000	12,331	20,000	30,000		30,000
Professional Services County Legal	-	-	-	0				0
Professional Services Public Outreach,	15,000	-	15,000	0		15,000		15,000
Interbasin & DWR Coordination	-	-	-	0				0
Grant Writing	-	-	-	0				0
Subtotal	30,000	100,000	**130,000**	**131,641**	**190,000**	**395,000**	**100,000**	**469,000**
Technical and Engineering Services						**Contract**	**Staff**	**Total**
2025 GSP Update	650,000	-	650,000	833,440	845,000			0
Annual Report	75,586	-	75,586	65,289	75,586	80,000		80,000
Groundwater Data Collection	100,000	25,000	125,000	37,878	125,000	100,000	15,000	115,000
ARPA - Implementation of Instrumentation (Representative Wells)	150,000	-	150,000	0	0	350,000		350,000
ARPA - Monitoring Network Evaluation/Management	-	50,000	50,000	0	7,500		50,000	50,000
ARPA - Monitoring Network Improvements (wells; SW/GW Interact)	600,000	-	600,000	0	50,000	1,500,000		1,500,000
ARPA - DMS Implementation	100,000	25,000	125,000	0	0	125,000	25,000	150,000
Model Development & Support	15,000	-	15,000	0	15,000	15,000		15,000
Domestic Well Mitigation Program Implementation	-	9,414	9,414	0	0		25,000	25,000
GW Accounting Framework/GW Model	-	-	-		0	200,000		150,000
Subsidence Surveying	25,000	-	25,000	0	15,000	25,000	10,000	35,000
Accelerated GSP Work	-	-	-		0			0
Subtotal	1,705,000	120,000	**1,825,000**	**936,607**	**1,133,086**	**2,395,000**	**125,000**	**2,470,000**
Work in Progress								
Professional Services WC (A-18-01)	-	-	-					
Professional Services WC (A-20-01)	-	-	-					
Completion of Prop 68 Project	-	-	-	289,950	312,744			
Subtotal	**0**	**0**	**0**	**289,950**	**312,744**			**0**
TOTAL EXPENSES	**1,753,000**	**220,000**	**1,973,000**	**$ 1,359,715**	**1,645,330**	**2,808,000**	**225,000**	**2,957,000**
Contributions to Reserve								
Reserve-GSP Update	100,000		100,000					200,000
ARPA Reserve Fund	1,179,000		1,179,000					0
Domestic Well Mitigation Program Fund	100,000		100,000					200,000
Total Reserve Contributions	1,379,000		1,379,000	**0**	**0**			**400,000**
TOTAL EXPENSES INCL RESERVE CONTR	**3,132,000**	**220,000**	**3,352,000**	**$ 1,359,715**	**$ 1,645,330**			**$ 3,357,000**
	Fund Balance			**$ 2,622,510**	**$ 2,467,247**	**Fund Balance**		**$ (664,753)**

Reserve Balance (Fund 21453)				
Reserve Balance	July 1, 2024	1,379,000	July 1, 2025	200,000
Reserve Contribution	FY 2024-25	1,379,000	FY 2025-26	200,000
Reserve Balance	June 30, 2025	200,000	June 30, 2026	400,000

2025-2026
ESJ Groundwater Authority Grant Fund (21452)
DWR SGMA Implementation

2025-2026		BUDGET	BUDGET	PROJECTED	BUDGET
Fund/ Department: 21452/2910000000		**2023-2024**	**2024-2025**	**2025-2026**	
Fund Name: Eastern SJ Groundwater Authority Grant Fund		**APPROVED**	**APPROVED**	**REQUESTED**	**Notes**
Fund Balance				**755,898**	
Line Item Account	**Account Description**				
Revenue					
4400000000	Interest				
4527600500	State- DWR -SGMA Grant	7,600,000	6,630,000	3,886,408	Per Tod Hill, use with Program Code 30308
4574003020	Other Govt Aid (Fr Local Proj Sp.)		118,000	66,000	$66K (COS & NSJWCD) + ~~52K (MRWPA)~~
Total Revenue		**7,600,000**	**6,748,000**	**4,708,306**	
Expenditures					
6221000000	Professional Services		135,000	50,000	Grant Admin. West Yost
6221019500	Professional Services Other Grants	4,300,000	3,300,000	1,481,500	to reimburse Local Project Sponsors: City of Stockton & NSJWCD for eligible project costs.
6221100802	Prof. Services-Water Resources		13,000	0	Staff
6221100810	Professional Services - Admin				
6601030100	Operating Transfer Out (MRWPA)	3,300,000	3,300,000	3,248,000	to reimburse Local Project Sponsor, San Joaquin County (MRWPA) for eligible project costs.
Total Expenditures		**7,600,000**	**6,748,000**	**4,779,500**	
Fund Balance			**0**	**(71,194)**	If negative number, the Transfer Out to MRWPA will be reduced by that amount.

	Grant	%	Admin cost> $100K
NSJWCD	3,900,000	0.52	61,141
COS	300,000	0.04	4,703
SJC	3,300,000	0.44	51,734
	7,500,000		117,578
	7,500,000		117,578

Table 2 - Recommended, Cost Allocation Based 60/40 w/ Minimum and East Side z2 Adjustment draft

			GSA Funding					
GSA	Total Pumping-Projected (AFY)	Population (2017)	Minimum	Pumping	Population	EastSide GSA Non-Zone 2 Adjustment	Total	%
CDWA	9,611	1,629	$ 10,000	$ 3,640	$ 549	$ (1,000)	$ 13,189	2.0%
CSJWCD	138,809	8,047	$ 10,000	$ 52,570	$ 2,710	$ (1,000)	$ 64,280	9.7%
Eastside SJ GSA	63,500	10,498	$ 10,000	$ 24,049	$ 3,536	$ 15,000	$ 52,585	7.9%
LCSD	1,153	1,558	$ 10,000	$ 437	$ 525	$ (1,000)	$ 9,961	1.5%
LCWD	485	2819	$ 10,000	$ 184	$ 949	$ (1,000)	$ 10,133	1.5%
Lodi	14,520	58,174	$ 10,000	$ 5,499	$ 19,593	$ (1,000)	$ 34,092	5.1%
Manteca	18,985	64,279	$ 10,000	$ 7,190	$ 21,649	$ (1,000)	$ 37,839	5.7%
NSJWCD	146,158	21,977	$ 10,000	$ 55,353	$ 7,402	$ (1,000)	$ 71,755	10.8%
OID	39,952	1,890	$ 10,000	$ 15,131	$ 637	$ (1,000)	$ 24,767	3.7%
SDWA	4,532	7,136	$ 10,000	$ 1,716	$ 2,403	$ (1,000)	$ 13,120	2.0%
SEWD	165,025	41,134	$ 10,000	$ 62,499	$ 13,854	$ (1,000)	$ 85,353	12.8%
SJC #1	74,448	16,859	$ 10,000	$ 28,195	$ 5,678	$ (1,000)	$ 42,873	6.4%
SJC #2	8,183	39,779	$ 10,000	$ 3,099	$ 13,398	$ (1,000)	$ 25,497	3.8%
SSJ GSA	60,031	38,080	$ 10,000	$ 22,735	$ 12,825	$ (1,000)	$ 44,561	6.7%
Stockton	23,035	277,120	$ 10,000	$ 8,724	$ 93,334	$ (1,000)	$ 111,058	16.7%
WID GSA	31,238	8,488	$ 10,000	$ 11,831	$ 2,859	(1,000)	$ 23,689	3.6%
	799,665	**599,467**	**$ 160,000**	**$ 302,852**	**$ 201,901**	**$ -**	**$664,753**	**100.0%**

State of California – Natural Resources Agency
DEPARTMENT OF FISH AND WILDLIFE
North Central Region
1701 Nimbus Road
Rancho Cordova, CA 95670
www.wildlife.ca.gov

GAVIN NEWSOM, Governor
CHARLTON H. BONHAM, Director

April 14, 2025

Via Electronic Mail and Online Submission

Monica Salais, PE
Supervising Water Resources Engineer
California Department of Water Resources
901 P Street, Sacramento, CA 94236

Email: Monica.Salais@water.ca.gov
Portal Submission: https://sgma.water.ca.gov/portal/#gsp

Fritz Buchman
Eastern San Joaquin Subbasin Plan Manager
San Joaquin County Public Works Department
1810 E. Hazelton Ave
Stockton, CA 95205

Email: info@esjgroundwater.org

Subject: CALIFORNIA DEPARTMENT OF FISH AND WILDLIFE COMMENTS ON THE EASTERN SAN JOAQUIN FINAL AMENDED GROUNDWATER SUSTAINABILITY PLAN AND 2025 PERIODIC EVALUATION

Dear Monica Salais and Fritz Buchman:

The California Department of Fish and Wildlife (CDFW) is providing comments on the Eastern San Joaquin Basin Final Amended Groundwater Sustainability Plan (GSP) made available to the public in November 2024 and the 2025 Periodic Evaluation prepared pursuant to the Sustainable Groundwater Management Act (SGMA). The Basin is designated as Critically Over Drafted under SGMA.

CDFW is writing to support ecosystem preservation and enhancement in compliance with SGMA and its implementing regulations based on Department expertise and best available information and science. CDFW has an interest in the sustainable management of groundwater, as many sensitive ecosystems, species, and public trust resources depend on groundwater and interconnected surface water (ISW), including groundwater dependent ecosystems (GDEs). In the context of SGMA statutes and regulations, and Public Trust Doctrine considerations, groundwater planning should carefully consider and protect environmental beneficial uses and users of groundwater, including fish and wildlife and their habitats, GDEs, and ISW. CDFW has enclosed, for reference, a summary of GSP requirements and GSA obligations with respect to the protection of fish and wildlife and public trust resources (Attachment A).

COMMENTS AND RECOMMENDATIONS

CDFW reviewed the Eastern San Joaquin Final Amended GSP and Periodic Evaluation and believes that they fail to adequately address the following two Recommended Corrective Actions identified in the Department of Water Resources (DWR) Approval Determination:

DWR Recommended Corrective Action 1b: The GSP should include a more thorough evaluation of the impacts to environmental uses and users related to groundwater level minimum thresholds, or, at minimum, describe a plan to perform this evaluation in the future when additional data becomes available.

Final Amended GSP: The Final Amended GSP partially addressed CDFW's recommendation in Corrective Action 1b by acknowledging existing data gaps in shallow groundwater monitoring near identified GDE areas (Sections 4.6.1, 4.6.4, and 4.7.1), indicating awareness that current monitoring networks might not fully capture groundwater conditions critical to these ecosystems. However, the document did not establish concrete timelines or commitments for expanding shallow groundwater monitoring networks, nor did it specify a monitoring frequency sufficient to detect seasonal groundwater fluctuations affecting GDEs or ISW. Additionally, CDFW's recommendation to revise depth-to-groundwater criteria for identifying GDEs (Section 2.3.7) was not addressed. Regarding ISW, CDFW's recommendation to implement direct streamflow and temperature monitoring at critical ISW locations was also left unaddressed, as the GSP continues to rely solely on groundwater-level proxies.

Periodic Evaluation: The 2025 Periodic Evaluation made incremental progress toward addressing GDE monitoring gaps by providing improved groundwater trend analyses (Section 2.3.7). However, it again did not commit to specific actions or timelines for addressing shallow groundwater monitoring gaps (Section 4.6.4). Additionally, the evaluation did not discuss increased monitoring frequency, nor did it commit to monthly or otherwise frequent groundwater data collection necessary to accurately assess seasonal impacts on GDEs and ISW. Regarding ISW depletion monitoring, the document introduced enhanced modeling methodologies (Sections 2.6.1 and 2.6.2), but continued reliance on groundwater-level proxies instead of direct monitoring methods.

CDFW Response and Recommendation: Upon review of the information provided in Sections 2.3.7, 3.3.6.2, 4.6.1, 4.6.4, and 4.7.1 of the GSP and Sections 2.3.7, 2.6.1, 2.6.2, and 4.6.4 of the Periodic Evaluation, CDFW believes the GSP's current approach to evaluating impacts to environmental beneficial users remains insufficient. Although the GSP and Periodic Evaluation recognize existing data gaps, the continued reliance on coarse groundwater level data as the sole metric for assessing impacts to GDEs and ISW, combined with the absence of specific plans or commitments to expand shallow groundwater and direct streamflow monitoring networks, is inadequate.

CDFW recommends that DWR require the GSAs to establish a structured groundwater monitoring program that includes monthly data collection in areas where GDEs and ISW interactions occur. Without frequent monitoring, seasonal fluctuations in groundwater levels—which can significantly impact riparian and aquatic habitats—may go undetected, potentially resulting in ecological harm.

As previously stated in CDFW's comments on the Amended GSP (Attachment B), CDFW further recommends that DWR require the GSP to explicitly commit to additional shallow groundwater monitoring wells in identified data gap areas, implement direct streamflow and temperature monitoring at key ISW locations, and revise the ISW connectivity criteria to include seasonally connected streams critical for maintaining ecological functions and habitats.

DWR Recommended Corrective Action 6: The following items related to Depletions of Interconnected Surface Water were recommended to be addressed by the first periodic evaluation:

1. *Establish undesirable results, minimum thresholds, and measurable objectives consistent with GSP regulations. Quantify the location, quantity, and timing of depletions of interconnected surface water due to groundwater extraction.*

2. *Continue to fill data gaps, collect additional monitoring data, and implement the current strategy to manage depletions of interconnected surface water and define segments of interconnectivity and timing. The monitoring network should be updated to reflect any corresponding changes and approaches.*

3. *Prioritize collaborating and coordinating with local, state, and federal regulatory agencies as well as interested parties to better understand the full suite of beneficial uses and users that may be impacted by pumping induced surface water depletion within the GSA's jurisdictional area.*

Final Amended GSP: The ISW connectivity criteria used in the Final Amended GSP (Section 3.3.6.2) continue to rely on a 75% connectivity threshold, potentially excluding critical seasonally interconnected streams and associated habitats.

Periodic Evaluation: The 2025 Periodic Evaluation did not reexamine the ISW connectivity threshold of 75% (Sections 2.6.1 and 2.6.2), leaving seasonally connected streams and their ecological functions potentially unprotected.

CDFW Response and Recommendation: Upon review of Section 3.3.6.2 of the Final Amended GSP and Sections 2.6.1 and 2.6.2 of the Periodic Evaluation, CDFW finds that the continued reliance on a 75% connectivity threshold to identify ISW reaches remains problematic, potentially excluding seasonally interconnected streams that provide critical habitat. As previously stated in CDFW's comments on the Amended

GSP (Attachment B), CDFW recommends that DWR require the GSP to reevaluate and revisit the ISW connectivity criteria, to ensure timely corrective actions and proactively protect environmentally sensitive areas.

Additional CDFW Comments:

Subsidence: The 2025 Periodic Evaluation (Section 2.3.5.4) and the Final Amended GSP (Section 3.3.5.1.4, 4.5.2, and 4.5.4) describe important improvements in subsidence monitoring, including the transition away from groundwater levels as a proxy and the adoption of InSAR and GPS-based methods. These advancements represent a more accurate and technically appropriate approach to tracking subsidence across the basin.

However, while the monitoring network has improved, the GSP does not establish response triggers for initiating management actions when subsidence is detected. Without defined response thresholds, mitigation may be delayed until subsidence causes irreversible impacts to environmental resources. This lack of response framework is concerning in areas where subsidence may alter surface water-groundwater interactions, disconnect streambeds, or affect habitat conditions for riparian and aquatic species.

CDFW recommends that DWR require the GSAs to define specific response triggers for subsidence and prioritize monitoring in areas where subsidence may pose a risk to environmental resources. A proactive approach is necessary to ensure timely management actions and prevent ecological degradation.

Climate Projections: CDFW acknowledges improvements made to climate-change modeling by incorporating recent historical drought data. CDFW also recognizes that the GSP uses the 2070 central tendency climate change scenario provided by DWR, as required. However, the GSP's reliance solely on this average-case projection, without additional evaluation of more severe or prolonged drought scenarios, may result in underestimating future reductions in surface water availability. For example, Section 2.4.4.4 of the Final Amended GSP explains that projected supplies are based on long-term averages and do not explicitly represent extreme drought events. Additionally, Section 2.4.7.5 notes that CalSim II modeling used for streamflow projections does not simulate local operations and treats flows on the Mokelumne River as unimpaired. Without adopting more conservative drought modeling and surface water availability assumptions and explicit planning for ecological contingencies, there remains significant risk to groundwater-dependent ecosystems and interconnected surface water habitats.

Therefore, CDFW recommends that DWR require the GSAs to use more conservative drought scenarios in future modeling efforts and clearly outline ecological contingency plans specifically designed to maintain the resilience of groundwater-dependent habitats during prolonged drought conditions. This proactive approach is necessary to ensure that fish and wildlife habitats receive sufficient protection under SGMA, particularly given the likelihood of more severe and sustained drought periods in the future.

CONCLUSION

In conclusion, CDFW deems the Final Updated GSP insufficient in its consideration of GDEs, ISW, and environmental beneficial uses and users of groundwater including fish and wildlife and their habitats. CDFW's comments further indicate that the Final Updated GSP fails to sufficiently address deficiencies previously identified by DWR, and thus may warrant a determination of incompletion due to the following deficiencies:

1. The assumptions, criteria, findings, and objectives, including the sustainability goal, undesirable results, minimum thresholds, measurable objectives, and interim milestones are not reasonable and/or not supported by the best available information and best available science [Cal. Code Regs., tit. 23, § 355.4, subd. (b)(1)];

2. The GSP does not identify reasonable measures and schedules to eliminate data gaps [Cal. Code Regs., tit. 23, § 355.4, subd. (b)(2)];

3. The interests of the beneficial uses and users of groundwater in the basin, and the land uses and property interests potentially affected by the use of groundwater in the basin, have not been considered [Cal. Code Regs., tit. 23, § 355.4, subd. (b)(4)];

CDFW has included a summary of GSP regulatory requirements pertaining to the protection of fish and wildlife (Attachment A) and has also included prior Department comments (Attachment B) for your reference.

CDFW appreciates the opportunity to provide comments on the Eastern San Joaquin Basin GSP and Periodic Evaluation. If you have any further questions or would like to discuss CDFW's comments, please contact R2Water@wildlife.ca.gov.

Sincerely,

DocuSigned by:
Morgan Kilgour
C3A86764C0AD4F6...

Morgan Kilgour
Regional Manager
North Central Region

Enclosures (Attachments A and B)

ec: <u>California Department of Fish and Wildlife</u>

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<u>California Department of Water Resources</u>

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<u>State Water Resources Control Board</u>

Natalie Stork, Director
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Attachment A

Summary of GSP Requirements and GSA Obligations with Respect to the Protection of Fish and Wildlife and Public Trust Resources

As trustee agency for the State's fish and wildlife resources, CDFW has jurisdiction over the conservation, protection, and management of fish, wildlife, native plants, and the habitat necessary for biologically sustainable populations of such species (Fish & G. Code, §§ 711.7 and 1802). SGMA and its implementing regulations afford ecosystems and species specific statutory and regulatory consideration, including the following as pertinent to GSPs:

- GSPs must **consider impacts to GDEs** (Water Code, § 10727.4, subd. (l); see also Cal. Code Regs., tit. 23, § 354.16, subd. (g));
- GSPs must consider the interests of all beneficial uses and users of groundwater, including environmental users of groundwater (Water Code, § 10723.2) and GSPs must **identify and consider potential effects on all beneficial uses and users of groundwater** (Cal. Code Regs., tit. 23, §§ 354.10, subd. (a), 354.26, subd. (b)(3), 354.28, subd. (b)(4), 354.34, subds. (b)(2), & (f)(3));
- GSPs must **establish sustainable management criteria that avoid undesirable results** within 20 years of the applicable statutory deadline, including **depletions of ISW that have significant and unreasonable adverse impacts on beneficial uses of the surface water** (Cal. Code Regs., tit. 23, § 354.22 *et seq*. and Water Code §§ 10721, subd. (x)(6) and 10727.2, subd. (b)) and describe monitoring networks that can identify adverse impacts to beneficial uses of ISW (Cal. Code Regs., tit. 23, § 354.34, subd. (c)(6)(D)); and
- GSPs must **account for groundwater extraction for all water use sectors,** including managed wetlands, managed recharge, and native vegetation (Cal. Code Regs., tit. 23, §§ 351, subds. (a) & (l) and 354.18, subd. (b)(3)).

Furthermore, the Public Trust Doctrine imposes a related but distinct obligation to consider how groundwater management affects public trust resources, including navigable surface waters and fisheries. Groundwater hydrologically connected to surface waters is also subject to the Public Trust Doctrine to the extent that groundwater extractions or diversions affect or may affect public trust uses. (*Environmental Law Foundation v. State Water Resources Control Board* (2018), 26 Cal. App. 5th 844; *National Audubon Society v. Superior Court* (1983), 33 Cal. 3d 419.) The GSA has "an affirmative duty to take the public trust into account in the planning and allocation of water resources, and to protect public trust uses whenever feasible." (*National Audubon Society*, *supra*, 33 Cal. 3d at 446.) Accordingly, groundwater plans should consider potential impacts to and appropriate protections for ISW and their tributaries, and ISW that support fisheries, including the level of groundwater contribution to those waters.

Attachment B

CALIFORNIA DEPARTMENT OF FISH AND WILDLIFE COMMENTS ON THE EASTERN SAN JOAQUIN BASIN AMENDED GROUNDWATER SUSTAINABILITY PLAN

State of California – Natural Resources Agency
DEPARTMENT OF FISH AND WILDLIFE
North Central Region
1701 Nimbus Road
Rancho Cordova, CA 95670
www.wildlife.ca.gov

GAVIN NEWSOM, Governor
CHARLTON H. BONHAM, Director

October 30, 2024

Fritz Buchman
Eastern San Joaquin Subbasin Plan Manager
San Joaquin County Public Works Department
1810 E. Hazelton Ave
Stockton, CA 95205
info@esjgroundwater.org

Subject: CALIFORNIA DEPARTMENT OF FISH AND WILDLIFE COMMENTS ON THE EASTERN SAN JOAQUIN BASIN AMENDED GROUNDWATER SUSTAINABILITY PLAN

Dear Fritz Buchman:

The California Department of Fish and Wildlife (Department) is providing comments on the 2024 Eastern San Joaquin Groundwater Sustainability Plan Amendment (Amended GSP) made available to the public on October 1, 2024 and prepared pursuant to the Sustainable Groundwater Management Act (SGMA). The Basin is designated as Critically Over Drafted under SGMA.

The Department is writing to support ecosystem preservation and enhancement in compliance with SGMA and its implementing regulations based on Department expertise and best available information and science. The Department has an interest in the sustainable management of groundwater, as many sensitive ecosystems, species, and public trust resources depend on groundwater and interconnected surface water (ISW), including groundwater dependent ecosystems (GDEs). In the context of SGMA statutes and regulations, and Public Trust Doctrine considerations, groundwater planning should carefully consider and protect environmental beneficial uses and users of groundwater, including fish and wildlife and their habitats, GDEs, and ISW. The Department has enclosed, for reference, a summary of GSP requirements and GSA obligations with respect to the protection of fish and wildlife and public trust resources (Attachment A).

COMMENTS AND RECOMMENDATIONS

The Department reviewed the Eastern San Joaquin Amended GSP and believes that it fails to adequately address the following two Recommended Corrective Actions identified in the Department of Water Resources (DWR) Approval Determination:

DWR Recommended Corrective Action 1b: The GSP should include a more thorough evaluation of the impacts to environmental uses and users related to the groundwater level minimum thresholds, or, at minimum, describe a plan to perform this evaluation in the future when additional data becomes available.

Amended GSP: A response to Recommended Corrective Action 1 is provided in Appendix 3-C of the Amended GSP. Through use of the same GDE mapping methodology included in the 2020 GSP, a count of GDE polygons was generated for the subbasin. For each representative monitoring well for the Chronic Lowering of Groundwater Levels Sustainable Management Criteria (SMC), an "impact zone" within a 3-mile radius of the well was delineated. The Amended GSP modeled groundwater levels at Minimum Thresholds, assessed which impact zones would experience groundwater levels more than 30 feet below the ground surface, and computed what percentage of GDEs within the subbasin would lose access to groundwater resources.

Department Response and Recommendation: The Department appreciates the effort to more thoroughly consider impacts to GDEs that may occur at the identified SMC for Chronic Lowering of Groundwater Levels. After reviewing the Amended GSP, the Department provides the following responses and recommendations:

a. Appendix 3-C Figures 6, 7, and 8 show examples of the GDE impact zone assessment. The inset map in each figure shows an overlay of the groundwater level monitoring network, the impact zone of each well, and the location of GDEs within the subbasin. It appears that a high proportion of GDEs within the subbasin are not located sufficiently close to a monitoring well to be within an analyzed impact zone, particularly in the northwestern portion of the subbasin and along the western boundary. It is therefore unclear to what extent, if any, the groundwater levels underlying these GDEs have been modeled or considered in the impact analysis presented in the Amended GSP. Without an associated monitoring well that can be used to assess whether or not groundwater levels in these areas would decline below the root zone of GDEs, the analysis and statistics presented in the Amended GSP stating that only a small percentage of GDEs would be impacted during a subbasin Undesirable Result scenario is insufficient and risks underestimating impacts to GDEs. The Department recommends the Amended GSP clearly identify the lack of monitoring wells sufficiently close to identified GDEs as a data gap and propose an actionable path to resolve the data gap. While the Amended GSP describes vague plans to install additional shallow monitoring wells in the future, the plan should provide a specific timeline for addressing this data gap.

b. The Amended GSP acknowledges that the GDE analysis completed was a desktop review, and field identification and verification of vegetated and wetland GDEs and associated wildlife is warranted. This data gap and need was also identified in the 2020 GSP, however no timeline or specific project or management action associated with GDE field verification was readily apparent in the Amended GSP. The Department recommends including GDE field identification and verification as a project and management action, with an associated timeline for implementation.

c. Appendix 3-C of the Amended GSP, when describing the GDEs located within impact zones shown in Figures 6, 7, and 8, states that if a potential GDE is proximate to irrigated agriculture or surface water sources that may provide some level of water supply to the potential GDE, that ecosystem may not be considered a GDE. This perpetuates a false dichotomy and incorrect assumption that GDEs must rely solely on groundwater in order to be considered groundwater dependent; instead, GDEs may rely on groundwater for *a portion* of their water needs and may rely on groundwater to varying degrees depending on water year type and relative water availability from surface or groundwater sources. The Department recommends that this language be updated accordingly or removed from the Amended GSP.

DWR Recommended Corrective Action 6: The following items related to Depletions of Interconnected Surface Water by the first periodic evaluation:

1. *Establish undesirable results, minimum thresholds, and measurable objectives consistent with GSP regulations. Quantify the location, quantity, and timing of depletions of interconnected surface water due to groundwater extraction.*

2. *Continue to fill data gaps, collect additional monitoring data, and implement the current strategy to manage depletions of interconnected surface water and define segments of interconnectivity and timing. The monitoring network should be updated to reflect any corresponding changes and approaches.*

3. *Prioritize collaborating and coordinating with local, state, and federal regulatory agencies as well as interested parties to better understand the full suite of beneficial uses and users that may be impacted by pumping induced surface water depletion within the GSA's jurisdictional area.*

Amended GSP: A response to Recommended Corrective Action 6 is provided in Appendix 3-G of the Amended GSP. The Amended GSP methodology identifies ISW by comparing modeled monthly groundwater conditions from the historic calibration scenario to streambed elevations. ISW are defined as surface water bodies in which groundwater levels are at or above the streambed elevation at least 75% of the time. The Amended GSP sets ISW SMC at the same levels as the SMC for Chronic Lowering of Groundwater Levels and provides figures that compare the spatial extent of ISW connectivity, annual gains and losses, and seasonal gains and losses for both 2015 and an increased pumping, minimum threshold scenario as justification that the selected thresholds are protective.

Department Response and Recommendation: The Department appreciates the additional analysis and information provided for ISW in the Amended GSP. After reviewing the Amended GSP, the Department provides the following responses and recommendations:

a. The Amended GSP does not provide context nor justification for requiring streams to be connected to groundwater at least 75% of the time to be considered ISW, as connectivity can vary seasonally and by water year type. The Department recommends that the Amended GSP revise this connectivity threshold and include surface waters that may be connected only seasonally, or in wetter water year types, as ISW and include them in the subsequent analysis. Discounting streams connected less than 75% of the time as ISW risks failure to characterize and protect ISW GDEs with corresponding Minimum Thresholds that may be critical to aquatic and riparian species.

   The Amended GSP also states that many smaller creeks and streams are used for the conveyance of irrigation water and are therefore not considered in the analysis of depletions. The Amended GSP does not provide specifics or rationale for this decision. The use of streams and creeks as conveyance does not preclude them from being ISW, particularly outside of the typical irrigation season when depletions may have relatively higher impacts to flows and instream temperatures. The Department recommends the Amended GSP identify what thresholds for irrigation conveyance were used to remove streams and creeks from the analysis, identify where they are located, and identify them as a data gap for improved ISW analysis in the future.

b. In DWR's 2023 Determination Letter for the Resubmitted Eastern San Joaquin GSP, DWR stated that the Resubmitted GSP did not quantify what would be considered an undesirable result in terms of stream depletion. Rather than defining groundwater level thresholds that could cause undesirable results, the GSP suggests that the Chronic Lowering of Groundwater Levels SMC would preemptively protect against stream depletion undesirable results.

   The Department does not believe that the Amended GSP adequately addresses and corrects this deficiency identified by DWR. Though the Amended GSP updates the ISW analysis to compare depletions estimated in 2015 to projected conditions at the minimum thresholds, the Amended GSP does not ever independently describe what would constitute an undesirable result for depletions of ISW. Instead, it presents metrics showing the relative change in depletions between the two scenarios, and though some segments experience increases in depletions beyond 2015 conditions, the changes are considered too small to constitute an undesirable result, though that undesirable result has not been otherwise defined. Additionally, the statistics presented are on a seasonal basis rather than a monthly basis, and the depletion values are aggregated for the entire length of each river through the subbasin which is too coarse a geography to meaningfully evaluate potential adverse impacts to ISW.

The Department recommends that the Amended GSP be updated with a definition of what would constitute an undesirable result for depletions of ISW that is independent of modeled changes based on the groundwater level SMC. The undesirable result definition should describe the rate, timing, and volume of depletions of ISW.

Additionally, a table presenting the baseline and projected scenario accretions and depletions by month, rather than in a figure showing quarterly values, would provide a higher resolution of information for review that is necessary for evaluating undesirable results to environmental beneficial users. As noted in the Amended GSP, some ISW within the subbasin experience markedly different depletion and accretion conditions in their upper vs lower reaches. Aggregating gains and losses across an entire river, rather than in more discrete segments, can mask localized adverse impacts to ISW in which specific segments may experience a significant increase in the rate of depletions, or decrease in the rate of accretions, that are not immediately evident when added together. The Department recommends separating ISW such as the Mokelumne River, Stanislaus River, Dry Creek, and the San Joaquin River into multiple segments and reporting modeled monthly depletion volumes for each.

c. The Amended GSP states that no undesirable results for ISW were occurring in 2015 in the subbasin because minimum instream flow requirements and agreements were met, and Chinook salmon populations were recovering after a decline in the late 2000s. Neither of these claims is evidence that demonstrates a lack of undesirable results due to depletions occurring in the subbasin.

Stream gauge compliance points located both upstream and downstream of the subbasin are used to inform surface water releases and allowable diversions to ensure that instream flow requirements and agreements are met. If significant depletions were occurring within the subbasin, additional surface water would be released, or diverters would bypass flow, to continue to maintain the required instream flows and offset the depletions.

Further, population dynamics of Chinook salmon are complex, variable, and not dependent solely on streamflow depletions. Streamflow, timing of pulse or attractant flows, water quality and temperature, habitat availability, and management actions all play a role in population numbers that are expected to vary from year to year. Presenting a single year of population data, which does not consider survival rates or spawning success, as evidence that depletions were not affecting aquatic users of ISW is overly simplistic and inappropriate.

The Department recommends the statements referenced above be removed from the Amended GSP. The Amended GSP should determine what *rates,* *timing, and volumes* of depletion of ISW would be considered an undesirable result (see above comment on defining ISW undesirable results).

d. The Department appreciates the work involved in installing 6 new monitoring wells within the subbasin that are now included as part of the ISW monitoring network. The Amended GSP states that due to the lack of historic groundwater level data, there are not yet any SMC thresholds identified for these six ISW wells. At least 4 years of data will need to be collected before SMC can be determined, but additional years of data collection may be required if one wet and one dry/critically dry year to not occur within those first 4 years.

   The Department acknowledges the challenges associated with the lack of measured groundwater level data at these 6 wells. However, the Amended GSP identifies only 12 wells as part of the ISW monitoring well network; for at least 4 more years, 6 of the 12, or half of the monitoring network, will not have any SMC defined. Should the required wet and dry hydrology not occur in those 4 years, the lack of SMC could stretch even further. Given the need to reach sustainability by 2040, this level of delay in determining SMC for half of the ISW monitoring network is not acceptable and would prevent identification of undesirable results for ISW should they occur. The northern portion of the subbasin, where 5 of the 6 new wells are located, would be particularly susceptible to having unidentified undesirable results occur due to the lack of SMC. The Department recommends the Amended GSP include an *interim* methodology for establishing SMC at the 6 new monitoring wells included in the ISW network, that will be refined with additional years of data collection.

e. The Department acknowledges that additional guidance from DWR on techniques for estimating depletions of ISW was not available prior to development of the Amended GSP. The Draft DWR guidance is now available for public review, and it encourages the use of numerical modeling to determine the depletion of ISW that is specifically attributable to groundwater pumping. The Amended GSP states that comparing modeled pumping and no-pumping scenarios using the most updated model for the Eastern San Joaquin subbasin was attempted, but it resulted in an inconclusive understanding and was therefore not incorporated into this Amended GSP.

   The Department recommends the Amended GSP include specific, time-based plans to develop numerical model scenarios in accordance with DWR resources, define the ISW undesirable result, and develop protective SMC.

CONCLUSION

In conclusion, the Department appreciates the updated analyses included in the Amended GSP, but the plan still needs improvement in its consideration of GDEs, ISW, and environmental beneficial uses and users of groundwater including fish and wildlife and their habitats. The Department's comments further indicate that the Amended GSP fails to sufficiently address deficiencies previously identified by DWR, and thus may still include deficiencies in the following areas:

1. The assumptions, criteria, findings, and objectives, including the sustainability goal, undesirable results, minimum thresholds, measurable objectives, and interim milestones are not reasonable and/or not supported by the best available information and best available science [Cal. Code Regs., tit. 23, § 355.4, subd. (b)(1)];

2. The GSP does not identify reasonable measures and schedules to eliminate data gaps [Cal. Code Regs., tit. 23, § 355.4, subd. (b)(2)];

3. The interests of the beneficial uses and users of groundwater in the basin, and the land uses and property interests potentially affected by the use of groundwater in the basin, have not been considered [Cal. Code Regs., tit. 23, § 355.4, subd. (b)(4)].

The Department has included a summary of GSP regulatory requirements pertaining to the protection of fish and wildlife (Attachment A) and has also included prior Department comments (Attachments B, C, and D) for your reference.

The Department appreciates the opportunity to provide comments on the Eastern San Joaquin Basin Updated GSP. If you have any further questions or would like to discuss the Department's comments, please contact R2Water@wildlife.ca.gov.

Sincerely,

DocuSigned by:
Morgan Kilgour
C3A86764C0AD4F6...

Morgan Kilgour
Regional Manager, North Central Region

Enclosures (Attachments A, B, C, D)

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April 18, 2025

Via Electronic Submission and Email

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Re: Comments on 2025 Revisions to East San Joaquin GSP

Dear Mr. Gosselin:

Thank you for the opportunity to comment on the 2025 Revisions to the Groundwater Sustainability Plan for the Eastern San Joaquin Subbasin (GSP). These comments are submitted on behalf of California Sportfishing Protection Alliance (CSPA). DWR cannot approve this GSP consistent with SGMA and its regulations.[1]

I. The GSP as Submitted and Posted to DWR's Website Was Not Approved by All GSAs

As an opening matter, the GSAs failed to submit a fully approved GSP to DWR and DWR must therefore determine the GSP to be at minimum "incomplete." DWR's website shows the GSP as submitted on January 28, 2025 and posted on February 4, 2025.[2] A statement appears on the website that that "[a]ll GSAs individually held public hearings where the Amended GSP was adopted." But as revealed by the posted material itself, several GSAs' resolutions approving the 2025 revisions are missing. These missing resolutions include:

- Central Delta Water Agency GSA,

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[1] CSPA's comments sent to the GSAs on December 10, 2024 and February 10, 2025 regarding this GSP, which are incorporated here by reference, are attached to this letter as Exhibits 1 and 2. We also attach here and incorporate to the extent relevant our prior comment letters to DWR regarding this GSP as Exhibits 3, 4, and 5.

[2] A screenshot of the DWR website page for the ESJ GSP as it appeared on April 16, 2025 is included as Exhibit 6.

- City of Stockton GSA,
- Eastside San Joaquin GSA (including its constituent GSAs Calaveras County Water District, Calaveras County, Stanislaus County, and Rock Creek Water District),[3]
- City of Manteca GSA, and
- City of Lodi GSA.

In actuality, at least two of those GSAs did not approve the amendments to the GSP until well after the date the GSP was submitted to DWR.[4] As a result, the statement that all GSAs had approved the GSP by the time of submission to DWR was not true, and the website is still missing several resolutions.

A GSP that is not approved by all GSAs covering its territory does not satisfy the regulations or statute. (See Wat. Code § 10728.4 [amendment to a Plan is only effective after a public hearing by the GSA]; Cal. Code Regs., tit. 23, §§ 355.2, subd. (a) [Plan must be "adopted" before submittal]; 355.4, subds. (a) [Plan must be "adopted"], (a)(2) [Plan must be "complete"], (a)(3) [Plan must cover entire basin].) Further, DWR must only evaluate "adopted" Plans. (Cal. Code Regs., tit. 23, § 355.4, subds. (b)(9) [DWR to evaluate whether GSP has "legal authority" to implement Plan]; 355.6, subd. (c)(4) [DWR to evaluate whether amended plan complies with section 355.4]; 355.10, subd. (d)(3) [DWR to evaluate amended approved plan under section 355.6, which in turn requires compliance with section 355.4].) And DWR must only post "adopted" Plans on its website and open a comment period on those "adopted" Plans. (Cal. Code Regs., tit. 23, § 355.2, subds. (b), (c).) Likewise, the statutory requirement to post a GSP on the website and open the comment period attaches only on "adoption" of the plan. (Wat. Code § 10733.4, subds. (a), (c).)

This is not a scenario where DWR may excuse noncompliance with the regulations based on the "substantial compliance" standard contained in section 355.4(b) of the regulations. That standard applies only to "adopted" plans that are "complete," and "cover[] the entire basin." (Cal. Code Regs., tit. 23, § 355.4 subds. (a), (b).) But this Plan was not complete and did not cover the entire basin as of January 28, as several GSAs

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[3] Rock Creek Water District does not appear to maintain a website, which itself is a violation of the statutory and regulatory requirements to post material on a GSA's website. (See Wat. Code §§ 10725.2, subd. (c), 10730, subd. (b)(2); Cal. Code Regs., tit. 23, § 353.6, subd. (a).)

[4] The resolutions of Central Delta Water Agency GSA and City of Stockton GSA approving the amendments are dated February 11, 2025, and March 18, 2025, respectively. Copies of these resolutions are included as Exhibits 7 and 8.

had not yet approved it.

Taken together, these provisions are clear that the GSAs here submitted the amended GSP prior to full approval by all GSAs. As a result, DWR should determine the GSP to be "incomplete" pursuant to the regulations and remand it to the GSAs for full approval, resubmission, and a reopened comment period.

II. The GSP as Revised Continues to Violate SGMA

Leaving aside the GSP's facial defectiveness, the plan as revised does not comply with SGMA's substantive requirements. CSPA is attaching its comment letters to the GSAs, which demonstrate that the GSP as amended continues to fail to comply with SGMA and the DWR regulations. To summarize:

- The GSP uses the wrong standard to identify interconnected surface waters. Instead of evaluating "surface water that is hydraulically connected at any point by a continuous saturated zone to the underlying aquifer and the overlying surface water is not completely depleted" (Cal. Code Regs., tit. 23, § 351, def. (o)), it defines ISW as areas where the water table is below the riverbed elevation (GSP at p. 2-156). This definition contradicts the regulatory definition and DWR guidance by excluding ISW where there is a saturated zone connecting the surface water and groundwater, even though the groundwater level is below the bed of the surface water body.[5]

- The GSP uses groundwater level measurements at a subset of wells as a proxy for depletions of ISW for setting the sustainable management criteria for ISW. The basis for the minimum thresholds (MTs) selected by the GSP is 2015 levels, on the (unsupported) theory that no undesirable results occurred in 2015 (despite comments in the record by CDFW, NMFS, and others showing that undesirable results likely did occur). But the GSP undercuts even this logic in three ways. First, it includes a large buffer in calculating the MTs, meaning that the actual MT is well below 2015 levels. Second, it only considers an undesirable result to have occurred if the violation occurs in two consecutive years, which is likely worse than actual conditions that occurred in 2015. And third, the modeling results in the GSP show higher depletions in the minimum

[5] See DWR, Depletions of ISW: An Introduction (2024), p. 5, available at https://data.cnra.ca.gov/dataset/68e0d8b6-a207-4b30-a16b-3daeb659faea/resource/218e3361-c142-400f-a97f-5dfa79cd4997/download/depletionsofisw_paper1_intro_draft.pdf.

threshold scenario than in 2015.[6] As a result, the ISW SMC are legally flawed and factually unsupported, and thus must be rejected.

- The locations of the proposed monitoring wells are not near stream gages and it is unclear how any proposed new wells will be utilized.

- There is a shortfall between the expected pumping reductions and/or recharge benefits attributed to the planned Projects and Management Actions and the needed actions to reach the basin's sustainable yield. This means that on the Plan's face, it will not reach sustainability by 2040 even if all planned PMAs are implemented.

- The water budget fails to include tabular annual figures, restricting the public's ability to evaluate the water budget. (See Cal. Code Regs., tit. 23, § 354.18, subd. (a).)

- The GSP continues many of the flaws identified in our earlier correspondence. It fails to adequately map groundwater dependent ecosystems, and improperly excludes them when they receive some surface water. It fails to consider impacts on the public trust, and authorizes unreasonable use of water. It fails to include any discussion of groundwater extraction's impact on surface water quality, including temperature. (See Wat. Code § 10727.2, subs. (d)(2), (e).)

For these reasons and others contained in the attached letters, we urge DWR to not approve the GSP until it has been revised to address these issues.

Sincerely,

Nathaniel H. Kane

Nathaniel Kane
Executive Director
Environmental Law Foundation

CC: Fritz Buchman, ESJGroundwater@sjgov.org

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[6] The GSP also fails to measure depletions caused by groundwater pumping, in violation of the regulations, instead using total groundwater depletions. (See, e.g., Cal. Code Regs., tit. 23, § 354.28, subd. (c).)

Exhibit 1

ENVIRONMENTAL LAW FOUNDATION

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Nathaniel Kane, Executive Director · nkane@envirolaw.org

December 10, 2024

Via E-mail

Fritz Buchman
Eastern San Joaquin Subbasin Plan Manager
Eastern San Joaquin Groundwater Authority
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info@esjgroundwater.org

Re: CSPA Comments on Eastern San Joaquin GSP

Dear Mr. Buchman:

California Sportfishing Protection Alliance (CSPA) respectfully offers comments on the final Groundwater Sustainability Plan (GSP) proposed for adoption on December 11, 2024.

We appreciate the significant progress made on the GSP since 2020, and the new analysis and detail included in this most recent iteration. The additional analysis underlying the sustainable management criteria, in particular, aids the public in understanding how those criteria were selected.

That said, we continue to have concerns that the GSP contains violations of SGMA. A non-exhaustive discussion of those violations is included below.

1. Groundwater Dependent Ecosystems

The GSP continues to fail to adequately identify groundwater dependent ecosystems (GDEs). (Cal. Code Regs., tit. 23, §§ 351, def. (m), 354.16, subd. (g); see Wat. Code § 10727.4, subd. (*l*) [1].) The GSP continues to exclude areas "close to managed wetlands, irrigated agriculture, or perennial surface water bodies" from the definition of GDEs because they have access to "alternate water supplies" and thus "would not be dependent on groundwater." (GSP at p. 2-122.) However, this definition potentially excludes GDEs that may require groundwater for survival, despite the presence of other

[1] Further references to California Code of Regulations, title 23, section 350 et seq. are to the "SGMA Regulations." Further unspecified statutory references are to the Water Code.

water at certain times of year. Notably, the SGMA Regulations define GDEs as species or ecological communities that "depend" on groundwater; this definition does not require that the ecosystem be solely supported by groundwater—the question is whether the ecosystem would be healthy without groundwater. (SGMA Regs. § 351, def. (m).)

We note that the GSP now states a commitment to conduct field surveys of GDEs by 2030. While this commitment is welcome, its deadline comes 15 years after SGMA's enactment. And CSPA is concerned that without addressing the definition of GDEs, the field surveys may still miss GDE that SGMA requires to be identified.

2. Sustainable Management Criteria

We appreciate the additional support underlying the sustainable management criteria.

However, the definitions of undesirable results remain flawed. SGMA requires "Measurable objectives, as well as interim milestones in increments of five years, to achieve the sustainability goal in the basin within 20 years of the implementation of the plan." (§ 10727.2, subd. (b)(1).) The regulations add specific requirements to this, including a requirement for "minimum thresholds" that set a numeric value that, if exceeded, "may cause undesirable results." (SGMA Regulations § 354.28, subd. (a).) And if a GSP uses one minimum threshold as a proxy for another—as the ESJ GSP used groundwater levels as a proxy for ISW depletions—it must present "adequate evidence" for the reasonableness of such a proxy. (SGMA Regs. § 354.28, subd. (d).)

And a GSP must define "undesirable results" by specifying the criteria the GSP uses to determine whether an effect becomes "significant and unreasonable," by referencing the effects on beneficial uses and users and a "quantitative description of the combination of minimum threshold exceedances" that would cause such significant and unreasonable effects. (SGMA Regs. § 354.26, subd. (b).)

The GSP still relies, in part, on statements that no undesirable results have occurred in the ESJ basin for interconnected surface waters (ISWs). (E.g., GSP, App. 3-G at pp. 23-24.) However, letters from CSPA, California Department of Fish and Wildlife, and National Marine Fisheries Service have provided evidence that fishery habitat conditions in the basin's interconnected rivers have been poor, including high temperatures and reduced flows.[2] In order to satisfy SGMA's requirement to base GSPs on the best available information, the GSP must grapple with this evidence and not

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[2] E.g., Morgan Kilgour, CDFW, Letter to Fritz Buchman, ESJGWA (October 30, 2024), att. B, C (2024 GSP, Appendices at pdf pages pp. 168-245.); Cathy Marcinkevage, National Marine Fisheries Service, Letter to Paul Gosselin, DWR (October 12, 2022), at p. 2, available at https://sgma.water.ca.gov /portal/gsp/comments/47 (accessed December 9, 2024).

simply dismiss it.

Nor can the GSP rely on the SGMA's provision that exempts it from avoiding undesirable results that "occurred before, and have not been corrected by, January 1, 2015." (§ 10727.2, subd. (b)(4).) By requiring two consecutive years of minimum threshold exceedances at 25 percent of wells, and by setting minimum thresholds below 2015 elevations, the GSP will potentially allow significantly worse conditions than were experienced prior to 2015. The analysis presented shows higher stream depletions as a percentage of flow under the minimum threshold scenario than in 2015 in the Stanislaus River. (App. 3-G at p. 48.) And the GSP acknowledges that the minimum threshold scenario has higher depletions by volume in that scenario for the Mokelumne, San Joaquin, and Stanislaus Rivers than in 2015.[3] (App. 3-G at p. 46.)

These facts do not square with the GSP's representation that undesirable results would not occur under the minimum threshold scenario. The Plan fails to analyze the actual in-stream effects of stream depletions, as required by the regulations, resting on promise that the plan will be protective of 2015 levels.[4] But the Plan's numbers show the potential for conditions that are worse than 2015.[5] This violates, inter alia, the requirement that the use of a proxy minimum threshold be supported by adequate

[3] Depletions were higher in the Calaveras River except in the October-December quarter as well. (App. 3-G at p. 46.)

[4] Additionally, the Plan references other potential undesirable results: maintaining "minimum instream flow requirements and agreements" and chinook salmon populations in 2015. (App. 3-G at pp. 23-24.) These parameters are not mentioned in the definition of undesirable results. (GSP at p. 3-31.) Further, the GSP does not mention that maintaining instream flow requirements may come at significant costs to surface water management, as dam operators must release additional water to compensate for stream losses. And a single year of Chinook escapement is not evidence that depletions were or were not harmful: populations crashed in 2020 and 2021. (See CDFW, California Central Valley Chinook Escapement Database Report (May 20, 2024), at pp 27-28, available at https://nrm.dfg.ca.gov/FileHandler.ashx ?DocumentID=84381 (accessed December 10, 2024).)

[5] We are also concerned that the plan's emphasis on maintaining "connectivity" is misplaced. While maintaining sufficiently high groundwater levels is important for both maintaining "connectivity" and for avoiding undesirable results, the GSP at times conflates the two concepts. Further, the GSP fails to support the definition of a stream being "connected." Per DWR guidance, a stream may be connected even if groundwater levels fall below the streambed, so long as a saturated zone exists at "any point." (SGMA Regs. § 351, def. (o); DWR, Depletions of ISW: An Introduction (2024), at p. 5, available at https://data.cnra.ca.gov/dataset/68e0d8b6-a207-4b30-a16b-3daeb659faea/resource/218e3361-c142-400f-a97f-5dfa79cd4997/download/depletionsofisw_paper1_intro_draft.pdf (accessed December 9, 2024). Under DWR's definition, a stream may be connected if it there is a saturated zone at any point. But the GSP excludes significant reaches of streams, especially the Calaveras River, Dry Creek, and Mormon Slough, that appear to meet this definition.

evidence. (SGMA Regs. § 354.28, subd. (d).) And it violates the requirement that a plan spell out the effects of undesirable results on beneficial uses and users.[6] (SGMA Regs. § 354.26(b).)

In addition, many of the proposed new monitoring wells are not near interconnected streams. And few, if any, are near stream gages. It is unclear how the GSAs plan to use these wells to generate information on ISW depletions given the lack of paired wells and stream gages.

The GSP also continues to fail to monitor or address the effects of groundwater depletions on surface water temperatures, in violation of Water Code section 10727.2, subds. (d)(2) and (f).

3. Projects and Management Actions

The Final GSP does not contain adequate projects and management actions (PMAs) to fulfill its obligations to plan for sustainability by 2040.

SGMA requires a basin to achieve the "sustainability goal" within 20 years. (§ 10727.2, subd. (b).) The "sustainability goal" is defined as requiring the basin to operate within its "sustainable yield." (§ 10721, def. (u).)

The GSP identifies a shortfall of 95,000 AF/y between its expected pumping and its sustainable yield in the non-climate change scenario, and 166,000 AF/y in the climate change scenario. (GSP at pp. 2-195, 2-200.) But the Category A PMAs sum up to only 90,200 AF/y of reductions and/or recharge. (GSP at pp. 2-202 to 2-203.)

As a result, the GSP admits that "there is still additional work (e.g., projects and/or management actions) that may need to be done to maintain subbasin sustainability." (GSP at p. 2-212.) In other words, the planned category A PMAs do not achieve the goal of SGMA: to achieve the sustainable yield.[7] This is a facial violation of SGMA.

4. Water Budget

We appreciate the addition of further information on climate change and its

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[6] CSPA's comments on the 2022 amendments still generally apply on this point and are incorporated here by reference. (Nathaniel Kane, Letter to Paul Gosselin, DWR (September 30, 2022) at pp. 4-13, available at https://sgma.water.ca.gov/portal/gsp/comments/47 (accessed December 9, 2024).

[7] Notably, the Category B PMAs will not be implemented unless Category A projects do not fulfill their goals—which are themselves insufficient. (GSP at p. 6-2.)

incorporation into the sustainable yield calculations.

However, the water budgets still fail to include, as required, tabular information with annual inflows and outflows from the basin. (See SGMA Regs. § 354.18(a).) This omission makes evaluation of the water budgets difficult, essentially with reference to evaluating the chosen 2015 benchmark for the ISW SMC.

5. Public Trust

As stated in CSPA's previous letters, the ESJ GSP fails to consider depletions of navigable waters that harm public trust resources in violation of the public trust doctrine. This omission has not been addressed.

* * *

Again, CSPA appreciates that significant changes have been made to the GSP. It is still, however, not in compliance with SGMA. CSPA urges that, in light of the legal and factual issues identified above and in previous comments, the ESJGWA not approve the revisions to the GSP until these issues have been addressed.

Sincerely,

Nathaniel H. Kane

Nathaniel Kane
Executive Director
Environmental Law Foundation

Exhibit 2

ENVIRONMENTAL LAW FOUNDATION
1222 Preservation Park Way, Suite 200, Oakland, California 94612 · (510) 208-4555 · www.envirolaw.org
Nathaniel Kane, Executive Director · nkane@envirolaw.org

February 10, 2025

Via E-mail

Central Delta Water Agency Board of Directors
P.O. Box 1461
Stockton, CA 95201-1461
ngmplcs@pacbell.net

Re: Comment Regarding February 11, 2025, Central Delta Water Agency Board of Directors Meeting, Agenda Item No. 3, Public Hearing on Adoption of Plan Amendment

Dear Members of the Board of Directors:

Environmental Law Foundation (ELF) represents the California Sportfishing Protection Alliance (CSPA) and submits these comments on CSPA's behalf. We provide the following comments opposing the approval of the 2024 Eastern San Joaquin Groundwater Sustainability Plan Amendment (2024 ESJ GSP) that is scheduled for consideration at the meeting on February 11, 2025.

CSPA opposes approval of the 2024 ESJ GSP because as currently constituted, it is not in compliance with the Sustainable Groundwater Management Act (SGMA), Water Code section 17200 et seq.; as well as California Code of Regulations, title 23, section 350 et seq.; the public trust doctrine; and the waste and unreasonable use doctrine. CSPA submitted comments to the Eastern San Joaquin Groundwater Authority on December 10, 2024 opposing the approval of the 2024 GSP, which are attached hereto as Exhibit A and incorporated herein by reference.

The failures of the 2024 ESJ GSP to comply with SGMA are more fully explained in the attached comments of Gregory Kamman, which are attached hereto as Exhibit B and incorporated herein by reference. Summarized, Mr. Kamman's concerns include the 2024 GSP's failure to comply with the regulatory requirements for identifying and defining interconnected surface waters and the Plan's conclusion that depletions of interconnected surface waters under the minimum threshold scenario are not greater than those that occurred in 2015 is contradicted by evidence that those depletions are in fact greater.

These concerns represent failures to comply with SGMA's legal requirements. CSPA therefore urges that the Board of Directors vote against the approval of the 2024 ESJ GSP.

Sincerely,

Nathaniel Kane
Executive Director
Environmental Law Foundation

Attachments: A: CSPA's December 10, 2024 Comments
B: Comments of Gregory Kamman

Exhibit A

ENVIRONMENTAL **L**AW **F**OUNDATION

1222 Preservation Park Way, Suite 200, Oakland, California 94612 · (510) 208-4555 · www.envirolaw.org
Nathaniel Kane, Executive Director · nkane@envirolaw.org

December 10, 2024

Via E-mail

Fritz Buchman
Eastern San Joaquin Subbasin Plan Manager
Eastern San Joaquin Groundwater Authority
1810 E. Hazelton Avenue
P. O. Box 1810
Stockton, CA 95201
info@esjgroundwater.org

Re: CSPA Comments on Eastern San Joaquin GSP

Dear Mr. Buchman:

California Sportfishing Protection Alliance (CSPA) respectfully offers comments on the final Groundwater Sustainability Plan (GSP) proposed for adoption on December 11, 2024.

We appreciate the significant progress made on the GSP since 2020, and the new analysis and detail included in this most recent iteration. The additional analysis underlying the sustainable management criteria, in particular, aids the public in understanding how those criteria were selected.

That said, we continue to have concerns that the GSP contains violations of SGMA. A non-exhaustive discussion of those violations is included below.

1. Groundwater Dependent Ecosystems

The GSP continues to fail to adequately identify groundwater dependent ecosystems (GDEs). (Cal. Code Regs., tit. 23, §§ 351, def. (m), 354.16, subd. (g); see Wat. Code § 10727.4, subd. (*l*) [1].) The GSP continues to exclude areas "close to managed wetlands, irrigated agriculture, or perennial surface water bodies" from the definition of GDEs because they have access to "alternate water supplies" and thus "would not be dependent on groundwater." (GSP at p. 2-122.) However, this definition potentially excludes GDEs that may require groundwater for survival, despite the presence of other

[1] Further references to California Code of Regulations, title 23, section 350 et seq. are to the "SGMA Regulations." Further unspecified statutory references are to the Water Code.

water at certain times of year. Notably, the SGMA Regulations define GDEs as species or ecological communities that "depend" on groundwater; this definition does not require that the ecosystem be solely supported by groundwater—the question is whether the ecosystem would be healthy without groundwater. (SGMA Regs. § 351, def. (m).)

We note that the GSP now states a commitment to conduct field surveys of GDEs by 2030. While this commitment is welcome, its deadline comes 15 years after SGMA's enactment. And CSPA is concerned that without addressing the definition of GDEs, the field surveys may still miss GDE that SGMA requires to be identified.

2. Sustainable Management Criteria

We appreciate the additional support underlying the sustainable management criteria.

However, the definitions of undesirable results remain flawed. SGMA requires "Measurable objectives, as well as interim milestones in increments of five years, to achieve the sustainability goal in the basin within 20 years of the implementation of the plan." (§ 10727.2, subd. (b)(1).) The regulations add specific requirements to this, including a requirement for "minimum thresholds" that set a numeric value that, if exceeded, "may cause undesirable results." (SGMA Regulations § 354.28, subd. (a).) And if a GSP uses one minimum threshold as a proxy for another—as the ESJ GSP used groundwater levels as a proxy for ISW depletions—it must present "adequate evidence" for the reasonableness of such a proxy. (SGMA Regs. § 354.28, subd. (d).)

And a GSP must define "undesirable results" by specifying the criteria the GSP uses to determine whether an effect becomes "significant and unreasonable," by referencing the effects on beneficial uses and users and a "quantitative description of the combination of minimum threshold exceedances" that would cause such significant and unreasonable effects. (SGMA Regs. § 354.26, subd. (b).)

The GSP still relies, in part, on statements that no undesirable results have occurred in the ESJ basin for interconnected surface waters (ISWs). (E.g., GSP, App. 3-G at pp. 23-24.) However, letters from CSPA, California Department of Fish and Wildlife, and National Marine Fisheries Service have provided evidence that fishery habitat conditions in the basin's interconnected rivers have been poor, including high temperatures and reduced flows.[2] In order to satisfy SGMA's requirement to base GSPs on the best available information, the GSP must grapple with this evidence and not

[2] E.g., Morgan Kilgour, CDFW, Letter to Fritz Buchman, ESJGWA (October 30, 2024), att. B, C (2024 GSP, Appendices at pdf pages pp. 168-245.); Cathy Marcinkevage, National Marine Fisheries Service, Letter to Paul Gosselin, DWR (October 12, 2022), at p. 2, available at https://sgma.water.ca.gov /portal/gsp/comments/47 (accessed December 9, 2024).

simply dismiss it.

Nor can the GSP rely on the SGMA's provision that exempts it from avoiding undesirable results that "occurred before, and have not been corrected by, January 1, 2015." (§ 10727.2, subd. (b)(4).) By requiring two consecutive years of minimum threshold exceedances at 25 percent of wells, and by setting minimum thresholds below 2015 elevations, the GSP will potentially allow significantly worse conditions than were experienced prior to 2015. The analysis presented shows higher stream depletions as a percentage of flow under the minimum threshold scenario than in 2015 in the Stanislaus River. (App. 3-G at p. 48.) And the GSP acknowledges that the minimum threshold scenario has higher depletions by volume in that scenario for the Mokelumne, San Joaquin, and Stanislaus Rivers than in 2015.[3] (App. 3-G at p. 46.)

These facts do not square with the GSP's representation that undesirable results would not occur under the minimum threshold scenario. The Plan fails to analyze the actual in-stream effects of stream depletions, as required by the regulations, resting on promise that the plan will be protective of 2015 levels.[4] But the Plan's numbers show the potential for conditions that are worse than 2015.[5] This violates, inter alia, the requirement that the use of a proxy minimum threshold be supported by adequate

[3] Depletions were higher in the Calaveras River except in the October-December quarter as well. (App. 3-G at p. 46.)

[4] Additionally, the Plan references other potential undesirable results: maintaining "minimum instream flow requirements and agreements" and chinook salmon populations in 2015. (App. 3-G at pp. 23-24.) These parameters are not mentioned in the definition of undesirable results. (GSP at p. 3-31.) Further, the GSP does not mention that maintaining instream flow requirements may come at significant costs to surface water management, as dam operators must release additional water to compensate for stream losses. And a single year of Chinook escapement is not evidence that depletions were or were not harmful: populations crashed in 2020 and 2021. (See CDFW, California Central Valley Chinook Escapement Database Report (May 20, 2024), at pp 27-28, available at https://nrm.dfg.ca.gov/FileHandler.ashx ?DocumentID=84381 (accessed December 10, 2024).)

[5] We are also concerned that the plan's emphasis on maintaining "connectivity" is misplaced. While maintaining sufficiently high groundwater levels is important for both maintaining "connectivity" and for avoiding undesirable results, the GSP at times conflates the two concepts. Further, the GSP fails to support the definition of a stream being "connected." Per DWR guidance, a stream may be connected even if groundwater levels fall below the streambed, so long as a saturated zone exists at "any point." (SGMA Regs. § 351, def. (o); DWR, Depletions of ISW: An Introduction (2024), at p. 5, available at https://data.cnra.ca.gov/dataset/68e0d8b6-a207-4b30-a16b-3daeb659faea/resource/218e3361-c142-400f-a97f-5dfa79cd4997/download/depletionsofisw_paper1_intro_draft.pdf (accessed December 9, 2024). Under DWR's definition, a stream may be connected if it there is a saturated zone at any point. But the GSP excludes significant reaches of streams, especially the Calaveras River, Dry Creek, and Mormon Slough, that appear to meet this definition.

evidence. (SGMA Regs. § 354.28, subd. (d).) And it violates the requirement that a plan spell out the effects of undesirable results on beneficial uses and users.[6] (SGMA Regs. § 354.26(b).)

In addition, many of the proposed new monitoring wells are not near interconnected streams. And few, if any, are near stream gages. It is unclear how the GSAs plan to use these wells to generate information on ISW depletions given the lack of paired wells and stream gages.

The GSP also continues to fail to monitor or address the effects of groundwater depletions on surface water temperatures, in violation of Water Code section 10727.2, subds. (d)(2) and (f).

3. Projects and Management Actions

The Final GSP does not contain adequate projects and management actions (PMAs) to fulfill its obligations to plan for sustainability by 2040.

SGMA requires a basin to achieve the "sustainability goal" within 20 years. (§ 10727.2, subd. (b).) The "sustainability goal" is defined as requiring the basin to operate within its "sustainable yield." (§ 10721, def. (u).)

The GSP identifies a shortfall of 95,000 AF/y between its expected pumping and its sustainable yield in the non-climate change scenario, and 166,000 AF/y in the climate change scenario. (GSP at pp. 2-195, 2-200.) But the Category A PMAs sum up to only 90,200 AF/y of reductions and/or recharge. (GSP at pp. 2-202 to 2-203.)

As a result, the GSP admits that "there is still additional work (e.g., projects and/or management actions) that may need to be done to maintain subbasin sustainability." (GSP at p. 2-212.) In other words, the planned category A PMAs do not achieve the goal of SGMA: to achieve the sustainable yield.[7] This is a facial violation of SGMA.

4. Water Budget

We appreciate the addition of further information on climate change and its

[6] CSPA's comments on the 2022 amendments still generally apply on this point and are incorporated here by reference. (Nathaniel Kane, Letter to Paul Gosselin, DWR (September 30, 2022) at pp. 4-13, available at https://sgma.water.ca.gov/portal/gsp/comments/47 (accessed December 9, 2024).

[7] Notably, the Category B PMAs will not be implemented unless Category A projects do not fulfill their goals—which are themselves insufficient. (GSP at p. 6-2.)

incorporation into the sustainable yield calculations.

However, the water budgets still fail to include, as required, tabular information with annual inflows and outflows from the basin. (See SGMA Regs. § 354.18(a).) This omission makes evaluation of the water budgets difficult, essentially with reference to evaluating the chosen 2015 benchmark for the ISW SMC.

5. Public Trust

As stated in CSPA's previous letters, the ESJ GSP fails to consider depletions of navigable waters that harm public trust resources in violation of the public trust doctrine. This omission has not been addressed.

* * *

Again, CSPA appreciates that significant changes have been made to the GSP. It is still, however, not in compliance with SGMA. CSPA urges that, in light of the legal and factual issues identified above and in previous comments, the ESJGWA not approve the revisions to the GSP until these issues have been addressed.

Sincerely,

Nathaniel Kane
Executive Director
Environmental Law Foundation

Exhibit B

January 13, 2025
Attorney-Client Work Product

Mr. Nathaniel Kane, Executive Director
Environmental Law Foundation
1222 Preservation Park Way, Suite 200
Oakland, CA 94612

Subject: Review of 2024 GSP Plan Amendment for the Eastern San Joaquin Groundwater Subbasin October 2024

Dear Mr. Kane:

I am a hydrologist with over thirty years of technical and consulting experience in the fields of geology, hydrology, and hydrogeology. I have been providing professional hydrology and geomorphology services throughout California since 1989 and routinely manage and lead projects in the areas of surface- and groundwater hydrology, water supply, water quality assessments, water resources management, and geomorphology. A copy of my resume is attached.

I have reviewed the 2024 Groundwater Sustainability Plan Amendment for the Eastern San Joaquin Groundwater Subbasin, including the revisions proposed for adoption in late 2024 (GSP Amendment). I have the following comments on the GSP Amendment.

The GSP Amendment presents a new approach to identifying which streams in the basin constitute interconnected surface waters (ISWs):[1] "Connected streams were defined as Layer 1 groundwater levels at or above the streambed elevation at least 75 percent of the time."[2] (GSP Amendment at p 2-156.)

[1] The SGMA Regulations define ISW as "surface water that is hydraulically connected at any point by a continuous saturated zone to the underlying aquifer and the overlying surface water is not completely depleted." (§ 351, def. (*o*).)
[2] Appendix 3-G also states that ISWs are where "the water table and surface water features intersect at the same elevations and locations;" this statement improperly excludes situations where the water table is below the elevation of the streambed, but a saturated zone connects them. (App. 3-G at p. 3.)

Under this new definition, the GSP includes the Mokelumne River, Stanislaus River, and lower San Joaquin River as "connected," while Dry Creek, Calaveras River, and Mormon Slough are "disconnected." This definition is potentially faulty: the definition of ISW refers to "water that is hydraulically connected at any point." (SGMA Regs. § 351, def. (o).) Connectivity requires a saturated zone between stream and aquifer.[3] Thus a stream may be ISW even though the water table is below the elevation of the riverbed, if this saturated zone exists.[4] As a result, the GSP Amendment's definition of ISWs potentially excludes streams and stream reaches that should be considered ISWs under the regulatory definition. This failure is significant considering the GSP Amendment's emphasis on "keeping connected reaches connected" when arguing that undesirable results have not been experienced with respect to ISWs in the basin: reaches that should be considered "connected" are excluded from this conclusion, throwing the conclusion in doubt.

In addition, Figures 28 and 31 both indicate that PCBL CC MT results in increased depletions over those that occurred in 2015. (Appendix 3-G at pp. 41, 43.) These additional depletions undermine the GSP Amendment's conclusion that the minimum thresholds are protective of depletion levels occurring in 2015.

Please feel free to contact me with any questions regarding the material and conclusions contained in this letter.

Sincerely,

Gregory R. Kamman

Greg Kamman, PG, CHG
Senior Ecohydrologist

REGISTERED GEOLOGIST
GREGORY R. KAMMAN
NO. 360
CERTIFIED HYDROGEOLOGIST
12/31/26
STATE OF CALIFORNIA

[3] See DWR, Depletions of ISW: An Introduction (2024), p. 5, available at https://data.cnra.ca.gov/dataset/68e0d8b6-a207-4b30-a16b-3daeb659faea/resource/218e3361-c142-400f-a97f-5dfa79cd4997/download/depletionsofisw_paper1_intro_draft.pdf.

[4] See the graphic on the right in Figure 2-104 on page 2-158 of the GSP, which illustrates a connected losing stream where groundwater levels are lower than the stream stage.

Greg Kamman, PG, CHG
Senior Ecohydrologist III

Education

MS, 1989, Geology, Sedimentology and Hydrogeology, Miami University, Oxford, OH

BA, 1985, Geology, Miami University, Oxford, OH

Professional Registration

1993, Professional Geologist, California, #5737

1995, Certified Hydrogeologist, California, #360

Professional Experience

cbec, inc., eco-engineering, West Sacramento, CA, Senior Ecohydrologist III, 2020–present

Kamman Hydrology & Engineering, Inc., San Rafael, CA, Principal Hydrologist/Vice President, 1997–2020

Balance Hydrologics, Inc., Berkeley, CA , Sr. Hydrologist/ Vice President, 1994-1997

Geomatrix Consultants, Inc., San Francisco, CA, Project Geologist/Hydrogeologist, 1991-1994

Environ International Corporation, Princeton, NJ, Sr. Staff Geologist/Hydrogeologist, 1989-1991

Miami University, Oxford, OH, Field Camp Instructor and Research Assistant, 1986-1989

Greg Kamman is a professional geologist and certified hydrogeologist with over 30 years of technical and consulting experience in the fields of geology, hydrology, and geomorphology. Mr. Kamman's areas of expertise include characterizing and quantifying changes in hydrologic conditions and the geomorphic response to land use changes in watersheds. He specializes in directing and managing projects in the areas of geomorphology, evaluating the causes of stream channel instability, surface and groundwater hydrology, stream and wetland natural habitat restoration planning and design, water supply and water quality assessments, and water resources management. Mr. Kamman has worked extensively throughout California's coastal rural and urban watersheds and on multiple projects in Oregon and Hawaii.

Mr. Kamman's experience and expertise includes evaluating surface and groundwater resources and their interaction, stream and coastal wetland habitat restoration assessments and design, characterizing and modeling basin-scale hydrologic and geologic processes, assessing watershed hydraulic and geomorphic responses to land-use change, and designing and conducting field investigations characterizing surface and subsurface hydrologic and water quality conditions. Greg commonly works on projects that revolve around sensitive fishery, wetland, wildlife, and/or riparian habitat enhancement within urban and rural environments. Mr. Kamman performs many of these projects in response to local, state (CEQA) and federal statutes (NEPA, ESA), and other regulatory frameworks. Mr. Kamman frequently applies this knowledge to the review and expert testimony on state and federal water operation plan EIR/EIS reports, Groundwater Sustainability Plans, Habitat Conservation Plans, and biological assessments.

Mr. Kamman is accustomed to working multi-objective projects as part of an interdisciplinary team including biologists, engineers, planners, architects, lawyers, and resource and regulatory agency staff. Mr. Kamman is a prime or contributing author to over 360 technical publications and reports in the discipline of hydrology, the majority pertaining to the protection and enhancement of aquatic resources. Mr. Kamman has taught the following courses: hydrology and hydraulic modeling through U.S. Davis Extension (2020–present); stream restoration through U.C. Berkeley Extension (2001–2008); and wetland hydrology through San Francisco State University's Romberg Tiburon Center (2007 and 2012–2014). He has devoted his career to the protection, enhancement and sustainable management of water resources and associated ecosystems.

SELECTED EXPERIENCE

Fluvial Projects

College Lake Hydrologic Monitoring Project, Santa Cruz County, CA
Pajaro Valley Water Management Agency, 2020–present

This project supports the integrated management plan generated for the previous College Lake Improvement and Watershed Management Project, with work performed on behalf of Pajaro Valley Water Management Agency, and working closely with Carollo design engineers. cbec installed, and continues to monitor and maintain, gages at multiple sites upstream and downstream of College Lake to gather water levels and stream flow. Scour analyses were conducted at the proposed diversion/fish-passage weir on Salsipuedes Creek, and two pipeline crossings on Pinto Creek. These analyses necessitated the following tasks: completing topographic and bathymetric surveys at the crossings; collecting sediment samples for laboratory grain-size analysis; updating and running an existing HEC-RAS hydraulic model for variety of design storms; and estimating long-term and contraction scour estimates at each site pursuant to FHWA HEC-18 methods and criteria. Based on the results of this analysis, cbec was able to recommended bed and bank rock size and thickness for channel stability design. Mr. Kamman managed this effort and provided scour calculations technical oversight.

2544 INDUSTRIAL BLVD, WEST SACRAMENTO, CA 95691 | 916.231.6052 | CBECOENG.COM

SELECTED EXPERIENCE

Creek Crossing Project, Sacramento County, CA
Sacramento Area Sanitation District, 2021–present

This project builds off the findings of cbec's previous Sewer Crossing Bank Stabilization and Toe Stabilization Design project for the SASD. This evaluation is part of a multi-specialty assessment to ascertain the existing stability and integrity of select stream sewer crossings on numerous creeks in the region. For this phase, cbec teamed with Water Systems Consulting to conduct a geomorphic reconnaissance at 12 stream sewer crossings in Sacramento County. All work performed was in accordance with the project specifications set forth by the United States Army Corps of Engineers, Sacramento County Department of Water Resources, and the State Water Resources Control Board. As part of the multi-specialty team, cbec is completing: geomorphic and fluvial audits at each site; 1-D and 2-D hydrodynamic modeling and scour analyses; and developing creek and bank stabilization design drawings and cost estimates for each of the sites. Deliverables consist of technical memos that provide relevant design assumptions, criteria, and analysis used to support the design. As Project Manager, Mr. Kamman is responsible for coordinating field efforts, overseeing model development, assisting the technical team with alternative development, presentation of findings to SASD staff, internal technical review, client interaction, and project management. Mr. Kamman will also provide technical input in support of project environmental compliance and permitting.

Muir Woods National Monument Bank Stabilization Plan for Conlon Creek, Marin County, CA
Golden Gate National Parks Conservancy (GGNPC), 2018–present

Mr. Kamman developed a grading and drainage plan for the Conlon Avenue Parking Lot, located adjacent to Redwood Creek and sensitive Coho salmon habitat. More recently, he has assisted GGNPC and the NPS in assessing the planning and design for creek bank stabilization and ecological enhancement at a failed culvert on a tributary channel at the project site. This work includes constructing a HEC-RAS model to evaluate: culvert removal and channel design; fish passage; and water quality impacts. Work is currently in development of 100% engineering design.

Hydrology and Hydraulic Assessments for Design of Butte Sink Mitigation Bank Project, Colusa County, CA
WRA, Inc., 2017–2018

Mr. Kamman was retained to provide hydrology and hydraulic modeling support in the development of design and Draft Prospectus for the Butte Sink Mitigation Bank (Bank). This work entailed developing the necessary hydrology information, hydraulic model and documentation to support further design, environmental compliance and agency approvals/permitting of the Bank. The main objective of work was to develop a design that provides the necessary ecological conditions and functions for successful establishment and operation of the Bank.

Lagunitas Creek Salmonid Winter Habitat Enhancement Project, Marin County, CA
Marin Municipal Water District, 2013–2018

Mr. Kamman designed and led a study to evaluate opportunities to enhance winter habitat for coho and other salmonids in Lagunitas Creek and its largest tributary - Olema Creek. This work was done as a two–phase assessment and design effort. The first phase (completed in 2013) included a winter habitat assessment to evaluate existing juvenile salmonid winter habitat in Lagunitas Creek and lower Olema Creek. The results of this assessment were used to prioritize winter habitat needs, and identify opportunities for winter habitat enhancement to increase the winter carrying capacity of coho salmon and steelhead. The second phase (completed in 2017) consisted of a designing winter habitat enhancements. These enhancements focused on restoring floodplain and in-channel habitat structures. Winter habitat enhancement work also needed to consider potential impacts to or benefits for California freshwater shrimp (Syncaris pacifica), a federally endangered species.

This work included field reconnaissance, topographic surveys and the preparation of final design drawings at nine different project sites. An overall self-maintaining design approach was developed to guide individual project plan, with minimal earthwork and disturbance to existing riparian and wetland habitat. Self-sustained, natural evolution of a multi-thread channel within a more active floodplain is a desired outcome of project actions. Design elements and structures are intended to enhance or restore natural hydrologic processes to promote geomorphic evolution of more active high flow (side) channels and floodplain. Design elements include construction of 24 individual log structures.

Lower Miller Creek Management and Channel Maintenance, Marin County, CA
Las Gallinas Valley Sanitary District, 2013–2015

Mr. Kamman was commissioned to formulate and implement a plan for sediment removal and improved flood flow conveyance in the Lower Miller Creek channel. The need for improved flood and sediment conveyance was driven by progressive accumulation of course sediment in the project reach that reduced flow conveyance along Miller Creek and threatened to bury District outfalls. Miller Creek supports a population of federally listed Steelhead, and adjacent wetland areas potentially support other state and federally listed special status species. Permit conditions and cost efficiency required designing a project that minimized the extent and frequency of channel excavation/maintenance that could adversely impact Steelhead, listed wetland species, and wetland and riparian habitat. Mr. Kamman's work on this project included: developing a suite of potential project alternatives and identification of a preferred approach, CEQA compliance (IS/MND) and permitting, managing development of engineered drawings, and assisting in bid document preparation.

Vineyard Creek Channel Enhancement Project, Marin County, CA
Marin County Department of Public Works, 2007–2013

Mr. Kamman managed the preparation of designs and specifications for a flood conveyance and fish habitat and passage improvement project on Vineyard Creek. Creek corridor modifications included replacing the box culvert at the Center Road crossing with a free span bridge or bottomless arch culvert (civil and structural design by others), providing modifications to the bed and bank to eliminate erosion risks to adjacent properties and improve water quality, promoting active channel conveyance of both water and sediment, and providing improved low and highflow fish passage, improved low flow channel form and enhanced in-stream habitat, repairing eroding banks, and expanding/enhancing adjacent channel floodplains. The riparian corridor was replanted to provide a low-density native understory, "soft" bank erosion protection, and increased tree canopy along the tops of banks. Mr. Kamman prepared the JARPA for the project and conducted permit compliance and negotiations with all participating resource agencies. Designs and permitting also address the known presence of Native American artifacts. This work was contracted under an expedited design schedule and phased construction was initiated the summer of 2008 and continued the summer of 2009.

Miller Creek Sanitary Sewer Easement Restoration, Marin County, CA
Las Gallinas Valley Sanitary District, 2010

Working on behalf of the District, Mr. Kamman completed field surveys and technical

SELECTED EXPERIENCE

feasibility studies to develop engineering plans and specifications for a stream bank restoration project to protect an exposed sanitary sewer pipeline, stabilize incised banks, and promote an ecologically healthy stream corridor along an approximately 50 linear foot damaged reach of Miller Creek. The design includes backfill and materials to accommodate construction of a vegetated stabilized slope. The eroded bank repair included design of a 1:1 Envirolok vegetated slope with geogrid reinforced soil lifts extending eight to ten feet back from the slope face. One-quarter-ton rock will be placed in front of the Envirolok wall at the toe of the reconstructed bank to provide added scour protection. In order to perform the work, the project site will be dewatered. An existing felled tree perpendicular to the creek flow will be relocated and secured into the right creek bank with root wad remaining in active channel. All work on the bank and within the creek bed must be completed pursuant to project permits due to presence of steelhead trout.

Bear Valley Creek Watershed and Fish Passage Enhancement Project, Marin County, CA
The National Park Service and Point Reyes National Seashore Association, 2005–2013

Working on behalf of the NPS and PRNSA, Mr. Kamman completed a watershed assessment and fish passage inventory and assessment for Bear Valley Creek. Work included a geomorphic watershed assessment and completing field surveys and hydraulic modeling (including flood simulations) of ten road/trail crossings to identify and prioritize creek and watershed restoration efforts while considering and addressing current flooding problems at Park Headquarters – a major constraint to channel restoration efforts that would likely exacerbate flooding. Mr. Kamman also completed a suite of conceptual restoration designs (Phase 1) including: the replacement of two county road culvert crossings with bridges; channel creation through a ponded freshwater marsh (former tidal marsh); and replacement of 4 trail culverts with prefabricated bridges; and associated in-channel grade control and fishway structures. Engineered drawings and specifications were also developed for some of these sites to assist PORE with emergency culvert replacements after damages sustained during the New Year's Eve flood of 2005. Mr. Kamman also directed geotechnical, structural and civil design of project components.

Two projects were completed in 2006 on emergency repair basis resulting from flood damages suffered during the New Year's Eve storm of 2005. The two most recent projects were constructed in 2013, consisting of a large bank repair and adjacent to main access road/trail and culvert replacement further upstream on same road. The bank repair utilized bioengineering approaches including engineered log revetments and log diversion vanes.

California Coastal Trail Planning and Design at Fitzgerald Marine Reserve, San Mateo County, CA
WRA, Inc., 2008–2009

Mr. Kamman provided hydrology and hydraulics expertise in the planning and design for the 0.25-mile segment of the California Coastal Trail at the Fitzgerald Marine Reserve. The project was overseen by the San Mateo County Parks Department. This segment of Coastal Trail provides improved access from the trailhead to the beach as well as a free span bridge over Vicente Creek. Greg completed the field surveys and hydraulic modeling to assist an interdisciplinary team to design the project. Understanding the hydrology of Vicente Creek and quantifying flood conditions was critical to successfully designing and constructing the free span bridge. He also evaluated how creek hydrology and coastal wave processes interact at the beach outfall in order to identify opportunities and constraints to beach access improvements (which will include crossing the creek on the beach) during both wet and dry season conditions in order to evaluate both permanent and seasonal crossing design alternatives.

Hydrologic Assessment and Conceptual Design for Conservation and Wetland Mitigation Bank Project, Merced County, CA
WRA, Inc., 2009

Working as a subcontractor to WRA, Inc., Mr. Kamman provided hydrology, geomorphology and engineering support for the planning and design for a Conservation and Wetland Mitigation Bank on the San Joaquin River, in the Central Valley near Newman, California. The property is currently owned by the Borba Dairy Farms. The primary objective of the study was to characterize the hydrologic and geomorphic controls on the spatial distribution of habitat types. To meet this objective, Mr. Kamman's assessment included: (1) collecting and synthesizing hydrologic data to characterize existing and historic streamflow, geomorphic and shallow groundwater conditions; (2) filling a data gap by collecting topographic data of hydrologic features; (3) developing a hydraulic model capable of predicting water surface profiles for a range of design flows; and (4) quantifying the linkage between surface water/groundwater conditions and specific vegetation communities and habitat types through implementation of reference site assessments. Mr. Kamman also provided conceptual design and permitting support in evaluating habitat enhancement and creation opportunities on the site.

Redwood Creek Floodplain and Salmonid Habitat Restoration, Marin County, CA
Golden Gate National Recreation Area and Golden Gate Parks Conservancy, 2005–2008

Mr. Kamman lead development of a preferred project alternative and final project design drawings and specifications for a floodplain and creek restoration and riparian corridor enhancement effort on lower Redwood Creek above Muir Beach at the Banducci Site. A primary objectives of the project was to: improve salmonid passage/rearing/refugia habitat; riparian corridor development to host breeding by migratory song birds; and wetland/pond construction to host endangered red-legged frog. The preferred design includes: excavation along the creek banks to create an incised flood terrace; engineered log deflector vanes; removing and setting back (constructing) approximately 400-feet of levee; creating in- and off-channel salmonid rearing and refugia habitat; reconnecting tributary channels to the floodplain; and creating California red-legged frog breeding ponds. Designs were completed in 2007 and the project constructed in the summer of 2007.

Considerable hydraulic modeling was completed to evaluate and develop means to help reduce chronic flood hazards to surrounding roadways and properties. Alternatives that included set-back levees and road raising were developed and evaluated. Detailed and careful hydraulic (force-balance) analyses and computations were completed as part of engineered log deflector designs. These were unique and custom designed structures, building on past project efforts and in consultation with other design professionals.

This project demonstrates Mr. Kamman's ability to work closely with the project stakeholders to develop a preferred restoration alternative in a focused, cost-effective and expedited fashion. This was achieved through close coordination with the NPS and the effective and timely use of design charrette-type meetings to reach consensus with participating stakeholders. Conceptual through full PS&E were completed on-time and on-budget in 2007 and was project constructed in the fall of 2007. Mr. Kamman worked closely with NPS staff to "field fit" the project, by modifying grading plans to protect existing riparian habitat. Mr. Kamman also provided construction management and oversight to floodplain grading and installation of engineered log structures. Based on field observations, the project is performing and functioning as desired.

SELECTED EXPERIENCE

Pilarcitos Creek Bank Stabilization Project, San Mateo County, CA
TRC Essex, 2006–2007

Mr. Kamman directed field surveys and technical modeling analyses to develop restoration design alternatives for a Bank Stabilization Project on Pilarcitos Creek in unincorporated San Mateo County, California. This work included hydrology and hydraulic design and preparation of plan sheets and technical specifications as well as a revegetation plan. Due to the importance of protecting an existing gas mainline, the design package will be completed in close coordination with TRC Essex geotechnical staff and revegetation subcontractor and PG&E civil staff. Design feasibility analyses focused on developing hydraulic design criteria for the project, including: estimates of design flood flow magnitudes (2-, 5-, 10-, 25-, 50- and 100-year floods); water surface elevation estimates for a suite of design floods; associated average channel velocities and shear stresses; and estimates for riprap sizing for channel bank toe protection. Plan sheets, technical specifications and cost estimates were provided for review and approval.

Floodplain Management Projects

Hydrologic and Hydraulic Evaluation for Trinity County Bridge Replacement, Trinity County, CA
Trinity County Planning Department, 2002

Mr. Kamman completed technical peer review of peak flow estimates and hydraulic design parameters associated with the replacement of 4 bridges across the upper Trinity River in Trinity County, California. A primary study component was accurately predicting the magnitude and frequency of flood releases from Trinity Dam. Numerous flood frequency analytical approaches were evaluated and used throughout this study.

Flood Reduction, Mitigation Planning, and Design on Yreka Creek, Siskiyou County, CA
City of Yreka as subcontractor to WRA, Inc., 2008–2010

Mr. Kamman completed a series of field and hydraulic model investigations for restoration planning and design along Yreka Creek to reduce flood hazards and potential damage to the City's water treatment plant and disposal field infrastructure. This work also addresses and satisfies dike repair mitigation conditions stipulated by state resource agencies. While achieving these goals, Mr. Kamman tailored analyses and study objectives to assist the City in: enhancing the ecological floodplain restoration along Yreka Creek; providing opportunities for expanded public access and trail planning consistent with the goals of the Yreka Creek Greenway Project; and improving the water quality of Yreka Creek.

Key elements of this work included: review and synthesize existing information; identify and analyze the feasibility for three conceptual alternatives; and conceptual design and report preparation. Funding for implementation of restoration work over such a large area was a significant concern to the City. Therefore, designs identify and define phasing in a fashion that gives the City flexibility in implementation.

West Creek Drainage Improvement Assessment, Marin County, CA
Marin County Flood Control, 2006–2008

Mr. Kamman prepared a study focused on characterizing existing flood conditions and developing and evaluating flood reduction measures along West Creek in Tiburon. The work was completed through the implementation of hydrologic and hydraulic feasibility and design assessments. The conceptual design and analysis of potential flood reduction strategies (alternatives) was completed through the development of a HEC-RAS hydraulic model that simulates historic, existing and proposed project flood conditions. It was intended that the conceptual design developed under this scope of work would be of sufficient detail and quality to initiate project permitting and the environmental compliance process and documentation. Opportunities for riparian corridor and aquatic habitat enhancement were also considered and integrated into the conceptual design. Mr. Kamman also developed and assessed six alternative flood hazard reduction measures. The hydraulic model results for each alternative were compared against baseline conditions in order to evaluate their ability to alleviate flood hazards.

Gallinas Creek Restoration Feasibility Assessment, Marin County, CA
San Francisco Bay Institute, 2003–2005

Mr. Kamman completed a feasibility assessment for restoration of Gallinas Creek in northern San Rafael. Restoration will require removal of a concrete trapezoidal flood control channel and replacement with an earthen channel and floodplain in a "green belt" type corridor. Work included the collection of field data and development of a HEC-RAS hydraulic model to evaluate and compare existing and proposed project conditions. Designs must continue to provide adequate flood protection to the surrounding community. The study also includes and evaluation of existing habitat values, potential habitat values, and restoration opportunities and constraints.

Restoration of Lower Redwood Creek Floodway and Estuary, Humboldt County, CA
California State Coastal Conservancy and Humboldt County DPW, 2002–2003

Mr. Kamman provided technical review for the development of a hydraulic model to evaluate river and estuary restoration alternatives along the lower portions of Redwood Creek between Orrick (Highway 1) and the Pacific Ocean. This work was completed to evaluate the feasibility for creek/estuary restoration alternatives developed by the County, and effects on flood hazards along this flood–prone reach.

In order to better address and evaluate the current flood hazards along the entire floodway and identify potential flood hazard reduction measures, Mr. Kamman was retained to update HEC–2 models previously prepared by the Army Corps, and to evaluate the impacts of vegetation encroachment (increased roughness) and sediment deposition on floodway conveyance. Mr. Kamman expanded the Corps hydraulic model with newly completed channel surveys and channel roughness observations. The impetus for this work was to assist the County in identifying mutually beneficial strategies for ecosystem restoration and flood hazard reduction. Technical work was completed under close coordination and communication with county engineers. Study results and findings were presented at public meetings of local area landowners and stakeholders.

Tembladero Slough Small Community Flood Assessment, Monterey County, CA
Phillip Williams & Associates, Ltd., 1997

Mr. Kamman completed a flood information study of Tembladero Slough near Castroville on behalf of the San Francisco District Corps of Engineers. The purpose of this work was to identify and document local flood risks existing in the community and propose potential floodplain management solutions as part of the Corps 1995/1997-flood recovery process. Work centered on conducting a field reconnaissance, reviewing available historical data, and conducting discussions/interviews with local landowners and agency personnel.

SELECTED EXPERIENCE

Watershed Assessments

Lower Sutter Bypass Anadromous Fish Habitat Restoration Planning, Sutter County, CA
River Partners and California Department of Fish and Wildlife, 2020–present

cbec is leading a multi-disciplined technical team in the development of a Management Plan intended to increase the ecological functions of the Lower Sutter Bypass to benefit anadromous fishes and other species of conservation concern, while maintaining agricultural viability and flood conveyance. The cbec team consists of professionals with extensive expertise in fisheries biology and ecology, hydrology and hydraulics, agriculture economics, outreach, and the Structured Decision-Making (SDM) process. The project encompasses 10.5-miles of agricultural and conservation lands within the Lower Sutter Bypass immediately north of the confluence of the Sacramento and Feather Rivers. The Management Plan was developed in coordination with over a dozen local and area-wide management plans and ongoing initiatives that affect the potential to improve habitat conditions in the Lower Sutter Bypass. Development of the Management Plan included synthesizing existing information and utilizing existing hydraulic modeling tools and data to develop and evaluate project alternatives. In addition to hydraulic and flood modeling, the cbec team developed site-specific models to assess ecological habitat benefits, anadromous fish habitat, and agricultural production and economics. Development of project alternatives and the Management Plan progressed through an organized consensus based SDM process via regular Working Group meetings and stakeholder workshops. As project manager, Mr. Kamman is responsible for client and technical team communications, administrative management, and leading Management Plan reporting.

Evaluation of Project Impacts on Oregon Spotted Frog, Klamath County, OR
Oregon Water Watch and Earthjustice, 2016–2019

Mr. Kamman designed a suite of hydrologic, hydraulic and geomorphic studies to evaluate proposed change operations of the Crane Prairie, Wickiup and Crescent Lake dams and reservoirs as related to harm to Oregon spotted frogs. Work began with analyzing impacts associated with proposed water delivery operations and developing a proposed alternative prioritizing protection and enhancement of frog habitat. This work followed with a technical review and critique of the USFWS's Biological Assessment. Work included preparation of four declarations for the clients.

Tennessee Hollow Creek Riparian Corridor Restoration, San Francisco County, CA
Presidio Trust, 2001–present

Mr. Kamman has been leading and assisting the Trust and Golden Gate National Recreation Area (GGNRA) in the planning and design on over a dozen multi-objective riparian corridor restoration and watershed management projects in the Tennessee Hollow/Crissy Marsh watershed since 2001. Specific project objectives include: daylighting creeks; riparian corridor restoration; expanding Crissy Marsh; enhancing recreation, education, archeological, and cultural resource opportunities; improving water quality discharges to San Francisco Bay; and remediation of numerous landfills within the watershed. Typical initial phases of work focus on characterizing surface and groundwater conditions within each project area and identifying opportunities and constraints to restoration of natural wetlands and creek/riparian corridors. Notable challenges of this work include restoring heavily disturbed natural resources in an urban setting while integrating designs with recreation, archeology/cultural resources, education and remediation programs. Mr. Kamman has acted as lead hydrologist and designer on eight separate reaches in the 271-acre Tennessee Hollow Creek watershed and several other projects within and in the vicinity of Mountain Lake.

All task authorizations under these on-call and individual design contracts and included hydrology and water quality assessments and conceptual restoration planning and design. The project areas overlapped both the Presidio Trust and NPS-GGNRA management areas. Preliminary construction cost estimates for project alternatives within the Tennessee Hollow watershed range from $10- to $20- million. Several restoration projects are also tied to providing mitigation for the current San Francisco Airport expansion and Doyle Drive Seismic Improvement projects. Several projects have been constructed since 2012 (Thompson's Reach, El Polin Loop), two projects (East Arm Mtn. Lake and YMCA Reach) were constructed in 2014, and MacArthur Meadow restoration in 2016.

This work illustrates the Mr. Kamman's ability to complete a broad variety of hydrologic analyses, including: multiple years of rigorous and thorough surface water and groundwater hydrologic and water quality monitoring throughout the entire watershed to characterize and quantify existing hydrologic conditions; development of a detailed watershed-scale water budget for existing and proposed land-used conditions (capturing existing and proposed vegetation cover types and land use activities) to calculate groundwater recharge estimates input into the numerical watershed model; preparation of EA sections on water resources and water quality (NEPA compliance) regarding Environmental Conditions, proposed Impacts, and Proposed Mitigations associated with the project; preparing detailed alternative plans; and coordination and preparation of engineered plans/specifications for construction. All work was completed on budget and in a timely fashion.

Mountain Lake Water Budget, San Francisco County, CA
Presidio Trust, 2012–2017

Mr. Kamman was retained to develop a water balance model for Mountain Lake in the Presidio of San Francisco. Through development of a water balance model, the Trust seeks to understand: the major source(s) of inflow to both Mountain Lake; anticipated seasonal (monthly) changes in water level relative to various outflow assumptions; and the relationship of surface and groundwater interaction. This information gained from this study will be used to: 1) better understand and manage lake levels for ecological habitats; 2) identify flood storage capacity of Mountain Lake and fluctuations in lake level under various storm conditions; 3) better understand and maintain wetland habitat in the east arm; and 4) complete mass balance calculations to assess water quality in and feeding into the lake.

To implement this study, Mr. Kamman developed a water budget model to identify and quantify the primary water inputs and outputs to the lake and determine major controls over water storage. Primary water budget variables analyzed includes: precipitation; evaporation/evapotranspiration; groundwater exchange; and surface runoff. This study also included a long-term field investigation completed between 2012 and 2016 to: identify all point source inputs such as culverts and drainage outlets; identify diffused surface runoff inputs from surrounding lands, including a golf course; better characterizing the function and performance of the primary lake outfall structure; monitor groundwater levels surrounding the lake; and continuously monitor lake water level and storage over a mult9i-year period. These data were used to quantify water budget variables used to build the water budget model. Precipitation and barometric pressure data used in the model was provided by the Trust maintained weather station. Model daily evaporation estimates came from a variety of local area gauges maintained by state agencies.

SELECTED EXPERIENCE

The water budget model developed for this study is successful in accurately simulating historic water level conditions. The model using a daily time-step appears more accurate than model using a weekly time-step, but both provide reasonable agreement with observed conditions. The model is highly sensitive to groundwater exchange with the lake. The water budget is also a proven useful tool for the design and analysis of improvements to the lake outfall structure and establishing flood storage needs to protect the adjacent highway.

Cordilleras Creek Hydrologic Assessment, San Mateo County, CA
City of Redwood City, 2002–2003

Mr. Kamman assisted the Cordilleras Creek Watershed Coordinator in planning, seeking funding, and implementing a hydrologic and biologic assessment of the Cordilleras Creek watershed. Work completed included completing a full creek reconnaissance and channel stability assessment, preparation of a watershed assessment work plan, presentations at public meetings, and study/review of flooding issues in the watershed. Challenges faced in this predominantly privately owned watershed include removal of numerous fish passage barriers and educating/coordinating property owners.

Capay Valley Hydrologic and Geomorphic Watershed Assessment, Yolo County, CA
Yolo County RCD, 2008–2010

Mr. Kamman designed and supervised a hydrologic, geomorphic watershed assessment, and conceptual restoration design for the Capay Valley segment of Lower Cache Creek . Funding for the project was from a CALFED Watershed Program grant. The Capay Valley reach of Cache Creek experiences considerable stream bank erosion, which contributes to downstream sedimentation. The channel instability also threatens adjacent homes and can negatively impact the riparian habitat along the creek that functions as an important wildlife corridor from the Western Coastal Range to the Yolo Bypass. Additionally, a significant proportion of methylmercury transported into the Bay-Delta originates from the Cache Creek watershed. The main goal of this proposed study is to address both the causes and the aforementioned consequences of bank erosion.

The assessment was designed to evaluate and quantify changes in hydrologic and geomorphic conditions in response to historical changes in land-use and water development (e.g., diversions, reservoir construction, groundwater pumping, etc.). This assessment also evaluated how historic human induced changes in hydrologic and geomorphic conditions affect riparian ecology in terms of the lost or altered floodplain area, character, and inundation frequency. A key product of this assessment was to distinguish between “natural” and “accelerated” bank erosion, and to identify the underlying causes (both natural and anthropogenic) so that appropriate solutions can be developed. Desired outcomes of the study included: reduce bank erosion by developing restoration designs for typical trouble sites; produce a ranking system to prioritize sites for stabilization and restoration; contribute to community education through watershed science education and the Yolo STREAM Project outreach program; improve water quality through reduction in accelerated erosion; and contribute to riparian corridor restoration and support the RCD’s Wildlife Conservation Board funded efforts to remove non-native tamarisk and around from the creek corridor. Work was completed through a broad spectrum of field and analytical investigations that received close review by the RCD, stakeholders, and a Technical Advisory Committee.

Ventura River Unimpaired Flow and Habitat Assessment, Ventura County, CA
City of Buenaventura and Nautilus Environmental, 2006–2007

Mr. Kamman completed a hydrology feasibility assessments as part of evaluating the reuse of Ojai Valley Sanitary District (OVSD) effluent for other beneficial uses. Currently, OVSD discharges treatment plant effluent to the lower Ventura River. The City and OVSD recognize that the reduction in the discharge of treated effluent to the Ventura River could have an environmental effect on sensitive and endangered species. In light of these concerns, this study was conducted to determine if a reuse project is feasible without significant environmental harm.

The assessment included hydrologic and geomorphic field and analytical assessments of past (unimpaired), current and proposed surface and groundwater flow conditions over a wide range of dry- through wet water year-types. The main objective if these analyses was to determine the linkage to water quality and aquatic habitat conditions including: flow durations; extent of gaining vs. losing reaches; low flow inundation/wetted area; and influence on barrier beach dynamics. Mr. Kamman collaborated with a team of other professionals to prepare a facility plan documenting the analyses and conclusions of respective water recycling investigations.

Hydrologic Analysis of FERC Minimum Flows on Conway Ranch Water Rights, Mono County, CA
Law Office of Donald Mooney, 2001–2002

Mr. Kamman completed a hydrologic analysis to evaluate if FERC’s proposed Minimum Flow Plan for Mill Creek would interfere with the exercise of the Conway Ranch’s water rights from Mill Creek. The approach to this analysis was to quantify the duration of time the Conway Water right was met under historic gaged and simulated proposed Minimum Flow Plan conditions. The primary objective of the analysis was to evaluate impacts during the winter period when flows are typically limited due to water storage as snow pack. Minimum Flow Plan conditions were simulated by developing a spreadsheet model that redistributes actual (historic) Lundy Lake releases in a fashion that maintains a minimum flow of 4 cfs to Mill Creek to accommodate the downstream Southern California Edison’s (SCE) power plant. The analysis period for both historic and simulated Minimum Flow Plan conditions consisted of water years (WY) 1990 through 1998 to capture an exceptionally diverse range of wet and dry year-types.

The primary method used to quantify changes in flow between historical and simulated Minimum Flow Plan conditions was to prepare and compare flow duration curves for each condition during both the winter and summer periods during a variety of water year types. Model results were tabulated for each conditions to determine the differences in the percentage of time target flows were equaled or exceeded. Based on these findings, Greg was contracted to complete more in-depth monthly modeling.

Groundwater Management Projects

Sycamore Grove Park Natural Resources Management Plan, Alameda County, CA
Livermore Area Recreation and Park District, 2001–2009

Mr. Kamman worked with a team of ecologists, planners, and cultural resource personnel in the preparation of a long-term natural resource management plan and a Sycamore Grove Recovery Program for the Livermore Area Recreation and Park District’s (LARPD) Sycamore Grove Park. Hydrologic investigations included implementing a surface water-groundwater interaction study of upper Arroyo Valle below Del Valle Reservoir to evaluate the linkage between altered shallow groundwater conditions and the health of the Parks Sycamore grove. This study characterized and documented the strong link between Arroyo flow and shallow groundwater conditions. Another important study component involved evaluating the role of flood disturbance (esp. scour) in the regeneration of Sycamore trees and the effect associated with altered flood releases through the Park due to construction of Del Valle Reservoir. The Resource Management Planning effort was followed up with two phases of work to assist LARPD and the Zone 7 with operational actions to promote recovery and sustainability of Sycamore grove.

This project illustrates Mr. Kamman's ability to integrate hydrologic studies with a variety of ecological studies to evaluate and characterize the linkage between physical and biological processes. Specific analyses completed include: field programs and data collection efforts to quantify surface-groundwater interactions; flood frequency analysis; flow duration analysis for periods of time under varying reservoir/water management strategies; geomorphic analyses; water quality analyses; and development of project documentation and correspondence. Mr. Kamman served as author and editor for select technical sections of the Final Recovery Plan for Sycamore Grove Park.

Assessments of Groundwater-Surface Water Interaction, Stanislaus County, CA
The Law Offices of Thomas N. Lippe, APC and California Sportfishing Protection Alliance, 2015–present

Since 2015, Mr. Kamman has been assessing groundwater conditions within Stanislaus County and evaluating potential impacts of groundwater pumping on surface water flow and aquatic habitat of the Stanislaus, Tuolumne and San Joaquin Rivers. Mr. Kamman completed a comprehensive review and synthesis report of available groundwater and interconnected surface water (ISW) reports and data. Using available soils, geology and hydrology information, Mr. Kamman also delineated and mapped subterranean streams and Potential Stream Depletion Areas (PSDAs) to identify stream corridors susceptible to adverse impacts from groundwater pumping. This information is intended to help Groundwater Sustainability Agencies identify potential impacts to ISW.

Most recently, Mr. Kamman has been retained to review and comment on 7 Groundwater Sustainability Plans (GSPs) for critically overdraft groundwater subbasins within or adjacent to Stanislaus County. This review focused on how GSPs address Groundwater Dependent Ecosystems (GDE) and ISW. Comments included recommendations on monitoring and study plans to identify and quantify impacts of groundwater pumping on stream flow rates and associated ecological habitats.

Assessment of Surface Water-Groundwater Interaction, Humboldt County, CA
Friends of the Eel River (FOER), 2020–present

Mr. Kamman is currently providing technical assistance in understanding surface water-groundwater interactions in the Lower Eel River Valley. Work includes reviewing and synthesizing available reports and hydrologic data and providing a science-based opinion on the role groundwater plays in supporting stream flow and aquatic habitats. This analysis addresses conditions and changes associated with seasonal and long-term wet-dry cycles. Data gaps will be identified and documented during the analysis.

This work is being completed to support FOER efforts at protecting aquatic resources within the framework of current water management practices and the public trust doctrine under California law. Additionally, this work includes providing hydrologic and hydrogeologic review, comment and recommendations during development of the basin's Groundwater Sustainability Plan (GSP) under the California Sustainable Groundwater Management Act (SGMA).

Scott Valley Subbasin Technical Hydrogeologist Assistance, Siskiyou County, CA
Klamath Tribal Water Quality Consortium and Quartz Valley Indian Reservation, 2019–present

Mr. Kamman is providing technical review and comment on the groundwater models and associated studies in the Scott Valley groundwater subbasin under the Sustainable Groundwater Management Act (SGMA) process. Work includes: review of groundwater models; synthesis and review of available groundwater quality data; assisting to identify constituents of concern; and review of the planning and technical studies being used to develop a basin Groundwater Sustainability Plan (GSP).

Middle Russian River Valley Shallow Groundwater Storage Enhancement Study, Sonoma County, CA
Friends of the Eel River, 2016

Working on behalf of Friends of the Eel River, Mr. Kamman completed a study to identify and quantify the volume of recoverable aquifer storage along two independent 6-mile reaches within the alluvial fill valley of the Russian River. The approach to this study was to quantify how channel incision has reduced shallow groundwater levels and quantify how much aquifer storage can be increased if channel bed elevations are restored to historic levels. The goal of this investigation was to identify feasible approaches to increase groundwater storage that would off-set losses associated with the termination of out-of-basin diversions from the Eel River. This work was completed through: intensive review and mapping of available groundwater level data; quantification of aquifer hydraulic properties; and calculating the shallow aquifer storage volume. In total, reclaiming the shallow aquifers within these two areas yield a total added storage volume of over 20,000 AF.

Green Gulch Farm (GGF)/Zen Center Water Resources Investigation, Marin County, CA
Green Gulch Farm, 1998–2019

Mr. Kamman completed a multi–phase study to evaluate the short- and long-term water uses and resources at GGF. Work was initiated by developing comprehensive water usage/consumption estimates and assessing available water resources, including spring, surface water, and ground water sources. Water demand estimates included quantifying potable and agricultural water usage/demands. Once reliable water supplies were identified and water usage/demand figures calculated, Mr. Kamman provided recommendation for improvements to water storage and distribution systems, land-use practices, conservation measures, treatment methods, waste disposal, and stream and habitat restoration. The initial phase of work included: in-depth review of available reports and data; review of geology maps and aerial photography; review of water rights and historic land use records; field reconnaissance including year-round spring flow monitoring; mapping and quantifying existing runoff storage ponds; and surface water peak- and base-flow estimates.

The second phase of work included identification of possible groundwater sources and siting and installation of production wells. This included sighting three drilling locations, obtaining County and State well drilling permits for a domestic water supply; coordination and oversight of driller; and directing final well construction. Upon completion of a well, Mr. Kamman directed a well pumping yield test and the collection and analysis of water quality samples (including Title 22) for small water supply system use. The final phase of work included assisting GGF with water treatment system options at the well head and integration of the groundwater supply into an existing ultra-violet light treatment system servicing spring water sources. Work was completed in 2000 with a budget of approximately $25,000, including all driller and laboratory subcontracting fees.

Stanford Groundwater Assessments, Santa Clara County, CA
Stanford University Real Estate Division, 2012–2016

Mr. Kamman provided technical hydrogeologic services to evaluate groundwater conditions and drainage requirements associated with the construction of several new facilities on or near Page Mill Road. The main objective of this study is to determine the seasonal depth to groundwater beneath the project site under existing and potential future conditions and provide an opinion on if the project is required to comply with the City of Palo Alto, Public Works Engineering Basement Exterior Drainage Policy (effective October 1, 2006). This work included obtaining and reviewing available technical reports, maps and literature pertaining to groundwater conditions in the project vicinity. Based on this review, we have prepared a letter report of findings and recommendations.

Bodega Bay Wetland Water Supply, Sonoma County, CA
Friends of Bodega Bay, 2007

Mr. Kamman Conducted an evaluation of the groundwater underflow feeding a large coastal wetland in Bodega Bay and recommended mitigation measures for potential losses in supply associated with proposed residential development in recharge areas. Work included: long-term monitoring of ground water quality and supply; monitoring surface water and spring flow and water quality; assessing and characterizing the interaction between surface and subsurface water sources during different seasons and water year-types; developing a detailed water budget for the site to assess impacts to recharge areas; and developing a number of physical solutions to mitigate for recharge losses.

L.A. Department of Water and Power, Groundwater Recharge Facility Operation Study, Los Angeles County, CA
ICF Consulting, 2006

Working as a subcontractor to ICF Consulting of Laguna Niguel, California, Mr. Kamman provided technical assistance in the hydraulic modeling of sediment accumulation in selected spreading ground facilities owned and operated by the Los Angeles Department of Public Works. The object of this work is to evaluate changes in infiltration and groundwater recharge rates over time within the spreading grounds in association with sediment accumulation from turbid waters.

Corde Valle Golf Club Surface-Groundwater Interaction Study, Santa Clara County, CA
LSA Associates, 2004

On behalf of LSA Associates of Pt. Richmond, CA, Mr. Kamman completed a 3rd party independent review of available reports and data sets (boring logs, well water levels, groundwater quality, aquifer pump-test, and surface water monitoring) to evaluate if pumping of the Corde Valle irrigation well is adversely impacting flow in West Llagas Creek. This investigation was implemented in response to a concern expressed by California Department of Fish and Game staff regarding the potential for differential drying of the West Branch of Llagas Creek along Highland Avenue. The analysis was also complicated by the likely effects of pumping from surrounding off-site wells.

Aquifer Testing for Tennessee Hollow Watershed Project, San Francisco County, CA
Presidio Trust, 2002

The Mr. Kamman assisted in the design and implementation of an aquifer test at the Presidio of San Francisco. We prepared an aquifer test work plan and conducted step-drawdown and constant-rate aquifer tests at the site using both manual and electronic data collection methods. This work included interpretation of the aquifer test results using software-based solution methods and prepared a written summary of methods and findings. In addition, Mr. Kamman located, coordinated and managed a drilling effort for the logging and installation of several groundwater monitoring wells in the project area to address identified data gaps.

San Joaquin River Riparian Corridor Restoration Project, San Joaquin Valley, CA
McBain-Trush, 2002

Mr. Kamman completed an assessment of historic and existing shallow groundwater conditions beneath and adjacent to the San Joaquin River between Friant Dam and the Merced River. This work focused on reviewing available reports and flow/ groundwater- level data to characterize surface water and groundwater interaction and implications for riparian vegetation, water quality and fishery habitat restoration. Hydrologic analyses were performed to identify the location and seasonal evolution of losing and gaining reaches an implication on future restoration planning and design efforts. The main deliverable for this analysis was a report section focused on describing the historical changes in regional and local groundwater conditions in the San Joaquin Valley and evolution of anthropogenic activities (e.g., groundwater withdrawals, irrigation drainage systems and return flows, development of diversion structures, changes in land-use; and introduction of CVP/State Water Project deliveries) and associated impacts on deep/shallow groundwater levels, surface water flows, and surface and groundwater quality.

Tidal, Estuarine & Coastal Projects

Meadow Creek Lagoon Connection Project, San Luis Obispo County, CA
County of San Luis Obispo Flood Control and Water Conservation District, 2021–present

As part of a technical team, cbec is providing hydraulic modeling support to develop and evaluate alternatives to increase connectivity between Arroyo Grande Creek and Meadow Creek lagoons and to restore approximately 8.3 acres of degraded habitat in Meadow Creek Lagoon in Oceano, California. The purpose of the project is to increase habitat for growth and survival of smolt and rearing juvenile steelhead, as well as to enhance and protect lagoon wildlife and fisheries habitat in general. The lagoons also provide habitat for the California red-legged frog and tidewater goby, also federally listed species. As part of alternatives analysis, cbec developed an integrated numerical hydraulic and sediment transport (HD/ST) model encompassing Meadow and Arroyo Grande Creek channels and lagoons using the U.S. Army Corps of Engineers HEC-RAS one- and two-dimensional unsteady model code. Simulated conditions included a suite of design flow events and lagoon and tidal water levels controlled by varying lagoon inlet geometries. The model was used to evaluate water level and geomorphic response for a pair of levee setback alternatives, including water control structures between Meadow Creek Lagoon and Arroyo Grande Creek. The modeling results were key to understanding the interplay of flood and tidal peak timing from contributing systems on lagoon water levels and associated flood hazards, as well as identifying scour and sediment deposition patterns that affect control structure and channel flow conveyance. As the project manager for this work, Greg coordinated

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and directed hydraulic model development, acted as primary contact with the client, and presented findings during science panel meetings. Greg continues this roll in continued development and evaluation of project alternatives.

Quartermaster Reach Wetland Restoration Project, San Francisco County, CA
Presidio Trust, 2006–present

Mr. Kamman was retained as part of a multi-disciplinary team to develop restoration alternative designs for a 10-acre filled and paved site marking the historic confluence of Tennessee Hollow Creek and Crissy Marsh adjacent to San Francisco Bay. Key project objectives included expanding riparian habitat and creating an integrated system of freshwater streams and freshwater, brackish, and tidal marsh through re-establishing a creek connection to Crissy Marsh. Mr. Kamman provided H&H technical input and consultation to the design team to develop a restoration project consisting of a creek-brackish marsh-salt marsh interface and associated upland habitats. His work included evaluating surface water and groundwater and tidal sources. In addition, he developed both HEC-RAS and MIKE11 hydrodynamic models to inform and guide a preferred project design and analysis, including evaluation of storm surge, road crossing and Tsunami impacts to the project. Mr. Kamman continues to provide technical review of this project with respect to impacts to water resources and associated existing and proposed ecological habitats.

Salt River Ecosystem Restoration Project, Humboldt County, CA
Humboldt County RCD, 2005–2019

Mr. Kamman provided hydrology, engineering and environmental compliance services towards the planning and design of river and tidal wetland restoration on the Salt River (Eel River Delta plain) near Ferndale, California, in Humboldt County. The purpose of the Salt River Ecosystem Restoration Project (SRERP) is to restore historic processes and functions to the Salt River watershed and includes three components: 1) increasing flow conveyance through the lower Salt River and lower Francis Creek from near the Wastewater Treatment Plant downstream for 2.5 miles, 2) restoring 247 acres of wetland estuary habitat in the lower Salt River within the 440-acre former dairy, and 3) reducing sediment inputs from tributary watersheds. The Salt River Project was designed using an “ecosystem approach” to address hydrology, sedimentation, and fish and wildlife habitat.

As part of project feasibility assessment, Mr. Kamman completed a hydrologic and water quality monitoring program, and developed a MIKE11 hydrodynamic model of the lower Salt River and Eel River estuary in Humboldt County, for the Humboldt County RCD. Land use changes in the area have caused significant aggradation and infilling of the Salt River, significantly reducing tidal exchange, fish passage, and exacerbating flooding in upland areas. A primary goal of this study is to evaluate the feasibility of proposed restoration elements intended to increase tidal prism and exchange and in-channel sediment scour and transport. The desired outcome is a sustained increase in river conveyance capacity to improve drainage of surrounding flood–prone lands and improve aquatic, wetland, and riparian habitat.

Western Stege Marsh Restoration Project, Contra Costa County, CA
Tetra Tech, 2008–2010

Mr. Kamman provided technical hydrology and wetland hydraulics support to post–project monitoring of the Western Stege Marsh Restoration Project. His involvement began by providing an independent technical review of previous year’s hydrologic monitoring results to evaluate the proposed monitoring success criteria and the rationale used to develop these criteria. This work entailed reviewing historic monitoring data and available natural slough channel geometry data-sets for San Francisco Bay area marshes. Mr. Kamman’s study approach was to independently develop desired and sustainable channel geometry relationships for natural, healthy San Francisco Bay salt-marshes and compare them to the published success criteria. Greg was also retained to implement the Year 4 post–project hydrologic monitoring, with modifications to aid in better linking hydrologic processes to ecological conditions and function within the restored marsh. This work consisted of completing more targeted water level monitoring and channel geometry surveys in reference marsh areas containing desired physical and ecological attributes. These data were used to develop geomorphic success criteria (target channel geometry) more tailored to the project marsh and augment the criteria provided in available literature. Working closely with the project team of scientists, Mr. Kamman compared these hydrologic monitoring results to available vegetation surveys to better assess the overall success and evolutionary trend of the marsh.

Giacomini Wetland Restoration Project, Marin County, CA
The National Park Service and Point Reyes National Seashore Association, 2003–2012

Mr. Kamman managed a multi-year project for the NPS in the design and feasibility analysis of a tidal wetland, riparian, and freshwater marsh complex, on the 500-acre Giacomini Dairy Ranch at the south end of Tomales Bay. The project included hydraulic, hydrologic, and geomorphic assessments to characterize existing physical conditions, developing restoration alternatives, and completing hydrologic and hydraulic feasibility analyses. Restoration alternatives evaluated creation of a mosaic of subtidal through upland wetland and riparian habitat zones, as well as improvements to salmonid passage, red-legged frog habitat, tidewater goby habitat, and clapper-rail habitat. Emphasis was placed on completing detailed studies to quantify project-induced changes in flood frequency, magnitude and duration, impacts on water quality to local groundwater supply wells, and changes in sediment and water quality conditions in Tomales Bay. Mr. Kamman managed and assisted design engineers, preparing plans, specification, and cost estimates for a three phased construction schedule, that was completed in the summer of 2008.

Critical Dune Habitat Restoration to Protect Threatened and Endangered Species, Marin County, CA
The National Park Service, 2009–2010

Mr. Kamman provided and managed engineering, design, and implementation planning support for the restoration of 300 acres of critical dune habitat at Abbots Lagoon within the NPS Point Reyes National Seashore. He developed engineered drawings, technical specifications and engineer’s cost estimates, and assisted NPS in defining a range of methodologies suitable to local conditions and sensitive flora and fauna. This area of the park supports the best remaining intact dune habitat, including some of the largest remaining expanses of two rare native plant communities: American dune grass (Leymus mollis) foredunes, and beach pea (Lathyrus littoralis). European beach grass and iceplant were removed from the project site using mechanical removal and hand removal techniques. The project goal was to remove these invasive species from approximately 135 acres of prime dune habitat in the 300-acre project site, while not impacting sensitive species and habitats. The intended result was to remobilize this historic dune field and restore their natural form and migratory processes.

This project illustrates Mr. Kamman’s ability to work closely with NPS staff to balance habitat protection and restoration across the landscape. As part of project design, he developed grading plans, and specified work flow, equipment movement and

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access routes which minimize impacts to special status species. Extensive fencing and exclusions zone planning was required to protect existing native habitats, and minimize tracking of plant stock to or through restored sties. In addition work elements had to be structured and prioritized to maximize ground work subject to budgetary constraints and work flow uncertainties. All work has been completed on budget and in a timely fashion, even with repeated expansions to the project boundary and affected area and last minute changes driven by endangered species issues.

Lower Gualala River and Estuary Assessment and Management Plan, Mendocino County, CA
California State Coastal Conservancy and Gualala River Watershed Council, and Sotoyome RCD, 2002–2005

Mr. Kamman worked with fisheries biologists to evaluate the hydrologic and water quality conditions in the lower Gualala River and estuary and identify and evaluate potential impacts to summer rearing habitat for salmonids and other aquatic organisms. This work included: assessing how the impacts of upstream land use (logging and water diversions) have altered water delivery and water quality to the Lower River and estuary over time; characterizing the physical coastal and riverine processes controlling opening and closure of the estuary inlet and lagoon morphology; monitoring and characterizing real-time and seasonal changes in lagoon water level and water quality; and evaluating the sediment transport capacity and geomorphic condition of the lower river and estuary. An important aspect of this work was to integrate physical, water quality, and biological data and information into a coherent and understandable description of the interrelated processes controlling the aquatic ecology of a lagoon system. Mr. Kamman took the lead in developing and editing a management plan for the lagoon, prescribing actions to preserve, protect and enhance ecological habitats (with emphasis on salmonids) within the lagoon and lower Gualala River.

Suisun Bay Tidal Wetland Restoration Design, Contra Costa County, CA
East Bay Regional Park District and LSA Associates, 1999–2005

Mr. Kamman provided hydrologic design services to the restoration of a 55-acre tidal wetland on Suisun Bay. The design will maximize habitat for special status fish species, and (to the extent possible) habitat for other special status animal and plant species. Working with a multi-disciplinary design team, Mr. Kamman assisted in developing a design based on analysis of habitat needs, tidal hydrodynamic and geomorphic processes, sedimentation rates and soil characteristics. Project tasks included: a site analysis defining existing ecological and hydrologic conditions; a hydrologic and biological restoration opportunities and constraints analysis to define restoration and management objectives; and hydrodynamic and sedimentation modeling to evaluate design alternatives. The final restoration and management plan included a grading plan, landscape revegetation plan and monitoring and maintenance plans. This work again illustrates his capabilities in the characterization of physical site conditions, development and feasibility analysis of project alternatives, and preparation of preliminary designs of sufficient detail to allow for environmental compliance through the CEQA/NEPA process.

Santa Clara River Estuary and Lower River Assessment, Ventura County, CA
Nautilus Environmental on behalf of the City of Ventura, Public Works Department, 2003–2004

Mr. Kamman directed a hydrologic and geomorphic assessment of the lower Santa Clara River and estuary. The proposed study entailed characterizing existing and historic hydrologic and physiographic conditions and an assessment of historic changes in inflow to the estuary. Mr. Kamman designed and conducted a multi-year monitoring program of water levels, water quality (temperature, dissolved oxygen, salinity, and pH), and sand-spit morphology in order to evaluate inlet opening/closure frequency and associated changes in aquatic habitat (esp. tidewater goby) and other ecologic communities. Work included a detailed coastal process analysis (including wave power analyses and littoral sand transport), which, considered with the inflow analysis, provides a basis to evaluate the seasonal cycle of barrier beach buildup and destruction. Mr. Kamman also developed a detailed surface-/ground-water and salinity budget model for the estuary to evaluate the impacts of a wide variety of proposed and modified estuary inflow regimes to determine potential future water level and salinity conditions in the lagoon and impact on frequency of inlet breaching.

Eden Landing Ecological Reserve Restoration, Alameda County, CA
East Bay Regional Park District, 2000–2003

Mr. Kamman developed and completed hydraulic modeling assessments for the design of an approximately 1000-acre tidal marsh restoration in former Cargil salt manufacturing ponds, located a mile inland of San Francisco Bay. The restoration goals required balancing the desires to restore tidal marsh conditions to the site, while maintaining and enhancing the open water and salt panne habitats preferred by resident and migratory shorebirds. The project design also addressed and incorporated remediation of high soil salinities resulting from past salt production, subsided ground elevations, dredging of new channels to the bay, existing infrastructure constraints, public access for the San Francisco Bay Trail, and preservation of several important cultural and historical sites. Hydraulic design objectives include maximizing both interior circulation and tidal exchange between the restoration parcel and the bay. A series of one-dimensional unsteady hydrodynamic models (MIKE11) were used to design the channel network, identify high velocity areas requiring erosion protection, and characterize expected habitat conditions. An important component of this design and feasibility assessment was to translate desired ecological habitat conditions identified in the EIR into specific hydrologic design criteria, considering channel velocities, scour, sediment transport, tidal water inundation frequencies and seasonality of ponding. Mr. Kamman worked closely with EBRPD civil engineers, assisting with the translation of hydraulic design criteria into final engineered drawings and specifications.

Eel River Estuary Preserve Ecosystem Enhancement Project, Humboldt County, CA
California Trout and State Coastal Conservancy, 2015–2019

Mr. Kamman led the technical hydrodynamic studies for feasibility alternatives analysis for ecosystem enhancement on the Eel River Estuary Preserve in Ferndale, CA. Construction of levees and tide gates around the project area has severely limited tidal exchange and degraded historic project wetlands, reduced flood drainage and sediment transport, and obstructed fish passage. The goal of the project is to improve geomorphic and ecosystem functions that would enhance habitat for native fisheries and aquatic species, support waterfowl and wildlife species, and benefit agricultural land management by more effectively managing onsite flooding and sedimentation. Other project objectives included: designing and planning for future climate scenarios and sea level rise in relation to agricultural land management, capacity and uses, and vegetative communities; establishment of a sediment management area; and beach dune enhancement. Mr. Kamman developed and evaluated a suite of channel and tidal restoration alternatives through muted tidal exchange with outboard tide waters, either via retrofitting existing tide gates or through new Muted Tide Regulator (MTR) style gates installed through the existing outboard levee. Using available topographic and bathymetric information, Mr. Kamman developed a 1-dimensional model to

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evaluate a suite of proposed project alternatives. Working with the project design team's aquatic ecologist, results of the hydraulic analysis were used to evaluate and characterize the potential benefits and impacts to important species that exist or could colonize the project area, including coho salmon, tidewater goby, coastal cutthroat trout, longfin smelt, lamprey eel, water fowl, shore-birds, eelgrass and other sensitive fish, wildlife and plant species. Mr. Kamman also provided technical support for the siting and design of sediment management areas and completed a planning and technical feasibility study for dune restoration alternatives along three miles of project coastline immediately south of the Eel River mouth.

Design of California Red-Legged Frog Breeding Ponds, San Francisco Bay Area (various), CA
The National Park Service and Golden Gate National Parks Conservancy, 1997–present

Mr. Kamman has lead or provided hydrologic and engineering design assistance to the sighting and design of nearly two dozen breeding ponds for California red-legged frog throughout the San Francisco Bay Area. Work has been completed in Marin, Sonoma, Solano, Contra Costa, Alameda, and Santa Clara Counties under the auspices of numerous federal, state, and local county/city agencies. A common study approach consists of an initial site reconnaissance of watershed conditions and identification of potential sites. The reconnaissance is followed by a surface water hydrologic sufficiency analysis using available meteorologic and stream flow information. An important variable sought during pond sighting is the presence of migration corridors between known breeding areas and/or perennial water sources. Based on in-depth research and post–project monitoring, Mr. Kamman has refined or developed site-specific evapotranspiration estimates, which commonly do not match standard applied values. Accurate evapotranspiration rates are necessary if ponds are intended to periodically dry-down as a means to preclude undesired species such as bullfrog or mosquito fish. In many instances, a seasonal groundwater-monitoring program is implemented in order to better investigate and quantify potential and seasonal groundwater contributions. Other design challenges we commonly experience include: design of impermeable liners for ponds located in upland areas or highly permeable soils; hydraulic analyses and design of outfalls/spillways; sedimentation management/maintenance approaches; and requirements of inoculum and water used to line and fill the pond, respectively.

Hydrologic Feasibility Assessment for Mana Plain Wetland Restoration Project, Kauai, HI
State of Hawaii Department of Land and Natural Resources, 2010–2019

Working on behalf of the Mana Plain Wetland Restoration Partnership, Mr. Kamman completed a hydrologic feasibility assessment for the Mana Plain Wetland Restoration Project proposed by the State of Hawaii Department of Land and Natural Resources (DLNR), Division of Forestry and Wildlife (DOFAW) on the island of Kauai. The Mana Plain Wetland Restoration Project site is approximately 105 acres of low-lying abandoned sugarcane fields immediately north of the Kawaiele Waterbird Sanctuary and east of the Pacific Missile Range Facility. The purpose of the Mana Plain Wetland Restoration Project is to maximize the area of constructed wetlands within the restoration site. Palustrine emergent wetlands within the project will create habitat for four species of endangered Hawaiian waterbirds and other sensitive species, including: Hawaiian stilts; Hawaiian ducks; Hawaiian coots; Hawaiian moorhen; migratory waterfowl; and migratory shorebirds. The Mana Plain is of vital importance for the recovery of endangered waterbirds species. This restoration project will be designed to provide important breeding and feeding wetland habitats on an island where; 1) wetlands have been severely degraded, and 2) mongoose, an introduced predator, have not been established.

Mr. Kamman's work on this project included technical assessments and development of proposed restoration alternatives. Analyses completed included: a synthesis of the physical site setting (topography, geology, hydrogeology and soil); reviewing available data to characterize site meteorology, surface water drainage, water quality, and groundwater conditions; preparing a detailed water budget to describe the characteristics and processes of surface water and groundwater movement into and through the project area; evaluating project feasibility, water supply alternatives and costs; and completing a flood hazard impact assessment to evaluate potential project benefits and impacts to local area flooding. Working with the project partners, Mr. Kamman developed a preferred project alternative and supported in preparation of the project Environmental Assessment document. Mr. Kamman's firm was also retained by the State of Hawaii to develop engineering designs of the project.

MacArthur Meadow Wetland Restoration, San Francisco County, CA
Presidio Trust, 2013–2016

Mr. Kamman has been working on over a dozen independent wetland and creek restoration planning and design efforts within the Presidio of San Francisco since 2001. Most recently (2016), he developed a wetland restoration grading plan for the MacArthur Meadow Wetland Restoration Project in the central portion of the Tennessee Hollow watershed. As part of the site assessment, Greg characterized and modeled surface and groundwater interactions and identified a unique opportunity to restore 4 acres of mixed meadow, natural wetlands and creek/riparian corridor. This was possible due to the discovery of shallow groundwater conditions beneath this historically disturbed landscape. Various design components were integrated into the grading plan in order to enhance groundwater recharge and storage in the Meadow, while retarding runoff and drainage out of the wetland, including: daylighting storm drain runoff into the Meadow; reconfiguring internal channel alignments to enhance channel habitat and groundwater recharge; creation of wetland depressions to retain and recharge surface water; and removal of fill material to decrease the depth to the water table. Notable challenges of this work include restoring heavily disturbed natural resources in an urban setting while integrating designs with archeology/cultural resources, education and remediation programs.

Dragonfly Creek Restoration Project, San Francisco County, CA
Presidio Trust, 2007–2011

Mr. Kamman designed and managed hydrologic monitoring and analysis studies in support of planning and design for riparian and wetland habitat restoration along approximately 500-linear feet of the Dragonfly Creek corridor near Fort Scott of the Presidio of San Francisco. Work has included completing subsurface investigations including the installation of shallow wells and a sharp-crested weir with recorder to gauge creek flows. Mr. Kamman assisted in the development and selection of a preferred project alternative, considering on-site cultural resource protection, education and resource management issues (including flood control). Mr. Kamman prepared permit applications. Major components of the project included removal of significant fill and building foundations and installation of a new creek road crossing that will maintain the historical alignment, function and architectural character of a culturally significant roadway. Mr. Kamman oversaw development of PS&E for this project, which will create mitigation wetlands for a highway earthquake retrofit project that passes through the Park.

This project illustrates Mr. Kamman's ability to complete a broad variety of hydrologic

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analyses, including: surface water and groundwater hydrologic monitoring to characterize and quantify existing hydrologic conditions; rainfall-runoff modeling; hydraulic modeling of flood and scour conditions (including road crossing); preservation of existing wetland habitat and vegetation communities; integration with other Presidio Trust programs; and contracting flexibility to assist in conceptual planning and environmental compliance without increasing project design costs.

Mori Point Sensitive Species Habitat Enhancement Project, San Mateo County, CA
Golden Gate National Recreation Area and Golden Gate National Parks Conservancy, 2005–2011

Mr. Kamman provided hydrologic analyses, sighting and engineering design (PS&E) for three California red-legged frog breading ponds within the 105-acre Mori Point area. These efforts were completed in association and collaboration with a larger Coastal Trail improvement and ecosystem restoration effort. Quarrying and off-road vehicle use have left this site heavily scarred. The focus of restoration work was to protect the endangered San Francisco garter snake and the threatened red-legged frog. Most of this work will be focused on invasive species removal and enhancing endangered species habitat. As part of species habitat improvement, Mr. Kamman worked with project ecologists to design the ponds to optimize breeding habitat for California red-legged frog.

Work started with an initial site reconnaissance and study of watershed conditions and identification of potential sites. The reconnaissance was followed by a surface water hydrologic sufficiency analysis using available meteorological and stream flow information and installation and monitoring of shallow piezometers to quantify the proximity and seasonal variability in depth to water table. An important variable sought during pond sighting was the presence of migration corridors between known breeding areas and/or perennial water sources. Based on in-depth research and post–project monitoring for other ponds they created in the San Francisco Bay area, Mr. Kamman refined site-specific evapotranspiration estimates. Accurate evapotranspiration rates are necessary if ponds are intended to periodically dry-down as a means to preclude undesired species such as bullfrog or mosquito fish.

Other design challenges experienced included: design of impermeable liners for ponds located in upland areas or highly permeable soils; hydraulic analysis and design of outfalls/spillways; sedimentation management/maintenance approaches; and requirements of inoculum and water used to line and fill the pond, respectively. Mr. Kamman has designed numerous ponds for the NPS and affiliates within the Bay Area, including Mori Point (constructed 2007), Banducci (constructed 2007) and Giacomini (Phase I and Phase II constructed in 2007 and 2008) project sites.

Hydrologic Assessment and Restoration Feasibility Study for Shadow Cliffs Regional Recreation Area, Alameda County, CA
East Bay Regional Park District, 2009–2010

Mr. Kamman developed and implemented an assessment to identify groundwater levels and supplemental water supplies that will sustain seasonal wetland restoration areas and riparian habitats under an altered future hydrologic regime. This work will inform a forthcoming Land Use Plan Amendment for park occupying a series of former gravel quarry pits. Work included: obtaining and synthesizing available surface water and groundwater data to characterize existing hydrologic and water supply conditions and seasonal variability; quantifying the likely changes in groundwater conditions and quarry pit lake levels in association with changes in regional water transmission and groundwater recharge operations; and identifying, developing and evaluating a suite of ecosystem restoration alternatives. Other important project objectives include: improving habitat for waterfowl and wildlife; broadening recreational use; enhancing visitor education and wildlife interpretation; improve park aesthetics. Mr. Kamman evaluated a preferred park and ecosystem enhancement alternative that involves diverting high winter flows from an adjacent arroyo. This project demonstrates Greg's ability to characterize hydrologic conditions and quantify the relationship between groundwater, surface water and wetland habitat conditions, both under existing conditions and in predicting future hydrologic and ecologic conditions under an altered hydrologic regime (i.e., lower groundwater table).

Laguna Salada Marsh and Horse Stable Pond Restoration Project, San Mateo County, CA
Tetra Tech, 2007–2009

Mr. Kamman provided technical hydrology and hydraulics support to the planning and conceptual restoration design of Laguna Salada marsh and Horse Stable Pond, located adjacent to Sharp Park Golf Course in the town of Pacifica, California. The primary objectives of the project are: to reduce flood impacts within the project vicinity; improve sustainable ecological habitat for the endangered San Francisco garter snake and the threatened California red-legged frog; better understand and characterize the hydrologic and water quality conditions/processes affecting flood and ecological habitat conditions within the project vicinity; provide an effective pumping operation plan to meet ecological objectives; and develop appropriate hydrologic analytical approaches and models to assist Tetra Tech and the San Francisco Recreation and Park Department in the planning and design for marsh, pond, and creek restoration. The project is also a unique opportunity to connect this resource with the California Coastal Trail, the Bay Area Ridge Trail, and the surrounding GGNRA lands.

Mr. Kamman's work included completing a comprehensive review of available hydrologic and site information and implementing selected field investigations to develop and calibrate an integrated hydrology-flood routing–pond water operations model that will quantify the volume and depth of water moving through the project system. The investigation will also further characterize shallow groundwater conditions and water quality with respect to effects on Laguna Salada and Horse Stable Pond. Analytical and numerical modeling tools are being used to better characterize existing hydrologic and water quality conditions and to assist in identifying project opportunities and constraints as well as evaluate potential restoration design components - all necessary to inform a sustainable and successful restoration design.

Tolay Lake Restoration Feasibility Assessment, Sonoma County, CA
Sonoma County Agricultural Preservation and Open Space District, 2003

Mr. Kamman completed a detailed hydrologic feasibility analysis to evaluate a suite of potential freshwater lake and wetland restoration alternatives. Sites were evaluated under existing watershed land-use practices and under existing and forecasted water demands (in the form of existing water rights/applications). Analysis consisted of developing a detailed water budget model to simulate alternative restored lake inundation areas and depths under median and dry year conditions, as well as a 50-year historic period (1947-1997) displaying highly variable rainfall and runoff supplies. Three lake restoration alternatives were evaluated based on existing topography and likely historic lake configurations. The restoration alternatives include lakes with storage volumes equivalent to 136-, 1100-, and 2550-acre feet.

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Haypress Pond Decommissioning and Riparian and Channel Restoration, Marin County, CA
Golden Gate National Recreation Area (GGNRA), 2001–2002

This project restored 170 meters of historic creek and riparian habitat through removal of Haypress Pond dam in Tennessee Valley within GGNRA. The goals of the project were to alleviate long-term maintenance needs and eliminate non-native bullfrog habitat threatening native California red-legged frog habitat in adjacent watersheds.

Working with the Park biologist, Mr. Kamman developed designs to decommission the dam and restore natural riparian and meadow habitat. This work included: characterization of existing topographic conditions; design of a channel profile through the proposed restoration project reach; preparation of a grading plan for the restoration project; and hydrologic and hydraulic analyses to evaluate the performance of the creek channel and flood plain below the former dam during a variety of flows. Challenges of this work included integrating sediment reuse into plans and construction phasing.

Damon Slough Site Seasonal Wetland Design, Alameda County, CA
Port of Oakland, 1999–2001

Working on behalf of the Port of Oakland, Mr. Kamman completed extensive surface and groundwater monitoring and data analyses to develop a detailed water budget to assist in the evaluation and design of a 7.5 acre seasonal freshwater wetland. Primary project objectives included a design that would provide shorebird/waterfowl roosting habitat, minimize impacts to existing seasonal wetland areas, and lengthen the duration of ponding through the end of April to promote use by migratory birds. In addition to developing hydrologic design criteria, responsibilities included development of grading plans to accommodate a local extension of the Bay Trail and wetland outlet works.

Water Quality Projects

Lower Miller Creek Channel Maintenance and Material Reuse Sampling Analysis Plan, Marin County, CA
Las Gallinas Valley Sanitary District, 2015

Mr. Kamman was commissioned to formulate and implement a plan for sediment removal and improved flood flow conveyance in the Lower Miller Creek channel. Accumulation of course sediment in the project reach had reduced discharge efficiencies at District outfalls. Miller Creek supports a population of federally listed Steelhead and adjacent wetland/marsh areas potentially support other state and federally listed special status species. Working with District Staff, Greg developed a suite of potential project alternatives and identified a preferred approach. Mr. Kamman completed all CEQA compliance (IS/MND), permitting and oversaw development of engineered plans and specifications.

In order to evaluate if reuse of excavated material from 2,655 feet of creek corridor in upland areas was feasible, Mr. Kamman developed and implemented a Sampling Analysis Plan (SAP) pursuant to U.S. Army Corps Guidance for Dredging Projects within the San Francisco District. Sample collection, sample handling, and analysis were performed in accordance with the SAP. Results for analytes were compared to a variety of screening criteria to determine the material's suitability for reuse in aquatic environments. A full suite of chemical and physical analyses were performed on soil samples collected from 16 locations, including: metals, PAHs, PCBs, pesticides, TOC, specific conductance, pH, sulfides, percent moisture and grain-size. Mr. Kamman managed all aspects of this effort including reporting and presentations/negotiations at multi-agency meetings through the Corps Dredge Materials Management Office (DMMO).

Chicken Ranch Beach Soil and Groundwater Quality Investigation and Restoration Planning, Marin County, CA
Tomales Bay Watershed Council, 2007–present

Mr. Kamman is leading scientific and engineering efforts for a wetland and riparian corridor restoration project on Third Valley Creek and Chicken Ranch Beach in Inverness, California. The main project goals are to create a self-sustaining riparian and wetland system (requiring minimal operation and maintenance) and eliminate public exposure to high levels of bacteria that exist in a site drainage ditch discharging to the beach. The design will likely include establishing a blend of habitats, including: riparian stream corridor, seasonal/perennial freshwater marsh, and tidal/saltwater marsh.

Current efforts have included the development and implementation of a soil and groundwater quality investigation to delineate the source of elevated bacteria levels. This work includes: the collection and testing of depth-discrete soil samples; groundwater well installation, sampling and testing; and surface water sampling and testing; analysis of laboratory results; and reporting, including recommendations for further/expanded investigations. Mr. Kamman coordinated this time-sensitive sampling and analysis (six hour hold times) with Brulje and Race Laboratories in Santa Rosa.

Lower Pitkin Marsh Hydrologic and Water Quality Monitoring, Sonoma County, CA
Sonoma Land Trust, 2008–2010

Mr. Kamman was retained to develop and implement a hydrologic and water quality monitoring program at Lower Pitkin Marsh outside of Forestville, California. The Pitkin Marsh area is one of the most valuable complexes of mixed riparian woodland and thicket, freshwater marsh, wet meadow, oak woodland and grassland in Sonoma County. The complex interaction of surface water, ground water, and scattered seeps and springs on the site creates unusual hydrologic conditions that promote a rare assemblage of plant species which includes several endemics. The primary objective of the hydrologic monitoring program was to understand the annual and season sources of both surface and ground water supplying wetlands. Hydrologic and water quality monitoring was initiated during the winter wet season of 2008/09 and will be conducted for a 12-month period through the ensuing summer dry-down and into the following wet season. Understanding how groundwater levels, spring flow and creek flow rates recede from winter wet to summer dry conditions will provide an important understanding and quantification of the seasonal variability in water supplies feeding selected wetland types. General water quality parameters (temperature, pH, specific conductance, and ORP) are measured at all monitoring locations during each visit. Nutrients (N and P) are measured in selected surface water and groundwater samples collected during at least three monitoring events, including a winter high flow, spring high base flow and summer low baseflow.

Pescadero Lagoon Restoration and Enhancement, San Mateo County, CA
California State Coastal Conservancy, 2005–2006

Mr. Kamman was retained to support restoration and water quality enhancement planning efforts in Pescadero Lagoon. In 2005–2006, he completed a synthesis of available hydrologic and water quality information in responding to requests for development of a hydrodynamic and water quality model of the lagoon. This model was considered as a means to identify causes for repeated fish-kills in the lagoon that occurred during initial breaching of the inlet. Mr. Kamman assisted in preparing a synthesis and model development feasibility report from this effort.

SELECTED EXPERIENCE

Water Temperature Simulations for Trinity River Fish and Wildlife Restoration Project, Trinity County, CA
Trinity County Planning Department, 1994–2004

For over a decade, Mr. Kamman completed a number of hydrology and water quality investigations in support of alternative feasibility studies on the Trinity River Fish and Wildlife Restoration Project in direct support of the Trinity River Restoration EIR/EIS. Studies involve assessing the effects of proposed flow alternatives on water temperature within and downstream of Lewiston Reservoir. Mr. Kamman was responsible for data collection, processing, and flow/temperature modeling of Lewiston Reservoir as part of a coordinated evaluation including other Trinity River system models. Another study included evaluating how project operations could be implemented or modified to optimize Lewiston Lake release temperatures to meet downstream temperature criteria and compensate for increased warming of the river associated with side channel and feather edge restoration activities. Mr. Kamman continues to evaluate how more recent water projects (raising Shasta Dam, Sites Reservoir, and the Waterfix tunnels) consider and integrate with the Trinity Restoration Project.

Upper Eel River Unimpaired Flow and Water Temperature Assessments, Humboldt County, CA
CalTrout, 1997-1999

Mr. Kamman evaluated changes in the natural flow regime of the upper Eel River, and developed an Upper Eel River proposed release schedule to enhance downstream Chinook and Steelhead spawning and rearing habitat. This work was triggered by proposals set forth by PG&E as part of their Potter Valley Project FERC relicensing process. Work consisted of two main investigations. The first included reviewing results of a ten year PG&E study and development of multivariate regression and stream reach (SSTEMP) temperature models to assess the effects proposed flow alternatives would have on downstream temperatures. The second investigation consisted of characterizing unimpaired flow conditions and developing a daily unimpaired flow record for use in project operation models.

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Kamman, G.R., 2019, Review of Draft Environmental Impact Report/Statement, Sites Reservoir Project. Prepared for: Pacific Coast Federation of Fisherman's Association (PCFFA) and Save California Salmon, January 21, 45p.

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Kamman, G.R., 2016, Review of Draft General Waste Discharge Requirements for Vineyard Dischargers in the Napa River and Sonoma Creek Watersheds. Prepared for: Law Offices of Thomas N. Lippe APC, December 12, 4p.

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Kamman, G.R., 2015, Sharp Park Project Impacts to Laguna Salada. Prepared for National Parks Conservation Association and Wild Equity Institute, April 14, 1p.

Kamman, G.R., 2014, Review of Middle Green Valley Specific Plan Project, Revised Recirculated Draft Environmental Impact Report, Solano County, CA, Sch# 2009062048. Professional Declaration Prepared for: Law Offices of Amber Kemble, August 11, 11p.

Kamman, G.R., 2012, Deposition of Gregory Richard Kamman, R.G., C.H.G., Schaefer vs. City of Larkspur, CA, Superior Court of the State on California, County of Marin. August 23, 2012.

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Kamman, G.R. and Kamman, R.Z., 2015, Landscape Scale Urban Creek Restoration in Marin County, CA - Urban Creek Restoration: Interfacing with the Community. 33rd Annual Salmonid Restoration Conference, March 11-14, Santa Rosa, CA.

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Exhibit 3

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May 14, 2020

Craig Altare
Supervising Engineering Geologist
California Department of Water Resources
901 P Street, Room 213
Sacramento, California 94236

Re: California Sportfishing Protection Alliance's Comments on the Groundwater Sustainability Plan for the Eastern San Joaquin Subbasin

Dear Mr. Altare:

This office represents the California Sportfishing Protection Alliance (CSPA) regarding the Groundwater Sustainability Plan for the Eastern San Joaquin Subbasin (Plan).

CSPA's concerns substantially overlap the concerns expressed by the National Marine Fisheries Service (NMFS) in its March 17, 2020, comment letter on this Plan (NMFS 3/17/20) and the concerns expressed by the California Department of Fish and Wildlife (CDFW) in its May 13, 2020, comment letter on this Plan (CDFW 5/13/20). CSPA adopts the comments presented in each of these letters as its own, with the following emphasis: in all instances where NMFS or CDFW identifies a shortcoming in the Plan or recommends a change in the Plan, CSPA contends that each such aspect of the Plan represents a legal deficiency that precludes DWR from approving the Plan. CSPA also provides additional legal, biological, geological, and hydrological context for these comments where additional information is available and pertinent.

CSPA also adopts the comments made by Greg Kamman, its consulting geologist and hydrologist, in his May 14, 2020, letter attached as Exhibit 11.

I. Introduction

CSPA is primarily concerned with the deleterious effects of groundwater pumping on stream flow, which severely damages populations and habitat of many species of fish and wildlife dependent on aquatic and riparian ecosytems. The Plan fails to use the best available information to identify the geographic locations where, and times of year when, groundwater pumping depletes or is likely to deplete stream flow. Also, to the extent there are legitimate "data gaps," the Plan fails to include a plan or protocol to fill these gaps. While the Sustainable Groundwater Management Act (SGMA) contemplates the possibility of "data gaps," it does not authorize the wholesale "kick the can down the road" approach taken by the Plan.

The same is true regarding areas where the groundwater table has already dropped below the elevation of hydrologic connection to stream channels due to pumping groundwater. In these areas, the continuing loss of stream flow to groundwater remains an undesirable result. The Plan gives no thought to changing these conditions to recover hydrologic connection between such channels and their historical sources of groundwater derived base flow.

As discussed below, the streams and rivers in this subbasin are home to several species of endangered or special concern salmonids on the verge of extinction. The failure of the Plan to describe how it will avoid further harm to these species and contribute to their recovery from the brink of extinction represents a monumental failure to comply with SGMA's requirement to avoid undesirable results by establishing minimum thresholds, measurable objectives, and interim milestones supported by the best available information and best available science.

With respect to identifying the undesirable result of stream flow depletion as a result of pumping inter-connected groundwater, the Plan treats the topic as an afterthought, when it must be recognized as a critical factor in determining the extinction or recovery of Central Valley steelhead and Central Valley spring-run Chinook salmon, two anadromous salmonid species listed as "threatened" under the federal Endangered Species Act ("ESA").[1]

As a result, the Plan's announced sustainable yield estimate of 715,000 AF/year ± 10 percent and its overdraft reduction estimate of 78,000 AF/year are invalid, as they fail to reflect consideration of these undesirable results.

Also, the Plan's failure to incorporate the best information available regarding the effect of climate change on water supply and demand in the water budget violates 23 CCR § 354.18(c)(3), (d)(3), and SGMA''s requirement to base GSPs on the best available information and best available science. (See e.g., 23 CCR § 354.18(e).)

The Plan fails to demonstrate achievement of sustainable groundwater management or the Plan's sustainability goal within 20 years. (See Water Code § 10720.1 ["it is the intent of the Legislature to ... (a) To provide for the sustainable management of groundwater basins"]; § 10721(v) ["Sustainable groundwater management" means "the management and use of groundwater in a manner that can be maintained during the planning and implementation horizon without causing undesirable results"]; § 10733(a) ["DWR must determine if GSP "is likely to achieve the sustainability goal for the basin"].)

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[1]In 2005 and 2006, respectively, the National Marine Fisheries Service (NMFS) designated the the California Central Valley spring-run Chinook salmon ESU and the California Central Valley steelhead DPS as "threatened species" under the federal ESA after finding both species to be "at risk of becoming endangered in the foreseeable future throughout all or a significant portion of their range." (Ex 4, p. 50412; Ex. 2 p. 857.)

CSPA objects to DWR's approval of the Plan because it does not meet the requirements of the Sustainable Groundwater Management Act, DWR's GSP Emergency Regulations at Title 23, Cal. Code Regs. section 350 et seq. (GSP Rules), the reasonable use doctrine, or the public trust doctrine. The Plan does not satisfy GSP Rule 355.4(b)(1) , the reasonable use doctrine, or the public trust doctrine because the Plan's description of the sustainability goal, undesirable results, minimum thresholds, measurable objectives, and interim milestones are not reasonable or supported by the best available information and best available science.

II. Factual Background

Four distinct runs of Chinook Salmon spawn in the Sacramento-San Joaquin River system, named for the season when the majority of the run enters freshwater as adults. Fall-run Chinook Salmon migrate upstream as adults from July through December and spawn from early October through late December. The timing of runs varies from stream to stream. Late-fall-run Chinook Salmon migrate into the rivers from mid-October through December and spawn from January through mid-April. The majority of young salmon of these runs migrate to the ocean during the first few months following emergence, although some may remain in freshwater and migrate as yearlings.

Spring-run Chinook Salmon enter the Sacramento River from late March through September. Adults hold in cool water habitats through the summer, then spawn in the fall from mid-August through early October. Spring run juveniles migrate soon after emergence as young-of-the-year, or remain in freshwater and migrate as yearlings.[2]

Fall-run Chinook Salmon are currently the most abundant of the Central Valley races, contributing to large commercial and recreational fisheries in the ocean and popular sport fisheries in the freshwater streams. Fall-run Chinook Salmon are raised at five major Central Valley hatcheries which release more than 32 million smolts each year. Due to concerns over population size and hatchery influence, Central Valley fall and late-fall-run Chinook Salmon are a Species of Concern under the federal Endangered Species Act.[3]

NMFS' proposed decision to list Central Valley steelhead as "threatened" under the federal ESA states:

> This coastal steelhead ESU occupies the Sacramento and San Joaquin Rivers and their tributaries. In the San Joaquin Basin, however, the best available information suggests that the current range of steelhead has been limited to the Stanislaus, Tuolumne, and Merced Rivers (tributaries), and the mainstem San Joaquin River to

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[2]https://wildlife.ca.gov/Conservation/Fishes/Chinook-Salmon

[3]https://wildlife.ca.gov/Conservation/Fishes/Chinook-Salmon

> its confluence with the Merced River by human alteration of formerly available habitat. The Sacramento and San Joaquin Rivers offer the only migration route to the drainages of the Sierra Nevada and southern Cascade mountain ranges for anadromous fish. The distance from the Pacific Ocean to spawning streams can exceed 300 km, providing unique potential for reproductive isolation among steelhead. The Central Valley is much drier than the coastal regions to the west, receiving on average only 10– 50 cm of rainfall annually. The valley is characterized by alluvial soils, and native vegetation was dominated by oak forests and prairie grasses prior to agricultural development. Steelhead within this ESU have the longest freshwater migration of any population of winter steelhead.

(Ex 1, p. 41547.)

> In the San Joaquin River Basin, there is little available historic or recent information on steelhead distribution or abundance. According to McEwan and Jackson (1996), there are reports of a small remnant steelhead run in the Stanislaus River. Also, steelhead were observed in the Tuolumne River in 1983, and large rainbow trout (possibly steelhead) have been observed at Merced River Hatchery recently. NMFS concludes that the Central Valley steelhead ESU is presently in danger of extinction. Steelhead have already been extirpated from most of their historical range in this ESU. Habitat concerns in this ESU focus on the widespread degradation, destruction, and blockage of freshwater

(Ex 1, p. 41554.)

> Steelhead on the west coast of the United States have experienced declines in abundance in the past several decades as a result of natural and human factors. Forestry, agriculture, mining, and urbanization have degraded, simplified, and fragmented habitat. Water diversions for agriculture, flood control, domestic, and hydropower purposes (especially in the Columbia River and Sacramento-San Joaquin Basins) have greatly reduced or eliminated historically accessible habitat. Studies indicate that in most western states, about 80 to 90 percent of the historic riparian habitat has been eliminated. Further, it has been estimated that during the last 200 years, the lower 48 states have lost approximately 53 percent of all wetlands and the majority of the rest are severely degraded. Washington and Oregon's wetlands are estimated to have diminished by one-third, while California has experienced a 91-percent loss of its wetland habitat. Loss of habitat complexity has also contributed to the decline of steelhead. For example, in national forests in Washington, there has been a 58-percent reduction in large, deep pools due to sedimentation and loss of pool-forming structures such as boulders and large wood. Similarly, in Oregon, the abundance of large, deep pools on private coastal lands has decreased by as much as 80 percent. Sedimentation from land use activities is recognized as a primary cause

> of habitat degradation in the range of west coast steelhead.

(Ex. 1, p. 41557.)

NMFS' final decision to list Central Valley steelhead as "threatened" under the federal ESA states:

> Modification of natural flow regimes have resulted in increased water temperatures, changes in fish community structures, depleted flow necessary for migration, spawning, rearing, flushing of sediments from spawning gravels, reduced gravel recruitment and the transport of large woody debris. In addition to these indirect effects from dams and other water control structures, they have also resulted in increased direct mortality of adult and juvenile steelhead.

(Ex 2, p. 856.)

NMFS's proposed decision to list Central Valley spring-run Chinook salmon as "threatened" under the federal ESA states:

> Chinook salmon (O. tshawytscha) are easily distinguished from other Oncorhynchus species by their large size. Adults weighing over 120 pounds have been caught in North American waters. ... Chinook salmon are anadromous and semelparous. This means that as adults, they migrate from a marine environment into the fresh water streams and rivers of their birth (anadromous) where they spawn and die (semelparous). Adult female chinook will prepare a spawning bed, called a redd, in a stream area with suitable gravel composition, water depth and velocity. ... Stream flow, gravel quality, and silt load all significantly influence the survival of developing chinook salmon eggs.

(Ex 3, p. 11483.)

> Native spring chinook salmon have been extirpated from all tributaries in the San Joaquin River Basin, which represents a large portion of the historic range and abundance of the ESU as a whole. The only streams considered to have wild spring-run chinook salmon are Mill and Deer Creeks, and possibly Butte Creek (tributaries to the Sacramento River), and these are relatively small populations with sharply declining trends. Demographic and genetic risks due to small population sizes are thus considered to be high.
>
> Habitat problems are the most important source of ongoing risk to this ESU. Spring-run fish cannot access most of their historical spawning and rearing habitat in the Sacramento and San Joaquin River Basins (which is now above impassable dams), and current spawning is restricted to the mainstem and a few river tributaries

> in the Sacramento River. The remaining spawning habitat accessible to fish is severely degraded. Collectively, these habitat problems greatly reduce the resiliency of this ESU to respond to additional stresses in the future. The general degradation of conditions in the Sacramento River Basin (including elevated water temperatures, agricultural and municipal diversions and returns, restricted and regulated flows, entrainment of migrating fish into unscreened or poorly screened diversions, and the poor quality and quantity of remaining habitat) has severely impacted important juvenile rearing habitat and migration corridors

(Ex 3, pp. 11491-11492.)

NMFS's final decision to designate critical habitat for Central Valley steelhead and Central Valley spring-run Chinook salmon, under the federal ESA states, regarding these species' life cycle and habitat needs:

> Juveniles and subadults typically spend from 1 to 5 years foraging over thousands of miles in the North Pacific Ocean before returning to spawn. Some species, such as coho and Chinook salmon, have precocious life history types (primarily male fish known as ''jacks'') that mature and spawn after only several months in the ocean. Spawning migrations known as ''runs'' occur throughout the year, varying by species and location. Most adult fish return or ''home'' with great fidelity to spawn in their natal stream, although some do stray to non-natal streams. Salmon species die after spawning, except anadromous O. mykiss (steelhead), which may return to the ocean and make one or more repeat spawning migrations. This complex life cycle gives rise to complex habitat needs, particularly during the freshwater phase (see review by Spence et al., 1996). Spawning gravels must be of a certain size and free of sediment to allow successful incubation of the eggs. Eggs also require cool, clean, and well oxygenated waters for proper development. Juveniles need abundant food sources, including insects, crustaceans, and other small fish. They need places to hide from predators (mostly birds and bigger fish), such as under logs, root wads and boulders in the stream, and beneath overhanging vegetation. They also need places to seek refuge from periodic high flows (side channels and off channel areas) and from warm summer water temperatures (cold water springs and deep pools). Returning adults generally do not feed in fresh water but instead rely on limited energy stores to migrate, mature, and spawn. Like juveniles, they also require cool water and places to rest and hide from predators. During all life stages salmon require cool water that is free of contaminants. They also require rearing and migration corridors with adequate passage conditions (water quality and quantity available at specific times) to allow access to the various habitats required to complete their life cycle.

(Ex 6, p. 52519 (italics added.)

NMFS's final decision to designate critical habitat for Central Valley steelhead and Central Valley spring-run Chinook salmon also discusses the required scale for analyzing impacts on these species:

> We are now also able to identify "specific areas" (ESA section 3(5)(a)) and "particular areas" (ESA section 4(b)(2)) at a finer scale than in 2000. As used the State of California's CALWATER watershed classification system, which is similar to the USGS watershed classification system that was used for salmonid critical habitat designations in the Northwest. This information is now generally available via the internet, and we have expanded our GIS resources to use these data. We used the CALWATER Hydrologic Subarea (HSA) unit (which is generally similar in size to USGS HUC5s) to organize critical habitat information systematically and at a scale that, while somewhat broad geographically, is applicable to the spatial distribution of salmon. Organizing information at this scale is especially relevant to salmonids, since their innate homing ability allows them to return to the watersheds where they were born. Such site fidelity results in spatial aggregations of salmonid populations that generally correspond to the area encompassed by HSA watersheds or aggregations of these watersheds.
>
> The CALWATER system maps watershed units as polygons, bounding a drainage area from ridge-top to ridgetop, encompassing streams, riparian areas and uplands. Within the boundaries of any HSA watershed, there are stream reaches not occupied by the species. Land areas within the CALWATER HSA boundaries are also generally not "occupied" by the species (though certain areas such as flood plains or side channels may be occupied at some times of some years). We used the watershed boundaries as a basis for aggregating occupied stream reaches, for purposes of delineating "specific"' areas at a scale that often corresponds well to salmonid population structure and ecological processes. This designation refers to the occupied stream reaches within the watershed boundary as the "habitat area'" to distinguish it from the entire area encompassed by the watershed boundary. Each habitat area was reviewed by the CHARTs to verify occupation, PCEs, and special management considerations (see ''Critical Habitat Analytical Review Teams'' section below).
>
> The watershed-scale aggregation of stream reaches also allowed us to analyze the impacts of designating a "particular area,"' as required by ESA section 4(b)(2). As a result of watershed processes, many activities occurring in riparian or upland areas and in nonfish-bearing streams may affect the physical or biological features essential to conservation in the occupied stream reaches. The watershed boundary thus describes an area in which Federal activities have the potential to affect critical habitat (Spence et al., 1996). Using watershed boundaries for the economic analysis ensured that all potential economic impacts were considered. Section 3(5) defines critical habitat in terms of "specific areas," and section 4(b)(2) requires the agency

> to consider certain factors before designating "'particular areas." In the case of Pacific salmonids, the biology of the species, the characteristics of its habitat, the nature of the impacts and the limited information currently available at finer geographic scales made it appropriate to consider "specific areas"' and "particular areas" as the same unit.

(Ex 6, p. 52520.)

III. Legal Framework

A. SGMA and GSP Regulations.

Both SGMA and the GSP regulations require GSPs and DWR to consider the interactivity between surface waters and groundwater extractions in its decision regarding a submitted GSP.

The purpose of a GSP is to facilitate the achievement of a basin's sustainability goal,[4] which is the "implementation of measures targeted to ensure that the applicable basin is operated within its sustainable yield."[5] A basin's "sustainable yield" is "the maximum quantity of water… that can be withdrawn annually from a groundwater supply without causing an undesirable result."[6] Six undesirable results are identified, including "depletions of interconnected surface water that have significant and unreasonable adverse impacts on beneficial uses of the surface water."[7] Thus, a GSP must facilitate achieving no depletions of interconnected surface waters that have significant and unreasonable adverse impacts on the beneficial uses of the surface water in a basin.

Each GSP must include a water budget—"an accounting of the total groundwater and surface water entering and leaving a basin including the changes in the amount of water stored."[8] Further, SGMA requires consideration of the interests of all beneficial uses and users of groundwater, which include "surface water users, if there is a hydrologic connection between surface and groundwater

[4] See Water Code, § 10727, subd. (a).

[5] *Ibid.*, subd. (u).

[6] *Ibid.*, subd. (v).

[7] *Ibid.*, subd. (x)(6).

[8] Water Code, § 10727, subd. (y)

bodies."[9] GSPs must also identify "groundwater dependent ecosystems",[10] which are "ecological communities or species that depend on groundwater emerging from aquifers or on groundwater occur near the ground surface."[11] Finally, GSPs must identify minimum thresholds for depletions of interconnected surface water, which are "the rate or volume of surface water depletions caused by groundwater use that has adverse impacts on beneficial uses of the surface water and may lead to undesirable results."[12] Thus, both SGMA and the regulations require DWR to consider the interactivity between groundwater pumping and interconnected surface water.

B. Reasonable and beneficial use doctrine.

The "reasonable and beneficial use" doctrine, to which SGMA expressly must comply,[13] is codified in the California Constitution. It requires that "the water resources of the State be put to beneficial use to the fullest extent of which they are capable, and that the waste or unreasonable use or unreasonable method of use of water be prevented, and that the conservation of such waters is to be exercised with a view to the reasonable and beneficial use thereof in the interest of the people and for the public welfare." (Cal Const, Art. X § 2; see also *United States v. State Water Resources Control Bd.* (1986) 182 Cal.App.3d 82, 105 ["…superimposed on those basic principles defining water rights is the overriding constitutional limitation that the water be used as reasonably required for the beneficial use to be served."].) The reasonable and beneficial use doctrine applies here given the negative impacts of the Draft GSP on groundwater supply, which are likely to unreasonably interfere with the use of groundwater for in-stream and riparian habitat uses. As the GSP authorizes waste and unreasonable use, it conflicts with the reasonable and beneficial use doctrine and the California Constitution.

C. Public Trust Doctrine.

The "public trust" doctrine applies to the waters of the State, and establishes that "the state, as trustee, has a duty to preserve this trust property from harmful diversions by water rights holders" and that thus "no one has a vested right to use water in a manner harmful to the state's waters."[14]

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[9] *Id.*, § 10723.2, subd.(f).

[10] *Id.*, subd. (g).

[11] *Ibid.*, § 351, subd. (m).

[12] *Ibid.*, § 354.28, subd. (6).

[13] Water Code § 10720.1(a)

[14] *United States v. State Water Resources Control Bd.* (1986) 182 Cal.App.3d 82, 106; see also *National Audubon Society v. Superior Court* (1983) 33 Cal.3d 419, 426 ["before state courts and

The "public trust" doctrine has recently been applied to groundwater where there is a hydrological connection between the groundwater and a navigable surface water body. (*Environmental Law Foundation v. State Water Resources Control Bd.* (2018) 26 Cal.App.5th 844 (*Environmental Law Foundation* or *ELF*). In *Environmental Law Foundation*, the court held that the public trust doctrine applies to "the extraction of groundwater that adversely impacts a navigable waterway" and that the government has an affirmative duty to take the public trust into account in the planning and allocation of water resources.[15] The court also specifically held that SGMA does not supplant the requirements of the common law public trust doctrine.[16] In contrast to these requirements, the GSP does not consider impacts on public trust resources, or attempt to avoid insofar as feasible harm to the public's interest in those resources.

The Public Trust Doctrine imposes an "affirmative duty on the state to act on behalf of the people to protect their interest in navigable water."[17] The doctrine is expansive and flexible—public trust uses include not only navigation, commerce, and fishing, but also hunting, bathing and swimming.[18] Further, "an increasingly important public use is the preservation of trust lands 'in their natural state, so that they may serve as ecological units for scientific study, as open space, and as environments which provide food and habitat for birds and marine life, and which favorably affect the scenery and climate of the area.'"[19]

ELF held that the State Board's public trust obligation was independent of, and not limited by, its authority to oversee permitting.[20] Relying on *National Audubon Society v. Superior Court*, ELF held that state agencies have "an affirmative duty to take the public trust into account in the

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agencies approve water diversions they should consider the effect of such diversions upon interests protected by the public trust, and attempt, so far as feasible, to avoid or minimize any harm to those interests."].

15 *Id*. at 856-62.

16 *Id*. at 862-870.

17 *ELF, supra*, 26 Cal.App.5th 844, 857.

18 *ELF, supra*, 26 Cal.App.5th at p. 857

19 *ELF, supra*, 26 Cal.App.5th 844, 857 [quoting *San Francisco Baykeeper, Inc. v. State Lands Com.* (2015) 242 Cal.App.4th 202, 234.]

20 *ELF, supra*, 26 Cal.App.5th at p. 862.

planning and allocation of water resources and to protect public trust uses whenever feasible."[21] Further, ELF held that "SGMA does not . . . replace or fulfill public trust duties, or scuttle decades of decisions upholding, defending, and expanding the public trust doctrine."[22] Therefore, SGMA does not supplant a state agency's affirmative and independent obligation to consider the public trust in decisions regarding the planning and allocation of water resources and to protect public trust uses whenever feasible.

Both GSPs and DWR must comply with the holding of *Environmental Law Foundation v. State Water Resources Control Board* in your decisions to approve, deem incomplete, or reject this Plan. Pursuant to *Environmental Law Foundation*, DWR must: (1) identify any public trust resources within each basin; (2) identify any public trust uses within each basin; (3) identify and analyze the potential adverse impact of groundwater extractions on public trust resources and uses; and (4) determine the feasibility of protecting public trust uses and protect such uses "whenever feasible."

The affirmative and independent obligation to consider the public trust applies to DWR's decisions regarding submitted GSPs and Alternatives, imposing a legal duty on DWR to not only consider the potential adverse impacts of groundwater extractions on navigable waterways but also "to protect public trust uses whenever feasible."[23] ELF explicitly held that this affirmative duty is not supplanted by SGMA.[24] GSAs and DWR are thus legally obligated to consider the public trust in adopting or approving GSPs. The criteria for each basin should include: (1) identifying any public trust resources within the basin; (2) identifying any public trust uses within the basin; (3) identifying and analyzing potential adverse impacts of groundwater extractions on public trust resources and uses; and (4) determining the feasibility of protecting public trust uses and protecting such uses "whenever feasible."

1. Identifying Any Public Trust Resources Within the Basin.

The first step is to identify any public trust resources—state-owned navigable waterways—within the groundwater basin.[25] The public trust doctrine mandates that "the title which

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[21] *ELF, supra*, 26 Cal.App.5th at p. 865 [quoting *National Audubon Society v. Superior Court* (1983) 33 Cal.3d 419, 446-47 [hereinafter *National Audubon*].)

[22] *ELF, supra*, 26 Cal.App.5th at p. 865.

[23] *ELF, supra*, 26 Cal.App.5th at p. 865

[24] *ELF, supra*, 26 Cal.App.5th at p. 856-67.

[25] See *Illinois Central Railroad Co. v. State of Illinois* (1892) 146 U.S. 387, 436 ["the [public trust] doctrine is founded upon the necessity of preserving to the public the use of navigable

a State holds to land under navigable waters is . . . held in trust for the people of the State."[26] In ELF, the Scott River was a navigable waterway and so constituted a public trust resource.[27] Thus, to satisfy its public trust duty, DWR must identify all state-owned navigable waterways in each basin—this step should be formally incorporated as the first public trust criteria in the GSP regulations. DWR must ensure that it has identified all state-owned navigable waterways in each basin when making its decision regarding a submitted GSP or Alternative.

2. Identifying Any Public Trust Uses Within the Basin.

The second step is to identify any public trust uses within the groundwater basin for each public trust resources identified above. DWR must identify all public trust uses, including but not limited to: navigation, commerce, fishing, hunting, bathing, and swimming as well as preserving natural spaces to "serve as ecological units for scientific study, as open space, and as environments which provide food and habitat for birds and marine life, and which favorably affect the scenery and climate of the area."[28] As explained in ELF, "the range of public trust uses is broad" as well as "flexible, accommodating changing public needs."[29] To satisfy its public trust obligation, DWR must identify all public trust uses in each basin-this step should be incorporated as the second public trust criteria in the GSP regulations. Due to the flexibility of the doctrine, DWR should also include language which clarifies that it includes any uses that are declared as public trust uses in the future. DWR must ensure that it has identified all public trust uses in each basin when making its decisions regarding a submitted GSP or Alternative.

3. Identifying and Analyzing Potential Adverse Impacts of Groundwater Extractions on Public Trusts Resources and Uses.

The third step is to identify potential adverse impacts of groundwater extractions on the identified public trust resources and uses. As held in ELF, "the public trust doctrine applies if extraction of groundwater adversely impacts a navigable waterway to which the public trust doctrine

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waters"]; ELF, supra, 26 Cal.App.5th at p. 857-58.

[26] *ELF, supra*, 26 Cal.App.5th at p. 856-57 [quoting *Long Sault Development Co. v. Call* (1916) 242 U.S. 272, 278-79.]

[27] *ELF, supra*, 26 Cal.App.5th at p. 853.

[28] *ELF, supra*, 26 Cal.App.5th at p. 857

[29] ELF, supra, 26 Cal.App.5th at p. 857 [quoting *San Francisco Baykeeper, Inc. v. State Lands Com., supra*, 242 Cal.App.4th at p. 233.]

does apply."[30] DWR must analyze all potential harm from groundwater pumping to the identified public trust resources and uses within each basin. This encompasses analyzing all instances where groundwater extractions "allegedly harm[] a navigable waterway" and "thereby violate[] the public trust."[31] This step should be incorporated into the GSP regulations as the third public trust criteria. DWR must ensure it has identified and analyzed all potential adverse impacts of groundwater extractions on the public trust resources and uses during its GSP and Alternative decision-making.

4. Analyzing the Feasibility of Protecting Public Trust Uses and Protecting Such Uses "Whenever Feasible."

The fourth step is to analyze the feasibility of protecting the identified public trust uses from the identified potential harms due to groundwater extractions. As held in *ELF* and *National Audubon*, "the state has an affirmative duty to . . . protect public trust uses whenever feasible."[32] Thus, GSAs and DWR must analyze the feasibility of protecting public trust uses before making its decision regarding a GSP or Alternative.

However, not only must agencies analyze feasibility, but also protect public trust uses within each basin "whenever feasible." If it is feasible to protect public trust uses in decisions regarding GSPs and Alternatives, then DWR and GSAs must do so—even if the depletions of interconnected surface water are not determined by DWR to have "significant and unreasonable adverse impacts" on its beneficial uses.[33]

While SGMA sets a deadline of 2020 or 2022 for adopting GSPS for high- and medium-priority basins,[34] it delays until 2025 any SGMA-based state board interim plan intended to remedy a condition where the groundwater extractions result in significant depletions of interconnected surface waters in probationary basins.[35] However, under *ELF* and the public trust doctrine, DWR and GSAs have the authority, and the obligation, to take action now.

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[30]ELF, supra, 26 Cal.App.5th at p. 859 ["the determinative fact is the impact of the activity on the public trust resource."]

[31] *ELF, supra,* 26 Cal.App.5th at p. 859-60.

[32] *ELF, supra,* 26 Cal.App.5th at p. 862 [quoting *National Audubon, supra,* 33 Cal.3d 419, 446-47.]

[33] See Wat. Code, § 10727, subd. (x)(6).

[34] See Wat. Code, § 10720.7, subd. (a).

[35] *Ibid.*, § 10735.8, subd. (h).

IV. Discussion

In 2019, the California Department of Fish & Wildlife (CDFW) published "Fish & Wildlife Groundwater Planning Considerations" specifically to provide guidance to GSA's in their efforts to draft GSPs that adequately address both "Groundwater Dependents Ecosytems" (GDEs) and "Interconnected Surface Waters" (ISW). (Ex 7.) This guide book provides important criteria for judging the Plan's failure to adequately address both issues.

A. Interconnected Surface Water Systems.

With respect to Interconnected Surface Waters, CDFW's Groundwater Planning Considerations pose three simple questions taht GSPs should answer:

> 1. How will groundwater plans document the timing, quantity, and location of ISW [Interconnected Surface Waters] depletions attributable to groundwater extraction and determine whether these depletions will impact fish and wildlife?
> 2. How will GSAs determine if fish and wildlife are being adversely impacted by groundwater management impacts on ISW?
> 3. If adverse impacts to ISW-dependent fish and wildlife are observed, how will GSAs facilitate appropriate and timely monitoring and management response actions?

(Ex 7, p. 5.) This Plan answers none of these questions.

Given the critical importance of avoiding harmful stream flow depletion in the subbasin's rivers and stream, one would expect it to be a major topic of investigation, reporting, and planning in development of the Plan over the last five years. In its comment letter, NMFS emphasized the need to identify conditions in which groundwater pumping may causes stream flow depletion. (NMFS 3/17/20, p. 1.) Instead, the entire topic is disposed of in five short paragraphs, as follows:

> Interconnected surface waters are surface water features that are hydraulically connected by a saturated zone to the groundwater system. In these systems, the water table and surface water features intersect at the same elevations and locations. Interconnected surface waters may be either gaining or losing, wherein the surface water feature itself is either gaining water from the aquifer system or losing water to the aquifer system.
>
> In the Eastern San Joaquin Subbasin, stream connectivity was analyzed by comparing monthly groundwater elevations from the historical calibration of the ESJWRM to streambed elevations along the streams represented in ESJWRM. This analysis was based on modeling results from the historical calibration of the ESJWRM for approximately 900 stream nodes in the Eastern San Joaquin Subbasin, which

> represents that best available information for current and historical conditions related to interconnected surface water systems. Figure 2-71 shows locations where streams are interconnected at least 75 percent of the time (shown in blue) or interconnected less than 25 percent of the time (shown in green).
>
> Disconnected streams will always be losing streams, but interconnected streams may be either losing or gaining, depending on the surface water and groundwater conditions. Groundwater discharge from the aquifer is primarily through groundwater pumping, however, groundwater also discharges to streams where groundwater elevations are higher than the streambed elevations. Figure 2-72 shows mostly gaining streams in blue where groundwater discharges to rivers more than 75 percent of the time, mostly losing streams in red where streams lose water to the groundwater system more than 75 percent of the time, and mixed streams (gaining or losing less than 75 percent of the time) in orange.
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> Due to limited model calibration based on insufficient calibration information, stream nodes in the Delta area and along stretches of streams near the foothill boundary of the Subbasin are not shown on Figure 2-71 and Figure 2-72. Interconnected surface water is highlighted as a data gap in Section 4.7.3 due to a lack of data from shallow monitoring wells near streams. Future improvements to the understanding of interconnected surface water include proposed monitoring wells in Section 4.7.5 that are largely located along streams or in areas of the foothills where current monitoring coverage is lacking and a specific project in Section 6.2.7 to improve understanding of losses along Mokelumne River. Section 7.4.1 discusses model refinements over the next five years in order to improve calibration of the model and its use in analysis of GSP water budgets and sustainability criteria.

(Final GSP, § 2.2.6, p. 2-104.)

Every portion of this truncated discussion is deeply flawed.

1. The purpose of classifying of stream reaches as “gaining” or losing” is unstated.

The text of section 2.2.6 quoted above fails to explain the function or purposes of classifying stream reaches as “gaining” or losing.” To what uses will these classifications be put? The Plan does not say. NMFS made a similar point, stating: “there appears to be little to no explanation of how classifying stream interconnection in this way will be used to inform the existing streamflow depletion dynamic, or investigate and address significant and unreasonable impacts to beneficial uses of that streamflow that may result.” (NMFS 3/17/20, p. 2.)

NMFS also commented that the Plan’s “‘less than 25% of the time’ threshold for displaying interconnected surface waters excludes reaches of stream that are connected intermittently to groundwater and that may depend on groundwater contributions to meet the needs of instream or riparian beneficial uses and users of interconnected surface waters." NMFS' assumption that the "less than 25% of the time" metric represents a threshold below which the Plan does not consider surface and ground waters to be interconnected may be correct, but the Plan does not say this. As noted above, the Plan fails to say what the purpose of this metric is.

2. The classification of stream reaches as "gaining" or losing" is arbitrary.

If NMFS's assumption about the purpose of the "less than 25% of the time" metric is correct, then NMFS is also correct that use of this metric is unsupported. ((NMFS 3/17/20, p. 2 [NMFS recommends that the final GSP explain and justify the above-described process for characterizing interconnected surface flow"].)

If NMFS's assumption is correct, then NMFS is also correct that the metric excludes stream conditions that pose a risk of groundwater pumping induced stream flow depletion:

> Instream habitat quality and persistence, and the ability of salmon and steelhead to use that habitat, is largely dictated by the timing and duration of streamflow. Intermittent stream channels that lose flow during summer/fall nevertheless provide considerable ecosystem benefits to many GDEs, including salmonids. ... The "less than 25% of the time" threshold for displaying interconnected surface waters excludes reaches of stream that are connected intermittently to groundwater and that may depend on groundwater contributions to meet the needs of instream or riparian beneficial uses and users of interconnected surface waters

(NMFS 3/17/20, p. 2.) As NMFS has repeatedly pointed out in its ESA listings and critical habitat designations for the species most at risk, salmonids have evolved to adapt to the specific seasonal and annual timing, duration, and depth of stream flow in their natal rivers and streams.

The Plan fails to take the these species' life cycle and habitat needs into account for purposes of identifying and avoiding deleterious groundwater pumping induced stream flow depletion. Nor does it propose a protocol or plan to take these species' life cycle and habitat needs into account for this purpose.

3. The Plan's informational basis for proposing classification of stream reaches as "gaining" or losing" is inadequate.

The Draft Plan circulated for public comment in 2019 states:

> In the Eastern San Joaquin Subbasin, groundwater discharge from the aquifer is primarily through groundwater pumping. However, groundwater also discharges to

> streams where groundwater elevations are higher than the streambed. Figure 2-65 shows gaining streams in blue where groundwater discharges to rivers, losing streams in red where streams lose water to the groundwater system, and mixed streams (gaining or losing less than 75 percent of the time) in orange. This analysis was based on modeling results from the historical calibration of the ESJWRM for approximately 900 stream nodes in the Eastern San Joaquin Subbasin.
>
> Stream connectivity was analyzed by comparing monthly groundwater elevations from the historical calibration of the ESJWRM to streambed elevations along the streams represented in ESJWRM. Shown in Figure 2-66 are locations where streams are interconnected at least 75 percent of the time (shown in blue) or disconnected (shown in green).

(Draft Plan, § 2.2.6, ¶ 2-97.

In comments on the Draft Plan CSPA's retained geologist, Greg Kamman, commented that:

> This section of the GSP only presents a description of historical (and dry) interconnected surface water conditions [based on data from 1996-2015]. Section 354.16 of the California Code of Regulations (Regulations) stipulates that each Plan shall provide a description of current and historical groundwater conditions in the basin. The GSP fails to describe the current conditions of the interconnected surface water system in the basin.
>
> ***
>
> In many instances, a losing stream may also be in hydraulic connection to the aquifer. Losing streams may become disconnected seasonally or during drought periods in response to a falling water table. There are inconsistencies between the results presented in Exhibits A and B where areas delineated as gaining streams are also identified as being disconnected. A good example of this is the upstream portion of the Stanislaus River located in the southeast corner of the basin. These inconsistencies should be corrected or explained. In addition, the stream connectivity presented in Exhibit B is for historic conditions – the current conditions should also be presented per Regulations.

(Final GSP, Appendix 1-I, Public Comments, pp. 564-565.)

The Final GSP responded to these and other comments, stating:

> The ESJGWA recognizes that depletions of interconnected surface water are a data gap area and supports the use of groundwater levels as a proxy, as this represents the best information currently available. The ESJGWA has identified a need for future study and refinement of interconnected surface water and will continue coordination

efforts to better inform basin conditions.

(Final GSP, Appendix 1-J, Response to Public Comments, p. Master Response 2.)

This response is inadequate because the use of groundwater levels as a proxy does not represent the best information currently available. As Mr Kamman and NMFS point out, the Plan's use of "groundwater elevations as a proxy" is only useful for identifying areas/times with a high risk of groundwater pumping induced stream flow depletion if groundwater elevations are correlated with surface flow stream elevations at a sufficiently specific geographic scale to identify at-risk locations at specific times of the year. The Plan does not do so.

CDFW's Groundwater Planning Considerations provide a detailed description of the factors that must be included in GSPs to evaluate impacts on fish and wildlife stream flow depletion from groundwater pumping, including factors relating to species life cycle (e.g., temporal water needs ["aquatic and terrestrial species require different quantities and qualities of water at different times and for different durations"]; spatial water needs ["similar to temporal water needs, species are sensitive to the location and coverage of ISW and GDE wetland habitat available to them"]; hydrologic variability ["water availability is naturally variable, and many species rely on a degree of hydrologic variability"]; water availability ["CDFW expects groundwater budget projections to include fish and wildlife water needs"]; water quality ["Groundwater quality and ISW quality play a significant role in habitat adequacy. Groundwater pumping can impact many components of water quality..."]) and factors relating to habitat value (e.g., connectivity ["Habitat connectivity is a key ecological attribute of thriving ecosystems"]; heterogeneity ["Habitat heterogeneity, such as vegetation age and diversity, is a key ecological attribute of many functional ecosystems ..."]; groundwater elevation ["Groundwater-dependent habitats, including ISW, are particularly susceptible to changes in the depth of the groundwater"].)[36] (Ex 7, pp. 9-11.)

(p. 11.) The Plan does not include any analysis of these factors, nor does it propose a plan or protocol to do so in the future.

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[36] "Lowered water tables that drop beneath root zones can cutoff phreatophyte vegetation from water resources, stressing or ultimately converting vegetated terrestrial habitat. Induced infiltration attributable to groundwater pumping can reverse hydraulic gradients and may cause streams to stop flowing, compromising instream dissolved oxygen and temperature characteristics, and eventually causing streams to go dry. The frequency and duration of exposure to lowered groundwater tables and low-flow or no-flow conditions caused by groundwater pumping, as well as habitat and species resilience, will dictate vulnerability to changes in groundwater elevation. For example, some species rely on perennial instream flow, and any interruption to flow can risk species survival. Impacts caused by changes in groundwater elevation should be considered in the evaluation of groundwater management effects on GDEs and ISW." (Ex 7, p. 11.)

Mr. Kamman's comments on the Draft GSP include a methodology previously used by the State Water Resources Control Board for mapping areas where groundwater pumping is likely to cause depletion of surface flows, known as Potential Stream Depletion Areas ("PSDA"). (Final GSP, Appendix 1-I, Public Comments, pdf pp. 589-597.) Mr. Kamman applied this methodology to the mainstem Stanislaus River watershed between Goodwin Dam and its confluence with the San Joaquin River; and the mainstem Tuolumne River watershed between La Grange Dam/Reservoir and the San Joaquin River (the "PSDA Study Area"). The results include fifteen (15) maps using USGS 7.5-minute topographic quadrangle sheets (quad sheets) showing the mainstem river channels. (Final GSP, Appendix 1-I, Public Comments, pdf pp. 598-612.)

Given the virtual absence of useable information in the Plan for identifying areas/times with a high risk of groundwater pumping induced stream flow depletion, Mr. Kamman's methodology and resulting maps represent the best information available for this purposes. Yet the Plan fails to adopt the methodology or the resulting maps; and fails to explain why they do not represent the best information available.

4. The Plan's proposed installation of new monitoring wells does not address the risk of deleterious groundwater pumping induced stream flow depletion.

The Plan fails to describe any protocol to obtain usable information to identify areas/times with a high risk of groundwater pumping induced stream flow depletion. Instead, the Plan proposes a handful of new monitoring wells, as follows.

> Section 2.2.6. Future improvements to the understanding of interconnected surface water include proposed monitoring wells in Section 4.7.5 that are largely located along streams or in areas of the foothills where current monitoring coverage is lacking and a specific project in Section 6.2.7 to improve understanding of losses along Mokelumne River. Section 7.4.1 discusses model refinements over the next five years in order to improve calibration of the model and its use in analysis of GSP water budgets and sustainability criteria.

(Final GSP, § 2.2.6, p. 2-105.)

> Section 4.7.3. Interconnected Surface Water System Data Gaps. The ESJGWA recognizes the depletions of interconnected surface water as a data gap area. The ESJGWA has identified a need for future study and refinement of interconnected surface water and will continue coordination efforts to better inform Subbasin conditions. As discussed in Section 7.4.1, future model calibration will be improved by more information on interconnected surface water, including the incorporation of shallow groundwater levels near streams from the proposed wells in Section 4.7.5 and the study of Mokelumne River losses in Section 6.2.7.

(Final GSP, § 4.7.3, p. 4-15.)

> Section 4.7.5. There are up to 12 proposed new monitoring well sites (shown in Figure 4-3 in orange); these wells will be measured for groundwater levels and groundwater quality. The locations of the proposed monitoring wells are subject to change based on the needs of the Subbasin and well siting feasibility.
> Two of these wells will be deep, multi-completion wells ... will improve the density and sampling frequency for both groundwater quality and groundwater level monitoring within data gap areas. Additional multi-completion groundwater level information will assist with better understanding of groundwater-surface water interaction and GDEs. One of the TSS wells is located approximately in the middle of the northern Subbasin boundary (near Dry Creek) and the other well is located along Calaveras River near Highway 88 in the approximate middle of the Subbasin. The remaining wells will be new shallow groundwater level and quality monitoring wells located near streams, Subbasin boundaries, and the groundwater depression area in the center of the Subbasin. ... The proposed locations of these wells were selected to be co-located with identified and potential GDE areas and near streams to further understanding of groundwater-surface water connectivity and to refine GDE data gaps. Additionally, groundwater level data collected from these wells will improve the understanding of groundwater flows between subbasins and groundwater quality data will assist in tracking quality in different areas of the Subbasin.

(Final GSP, § 4.7.5, p. 4-16.)

> Section 7.4.1. The ESJWRM will be updated based on newly available information or additional information provided by GSAs. This will include extending the historical model time series through at least 2020 and refining the model grid to align with the most recently updated GSA boundaries. Areas of higher uncertainty, such as the Sacramento-San Joaquin River Delta (Delta), Sierra Nevada foothills, and stream-aquifer interaction, will be refined using additional information made available through GSP monitoring and projects to achieve better calibration. Once the model has been updated and calibrated, new SGMA scenarios will be developed, including the current, projected, and sustainable scenarios as well as associated water budgets and the evaluation of sustainability indicators based on project implementation. The historical model is expected to be updated and calibrated by 2023 so that updated scenarios can be developed before the first GSP update in 2025.

(Final GSP, § 7.4.1, p. 4-16.)

There is nothing here suggesting that these wells will gather heretofore unavailable information that would allow for the correlation of groundwater and surface flow elevations at sufficiently fine-grained geographic and temporal scales necessary to evaluate the risk of harm to salmonids and their life cycle and habitat needs.

5. The Plan's conclusions regarding the significance of streamflow depletion impacts from groundwater pumping are arbitrary, unsupported by any evidence, and counterfactual.

The final GSP states:

> In discussions of interconnected surface water, the ESJGWA Board, Advisory Committee, Workgroup members, and GSA staff did not indicate any current or historical significant and unreasonable depletions. Based on this input, this Plan assumes that historical conditions are protective of beneficial uses related to interconnected surface water. Therefore, the historical depletions simulated by ESJWRM's historical calibration (documentation in Appendix 3-A) are assumed to have no associated undesirable results.

(Plan, §3.2.6.2; pp. 3-21, 3-22.)

This conclusion is directly contrary to DWR's finding, based on the best information available in 2019, that the evidence supports concluding that the Eastern San Joaquin subbasin is experiencing adverse effects on stream flow and habitat from groundwater pumping. Indeed, DWR assigned the maximum number of points for these effects for purposes of prioritizing this basin as "critically overdrafted." (Ex 9, pp. 29-31; Ex 10; NMFS 3/17/20, p. 3; see also, Ex 11, pp. 5-6.)

It is one thing to lack perfect information. It is quite another to ignore and contradict the only information that does exist.

This critical error in the Plan explains its utter failure to devote any analysis or resources—at all—to identifying and making plans to avoid existing undesirable results from groundwater pumping induced streamflow depletion. (See NMFS 3/17/20 ["NMFS recommends the final GSP elaborate sufficiently as to when, where, and how this data will be collected during the first few years of GSP implementation, or at the very least, clearly commit to developing a detailed data collection plan with interested stakeholders at a later date"].)

B. Groundwater Dependent Ecosystems.

CSPA adopts NMFS comment:

> The final GSP identifies spatial areas preliminarily disregarded as GDEs. One is any area with a depth to groundwater greater than 30-feet in spring 2015. The reasoning for this exclusion appears to concern oak tree rooting depth. However, judging oak rooting conditions based upon spring 2015 groundwater depths may be misleading,

> since 2015 is a drought year with historically low spring groundwater elevations. Focusing on this time period will likely exclude significantly more area from GDE consideration as compared to using more representative groundwater elevations (i.e., those not associated with a severe drought). A footnote acknowledges the potential bias, but only indefinably proposes to "consider the factor in future GDE analyses."

((NMFS 3/17/20, p. 2.)

C. Water Budget, Sustainable Yield Estimate, and Overdraft Reduction Estimate.

1. Lack of Transparency Precludes Stakeholder Participation.

There are fundamental problems with the Plan's water budget, sustainable yield estimate, and overdraft reduction estimate. The Plan identifies two areas of uncertainty associated with assumptions used in the modeling scenarios and estimate of sustainable yield that, "will be honed over time in updates to this Plan and refinements to the ESJWRM as described in Section 7.4.1." (Plan, p. 23-142.) The Plan describes one area of uncertainty as:

> There are uncertainties associated with projections in the ESJWRM scenarios due to the sequence of the hydrologic period, population projections, future cropping patterns, and irrigation practices and technologies, as well as uncertainties inherent in the representation of the physical groundwater and surface water system by the model. Therefore, to account for these uncertainties, a range of assumptions (from high-end estimates to low-end estimates) are used in running model scenarios to estimate the sustainable yield and an initial estimate of the adjustment that would be required to achieve the sustainable yield over the 50-year planning period. These assumptions will be honed over time in updates to this Plan and refinements to the ESJWRM as described in Section 7.4.1.

(Plan, p. 2-142.) The GSP, however, fails to disclose what "range of assumptions" were used in running model scenarios to estimate sustainable yield. The final average annual water budget parameters used to represent the "sustainable conditions scenario" are presented in Table 2-15, however there is no presentation on how any one variable may have been varied. Nor is there any discussion or presentation as to which variations in which variables accounted for differences in the final water budget. (See Ex 11.)

SGMA requires involving all stakeholders in the development of GSPs. The water budget is the heart of the GSP for purposes of achieving compliance with SGMA's goals. This lack of transparency precludes meaningful stakeholder participation.

2. The Plan fails to base its water budget estimate or its sustainable yield or groundwater extraction reduction estimates on reasonable climate change projections.

The Plan fails to base its water budget or its sustainable yield or groundwater extraction reduction estimates on reasonable climate change projections. The CDFW commented that this failure will cause the plan to overestimate surface water availability and sustainable yield and not rely on best available information, citing 23 CFR § 354.18(e). (Plan Appendix 1-J, Response Table, p. 1.) CDFW commented:

> Overestimation of water availability can result in the overallocation of both surface and groundwater water resources, unnecessarily jeopardizing environmental beneficial users. Two water budget assumptions that do not rely on best available information and that underscore current sustainable yield estimations are as follows: 1) the climate change analysis predicting a net depletion of aquifer storage is not reflected in the projected water budget or estimated sustainable yield, rather it is presented as a separate analysis; and 2) projected surface water deliveries need to be updated to reflect any new regulatory reductions of surface water deliveries such as those that may be codified in the State Water Resources Control Board Water Quality Control Plan for the Bay Delta: San Joaquin River Flows and Southern Delta Water Quality. b. Recommendation: Amend the water budget and sustainable yield: 1) apply climate change estimates to the projected water budget and scale the sustainable yield accordingly; and 2) adjust surface water delivery estimates to reflect any new regulatory compliance.

(Plan Appendix 1-J, Response Table, p. 1.)

The Plan's response to comments states:

> Consistent with regulations, the 2070 climate change sensitivity analysis on the projected conditions scenario was used to better understand trends and inform planning. Due to the uncertainty around climate projections in the 2070 timeframe, the ESJGWA Board determined the projected conditions scenario was most appropriate for analyzing sustainable yield in the GSP implementation time period beginning in 2040. Therefore, the sustainable yield analysis did not include climate change.

(Plan Appendix 1-J, Response Table, p. 1, pdf p. 903.)

The Plan's exclusion of conditions expected with future climate change from its calculation of the water budget or its sustainable yield or groundwater extraction reduction estimate on reasonable climate change projections violates well established California policies that require all public agencies in this state to plan for climate change. (See e.g., (Health and Safety Code §§ 38550, 38566), Executive Order S-3-05; *Cleveland National Forest Foundation v. San Diego Assn. of Governments* (2017) 3 Cal.5th 497, 504 ["targets were based on a scientific consensus that climate change was largely caused by human activity resulting in elevated levels of carbon dioxide and other heat-trapping gases in the atmosphere and that drastic reductions in greenhouse gas emissions were required to stabilize the climate"]; *Center for Biological Diversity v. California Dept. of Fish and Wildlife* (2015) 62 Cal.4th 204, 219 (*Newhall Ranch I*); *Center for Biological Diversity v. Department of Fish and Wildlife* (2016) 1 Cal.App.5th 452, 469 (*Newhall Ranch II*); *Spring Valley Lake Association v. City of Victorville* (2016) 248 Cal.App.4th 91, 101; *Sierra Club v. County of San Diego* (2014) 231 Cal.App.4th 1152, 1168; *Friends of Oroville v. City of Oroville* (2013) 219 Cal.App.4th 832, 841); *Citizens for Responsible Equitable Environmental Development v. City of Chula Vista* (2011) 197 Cal.App.4th 327, 335–336.)

The failure to include effects of climate change on water demand and water supply in the projected water budget violates 23 CCR § 354.18(c)(3), (d)(3), and SGMA's requirement to base GSPs on the best available information and best available science. (23 CCR § 354.18(e), and renders the Plan's water budget calculation and its sustainable yield and groundwater extraction reduction estimates invalid. The Plan's reliance on the "uncertainty around climate projections" is not legally valid. The state of California does not deny the reality and urgency of climate change and its effects on water supplies. (See e.g., Ex 8.)[37] SGMA does not require the use of "certain" information or bar the use of "uncertain" information. Its require using the best information. Assuming that climate change will not affect the water budget does not meet this standard.

3. The Plan fails to demonstrate achievement of sustainable groundwater management or the Plan's sustainability goal because it relies on proejcts of unknown feasiblity to reduce groundwater pumping.

CSPA commented on the Draft Plan that "the GSP has not demonstrated that the Project Actions will be effective in achieving stated reductions in groundwater use and avoiding undesirable results." (Plan, Appendix 1-I, pdf p. 567.) The final Plan concedes the point and responds that analysis of project feasibility will be deferred to an unspecified time in the future. (Plan, Appendix 1-J, pdf p. 907.) According to the Plan, achieving its sustained yield goal requires reducing groundwater pumping by 78,000 acre feet per year, and these reductions are dependent on implementing these projects. The Plan's failure to demonstrate their feasibility, therefore, means the Plan fails to demonstrate achievement of sustainable groundwater management or the Plan's sustainability goal.

[37] Guidance for Climate Change Data Use During Groundwater Sustainability Plan Development (Guidance Document), Department of Water Resources; July 2018.

V. CONCLUSION

The groundwater levels sustainable management criteria set by a GSA must be the point that, "if exceeded, may cause undesirable results."[38] Therefore, the Plan's groundwater levels sustainable management criteria must have the purpose of avoiding "significant and unreasonable" impacts on beneficial users caused by declining groundwater levels.[39] The GSA's determination of what is "significant and unreasonable" must consider the impacts on all types of beneficial users, including fish and wildlife, CSPA and its members, and all who use and are concerned about watershed health in the rivers and streams of California.

The regulations also establish that a failure to consider all beneficial uses and users of groundwater undermines the likelihood that a basin will reach its sustainability goal.[40] For groundwater levels specifically, GSAs must place minimum thresholds for each monitoring site at the level "that may lead to undesirable results."[41] Under the SGMA regulations, the GSP should provide a description of "the information and criteria relied upon to establish minimum thresholds," an explanation of how the proposed minimum thresholds will "avoid undesirable results," and "how minimum thresholds may affect the interests of beneficial uses and users of groundwater."[42]

Because the GSP does not consider effects on the interests of all the beneficial uses and users of groundwater, it fails to "include[] the information required by [SGMA] and [its accompanying regulations]" and is thus inadequate.[43] Here, the Plan fails to comply with 23 CCR § 355.4(b) ["(1) Whether the assumptions, criteria, findings, and objectives, including the sustainability goal, undesirable results, minimum thresholds, measurable objectives, and interim milestones are reasonable and supported by the best available information and best available science"]; ["(2) Whether the Plan identifies reasonable measures and schedules to eliminate data gaps]; ["(3)Whether sustainable management criteria and projects and management actions are commensurate with the level of understanding of the basin setting, based on the level of uncertainty, as reflected in the Plan"]; and (4) ["Whether the interests of the beneficial uses and users of groundwater in the basin, and the land uses and property interests potentially affected by the use of groundwater in the basin, have been considered"].)

Thus, DWR must determine the Plan is inadequate because it does not "include[] the information required by [SGMA] and [its accompanying regulations]." (23 CCR § 355.4(a)(2).)

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[38] 23 CCR § 354.28(a).
[39] 23 CCR § 354.26.
[40] 23 CCR § 355.4(b).
[41] 23 CCR § 354.28.
[42] 23 CCR § 354.28.
[43] 23 CCR § 355.4(a)(2).

Thank you for your attention to this matter.

Very Truly Yours,

Thomas N. Lippe

Exhibits

1. Proposed Endangered Status for Five ESUs of Steelhead and Proposed Threatened Status for Five ESUs of Steelhead in Washington, Oregon, Idaho, and California. Federal Register/Vol. 61, No. 155/Friday, August 9, 1996/pp. 41541-41561.

2. Final Listing Determinations for 10 Distinct Population Segments of West Coast Steelhead. Federal Register/Vol. 71/No. 3/January 5, 2006/pp. 834-862.

3. Proposed Endangered Status for Two Chinook Salmon ESUs and Proposed Threatened Status for Five Chinook Salmon ESUs. Federal Register/Vol. 63, No. 45/March 9, 1998/pp. 11482-11520.

4. Threatened Status for Two Chinook Salmon Evolutionarily Significant Units (ESUs) in California. Federal Register / Vol. 64, No. 179 / Thursday, September 16, 1999/pp. 50394-50415.

5. Designation of Critical Habitat for Seven Evolutionarily Significant Units of Pacific Salmon (Oncorhynchus tshawytscha) and Steelhead (O. mykiss) in California. Federal Register/Vol. 69, No. 237/Friday, December 10, 2004/Proposed Rules/pp. 71880-72017.

6. Final Critical Habitat Rule for Central Valley steelhead (Oncorhynchus mykiss) and Central Valley spring-run Chinook salmon (O. tshawytscha). Federal Register/Vol. 70, No. 170/September 2, 2005/pp. 52488-52627.

7. Fish & Wildlife Groundwater Planning Considerations. California Department of Fish & Wildlife, 2019.

8. Sustainable Groundwater Management Act - 2019 Basin Prioritization, Process and Results; Department of Water Resources, May 2020.

9. Excerpt from DWR Basin Priority Database for the Eastern San Joaquin Subbasin.

10. Guidance for Climate Change Data Use During Groundwater Sustainability Plan Development (Guidance Document), Department of Water Resources; July 2018.

11. Letter dated May 14, 2020, from Greg Kamman, consulting geologist and hydrologist.

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EXHIBIT 1

(c) Special flight permits may be issued in accordance with sections 21.197 and 21.199 of the Federal Aviation Regulations (14 CFR 21.197 and 21.199) to operate the airplane to a location where the requirements of this AD can be accomplished.

Issued in Renton, Washington, on August 2, 1996.

Gary L. Killion,

Acting Manager, Transport Airplane Directorate, Aircraft Certification Service.

[FR Doc. 96–20290 Filed 8–8–96; 8:45 am]

BILLING CODE 4910–13–P

DEPARTMENT OF THE INTERIOR

Minerals Management Service

30 CFR Part 250

RIN 1010–AC19

Proposed Rule to Clarify Unitization

AGENCY: Minerals Management Service (MMS), Interior.

ACTION: Extension of comment period for proposed rule.

SUMMARY: This document extends to August 19, 1996, the deadline for the submission of comments on the proposed rule governing unitization of Outer Continental Shelf oil and gas leases, which was published on June 5, 1996. The proposed rule amends the unitization regulations by removing the model unit agreements, making them available from the Regional Supervisor as needed.

DATES: We will consider all comments that are received by August 19, 1996. We will begin our review of those comments at that time and may not fully consider comments we receive after August 19, 1996.

ADDRESSES: Mail or hand-carry comments to the Department of the Interior; Minerals Management Service; 381 Elden Street; Mail Stop 4700; Herndon, Virginia 20170–4817; Attention: Chief, Engineering and Standards Branch.

FOR FURTHER INFORMATION CONTACT:

Judy Wilson, Engineering and Standards Branch, Telephone (703) 787–1600.

SUPPLEMENTARY INFORMATION: The MMS has been asked to extend the deadline for respondents to submit comments on the proposed rule published on June 5, 1996 (61 FR 28525). The requests explain that more time is needed to allow respondents time to prepare comments on omissions in the proposed rule.

Dated: August 5, 1996.

Lucy R. Querques,

Acting Associate Director for Offshore Minerals Management.

[FR Doc. 96–20354 Filed 8–8–96; 8:45 am]

BILLING CODE 4310–MR–M

DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

50 CFR Parts 222 and 227

[Docket No. 960730210–6210–01; I.D. 050294D]

Endangered and Threatened Species: Proposed Endangered Status for Five ESUs of Steelhead and Proposed Threatened Status for Five ESUs of Steelhead in Washington, Oregon, Idaho, and California

AGENCY: National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration (NOAA), Commerce.

ACTION: Proposed rule; request for comments.

SUMMARY: NMFS has completed a comprehensive status review of West Coast steelhead (*Oncorhynchus mykiss*, or *O. mykiss*) populations in Washington, Oregon, Idaho, and California, and has identified 15 Evolutionarily Significant Units (ESUs) within this range. NMFS is now issuing a proposed rule to list five ESUs as endangered and five ESUs as threatened under the Endangered Species Act (ESA). The endangered steelhead ESUs are located in California (Central California Coast, South/Central California Coast, Southern California, and Central Valley ESUs) and Washington (Upper Columbia River ESU). The threatened steelhead ESUs are dispersed throughout all four states and include the Snake River Basin, Lower Columbia River, Oregon Coast, Klamath Mountains Province, and Northern California ESUs. NMFS is also designating the Middle Columbia River ESU as a candidate species.

NMFS is requesting public comments on the biological issues pertaining to this proposed rule and suggestions on integrated local/state/Federal conservation measures that might best achieve the purposes of the ESA relative to recovering the health of steelhead populations and the ecosystems upon which they depend. Should the proposed listings be made final, protective regulations under the ESA would be put into effect and a recovery program would be implemented.

DATES: Comments must be received by November 7, 1996. NMFS will announce the dates and locations of public hearings in Washington, Oregon, Idaho, and California in a separate Federal Register document. Requests for additional public hearings must be received by September 23, 1996.

ADDRESSES: Comments on this proposed rule and requests for public hearings or reference materials should be sent to the Protected Species Branch, Environmental and Technical Services Division, NMFS, Northwest Region, 525 NE Oregon Street, Suite 500, Portland, OR 97232–2737.

FOR FURTHER INFORMATION CONTACT: Garth Griffin, 503–231–2005, Craig Wingert, 310–980–4021, or Marta Nammack, 301–713–1401.

SUPPLEMENTARY INFORMATION:

Background

On May 5, 1992, NMFS received a petition to list Illinois River winter steelhead from the Oregon Natural Resources Council, the Siskiyou Regional Education Project, Federation of Fly Fishers, Kalmiopsis Audubon Society, Siskiyou Audubon Society, Klamath/Siskiyou Coalition, Headwaters, The Wilderness Society, North Coast Environmental Center, The Sierra Club—Oregon Chapter, and the National Wildlife Federation. On July 31, 1992, NMFS published a notice stating that the petition presented substantial information indicating that a listing might be warranted (57 FR 33939) and concurrently solicited information about the status of this population. NMFS completed a status review (Busby et al. 1993) that was summarized in a May 20, 1993, determination (58 FR 29390). NMFS concluded that Illinois River winter steelhead did not represent a ‘‘species’’ under the ESA and therefore, a proposal to list this population was not warranted. However, NMFS recognized that this population was part of a larger ESU whose extent had not yet been determined, but whose status might warrant listing because of declining trends in steelhead abundance observed in several southern Oregon streams.

In its May 20, 1993, finding regarding Illinois River winter steelhead, NMFS announced that it would conduct an expanded status review to identify all coastal steelhead ESU(s) within California, Oregon, and Washington, and to determine whether any identified ESU(s) warrant listing under the ESA. Subsequently, on February 16, 1994, NMFS received a petition from the Oregon Natural Resources Council and 15 co-petitioners to list all steelhead (or specific ESUs, races, or stocks) within the states of California, Oregon, Washington, and Idaho. In response to this petition, NMFS announced the expansion of its status review of steelhead to include inland steelhead populations occurring in eastern Washington and Oregon and the State of Idaho (59 FR 27527, May 27, 1994).

On September 21, 1993, NMFS received a petition from Washington Trout to list Deer Creek summer steelhead. On December 23, 1993, NMFS concluded that the petition presented substantial information indicating that listing may be warranted (58 FR 68108). NMFS completed a status review which concluded that Deer Creek summer steelhead did not represent a ''species'' under the ESA (59 FR 59981, November 21, 1994), and, therefore, a proposal to list this population under the ESA was not warranted. However, NMFS further concluded that Deer Creek summer steelhead were part of a larger ESU that may warrant listing under the ESA and for which a status review was currently underway.

On March 16, 1995, NMFS published a proposed rule to list Klamath Mountains Province steelhead as threatened (60 FR 14253). This proposal included steelhead populations occurring in coastal streams between Cape Blanco, OR, and the Klamath River Basin in Oregon and California, inclusive. A brief summary of this ESU is included in the current proposed rule. Public comments were received on this earlier proposal.

During the coastwide steelhead status review, NMFS assessed the best available scientific and commercial data, including technical information from Pacific Salmon Biological Technical Committees (PSBTCs) and interested parties in Washington, Oregon, Idaho, and California. The PSBTCs consisted primarily of scientists (from Federal, state, and local resource agencies, Indian tribes, industries, universities, professional societies, and public interest groups) possessing technical expertise relevant to steelhead and their habitats.

A NMFS Biological Review Team, composed of staff from NMFS' Northwest Fisheries Science Center and Southwest Regional Office, as well as a representative of the National Biological Service, has completed a coastwide status review for steelhead [Memorandum to William Stelle and Hilda Diaz-Soltero from M. Schiewe, July 17, 1995, Review of the Status of Steelhead (*O. mykiss*) from Washington, Idaho, Oregon, and California under the U.S. Endangered Species Act]. Copies of the memorandum are available upon request (see **ADDRESSES** section). The review, summarized below, identifies 15 ESUs of steelhead in the four states. NMFS is proposing to list five ESUs as endangered and five ESUs as threatened under the ESA. In addition, NMFS is proposing to add the Middle Columbia River ESU to the candidate species list. The complete results of NMFS' status review of steelhead populations will be published in a forthcoming NOAA Technical Memorandum (Busby et al., in press).

Steelhead Life History

Steelhead exhibit one of the most complex suite of life history traits of any salmonid species. Steelhead may exhibit anadromy (meaning that they migrate as juveniles from fresh water to the ocean, and then return to spawn in fresh water) or freshwater residency (meaning that they reside their entire life in fresh water). Resident forms are usually referred to as ''rainbow'' or ''redband'' trout, while anadromous life forms are termed ''steelhead.'' Few detailed studies have been conducted regarding the relationship between resident and anadromous *O. mykiss* and as a result, the relationship between these two life forms is poorly understood. Recently however, the scientific name for the biological species that includes both steelhead and rainbow trout was changed from *Salmo gairdneri* to *O. mykiss.* This change reflects the premise that all trouts from western North America share a common lineage with Pacific salmon.

Steelhead typically migrate to marine waters after spending 2 years in fresh water. They then reside in marine waters for typically 2 or 3 years prior to returning to their natal stream to spawn as 4- or 5-year-olds. Unlike Pacific salmon, steelhead are iteroparous, meaning that they are capable of spawning more than once before they die. However, it is rare for steelhead to spawn more than twice before dying; most that do so are females. Steelhead adults typically spawn between December and June (Bell, 1990). Depending on water temperature, steelhead eggs may incubate in ''redds'' (nesting gravels) for 1.5 to 4 months before hatching as ''alevins'' (a larval life stage dependent on food stored in a yolk sac). Following yolk sac absorption, alevins emerge from the gravel as young juveniles or ''fry'' and begin actively feeding. Juveniles rear in fresh water from 1 to 4 years, then migrate to the ocean as ''smolts.''

Biologically, steelhead can be divided into two reproductive ecotypes, based on their state of sexual maturity at the time of river entry and the duration of their spawning migration. These two ecotypes are termed ''stream maturing'' and ''ocean maturing.'' Stream maturing steelhead enter fresh water in a sexually immature condition and require several months to mature and spawn. Ocean maturing steelhead enter fresh water with well-developed gonads and spawn shortly after river entry. These two reproductive ecotypes are more commonly referred to by their season of freshwater entry (e.g., summer and winter steelhead).

Two major genetic groups or ''subspecies'' of steelhead occur on the west coast of the United States: a coastal group and an inland group, separated in the Fraser and Columbia River Basins by the Cascade crest approximately (Huzyk & Tsuyuki, 1974: Allendorf, 1975; Utter & Allendorf, 1977; Okazaki, 1984; Parkinson, 1984; Schreck et al., 1986; Reisenbichler et al., 1992). Behnke (1992) proposed to classify the coastal subspecies as *O. m. irideus* and the inland subspecies as *O. m. gairdneri*. These genetic groupings apply to both anadromous and nonanadromous forms of *O. mykiss*. Both coastal and inland steelhead occur in Washington and Oregon. California is thought to have only coastal steelhead while Idaho has only inland steelhead.

Historically, steelhead were distributed throughout the North Pacific Ocean from the Kamchatka Peninsula in Asia to the northern Baja Peninsula. Presently, the species distribution extends from the Kamchatka Peninsula, east and south along the Pacific coast of North America, to at least Malibu Creek in southern California. There are infrequent anecdotal reports of steelhead continuing to occur as far south as the Santa Margarita River in San Diego County (McEwan & Jackson, 1996). Historically, steelhead likely inhabited most coastal streams in Washington, Oregon, and California as well as many inland streams in these states and Idaho. However, during this century, over 23 indigenous, naturally-reproducing stocks of steelhead are believed to have been extirpated, and many more are thought to be in decline in numerous coastal and inland streams in Washington, Oregon, Idaho, and California. Forty-three stocks have been identified by Nehlsen et al. (1991) as being at moderate or high risk of extinction.

Consideration as a ''Species'' Under the ESA

To qualify for listing as a threatened or endangered species, the identified populations of steelhead must be considered ''species'' under the ESA.

The ESA defines a ''species'' to include ''any subspecies of fish or wildlife or plants, and any distinct population segment of any species of vertebrate fish or wildlife which interbreeds when mature.'' NMFS published a policy (56 FR 58612, November 20, 1991) describing the agencies application of the ESA definition of ''species'' to anadromous Pacific salmonid species. NMFS's policy provides that a Pacific salmonid population will be considered distinct and, hence, a species under the ESA if it represents an ESU of the biological species. A population must satisfy two criteria to be considered an ESU: (1) It must be reproductively isolated from other conspecific population units, and (2) it must represent an important component in the evolutionary legacy of the biological species. The first criterion, reproductive isolation, need not be absolute, but must be strong enough to permit evolutionarily important differences to accrue in different population units. The second criterion is met if the population contributes substantially to the ecological/genetic diversity of the species as a whole. Guidance on the application of this policy is contained in a scientific paper ''Pacific Salmon (*Oncorhynchus* spp.) and the Definition of 'Species' under the Endangered Species Act'' and a NOAA Technical Memorandum ''Definition of 'Species' Under the Endangered Species Act: Application to Pacific Salmon,'' which are available upon request (see **ADDRESSES**). The following sections describe the genetic, ecological, and life history characteristics, as well as human-induced genetic changes that NMFS assessed to determine the number and geographic extent of steelhead ESUs.

Reproductive Isolation

Genetic data provide useful indirect information on reproductive isolation because they integrate information about migration and gene flow over evolutionarily important time frames. During the status review, NMFS worked in cooperation with the States of California, Oregon, Idaho, and Washington to develop a genetic stock identification data base for steelhead. Natural and hatchery steelhead were collected by NMFS, California Department of Fish and Game (CDFG), Oregon Department of Fish and Wildlife (ODFW), Idaho Department of Fish and Game (IDFG), Washington Department of Fish and Wildlife (WDFW), and U.S. Fish and Wildlife Service (USFWS) for protein electrophoretic analysis by NMFS and WDFW. Existing NMFS data for Columbia and Snake River Basin steelhead were also included in the data base.

In addition to the new studies, published results from numerous studies of genetic characteristics of steelhead populations were considered. These included studies based on protein electrophoresis (Huzyk & Tsuyuki, 1974; Allendorf, 1975; Utter & Allendorf, 1977; Okazaki, 1984; Parkinson, 1984; Campton & Johnson, 1985; Milner & Teel, 1985; Schreck et al., 1986; Hershberger & Dole, 1987; Berg & Gall, 1988; Reisenbichler & Phelps, 1989; Reisenbichler et al., 1992; Currens & Schreck, 1993; Waples et al., 1993; Phelps et al., 1994; Leider et al., 1995). Supplementing these protein electrophoretic studies were two studies based on mitochondrial DNA (Buroker, unpublished; Nielsen, 1994) and chromosomal karyotyping studies conducted by Thorgard (1977, 1983) and Ostberg and Thorgard (1994).

Genetic information obtained from allozyme, DNA, and chromosomal sampling indicate a strong differentiation between coastal and inland subspecies of steelhead. Several studies have identified coastal and inland forms of *O. mykiss* as distinct genetic life forms. Allendorf (1975) first identified coastal and inland steelhead life forms in Washington, Oregon, and Idaho based on large and consistent allele frequency differences which applied to both anadromous and resident *O. mykiss*. In the Columbia River, it was determined that the geographic boundary of these life forms occurs at about the Cascade crest. Subsequent studies have supported this finding (Utter & Allendorf, 1977; Okazaki, 1984; Schreck et al., 1986; Reisenbichler et al., 1992). Recent genetic data from WDFW further supports the major differentiation between coastal and inland steelhead forms.

Few detailed studies have explored the relationship between resident and anadromous *O. mykiss* residing in the same location. Genetic studies generally show that, in the same geographic area, resident and anadromous life forms are more similar to each other than either is to the same form from a different geographic area. Recently, Leider et al. (1995) found that results from comparisons of rainbow trout in the Elwha and Cedar Rivers and Washington steelhead indicate that the two forms are not reproductively isolated. Further, Leider et al. (1995) also concluded that, based on preliminary analyses of data from the Yakima and Big White Salmon Rivers, resident trout would be genetically indistinguishable from steelhead. Based on these studies, it appears that resident and anadromous *O. mykiss* from the same geographic area may share a common gene pool, at least over evolutionary time periods.

Based on the available genetic information, it was the consensus of NMFS scientists, as well as regional fishery biologists, that resident fish should generally be considered part of the steelhead ESUs. However, even though NMFS requested data regarding resident rainbow trout abundance during its west coast steelhead status review, very little was received, making status determinations with respect to resident rainbow trout problematic. Because available information does not clearly define the relationship between resident rainbow trout and steelhead, NMFS is not proposing to list resident rainbow trout at this time. However, through this proposed rule, NMFS is requesting public comment regarding the inclusion of resident rainbow trout in proposed steelhead ESUs. Prior to the final listing determination, NMFS will work with the U.S. Fish and Wildlife Service (USFWS) and other fisheries comanagers to examine the relationship between resident and anadromous *O. mykiss* in the ESUs proposed for listing.

Genetic Changes Due to Human Activities

The effects of artificial propagation and other human activities can be relevant to ESA listing determinations in two ways. First, such activities can genetically change natural populations so much that they no longer represent an evolutionarily significant component of the biological species (Waples, 1991). For example, in 1991, NMFS concluded that, as a result of massive and prolonged effects of artificial propagation, harvest, and habitat degradation, the agency could not identify natural populations of coho salmon (*O. kisutch*) in the lower Columbia River that qualified for ESA listing consideration (56 FR 29553, June 27, 1991). Second, risks to the viability and genetic integrity of native salmon populations posed by human activities may contribute to their threatened or endangered status (Goodman, 1990; Hard et al., 1992). The severity of these effects on natural populations depends both on the nature of the effects (e.g., harvest rate, gear size, or type of hatchery practice) and their magnitude (e.g., duration of a hatchery program and number and life-history stage of hatchery fish involved).

In the case of west coast steelhead, artificial propagation is a common practice to supplement stocks for recreational fisheries. However, in many areas, a significant portion of the naturally spawning population consists of hatchery-produced steelhead. In several of the steelhead ESUs, over 50 percent of the naturally spawning fish are from hatcheries. Many of these hatchery-produced fish are derived from a few stocks which may or may not have originated from the geographic area where they are released. Artificial propagation of steelhead has been, and continues to be, a common occurrence throughout the range of west coast steelhead. However, in several of the ESUs analyzed, insufficient or uncertain information exists regarding the interactions between hatchery and natural fish, and the relative abundance of hatchery and natural stocks. The impacts of hatchery activities in specific ESUs is discussed below under Status of Steelhead ESUs.

Ecological/Genetic Diversity

Several types of physical and biological evidence were considered in evaluating the contribution of steelhead from Washington, Oregon, Idaho, and California to the ecological/genetic diversity of the biological species throughout its range. Factors examined included: (1) The physical environment—geology, soil type, air temperature, precipitation, river flow patterns, water temperature, and vegetation; (2) biogeography—marine, estuarine, and freshwater fish distributions; and (3) life history traits—age at smolting, age at spawning, river entry timing, and spawning timing. An analysis of the physical environment and life history traits provides important insight into the ecological/genetic diversity of the species and can reflect unusual or distinctive adaptations that promote evolutionary processes. Following is a brief summary of the relevance of these factors for each ESU.

ESU Determinations

The ESU determinations described here represent a synthesis of a large amount of diverse information. In general, the proposed geographic boundaries for each ESU (i.e., the watersheds within which the members of the ESU are typically found) are supported by several lines of evidence that show similar patterns. However, the diverse data sets are not always entirely congruent (nor would they be expected to be), and the proposed boundaries are not necessarily the only ones possible. For example, in some cases (e.g., in the Middle Columbia River near the Cascade Crest), environmental changes occur over a transition zone rather than abruptly.

Based on the best available scientific and commercial information, including the biological effects of human activities, NMFS has identified 15 ESUs that include steelhead populations from Washington, Oregon, Idaho, and California. The 15 ESUs are briefly described and characterized below. Genetic data (from studies of protein electrophoresis and DNA) were the primary evidence considered for the reproductive isolation criterion, supplemented by inferences about barriers to migration created by natural geographic features and human-induced changes resulting from artificial propagation and harvest. Factors considered to be most informative in evaluating ecological/genetic diversity include data pertaining to the physical environment, ocean conditions/upwelling, vegetation, estuarine and freshwater fish distributions, river entry, and spawning timing.

(1) Puget Sound

The geographic boundaries of this coastal steelhead ESU extend from the United States/Canada border and include steelhead in river basins of the Strait of Juan de Fuca, Puget Sound, and Hood Canal, WA. Included are river basins east of and including the Elwha River and north to include the Nooksack River. This region is in the rain shadow of the Olympic Mountains, is therefore drier than the rainforest area of the western Olympic Peninsula, and is dominated by western hemlock forests. Streams are characterized by cold water, high average flows, and a relatively long duration of peak flows that occur twice each year.

Recent genetic data provided by WDFW show that steelhead in the Puget Sound area generally form a coherent group distinct from populations elsewhere in Washington. Chromosomal studies show that steelhead from the Puget Sound area have a distinctive karyotype not found in other regions. No recent genetic comparisons have been made between Puget Sound and British Columbia steelhead; however, Nooksack River steelhead tend to differ genetically from other Puget Sound stocks, indicating a genetic transition zone in northern Puget Sound.

In life history traits, there appears to be a sharp transition between steelhead populations from Washington, which smolt primarily at age 2, and those in British Columbia, which most commonly smolt at age 3. This pattern holds for comparisons across the Strait of Juan de Fuca as well as for comparisons of Puget Sound and Strait of Georgia populations. At the present time, therefore, evidence suggests that the northern boundary for this ESU coincides approximately with the United States/Canada border. This ESU is primarily composed of winter steelhead but includes several stocks of summer steelhead, usually in subbasins of large river systems and above seasonal hydrologic barriers.

(2) Olympic Peninsula

This coastal steelhead ESU occupies river basins of the Olympic Peninsula, WA, west of the Elwha River and south to, but not including, the rivers that flow into Grays Harbor, WA. Streams in the Olympic Peninsula are similar to those in Puget Sound and are characterized by high levels of precipitation and cold water, high average flows, and a relatively long duration of peak flows that occur twice a year. In contrast to the more inland areas of Puget Sound where western hemlock is the dominant forest cover at sea level, lowland vegetation in this region is dominated by Sitka spruce.

Genetic data collected by WDFW indicate that steelhead in this region are substantially isolated from other regions in western Washington. Only limited life history information is available for Olympic Peninsula steelhead, and the information that does exist is primarily from winter-run fish. As with the Puget Sound ESU, known life history attributes of Olympic Peninsula steelhead are similar to those for other west coast steelhead, the notable exception being the difference between United States and Canadian populations in age at smolting. This ESU is primarily composed of winter steelhead but includes several stocks of summer steelhead in the larger rivers.

(3) Southwest Washington

This coastal steelhead ESU occupies the river basins of, and tributaries to, Grays Harbor, Willapa Bay, and the Columbia River below the Cowlitz River in Washington and below the Willamette River in Oregon. Willapa Bay and Grays Harbor in southwest Washington have extensive intertidal mud and sand flats and differ substantially from estuaries to the north and south. This similarity between the Willapa Bay and Grays Harbor estuaries results from the shared geology of the area and the transportation of Columbia River sediments northward along the Washington coast. Rivers draining into the Columbia River have their headwaters in increasingly drier areas, moving from west to east. Columbia River tributaries that drain the Cascade Mountains have proportionally higher flows in late summer and early fall than rivers on the Oregon coast.

Recent genetic data (Leider et al., 1995) show consistent differences between steelhead populations from the southwest Washington coast and coastal areas to the north, as well as Columbia River drainages east of the Cowlitz River. Genetic data do not clearly define the relationship between southwest Washington steelhead and lower Columbia River steelhead. This ESU is primarily composed of winter steelhead but includes summer steelhead in the Humptulips and Chehalis River Basins.

(4) Lower Columbia River

This coastal steelhead ESU occupies tributaries to the Columbia River between the Cowlitz and Wind Rivers in Washington and the Willamette and Hood Rivers in Oregon. Excluded are steelhead in the upper Willamette River Basin above Willamette Falls, and steelhead from the Little and Big White Salmon Rivers in Washington. Similar to Willapa Bay and Grays Harbor in southwest Washington, the lower Columbia River has extensive intertidal mud and sand flats and differs substantially from estuaries to the north and south. This similarity results from the shared geology of the area and the transportation of Columbia River sediments northward along the Washington coast. Rivers draining into the Columbia River have their headwaters in increasingly drier areas, moving from west to east. Columbia River tributaries that drain the Cascade Mountains have proportionally higher flows in late summer and early fall than rivers on the Oregon coast.

Steelhead populations in this ESU are of the coastal genetic group (Schreck et al., 1986; Reisenbichler et al., 1992; Chapman et al., 1994), and a number of genetic studies have shown that they are part of a different ancestral lineage than inland steelhead from the Columbia River Basin. Genetic data also show steelhead from this ESU to be distinct from steelhead from the upper Willamette River and coastal streams in Oregon and Washington. WDFW data showed genetic affinity between the Kalama, Wind, and Washougal River steelhead. The data show differentiation between the Lower Columbia River ESU and the Southwest Washington and Middle Columbia River Basin ESUs. This ESU is composed of winter steelhead and summer steelhead.

(5) Upper Willamette River

This coastal steelhead ESU occupies the Willamette River and its tributaries, upstream from Willamette Falls. The Willamette River Basin is zoogeographically complex. In addition to its connection to the Columbia River, the Willamette has had connections with coastal basins through stream capture and headwater transfer events (Minckley et al., 1986).

Steelhead from the upper Willamette River are genetically distinct from those in the lower river. Reproductive isolation from lower river populations may have been facilitated by Willamette Falls, which is known to be a migration barrier to some anadromous salmonids. For example, winter steelhead and spring chinook salmon (*O. tshawytscha*) occurred historically above the falls, but summer steelhead, fall chinook salmon, and coho salmon did not (PGE, 1994).

The native steelhead of this basin are late-migrating winter steelhead, entering fresh water primarily in March and April (Howell et al., 1985), whereas most other populations of west coast winter steelhead enter fresh water beginning in November or December. As early as 1885, fish ladders were constructed at Willamette Falls to aid the passage of anadromous fish. The ladders have been modified and rebuilt, most recently in 1971, as technology has improved (Bennett, 1987; PGE, 1994). These fishways facilitated successful introduction of Skamania stock summer steelhead and early-migrating Big Creek stock winter steelhead to the upper basin. Another effort to expand the steelhead production in the upper Willamette River was the stocking of native steelhead in tributaries not historically used by that species. Native steelhead primarily used tributaries on the east side of the basin, with cutthroat trout predominating in streams draining the west side of the basin.

Nonanadromous *O. mykiss* are known to occupy the Upper Willamette River Basin; however, most of these nonanadromous populations occur above natural and manmade barriers (Kostow, 1995). Historically, spawning by Upper Willamette River steelhead was concentrated in the North and Middle Santiam River Basins (Fulton, 1970). These areas are now largely blocked to fish passage by dams, and steelhead spawning is now distributed throughout more of the Upper Willamette River Basin than in the past (Fulton, 1970). Due to introductions of nonnative steelhead stocks and transplantation of native stocks within the basin, it is difficult to formulate a clear picture of the present distribution of native Upper Willamette River Basin steelhead, and their relationship to nonanadromous and possibly residualized *O. mykiss* within the basin.

(6) Oregon Coast

This coastal steelhead ESU occupies river basins on the Oregon coast north of Cape Blanco, excluding rivers and streams that are tributaries of the Columbia River. Most rivers in this area drain the Coast Range Mountains, have a single peak in flow in December or January, and have relatively low flow during summer and early fall. The coastal region receives fairly high precipitation levels, and the vegetation is dominated by Sitka spruce and western hemlock. Upwelling off the Oregon coast is much more variable and generally weaker than areas south of Cape Blanco. While marine conditions off the Oregon and Washington coasts are similar, the Columbia River has greater influence north of its mouth, and the continental shelf becomes broader off the Washington coast.

Recent genetic data from steelhead in this ESU are limited, but they show a level of differentiation from populations from Washington, the Columbia River Basin, and coastal areas south of Cape Blanco. Ocean migration patterns also suggest a distinction between steelhead populations north and south of Cape Blanco. Steelhead (as well as chinook and coho salmon) from streams south of Cape Blanco tend to be south-migrating rather than north-migrating (Everest, 1973; Nicholas & Hankin, 1988; Pearcy et al., 1990; Pearcy, 1992).

The Oregon Coast ESU primarily contains winter steelhead; there are only two native stocks of summer steelhead. Summer steelhead occur only in the Siletz River, above a waterfall, and in the North Umpqua River, where migration distance may prevent full utilization of available habitat by winter steelhead. Alsea River winter steelhead have been widely used for steelhead broodstock in coastal rivers. Populations of nonanadromous *O. mykiss* are relatively uncommon on the Oregon coast, as compared with other areas, occurring primarily above migration barriers and in the Umpqua River Basin (Kostow, 1995).

Little information is available regarding migration and spawn timing of natural steelhead populations within this ESU. Age structure appears to be similar to other west coast steelhead, dominated by 4-year-old spawners. Iteroparity is more common among Oregon coast steelhead than populations to the north.

(7) Klamath Mountains Province

This coastal steelhead ESU occupies river basins from the Elk River in Oregon to the Klamath and Trinity Rivers in California, inclusive. A detailed discussion of this ESU is presented in a previous NMFS status review (Busby et al., 1994). Geologically, this region includes the

Klamath Mountains Province, which is not as erosive as the Franciscan formation terrains south of the Klamath River Basin. Dominant vegetation along the coast is redwood forest, while some interior basins are much drier than surrounding areas and are characterized by many endemic species. Elevated stream temperatures are a factor affecting steelhead and other species in some of the larger river basins. With the exception of major river basins such as the Rogue and Klamath, most rivers in this region have a short duration of peak flows. Strong and consistent coastal upwelling begins at about Cape Blanco and continues south into central California, resulting in a relatively productive nearshore marine environment.

Protein electrophoretic analyses of coastal steelhead have indicated genetic discontinuities between the steelhead of this region and those to the north and south (Hatch, 1990; Busby et al., 1993, 1994). Chromosomal studies have also identified a distinctive karyotype that has been reported only from populations within this ESU. Steelhead within this ESU include both winter and summer steelhead as well as the unusual ‘‘half-pounder’’ life history (characterized by immature steelhead that return to fresh water after only 2 to 4 months in salt water, overwinter in rivers without spawning, then return to salt water the following spring).

Among the remaining questions regarding this ESU is the relationship between *O. mykiss* below and above Klamath Falls, OR. Behnke (1992) has proposed that the two groups are in different subspecies, and that the upper group, a redband trout (*O. m. newberrii*), exhibited anadromy until blocked by the Copco dams in the early 1900's. However, Moyle (1976) stated that Klamath Falls was the upstream barrier to anadromous fish prior to construction of the dams.

(8) Northern California

This coastal steelhead ESU occupies river basins from Redwood Creek in Humboldt County, CA to the Gualala River, inclusive. Dominant vegetation along the coast is redwood forest, while some interior basins are much drier than surrounding areas and are characterized by many endemic species. This area includes the extreme southern end of the contiguous portion of the Coast Range Ecoregion (Omernick, 1987). Elevated stream temperatures are a factor in some of the larger river basins (greater than 20°C), but not to the extent that they are in river basins farther south. Precipitation is generally higher in this geographic area than in regions to the south, averaging 100–200 cm of rainfall annually (Donley et al., 1979). With the exception of major river basins such as the Eel, most rivers in this region have peak flows of short duration. Strong and consistent coastal upwelling begins at about Cape Blanco and continues south into central California, resulting in a relatively productive nearshore marine environment.

There are life history similarities between steelhead of the Northern California ESU and the Klamath Mountains Province ESU. This ESU includes both winter and summer steelhead, including what is presently considered to be the southernmost population of summer steelhead, in the Middle Fork Eel River. Half-pounder juveniles also occur in this geographic area, specifically in the Mad and Eel Rivers. Snyder (1925) first described the half-pounder from the Eel River; however, Cramer et al. (1995) suggested that adults with the half-pounder juvenile life history may not spawn south of the Klamath River Basin. As with the Rogue and Klamath Rivers, some of the larger rivers in this area have migrating steelhead year-round, and seasonal runs have been named. River entry ranges from August through June and spawning from December through April, with peak spawning in January in the larger basins and late February and March in the smaller coastal basins.

(9) Central California Coast

This coastal steelhead ESU occupies river basins from the Russian River to Soquel Creek, Santa Cruz County (inclusive), and the drainages of San Francisco and San Pablo Bays; excluded is the Sacramento-San Joaquin River Basin of the Central Valley of California. This area is characterized by very erosive soils in the coast range mountains; redwood forest is the dominant coastal vegetation for these drainages. Precipitation is lower here than in areas to the north, and elevated stream temperatures (greater than 20°C) are common in the summer. Coastal upwelling in this region is strong and consistent, resulting in a relatively productive nearshore marine environment.

Analysis of mitochondrial DNA (mtDNA) data suggests that genetic transitions occur north of the Russian River and north of Monterey, California. Allozyme data show large genetic differences between steelhead populations from the Eel and Mad Rivers and those to the south. Only winter steelhead are found in this ESU and those to the south. River entry ranges from October in the larger basins, late November in the smaller coastal basins, and continues through June. Steelhead spawning begins in November in the larger basins, December in the smaller coastal basins, and can continue through April with peak spawning generally in February and March. Little other life history information exists for steelhead in this ESU.

(10) South/Central California Coast

This coastal steelhead ESU occupies rivers from the Pajaro River, located in Santa Cruz County, CA, to (but not including) the Santa Maria River. Most rivers in this ESU drain the Santa Lucia Range, the southernmost unit of the California Coast Ranges. The climate is drier and warmer than in the north, which is reflected in the vegetational change from coniferous forest to chaparral and coastal scrub. Another biological transition at the north of this area is the southern limit of the distribution of coho salmon (*O. kisutch*). The mouths of many of the rivers and streams in this area are seasonally closed by sand berms that form during periods of low flow in the summer. The southern boundary of this ESU is near Point Conception, a well-known transition area for the distribution and abundance of marine flora and fauna.

Mitochondrial DNA data provide evidence for a genetic transition in the vicinity of Monterey Bay. Both mtDNA and allozyme data show large genetic differences between populations in this area, but do not provide a clear picture of population structure. Only winter steelhead are found in this ESU. River entry ranges from late November through March, with spawning from January through April. Little other life history information exists for steelhead in this ESU. The relationship between anadromous and nonanadromous *O. mykiss*, including possibly residualized fish upstream from dams, is unclear, but likely to be important.

(11) Southern California

This coastal steelhead ESU occupies rivers from (and including) the Santa Maria River to the southern extent of the species range which is presently considered to be Malibu Creek, in Los Angeles County (McEwan & Jackson, 1996). Migration and life history patterns of southern California steelhead depend more strongly on rainfall and streamflow than is the case for steelhead populations farther north (Moore, 1980; Titus et al., in press). River entry ranges from early November through June, with peaks in January and February. Spawning primarily begins in January and continues through early June, with peak spawning in February and March. Average rainfall is substantially lower and more variable in this ESU than regions to the north, resulting in increased duration of sand berms across the mouths of streams and rivers and, in some cases, complete dewatering of the marginal habitats. Environmental conditions in marginal habitats may be extreme (e.g., elevated water temperatures, droughts, floods, and fires) and presumably impose selective pressures on steelhead populations. The use of southern California streams and rivers with elevated temperatures by steelhead suggests that populations within this ESU are able to withstand higher temperatures than those to the north. The relatively warm and productive waters of the Ventura River resulted in more rapid growth of juvenile steelhead than occurred in northerly populations. However, relatively little life history information exists for steelhead from this ESU.

Genetic data show large differences between steelhead populations within this ESU as well as between these and populations to the north. Steelhead populations between the Santa Ynez River and Malibu Creek show a predominance of a mtDNA type that is rare in populations to the north. Allozyme data indicate that two samples from Santa Barbara County are genetically among the most distinctive of any natural populations of coastal steelhead yet examined.

Among the remaining questions regarding this ESU are the distribution and abundance of steelhead south of Malibu Creek. For example, in years of substantial rainfall there have been reports of steelhead in some coastal streams as far south as the Santa Margarita River, San Diego County (Hubbs, 1946; Barnhart, 1986; Higgins, 1991; McEwan & Jackson, 1996; Titus et al., in press).

(12) Central Valley

This coastal steelhead ESU occupies the Sacramento and San Joaquin Rivers and their tributaries. In the San Joaquin Basin, however, the best available information suggests that the current range of steelhead has been limited to the Stanislaus, Tuolumne, and Merced Rivers (tributaries), and the mainstem San Joaquin River to its confluence with the Merced River by human alteration of formerly available habitat. The Sacramento and San Joaquin Rivers offer the only migration route to the drainages of the Sierra Nevada and southern Cascade mountain ranges for anadromous fish. The distance from the Pacific Ocean to spawning streams can exceed 300 km, providing unique potential for reproductive isolation among steelhead. The Central Valley is much drier than the coastal regions to the west, receiving on average only 10–50 cm of rainfall annually. The valley is characterized by alluvial soils, and native vegetation was dominated by oak forests and prairie grasses prior to agricultural development. Steelhead within this ESU have the longest freshwater migration of any population of winter steelhead. There is essentially one continuous run of steelhead in the upper Sacramento River. River entry ranges from July through May, with peaks in September and February. Spawning begins in late December and can extend into April (McEwan & Jackson, 1996).

Steelhead ranged throughout the tributaries and headwaters of the Sacramento and San Joaquin Rivers prior to dam construction, water development, and watershed perturbations of the 19th and 20th centuries. Present steelhead distribution in the central valley drainages has been greatly reduced (McEwan & Jackson, 1996), particularly in the San Joaquin basin. While there is little historical documentation regarding steelhead distribution in the San Joaquin River system, it can be assumed (based on known chinook salmon distributions in this drainage) that steelhead were present in the San Joaquin River and its tributaries from at least the San Joaquin River headwaters northward. With regards to the present distribution of steelhead, there is also only limited information. McEwan and Jackson (1996) reported that a small, remnant run of steelhead persists in the Stanislaus River, that steelhead were observed in the Tuolumne River in 1983, and that a few large rainbow trout that appear to be steelhead enter the Merced River Hatchery annually.

Recent allozyme data show that samples of steelhead from Deer and Mill Creeks and Coleman NFH on the Sacramento River are well differentiated from all other samples of steelhead from California. There are two recognized taxonomic forms of native *O. mykiss* within the Sacramento River Basin: Coastal steelhead/rainbow trout (*O. m. irideus*, Behnke, 1992) and Sacramento redband trout (*O. m. stonei*, Behnke, 1992). It is not clear how the coastal and Sacramento redband forms of *O. mykiss* interacted in the Sacramento River prior to construction of Shasta Dam in the 1940s. However, it appears the two forms historically co-occurred at spawning time, but may have maintained reproductive isolation.

Among the remaining questions regarding this ESU are the current presence, distribution, and abundance of steelhead in the San Joaquin River and its main tributaries (stanislaus, tuolumne, and Merced Rivers), and whether these steelhead stocks historically represented a separate ESU from those in the Sacramento River Basin. Also, the relationship between anadromous and nonanadromous *O. mykiss*, including possibly residualized fish upstream from dams, is unclear.

(13) Middle Columbia River Basin

This inland steelhead ESU occupies the Columbia River Basin from Mosier Creek, OR, upstream to the Yakima River, WA, inclusive. Steelhead of the Snake River Basin are excluded. Franklin and Dyrness (1973) placed the Yakima River Basin in the Columbia Basin Physiographic Province, along with the Deschutes, John Day, Walla Walla, and lower Snake River Basins. Geology within this province is dominated by the Columbia River Basalt formation, stemming from lava deposition in the miocene epoch, overlain by plio-Pleistocene deposits of glaciolacustrine origin (Franklin & Dyrness, 1973). This intermontane region includes some of the driest areas of the Pacific Northwest, generally receiving less than 40 cm of rainfall annually (Jackson, 1993). Vegetation is of the shrub-steppe province, reflecting the dry climate and harsh temperature extremes.

Genetic differences between inland and coastal steelhead are well established, although some uncertainty remains about the exact geographic boundaries of the two forms in the Columbia River (see discussion above for the Lower Columbia River ESU). Electrophoretic and meristic data show consistent differences between steelhead from the middle Columbia and Snake Rivers. No recent genetic data exist for natural steelhead populations in the upper Columbia River, but recent WDFW data show that the Wells Hatchery stock from the upper Columbia River does not have a close genetic affinity to sampled populations from the middle Columbia River.

All steelhead in the Columbia River Basin upstream from The Dalles Dam are summer-run, inland steelhead (Schreck et al., 1986; Reisenbichler et al., 1992; Chapman et al., 1994). Steelhead in Fifteenmile Creek, OR, are genetically allied with inland *O. mykiss*, but are winter-run. Winter steelhead are also found in the Klickitat and White Salmon Rivers, WA.

Life history information for steelhead of this ESU indicates that most middle Columbia River steelhead smolt at 2 years and spend 1 to 2 years in salt water (i.e., 1-ocean and 2-ocean fish, respectively) prior to re-entering fresh water, where they may remain up to a year prior to spawning (Howell et al., 1985; BPA, 1992). Within this ESU, the Klickitat River is unusual in that it produces both summer and winter steelhead, and the summer steelhead are dominated by 2-ocean steelhead, whereas most other rivers in this region produce about equal numbers of both 1- and 2-ocean steelhead.

(14) Upper Columbia River Basin

This inland steelhead ESU occupies the Columbia River Basin upstream from the Yakima River, WA, to the United States/Canada Border. The geographic area occupied by this ESU forms part of the larger Columbia Basin Ecoregion (Omernik, 1987). The Wenatchee and Entiat Rivers are in the Northern Cascades Physiographic Province, and the Okanogan and Methow Rivers are in the Okanogan Highlands Physiographic Province. The geology of these provinces is somewhat similar and very complex, developed from marine invasions, volcanic deposits, and glaciation (Franklin & Dyrness, 1973). The river valleys in this region are deeply dissected and maintain low gradients except in extreme headwaters. The climate in this area includes extremes in temperatures and precipitation, with most precipitation falling in the mountains as snow. Streamflow in this area is provided by melting snowpack, groundwater, and runoff from alpine glaciers. Mullan et al. (1992) described this area as a harsh environment for fish and stated that ''it should not be confused with more studied, benign, coastal streams of the Pacific Northwest.''

Life history characteristics for Upper Columbia River Basin steelhead are similar to those of other inland steelhead ESUs; however, some of the oldest smolt ages for steelhead, up to 7 years, are reported from this ESU. This may be associated with the cold stream temperatures (Mullan et al., 1992). Based on limited data available from adult fish, smolt age in this ESU is dominated by 2-year-olds. Steelhead from the Wenatchee and Entiat Rivers return to fresh water after 1 year in salt water, whereas Methow River steelhead are primarily 2-ocean resident (Howell et al., 1985).

In 1939, the construction of Grand Coulee Dam on the Columbia River (RKm 956) blocked over 1,800 km of river from access by anadromous fish (Mullan et al., 1992). In an effort to preserve fish runs affected by Grand Coulee Dam, all anadromous fish migrating upstream were trapped at Rock Island Dam (RKm 729) from 1939 through 1943 and either released to spawn in tributaries between Rock Island and Grand Coulee Dams or spawned in hatcheries and the offspring released in that area (Peven, 1990; Mullan et al., 1992; Chapman et al., 1994). Through this process, stocks of all anadromous salmonids, including steelhead, which historically were native to several separate subbasins above Rock Island Dam, were randomly redistributed among tributaries in the Rock Island-Grand Coulee reach. Exactly how this has affected stock composition of steelhead is unknown.

(15) Snake River Basin

This inland steelhead ESU occupies the Snake River Basin of southeast Washington, northeast Oregon and Idaho. The Snake River flows through terrain that is warmer and drier on an annual basis than the upper Columbia Basin or other drainages to the north. Geologically, the land forms are older and much more eroded than most other steelhead habitat. The eastern portion of the basin flows out of the granitic geological unit known as the Idaho Batholith. The western Snake River Basin drains sedimentary and volcanic soils of the Blue Mountains complex. Collectively, the environmental factors of the Snake River Basin result in a river that is warmer and more turbid, with higher pH and alkalinity, than is found elsewhere in the range of inland steelhead.

Snake River Basin steelhead are summer steelhead, as are most inland steelhead, and comprise 2 groups, A-run and B-run, based on migration timing, ocean-age, and adult size. Snake River Basin steelhead enter fresh water from June to October and spawn in the following spring from March to May. A-run steelhead are thought to be predominately l-ocean, while B-run steelhead are thought to be 2-ocean (IDFG, 1994). Snake River Basin steelhead usually smolt at age-2 or -3 years (Whitt, 1954; BPA, 1992; Hassemer, 1992).

The steelhead population from Dworshak National Fish Hatchery (NFH) is the most divergent single population of inland steelhead based on genetic traits determined by protein electrophoresis. Additionally, steelhead returning to Dworshak NFH are considered to have a distinctive appearance and are the one steelhead population that is consistently referred to as B-run. NMFS considered the possibility that Dworshak NFH steelhead should be in their own ESU. However, little specific information was available regarding the characteristics of this population's native habitat in the North Fork Clearwater River, which is currently unavailable to anadromous fish due blockage by Dworshak Dam.

Status of Steelhead ESUs

The ESA defines the term ''endangered species'' as ''any species which is in danger of extinction throughout all or a significant portion of its range.'' The term ''threatened species'' is defined as ''any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.'' Thompson (1991) suggested that conventional rules of thumb, analytical approaches, and simulations may all be useful in making this determination. In previous status reviews (e.g., Weitkamp et al., 1995), NMFS has identified a number of factors that should be considered in evaluating the level of risk faced by an ESU, including: (1) Absolute numbers of fish and their spatial and temporal distribution; (2) current abundance in relation to historical abundance and current carrying capacity of the habitat; (3) trends in abundance; (4) natural and human-influenced factors that cause variability in survival and abundance; (5) possible threats to genetic integrity (e.g., from strays or outplants from hatchery programs); and (6) recent events (e.g., a drought or changes in harvest management) that have predictable short-term consequences for abundance of the ESU.

During the coastwide status review for steelhead, NMFS evaluated both quantitative and qualitative information to determine whether any proposed ESU is threatened or endangered according to the ESA. The types of information used in these assessments are described below, followed by a summary of results for each ESU.

Quantitative Assessments: A significant component of NMFS' status determination was analyses of abundance trend data. Principal data sources for these analyses were historical and recent runsize estimates derived from dam and weir counts, stream surveys, and angler catch estimates. Of the 160 steelhead stocks for which sufficient data existed, 118 (74 percent) exhibited declining trends in abundance, while the remaining 42 (26 percent) exhibited increasing trends in abundance. Sixty-five of the stock abundance trends analyzed were statistically significant. Of these, 57 (88 percent) indicated declining trends in abundance and the remaining 8 (12 percent) indicated increasing trends in abundance. It should be noted that NMFS' analysis assumes that catch trends reflect trends in overall population abundance. NMFS recognizes that there are many problems with this assumption, with the result that the index may not precisely represent trends in the total population in a river basin. However, angler catch is the only information available for many steelhead populations, and changes in catch still provide a useful indication of trends in total population abundance.

Analyses of steelhead abundance indicate that across the species' range, the majority of naturally-reproducing steelhead stocks have exhibited declining long-term trends in abundance. The severity of declines in abundance tends to vary by geographic region. Based on historical and recent abundance estimates, stocks in the southern extent of the coastal steelhead range (i.e., California's Central Valley, South/Central and Southern California ESUs) appear to have declined significantly, with widespread stock extirpations. Northern areas of the coastal steelhead range tend to be relatively more stable with larger overall population sizes. However, stocks in these areas continue to exhibit downward abundance trends as well. In several areas, a lack of accurate runsize and trend data make estimating abundance difficult.

Qualitative Assessments: Numerous studies have attempted to classify the status of steelhead populations on the west coast of the United States. However, problems exist in applying results of these studies to NMFS' ESA evaluations. A significant problem is that the definition of ''stock'' or ''population'' varies considerably in scale among studies, and sometimes among regions within a study. In several studies, identified units range in size from large river basins, to minor coastal streams and tributaries. Only two studies (Nehlsen et al., 1991; Higgins et al., 1992) used categories which relate to the ESA ''threatened'' or ''endangered'' status. However, these studies applied their own interpretations of these terms to individual stocks, not to broader geographic units such as those discussed here. Another significant problem in applying previously published studies to this evaluation is the manner in which stocks or populations were selected to be included in the review. Several studies did not evaluate stocks which were not perceived to be at risk; therefore, it is difficult to determine the proportion of stocks they considered to be at risk in any given area.

Nehlsen et al. (1991) considered salmon and steelhead stocks throughout Washington, Idaho, Oregon, and California and enumerated all stocks that they found to be extinct or at risk of extinction. They considered 23 steelhead stocks to be extinct, one possibly extinct, 27 at high risk of extinction, 18 at moderate risk of extinction, and 30 of special concern. Steelhead stocks that do not appear in their summary were either not at risk of extinction or there was insufficient information to classify them. Higgins et al. (1992) used the same classification scheme as Nehlsen et al. (1991), but provided a more detailed review of northern California salmon stocks. Of the eleven steelhead stocks Higgins et al. identified as being at some risk of extinction, eight were classified as at high risk, two were classified as at moderate risk, and one was classified as of concern. Nickelson et al. (1992) rated coastal Oregon (excluding Columbia River Basin) salmon and steelhead stocks on the basis of their status over the past 20 years, classifying stocks as ''depressed'' (spawning habitat underseeded, declining trends, or recent escapements below long-term average), ''healthy'' (spawning habitat fully seeded and stable or increasing trends), or ''of special concern'' (300 or fewer spawners or a problem with hatchery interbreeding). Of 27 coastal populations identified, 5 were classified as healthy, 1 as of special concern, and 21 as depressed. Washington Department of Fisheries et al. (1993) categorized all salmon and steelhead stocks in Washington on the basis of stock origin (''native,'' ''non-native,'' ''mixed,'' or ''unknown''), production type (''wild,'' ''composite,'' or ''unknown'') and status (''healthy,'' ''depressed,'' ''critical,'' or ''unknown''). Of the 141 steelhead stocks identified in Washington, 36 were classified as healthy, 44 as critical, 1 as depressed, and 60 as unknown.

The following summaries draw on these quantitative and qualitative assessments to describe NMFS' conclusions regarding the status of each steelhead ESU.

(1) Puget Sound

No estimates of historical (pre-1960s) abundance specific to the Puget Sound ESU are available. Total run size for Puget Sound for the early 1980s can be calculated from estimates in Light (1987) as about 100,000 winter steelhead and 20,000 summer steelhead. Light (1987) provided no estimate of hatchery proportion specific to Puget Sound streams. For Puget Sound and coastal Washington combined, Light (1987) estimated that 70 percent of steelhead in ocean runs were of hatchery origin; the percentage in escapement to spawning grounds would be substantially lower due to differential harvest and hatchery rack returns. Recent 5-year average natural escapements for streams with adequate data range from less than 100 to 7,200, with corresponding total run sizes of 550 to 19,800. Total recent run size for major stocks in this ESU was greater than 45,000, with total natural escapement of about 22,000.

Of the 21 independent stocks for which adequate escapement information exists, 17 stocks have been declining and 4 increasing over the available data series, with a range from 18 percent annual decline (Lake Washington winter steelhead) to 7 percent annual increase (Skykomish River winter steelhead). Eleven of these trends (nine negative, two positive) were significantly different from zero. The two basins producing the largest numbers of steelhead (Skagit and Snohomish Rivers) both have overall upward trends.

Hatchery fish in this ESU are widespread, spawn naturally throughout the region, and are largely derived from a single stock (Chambers Creek). The proportion of spawning escapement comprised of hatchery fish ranged from less than 1 percent (Nisqually River) to 51 percent (Morse Creek). In general, hatchery proportions are higher in Hood Canal and the Strait of Juan de Fuca than in Puget Sound proper. Most of the hatchery fish in this region originated from stocks indigenous to the ESU, but are generally not native to local river basins. The WDFW has provided information supporting substantial temporal separation between hatchery and natural winter steelhead in this ESU. Given the lack of strong trends in abundance for the major stocks and the apparently limited contribution of hatchery fish to production of the late-run winter stocks, most winter steelhead stocks in the Puget Sound ESU appear to be naturally sustaining at this time. However, there are clearly isolated problems with sustainability of some steelhead runs in this ESU, notably Deer Creek summer steelhead (although juvenile abundance for this stock increased in 1994) and Lake Washington winter steelhead. Summer steelhead stocks within this ESU are all small, occupy limited habitat, and most are subject to introgression by hatchery fish.

NMFS concludes that the Puget Sound steelhead ESU is not presently in danger of extinction, nor is it likely to become endangered in the foreseeable future. Despite this conclusion, NMFS has several concerns about the overall health of this ESU and about the status of certain stocks within the ESU. Recent trends in stock abundance are predominantly downward, although this may be largely due to recent climate conditions. Trends in the two largest stocks (Skagit and Snohomish Rivers) have been upward. The majority of steelhead produced within the Puget Sound region appear to be of hatchery origin, but most hatchery fish are harvested and do not contribute to natural spawning escapement. NMFS is particularly concerned that the majority of hatchery production originates from a single stock (Chambers Creek). The status of certain stocks within the ESU is also of concern, especially the depressed status of most stocks in the Hood Canal area and the steep declines of Lake Washington winter steelhead and Deer Creek summer steelhead.

(2) Olympic Peninsula

No estimates of historical (pre-1960s) abundance specific to the Olympic Peninsula ESU are available. Total run size for the major stocks in the Olympic Peninsula ESU for the early 1980's can be calculated from estimates in Light (1987) as about 60,000 winter steelhead. Light (1987) provided no estimate of hatchery proportion for these streams. For Puget Sound and coastal Washington together, Light (1987) estimated that 70 percent of steelhead were of hatchery origin. Recent 5-year average natural escapements for streams with adequate data range from 250 to 6,900, with corresponding total run sizes of 450 to 19,700. Total recent (1989–1993 average) run size for major streams in this ESU was about 54,000, with a natural escapement of 20,000 fish.

Of the 12 independent stocks for which adequate information existed to compute trends, 7 were declining and 5 increasing over the available data series, with a range from 8 percent annual decline to 14 percent annual increase. Three of the downward trends were significantly different from zero. Three of the four river basins producing the largest numbers of natural fish had upward trends in basinwide total numbers.

Hatchery fish are widespread and escaping to spawn naturally throughout the region, with hatchery production largely derived from a few parent stocks. Estimated proportions of hatchery fish in natural spawning areas range from 16 percent (Quillayute River) to 44 percent (Quinault River), with the two largest producers of natural fish (Quillayute and Queets Rivers) having the lowest proportions. The WDFW has provided information supporting substantial temporal separation between hatchery and natural winter steelhead in this ESU. Given the lack of strong trends in abundance and the apparently limited contribution of hatchery fish to production of the late-run winter stocks, most winter steelhead stocks in the Olympic Peninsula ESU appear to be naturally sustaining at this time. However, there are clearly isolated problems with sustainability of some winter steelhead runs in this ESU, notably the Pysht/Independents stock, which has a small population with a strongly declining trend over the available data series, and the Quinault River stock, which has a declining trend and substantial hatchery contribution to natural spawning.

NMFS concludes that the Olympic Peninsula steelhead ESU is not presently in danger of extinction, nor is it likely to become endangered in the foreseeable future. Despite this conclusion, NMFS has several concerns about the overall health of this ESU and about the status of certain stocks within the ESU. The majority of recent trends are upward (including three of the four largest stocks), although trends in several stocks are downward. These downward trends may be largely due to recent climate conditions. There is widespread production of hatchery steelhead within this ESU, largely derived from a few parent stocks, which could increase genetic homogenization of the resource despite management efforts to minimize introgression of the hatchery gene pool into natural populations.

(3) Southwest Washington

No estimates of historical (pre-1960's) abundance specific to this ESU are available. Recent 5-year average natural escapements for individual tributaries with adequate data range from 150 to 2,300, with the Chehalis River and its tributaries representing the bulk of production. Total recent (5-year average) natural escapement for major streams in this ESU was about 13,000.

All but 1 (Wynoochee River) of the 12 independent stocks have been declining over the available data series, with a range from 7 percent annual decline to 0.4 percent annual increase. Six of the downward trends were significantly different from zero. For Washington streams, these trends are for the late run ''wild'' component of winter steelhead populations; Oregon data included all stock components. Most of the Oregon trends are based on angler catch, and so may not reflect trends in underlying population abundance. In general, stock condition appears to be healthier in southwest Washington than in the lower Columbia River Basin.

Hatchery fish are widespread and escaping to spawn naturally throughout the region, largely from parent stocks from outside the ESU. This could substantially change the genetic composition of the resource despite management efforts to minimize introgression of the hatchery gene pool into natural populations. Estimates of the proportion of hatchery fish on natural spawning grounds range from 9 percent (Chehalis, the largest producer of steelhead in the ESU) to 82 percent (Clatskanie). Available information suggests substantial temporal separation between hatchery and natural winter steelhead in this ESU; however, some Washington stocks (notably lower Columbia River tributaries) appear to have received substantial hatchery contributions to natural spawning.

NMFS concludes that the Southwest Washington steelhead ESU is not presently in danger of extinction, nor is it likely to become endangered in the foreseeable future. Almost all stocks within this ESU for which data exist have been declining in the recent past, although this may be partly due to recent climate conditions. NMFS is very concerned about the pervasive opportunity for genetic introgression from hatchery stocks within the ESU and about the status of summer steelhead in this ESU. There is widespread production of hatchery steelhead within this ESU, largely from parent stocks from outside the ESU. This could substantially change the genetic composition of the resource despite management efforts to minimize introgression of the hatchery gene pool into natural populations.

(4) Lower Columbia River

No estimates of historical (pre–1960's) abundance specific to this ESU are available. Total run size for the major stocks in the lower Columbia River (below Bonneville Dam, including the upper Willamette ESU) for the early 1980's can be calculated from estimates in Light (1987) as approximately 150,000 winter steelhead and 80,000 summer steelhead. Light (1987) estimated that 75 percent of the total run (summer and winter steelhead combined) was of hatchery origin. Recent 5-year average natural escapements for streams with adequate data range from less than 100 to 1,100. Total recent run size for major streams in this ESU was greater than 16,000, but this total includes only the few basins for which estimates are available.

Of the 18 stocks for which adequate adult escapement trend data exists, 11 have been declining and 7 increasing, with a range from 24 percent annual decline to 48 percent annual increase. Eight of these trends (5 negative, 3 positive) were significantly different from zero. Most of the data series for this ESU are short, beginning only in the late 1970's to the mid-1980's. Thus, they may be heavily influenced by short-term climate effects. Some of the Washington trends (notably those for the Cowlitz and Kalama River Basins) have been influenced (positively or negatively) by the 1980 eruption of Mount Saint Helens. For Washington streams, these trends are for the late run ''wild'' component of winter steelhead populations; Oregon data included all stock components. Most of the Oregon trends are based on angler catch, and so may not reflect trends in underlying population abundance.

Hatchery fish are widespread, and many stray to spawn naturally throughout the region. Most of the hatchery stocks used originated primarily from stocks within the ESU, but many are not native to local river basins. The WDFW has provided information supporting substantial temporal separation between hatchery and natural winter steelhead in this ESU; however, some Washington stocks (notably Kalama River winter and summer steelhead) appear to have substantial hatchery contribution to natural spawning. ODFW estimates of hatchery composition indicate a range from about 30 percent (Sandy River and Tanner Creek winter steelhead) to 80 percent (Hood River summer steelhead) hatchery fish in spawning escapements. Estimates for Hood River winter steelhead range from 0 percent (ODFW, 1995b) to greater than 40 percent (ODFW, 1995a).

NMFS concludes that the Lower Columbia River steelhead ESU is not presently in danger of extinction, but is likely to become endangered in the foreseeable future. The majority of stocks within this ESU for which data exist have been declining in the recent past, but some have been increasing strongly. However, the strongest upward trends are either non-native stocks (Lower Willamette River and Clackamas River summer steelhead) or stocks that are recovering from major habitat disruption and are still at low abundance (mainstem and North Fork Toutle River). NMFS is very concerned about the pervasive opportunity for genetic introgression from hatchery stocks within the ESU and about the status of summer steelhead in this ESU. Concerns about hatchery influence are especially strong for summer steelhead and Oregon winter steelhead stocks, where there appears to be substantial overlap in spawning between hatchery and natural fish.

(5) Upper Willamette River

No estimates of historical (pre-1960's) abundance specific to this ESU are available. Total recent 5-year average run size for this ESU can be estimated from counts at Willamette Falls for the years 1989–1993. Dam counts indicate that the late-run (''native'') winter steelhead average run size was approximately 4,200, while early-run winter and summer steelhead averaged 1,900 and 9,700 respectively. Adequate angler catch data are available to derive approximate average winter steelhead escapement for three tributaries: Mollala River, 2,300 (predominantly non-native); North Fork Santiam River, 2,000; South Fork Santiam River, 550.

Total basin run-size or escapement estimates for both total winter and late winter steelhead exhibit declines, while summer steelhead estimates exhibit an increase. All of these basin-wide estimates have exhibited large fluctuations. Of the three tributary winter steelhead stocks for which adequate adult escapement information exists to compute trends, two have been declining and one increasing, with a range from 4.9 percent annual decline to 2.4 percent annual increase. None of these trends were significantly different from zero.

Hatchery fish are widespread and escaping to spawn naturally throughout the region. Both summer steelhead and early-run winter steelhead have been introduced into the basin and escape to spawn naturally in substantial numbers. Indigenous late-run winter steelhead are also produced in the Santiam River Basin. Estimates of hatchery contribution to winter steelhead escapements are available only for the North Fork Santiam River and the Mollala River and are variable, ranging from 14 percent (ODFW, 1995b) to 54 percent (ODFW, 1995a) on the North Fork Santiam River. There is probably some temporal and spatial separation in spawning between the early and late winter stocks. While little information exists on the actual contribution of hatchery fish to natural production, given the generally low numbers of fish escaping to tributaries and the general declines in winter steelhead abundance in the basin, NMFS has substantial concern that the majority of natural winter steelhead populations in this ESU may not be self-sustaining. All summer steelhead within the range of this ESU are introduced from outside the area (i.e., they are non-native), so are not considered as part of the ESU. Natural reproduction by these introduced summer steelhead may be quite limited.

NMFS concludes that the Upper Willamette steelhead ESU is not presently in danger of extinction, nor is it likely to become endangered in the foreseeable future. While historical information regarding this ESU is lacking, geographic range and historical abundance are believed to have been relatively small compared to other ESUs, and current production probably represents a larger proportion of historical production than is the case in other Columbia River Basin ESUs. NMFS is concerned about the pervasive opportunity for genetic introgression from hatchery stocks within the ESU, as well as the potential ecological interactions between introduced stocks and native stocks.

(6) Oregon Coast

No estimates of historical abundance specific to this ESU are available, except for counts at Winchester Dam on the North Umpqua River and angler catch records beginning in 1953. Estimated total run size for the major stocks on the Oregon Coast (including areas south of Cape Blanco) for the early 1980s are given by Light (1987) as approximately 255,000 winter steelhead and 75,000 summer steelhead. Of these, 69 percent of winter and 61 percent of summer steelhead were of hatchery origin, resulting in estimated naturally-produced run sizes of 79,000 winter and 29,000 summer steelhead. Recent 5-year average total (natural and hatchery) run sizes for streams with adequate data range from 250 to 15,000, corresponding to escapements from 200 to 12,000. Total recent (5-year average) run size for major streams in this ESU was approximately 129,000 (111,000 winter, 18,000 summer), with a total escapement of 96,000 (82,000 winter, 14,000 summer). These totals do not include all streams in the ESU, so they may underestimate total ESU run size and escapements.

Adequate adult escapement information was available to compute trends for 42 independent stocks within this ESU. Of these, 36 data series exhibit declines and six exhibit increases over the available data series, with a range from 12 percent annual decline (Drift Creek on the Siletz River) to 16 percent annual increase (North Fork Coquille River). Twenty (18 decreasing, 2 increasing) of these trends were significantly different from zero. Upward trends were only found in the southernmost portion of the ESU, from

Siuslaw Bay south. In contrast, longer-term trends in angler catch using data from the early 1950's to the present generally were increasing. This may reflect long-term stability of populations or may be an artifact of long-term increases in statewide fishing effort coupled with the differences in bias correction of catch summaries before and after 1970.

Hatchery fish are widespread and escaping to spawn naturally throughout the region. Most of the hatchery stocks used in this region originated from stocks indigenous to the ESU, but many are not native to local river basins. The ODFW estimates of hatchery composition for winter steelhead escapements are high in many streams, ranging from 10 percent (North Umpqua River) to greater than 80 percent (Drift Creek on the Alsea River and Tenmile Creek south of Umpqua Bay). For summer steelhead, hatchery composition (where reported) ranged from 38 percent (South Umpqua River) to 90 percent (Siletz River). Several summer steelhead stocks have been introduced to rivers with no native summer runs. Overall, about half of the stocks in this ESU for which NMFS has information have hatchery composition in excess of 50 percent. Few stocks in the ESU are documented to have escapements above 1,000 fish and no significant decline; most of these are in the southern portion of the ESU and have high hatchery influence. While little information exists on the actual contribution of hatchery fish to natural production, given the substantial presence of hatchery fish in the few stocks that are relatively abundant and stable or increasing, NMFS is concerned that the majority of natural steelhead populations in this ESU may not be self-sustaining.

NMFS concludes that the Oregon Coast steelhead ESU is not presently in danger of extinction, but is likely to become endangered in the foreseeable future. Most steelhead populations within this ESU have been declining in the recent past (although this may be partly due to recent climate conditions), with increasing trends restricted to the southernmost portion (south of Siuslaw Bay). NMFS is very concerned about the pervasive opportunity for genetic introgression from hatchery stocks within the ESU, as well as the potential ecological interactions between introduced stocks and native stocks.

(7) Klamath Mountains Province

NMFS has previously published a proposal to list this ESU as threatened under the ESA (60 FR 14253, March 16, 1995). Although historical trends in overall abundance within the ESU are not clearly known, NMFS believes there has been a substantial replacement of natural fish with hatchery-produced fish. While absolute abundance remains fairly high, since about 1970, trends in abundance have been downward in most steelhead populations for which NMFS has data within the ESU, and a number of populations are considered by various agencies and groups to be at some risk of extinction. Declines in summer steelhead populations are of particular concern. Most natural populations of steelhead within the area experience a substantial infusion of naturally spawning hatchery fish each year.

Risk analyses for this and other ESUs are unusually difficult due to the paucity of abundance data and, where data are available, the possible biases associated with particular data sets (e.g., angler catch records). Also, the Klamath Mountains Province status review was the first NMFS assessment in which the issue of naturally spawning hatchery fish and the questions they raise about the sustainability of natural populations was an important consideration. NMFS will continue to seek additional information and pursue assessments with Federal, state, and tribal fisheries managers that should help clarify the risk faced by Klamath Mountains Province Steelhead. Hence, NMFS will make a final determination on the status of this ESU concurrently with final listing determinations on all west coast steelhead ESUs.

(8) Northern California

Historical (pre-1960's) abundance information specific to this ESU is available from dam counts in the upper Eel River (Cape Horn Dam—annual average of 4,400 adult steelhead in the 1930's; McEwan & Jackson, 1996), the South Fork Eel River (Benbow Dam—annual average of 19,000 adult steelhead in the 1940's; McEwan & Jackson, 1996), and the Mad River (Sweasey Dam—annual average of 3,800 adult steelhead in the 1940's; Murphy & Shapovalov, 1951; CDFG, 1994).

In the mid-1960's, CDFG (1965) estimated that steelhead spawning populations for many rivers in this ESU totaled 198,000 fish. Estimated statewide total run size for the major stocks in California in the early 1980's was given by Light (1987) as approximately 275,000 fish. Of this total, 22 percent were estimated to be of hatchery origin, resulting in a naturally-produced run size of 215,000 steelhead statewide. Roughly half of this production was thought to be in the Klamath River Basin (including the Trinity River), so the total natural production for all ESUs south of the Klamath River was probably on the order of 100,000 adults.

The only current run-size estimates for this area are dam counts on the Eel River (Cape Horn Dam) and summer steelhead snorkel surveys in a few tributaries that provide no total abundance estimate. Statewide adult summer steelhead abundance is estimated at about 2,000 adults (McEwan & Jackson, 1996). While no overall recent abundance estimate for this ESU exists, the substantial declines in run size from historic levels at major dams in the region indicate a probable similar overall decline in abundance from historical levels.

Adequate adult escapement information was available to compute trends for seven stocks (Redwood Creek, Mad River [winter and summer runs], the mainstem, Middle Fork, and South Fork of the Eel River, and the South Fork of the Van Duzen River). Of these, five data series exhibit declines and two exhibit increases over the available data series, ranging from a 5.8-percent annual decline (mainstem Eel River) to a 3.5-percent annual increase (south Fork of the Van Duzen River). Three (all decreasing) of these trends were significantly different from zero. For one long-term data set (Eel River, Cape Horn Dam counts), a separate trend for the last 21 years (1971–1991) was calculated for comparison. The full-series trend showed a significant decline, but the recent data showed a lesser, non-significant decline, suggesting that the major stock decline occurred prior to 1970.

State hatchery planting records indicate that large numbers of out-of-basin hatchery fish are planted throughout this ESU and are allowed to spawn naturally throughout the region. According to McEwan and Jackson (1996), ''despite the large number of hatchery smolts released, steelhead runs in north coast drainages are comprised mostly of naturally produced fish.'' There is little information on the actual contribution of hatchery fish to natural spawning, and little information on present total run sizes for this ESU. However, given the preponderance of significant negative trends in the available data series, there is concern that steelhead populations in this ESU may not be self-sustaining.

NMFS concludes that the Northern California steelhead ESU is not presently in danger of extinction, but is likely to become endangered in the foreseeable future. Population abundances are very low relative to historical estimates (1930's dam counts), and recent trends are downward in stocks for which data exist, except for two small summer steelhead stocks. Summer steelhead abundance is very low. The abundance of introduced Sacramento squawfish (*Ptychocheilus grandis*), a known predator of salmonids, in the Eel River is also a concern. For certain rivers (particularly the Mad River), NMFS is concerned about the influence of hatchery stocks, both in terms of genetic introgression and potential ecological interactions between introduced stocks and native stocks.

(9) Central California Coast

Only two estimates of historical (pre-1960's) abundance specific to this ESU are available: an average of about 500 adults in Waddell Creek in the 1930's and early 1940's (Shapovalov & Taft, 1954), and an estimate of 20,000 steelhead in the San Lorenzo River before 1965 (Johnson, 1964). In the mid-1960's, CDFG (1965) estimated 94,000 steelhead spawning in many rivers of this ESU, including 50,000 and 19,000 fish in the Russian and San Lorenzo Rivers, respectively. NMFS has comparable recent estimates for only the Russian (approximately 7,000 fish) and San Lorenzo (approximately 500 fish) Rivers. These estimates indicate that recent total abundance of steelhead in these two rivers is less than 15 percent of their abundance 30 years ago. Additional recent estimates for several other streams (Lagunitas Creek, Waddell Creek, Scott Creek, San Vincente Creek, Soquel Creek, and Aptos Creek) indicate individual run sizes are 500 fish or less; however, no recent estimates of total run size exist for this ESU. McEwan and Jackson (1996) noted that steelhead in most streams tributary to San Francisco and San Pablo Bays have been extirpated. Small ''fair to good'' runs of steelhead apparently occur in coastal Marin County tributaries.

Adequate adult escapement information was not available to compute trends for any stocks within this ESU. However, general trends can be inferred from the comparison of 1960's and 1990's abundance estimates provided above, which indicate substantial rates of decline in the two main steelhead stocks (Russian and San Lorenzo Rivers) within this ESU.

The principal hatchery production in this ESU is from Warm Springs Hatchery on the Russian River and the Monterey Bay Salmon and Trout Project (Big Creek Hatchery off Scott Creek and other facilities). There are other small private and cooperative programs producing steelhead within this ESU. Most of the hatchery stocks used in this region originated from stocks indigenous to the ESU, but many are not native to local river basins. Little information is available regarding the actual contribution of hatchery fish to natural spawning, and little information on present run sizes or trends for this ESU exists. However, given the substantial rates of declines for those stocks where data do exist, it is likely that the majority of natural production in this ESU is not self-sustaining.

NMFS concludes that the Central California Coast steelhead ESU is presently in danger of extinction. The southernmost portion of the ESU (south of Scott and Waddell Creeks, including one of two major rivers within the ESU) and the portion within San Francisco and San Pablo Bays appear to be at highest risk. In the northern coastal portion of the ESU, steelhead abundance in the Russian River has been reduced roughly sevenfold since the mid-1960's, but abundance in smaller streams appears to be stable at low levels. There is particular concern for sedimentation and channel restructuring due to floods, apparently resulting in part from poor land management practices.

(10) South/Central California Coast

Historical estimates of steelhead abundance are available for a few streams in this region. In the mid-1960's, CDFG (1965) estimated a total of 27,750 steelhead spawning in many rivers of this ESU. Recent estimates for those rivers where comparative abundance information is available show a substantial decline during the past 30 years. In contrast to the CDFG (1965) estimates, McEwan and Jackson (1996) reported runs ranging from 1,000 to 2,000 in the Pajaro River in the early 1960's, and Snider (1983) estimated escapement of about 3,200 steelhead for the Carmel River for the 1964–1975 period. No recent estimates for total run size exist for this ESU; however, recent run-size estimates are available for five streams (Pajaro River, Salinas River, Carmel River, Little Sur River, and Big Sur River). The total of these estimates is less than 500 fish, compared with a total of 4,750 for the same streams in 1965, which suggests a substantial decline for the entire ESU from 1965 levels.

Adequate adult escapement information was available to compute a trend for only one stock within this ESU (Carmel River above San Clemente Dam). This data series shows a significant decline of 22 percent per year from 1963 to 1993, with a recent 5-year average count of only 16 adult steelhead at the dam. General trends can be inferred from the comparison of 1960's and 1990's abundance estimates provided above.

Presently, there is little hatchery production within this ESU. There are small private and cooperative programs producing steelhead within this ESU, as well as one captive broodstock program intended to conserve the Carmel River steelhead strain (McEwan & Jackson, 1996). Most of the hatchery stocks used in this region originated from stocks indigenous to the ESU, but many are not native to local river basins. Little information exists regarding the actual contribution of hatchery fish to natural spawning, and little information on present total run sizes or trends are available for this ESU. However, given the substantial reductions from historical abundance or recent negative trends in the stocks for which data does exist, it is likely that the majority of natural production in this ESU is not self-sustaining.

NMFS concludes that the South-Central California Coast steelhead ESU is presently in danger of extinction. Total abundance is extremely low, and most stocks for which NMFS has data in the ESU show recent downward trends. There is also concern about the genetic effects of widespread stocking of rainbow trout.

(11) Southern California

Historically, steelhead occurred naturally south into Baja California. Estimates of historical (pre-1960's) abundance for several rivers in this ESU are available: Santa Ynez River, before 1950, 20,000 to 30,000 (Shapovalov & Taft, 1954; CDFG, 1982; Reavis, 1991; Titus et al., in press); Ventura River, pre-1960, 4,000 to 6,000 (Clanton & Jarvis, 1946; CDFG, 1982; AFS, 1991; Hunt et al., 1992; Henke, 1994; Titus et al., in press); Santa Clara River, pre-1960, 7,000 to 9,000 (Moore, 1980; Comstock, 1992; Henke, 1994); Malibu Creek, pre-1960, 1,000 (Nehlsen et al., 1991; Reavis, 1991). ln the mid-1960's, CDFG (1965) estimated steelhead spawning populations for smaller tributaries in San Luis Obispo County as 20,000 fish; however, no estimates for streams further south were provided.

The present estimated total run size for six streams (Santa Ynez River, Gaviota Creek, Ventura River, Matilija Creek, Santa Clara River, Malibu Creek) in this ESU are summarized in Titus et al. (in press), and all are less than 200 adults. Titus et al. (in press) concluded that populations have been extirpated from all streams south of Ventura County, with the exception of Malibu Creek in Los Angeles County. While there are no comprehensive stream surveys conducted for steelhead trout occurring in streams south of Malibu Creek, there continues to be anecdotal observations of steelhead in rivers as far south as the Santa Margarita River, San Diego County, in years of substantial rainfall (Barnhart, 1986; Higgins, 1991; McEwan and Jackson, 1996). Titus et al. (in press) cited extensive loss of steelhead habitat due to water development, including impassable dams and dewatering.

No time series of data are available within this ESU to estimate population trends. Titus et al. (in press) summarized information for steelhead populations based on historical and recent survey information. Of the populations south of San Francisco Bay (including part of the Central California Coast ESU) for which past and recent information was available, 20 percent had no discernable change, 45 percent had declined, and 35 percent were extinct. Percentages for the counties comprising this ESU show a very high percentage of declining and extinct populations.

The influence of hatchery practices on this ESU is not well documented. In some populations, there may be genetic introgression from past steelhead plants and from planting of rainbow trout (Nielsen 1991). Habitat fragmentation and population declines resulting in small, isolated populations also pose genetic risk from inbreeding, loss of rare alleles, and genetic drift.

NMFS concludes that the Southern California steelhead ESU is presently in danger of extinction. Steelhead have already been extirpated from much of their historical range in this ESU. There is also concern about the genetic effects of widespread stocking of rainbow trout.

(12) Central Valley

Historical abundance estimates are available for some stocks within this ESU, but no overall estimates are available prior to 1961, when Hallock et al. (1961) estimated a total run size of 40,000 steelhead in the Sacramento River, including San Francisco Bay. In the mid-1960's, CDFG (1965) estimated steelhead spawning populations for the rivers in this ESU, totaling almost 27,000 fish. Limited data exist on recent abundance for this ESU. The present total run size for this ESU based on dam counts, hatchery returns, and past spawning surveys is probably less than 10,000 fish. Both natural and hatchery runs have declined since the 1960's. Counts at Red Bluff Diversion Dam averaged 1,400 fish over the last 5 years, compared with runs in excess of 10,000 fish in the late 1960's. Recent run-size estimates for the hatchery produced American River stock average less than 1,000 fish, compared to 12,000 to 19,000 in the early 1970's (McEwan & Jackson, 1996).

Adequate adult escapement information was available to compute a trend for only one stock within this ESU (Sacramento River above Red Bluff Diversion Dam). Fish passing over this dam are primarily (70 to 90 percent) of hatchery origin (CDFG, 1995; McEwan & Jackson, 1996). This data series shows a significant decline of 9 percent per year from 1966 to 1992. McEwan and Jackson (1996) cite substantial declines in hatchery returns within the basin as well. The majority of native, natural steelhead production in this ESU occurs in upper Sacramento River tributaries (Antelope, Deer, Mill, and other Creeks) below Red Bluff Diversion Dam, but these populations are nearly extirpated. The American, Feather, and Yuba (and possibly the upper Sacramento and Mokelumne) Rivers also have naturally-spawning populations (CDFG, 1995), but these populations have had substantial hatchery influence and their ancestry is not clearly known. The Yuba River had an estimated run size of 2,000 in 1984. Recent run size estimates for the Yuba River are unknown, but the population appears to be stable and supports a sport fishery (McEwan & Jackson, 1996). However, the status of native, natural fish in this stock is unknown. This stock has been influenced by Feather River Hatchery fish, and biologists familiar with the stock report that the Yuba River supports almost no natural production of steelhead (Hallock, 1989). However, CDFG (1995) asserted that ''a substantial portion of the returning adults are progeny of naturally spawning adults from the Yuba River.'' This stock currently receives no hatchery steelhead plants and is managed as a naturally sustained population (CDFG, 1995; McEwan & Jackson, 1996).

In the San Joaquin River Basin, there is little available historic or recent information on steelhead distribution or abundance. According to McEwan and Jackson (1996), there are reports of a small remnant steelhead run in the Stanislaus River. Also, steelhead were observed in the Tuolumne River in 1983, and large rainbow trout (possibly steelhead) have been observed at Merced River Hatchery recently.

NMFS concludes that the Central Valley steelhead ESU is presently in danger of extinction. Steelhead have already been extirpated from most of their historical range in this ESU. Habitat concerns in this ESU focus on the widespread degradation, destruction, and blockage of freshwater habitats within the region, and the potential results of continuing habitat destruction and water allocation problems. NMFS is also very concerned about the pervasive opportunity for genetic introgression from hatchery stocks within the ESU because of the widespread production of hatchery steelhead, and the potential ecological interactions between introduced stocks and native stocks.

(13) Middle Columbia River Basin

Estimates of historical (pre-1960's) abundance indicate that the total historical run size for this ESU might have been in excess of 300,000. Total run sizes for the major stocks in the upper Columbia River (above Bonneville Dam, including the Upper Columbia River, Snake River Basin, and parts of the Southwest Washington and Lower Columbia River ESUs) for the early 1980's were estimated by Light (1987) as approximately 4,000 winter steelhead and 210,000 summer steelhead. Based on dam counts for this period, the Middle Columbia River ESU represented the majority of this total run estimate, so the run returning to this ESU was probably somewhat below 200,000 at that time. Light (1987) estimated that 80 percent of the total Columbia River Basin run (summer and winter steelhead combined) above Bonneville Dam was of hatchery origin. The most recent 5-year average run size was 142,000, with a naturally-produced component of 39,000. These data indicate approximately 74 percent hatchery fish in the total run to this ESU. Recent escapement or run size estimates exist for only five basins in this ESU. For the main Deschutes River (counted at Sherars Falls), total recent (5-year average) run size was approximately 11,000, with a natural escapement of 3,000. Hatchery escapement to spawning grounds (calculated by subtracting Pelton Ladder and other hatchery returns from the counts at Sherars Falls) has averaged about 4,000 adults over the last five brood years (BPA 1992). For the Warm Springs River (steelhead passing above Warm Springs NFH), escapement has averaged 150 adults over the last 5 years. In the Umatilla River (counts at Three Mile Dam) escapement has averaged 1,700 adults over the last 5 years. In the Yakima River, total escapement has averaged 1,300 adults, with a natural escapement of 1,200 adults, over the last 5 years. In addition to these estimates, ODFW (1995a) suggested that 5 sub-basins of the John Day River each have runs in excess of 1,000, so the total run size for the John

Day River is probably in excess of 5,000 fish.

Stock trend data are available for various basins from dam counts, spawner surveys, and angler catch. Of the 14 independent stock indices for which trends could be computed, 10 have been declining and 4 increasing over the available data series, with a range from 20 percent annual decline to 14 percent annual increase. Eight of these trends (seven negative, one positive) were significantly different from zero. Of the major basins, the Yakima, Umatilla, and Deschutes Rivers show upward overall trends, although all tributary counts in the Deschutes River are downward and the Yakima River is recovering from extremely low abundance in the early 1980's. The John Day River probably represents the largest native, natural spawning stock in the ESU, and combined spawner surveys for the John Day River have been declining at a rate of about 15 percent per year since 1985. However, estimates of total run size for the ESU based on differences in counts at dams show an overall increase in steelhead abundance, with a relatively stable naturally-produced component.

Hatchery fish are widespread and straying to spawn naturally throughout the region. Hatchery production in this ESU is derived primarily from within-basin stocks. Recent estimates of the proportion of natural spawners with hatchery origin range from low (Yakima River, Walla Walla River, John Day River) to moderate (Umatilla River, Deschutes River). Little information is available on the actual contribution of hatchery production to natural spawning.

NMFS concludes that the Middle Columbia steelhead ESU is not presently in danger of extinction, but has reached no conclusion regarding its likelihood of becoming endangered in the foreseeable future. NMFS remains concerned about the status of this ESU and will carefully evaluate conservation measures affecting this ESU and continue monitoring its status during the period between this proposed rule and publication of a final rule. There is particular concern about Yakima River stocks and winter steelhead stocks. Winter steelhead are reported within this ESU only in the Klickitat River and Fifteenmile Creek. No abundance information exists for winter steelhead in the Klickitat River, but they have been declining in abundance in Fifteenmile Creek. Total steelhead abundance in the ESU appears to have been increasing recently, but the majority of natural stocks for which NMFS has data within this ESU have been declining, including those in the John Day River, which is the largest producer of native, natural steelhead. NMFS is very concerned about the pervasive opportunity for genetic introgression from hatchery stocks within the ESU. There is widespread production of hatchery steelhead within this ESU, but largely based on within basin stocks. Estimated proportion of hatchery fish on spawning grounds ranges from low (Yakima River, Walla Walla River, John Day River) to moderate (Umatilla River, Deschutes River).

(14) Upper Columbia River Basin

Estimates of historical (pre-1960s) abundance specific to this ESU are available from fish counts at dams. Counts at Rock Island Dam from 1933 to 1959 averaged 2,600 to 3,700, suggesting a pre-fishery run size in excess of 5,000 adults for tributaries above Rock Island Dam (Chapman et. al., 1994). However, runs may already have been depressed by lower Columbia River fisheries at this time. Recent 5-year (1989–93) average natural escapements are available for two stock units: Wenatchee River, 800 steelhead, and Methow and Okanogan Rivers, 450 steelhead. Recent average total escapement for these stocks were 2,500 and 2,400, respectively. Average total run size at Priest Rapids Dam for the same period was approximately 9,600 adult steelhead.

Trends in total (natural and hatchery) adult escapement are available for the Wenatchee River (2.6 percent annual increase, 1962–1993) and the Methow and Okanogan Rivers combined (12 percent annual decline, 1982–93). These two stocks represent most of the escapement to natural spawning habitat within the range of the ESU; the Entiat River also has a small spawning run (WDF et al., 1993).

Hatchery fish are widespread and escaping to spawn naturally throughout the region. The hatchery stock used in this region originated from stocks indigenous to the ESU during the Grand Coulee Fish Maintenance Project, but represents a blend of fish from all basins within the ESU (and from areas above Grand Coulee Dam). Spawning escapement is strongly dominated by hatchery production, with recent contributions averaging 65 percent (Wenatchee River) to 81 percent (Methow and Okanogan Rivers). The WDFW estimated adult replacement ratios of only 0.3:1.0 in the Wenatchee River and 0.25:1.0 in the Entiat River, and concluded that both these stocks and the Methow/Okanogan stock are not self-sustaining without substantial hatchery production.

NMFS concludes that the Upper Columbia steelhead ESU is presently in danger of extinction. While total abundance of populations within this ESU has been relatively stable or increasing, this appears to be true only because of major hatchery production programs. Estimates of the proportion of hatchery fish in spawning escapement are 65 percent (Wenatchee River) and 81 percent (Methow and Okanogan Rivers). The major concern for this ESU is the clear failure of natural stocks to replace themselves. NMFS is very concerned about problems of genetic homogenization due to hatchery supplementation within the ESU. Significant concern also exists regarding the apparent high harvest rates on steelhead smolts in rainbow trout fisheries and the degradation of freshwater habitats within the region.

(15) Snake River Basin

No estimates of historical (pre-1960's) abundance specific to this ESU are available. Light (1987) estimated that 80 percent of the total Columbia River Basin run (summer and winter steelhead combined) above Bonneville Dam was of hatchery origin. All steelhead in the Snake River Basin are summer steelhead, which for management purposes are divided into ''A-run'' and ''B-run'' steelhead. Each has several life history differences including spawning size, run timing, and habitat type. Although there is little information for most stocks within this ESU, there are recent run-size and/or escapement estimates for several stocks. Total recent-year average (1990–1994) escapement above Lower Granite Dam was approximately 71,000, with a natural component of 9,400 (7,000 A-run and 2,400 B-run). Run-size estimates are available for only a few tributaries within the ESU, all with small populations.

The aggregate trend in abundance for this ESU (indexed at Lower Granite Dam) has been upward since 1975, although natural escapement has been declining during the same period. However, the aggregate trend has been downward (with wide fluctuations) over the past 10 years, recently reaching levels below those observed at Ice Harbor Dam in the early 1960's. Naturally-produced escapement has declined sharply in the last ten years. Adult abundance trend information is available for several individual stocks from a variety of sources, including spawner surveys, dam counts, and angler catch. Of the thirteen stock indices (excluding the Lower Granite

Dam counts discussed above) for which sufficient adequate information exists to compute trends, nine have been declining and four increasing over the available data series, with a range from 30 percent annual decline to a 4 percent annual increase. Four of these trends (all negative) were significantly different from zero. In addition to these adult abundance data, the focus of IDFG's steelhead monitoring program is juvenile (parr) surveys in areas designated as ''wild'' (i.e., sites with limited hatchery influence) as well as in natural production areas. Summaries in Leitzinger and Petrosky (in press) show declines in average parr density over the past 7 or 8 years for both A- and B-run steelhead in both wild and natural production areas. From 1985 to 1993, estimates of mean percent of rated parr carrying capacity for these surveys ranged from as low as 11.2 percent (wild-production B-run) to 62.1 percent (wild-production A-run). The *U.S.* v. *Oregon* Technical Advisory Committee found that A-run steelhead densities were closer to rated capacities than were B-run steelhead; it noted that ''percent carrying capacity indicates that all surveyed areas are underseeded'' (TAC, 1991).

Hatchery fish are widespread and escaping to spawn naturally throughout the region. During the past five years, an average of 86 percent of steelhead passing above Lower Granite Dam were of hatchery origin. Only two hatchery composition estimates are available for individual stocks: 0 percent for Joseph Creek (Grande Ronde River), and 57 percent for the Tucannon River. In general, there are wild production areas with limited hatchery influence remaining in the Selway River, lower Clearwater River, Middle and South Forks of the Salmon River, and the lower Salmon River (Leitzinger & Petrosky, in press). In other areas, such as the upper Salmon River, there appears to be little or no natural production of locally-native steelhead (IDFG, 1995). Given the relatively low natural run sizes to individual streams for which estimates are available, the declines in natural returns at Lower Granite Dam and in parr density estimates, and the widespread presence of hatchery fish, NMFS concludes that the majority of natural steelhead populations in this ESU are probably not self-sustaining at this time.

NMFS concludes that the Snake River Basin steelhead ESU is not presently in danger of extinction, but is likely to become endangered in the foreseeable future. While total run size (hatchery and natural) has increased since the mid-1970's, there has been a severe recent decline in natural run size. The majority of natural stocks for which adequate data exists within this ESU have been declining. Parr densities in natural production areas have been substantially below estimated capacity in recent years. Downward trends and low parr densities indicate a particularly severe problem for B-run steelhead, the loss of which would substantially reduce life-history diversity within this ESU. NMFS is very concerned about the pervasive opportunity for genetic introgression from hatchery stocks within the ESU. There is widespread production of hatchery steelhead within this ESU. The total Snake River steelhead run at Lower Granite Dam is estimated to average 86 percent hatchery fish in recent years. Estimates of proportion of hatchery fish in spawning escapement for tributaries range from 0 percent (Joseph Creek) to above 80 percent (upper Salmon River, IDFG, 1995).

Existing Protective Efforts

Under § 4(b)(1)(A) of the ESA, the Secretary of Commerce is required to make listing determinations solely on the basis of the best scientific and commercial data available and after taking into account efforts being made to protect a species. During the status review for west coast steelhead, NMFS reviewed an array of protective efforts for steelhead and other salmonids, ranging in scope from regional strategies to local watershed initiatives. NMFS has summarized some of the major efforts in a document entitled ''Steelhead Conservation Efforts: A Supplement to the Notice of Determination for West Coast Steelhead under the Endangered Species Act.'' This document is available upon request (see **ADDRESSES** section).

Despite numerous efforts to halt and reverse declining trends in west coast steelhead, it is clear that the status of many native, naturally-reproducing populations has continued to deteriorate. NMFS therefore believes it highly likely that past efforts and programs to address the conservation needs of these stocks have proven inadequate, including efforts to reduce mortalities and improve the survival of these stocks through all stages of their life cycle. Important factors include the continued decline in the productivity of freshwater habitat for a wide variety of reasons, significant potential negative impacts from interactions with hatchery stocks, overfishing, and natural environmental variability.

While NMFS recognizes that many of the ongoing protective efforts are likely to promote the conservation of steelhead and other salmonids, in the aggregate, they do not achieve steelhead conservation at a scale that is adequate to protect and conserve ESUs. NMFS believes that most existing efforts lack some of the critical elements needed to provide a high degree of certainty that the efforts will be successful. These elements include: (1) Identification of specific factors for decline; (2) immediate measures required to protect the best remaining populations and habitats and priorities for restoration activities; (3) explicit and quantifiable objectives and timelines; and (4) monitoring programs to determine the effectiveness of actions, including methods to measure whether recovery objectives are being met.

The best available scientific information on the biological status of the species supports a proposed listing of 10 steelhead ESUs under the ESA (see Proposed Determination). NMFS concludes that existing protective efforts are inadequate to alter the proposed determination of threatened or endangered for these 10 steelhead ESUs. However, during the period between publication of this proposed rule and publication of a final rule, NMFS will continue to solicit information regarding protective efforts (see Public Comments Solicited) and will work with Federal, state and tribal fisheries managers to evaluate the efficacy of the various salmonid conservation efforts. If, during this process, NMFS determines that existing protective efforts are likely to avert extinction and provide for the recovery of a steelhead ESU(s), NMFS will modify this listing proposal.

Summary of Factors Affecting the Species

Section 2(a) of the ESA states that various species of fish, wildlife, and plants in the United States have been rendered extinct as a consequence of economic growth and development untempered by adequate concern for ecosystem conservation. Section 4(a)(1) of the ESA and the listing regulations (50 CFR part 424) set forth procedures for listing species. NMFS must determine, through the regulatory process, if a species is endangered or threatened based upon any one or a combination of the following factors: (1) The present or threatened destruction, modification, or curtailment of its habitat or range; (2) overutilization for commercial, recreational, scientific, or education purposes; (3) disease or predation; (4) inadequacy of existing regulatory mechanisms; or (5) other natural or human-made factors affecting its continued existence.

NMFS has prepared a supporting document which addresses the factors that have led to the decline of this species entitled ''Factors for Decline: A supplement to the notice of determination for West Coast steelhead.'' This report, available upon request (see **ADDRESSES** section), concludes that all of the factors identified in section 4(a)(1) of the ESA have played a role in the decline of the species. The report identifies destruction and modification of habitat, overutilization for recreational purposes, and natural and human-made factors as being the primary reasons for the decline of west coast steelhead. The following discussion summarizes findings regarding factors for decline across the range of west coast steelhead. While these factors have been treated here in general terms, it is important to underscore that impacts from certain factors are more acute for specific ESUs. For example, impacts from hydropower development are more pervasive for ESUs in the upper Columbia River Basin than for some coastal ESUs.

Steelhead on the west coast of the United States have experienced declines in abundance in the past several decades as a result of natural and human factors. Forestry, agriculture, mining, and urbanization have degraded, simplified, and fragmented habitat. Water diversions for agriculture, flood control, domestic, and hydropower purposes (especially in the Columbia River and Sacramento-San Joaquin Basins) have greatly reduced or eliminated historically accessible habitat. Studies indicate that in most western states, about 80 to 90 percent of the historic riparian habitat has been eliminated. Further, it has been estimated that during the last 200 years, the lower 48 states have lost approximately 53 percent of all wetlands and the majority of the rest are severely degraded. Washington and Oregon's wetlands are estimated to have diminished by one-third, while California has experienced a 91-percent loss of its wetland habitat. Loss of habitat complexity has also contributed to the decline of steelhead. For example, in national forests in Washington, there has been a 58-percent reduction in large, deep pools due to sedimentation and loss of pool-forming structures such as boulders and large wood. Similarly, in Oregon, the abundance of large, deep pools on private coastal lands has decreased by as much as 80 percent. Sedimentation from land use activities is recognized as a primary cause of habitat degradation in the range of west coast steelhead.

Steelhead support an important recreational fishery throughout their range. During periods of decreased habitat availability (e.g., drought conditions or summer low flow when fish are concentrated), the impacts of recreational fishing on native anadromous stocks may be heightened. Steelhead are not generally targeted in commercial fisheries. However, high seas driftnet fisheries in the past may have contributed slightly to a decline of this species in local areas, but this could not be solely responsible for the large declines in abundance observed along most of the Pacific coast over the past several decades.

Introductions of non-native species and habitat modifications have resulted in increased predator populations in numerous river systems, thereby increasing the level of predation experienced by salmonids. Predation by marine mammals is also of concern in areas experiencing dwindling steelhead runsizes. However, salmon and marine mammals have coexisted for thousands of years and most investigators consider predation an insignificant contributing factor to the large declines observed in west coast steelhead populations.

Natural climatic conditions have served to exacerbate the problems associated with degraded and altered riverine and estuarine habitats. Persistent drought conditions have reduced already limited spawning, rearing and migration habitat. Further, climatic conditions appear to have resulted in decreased ocean productivity which, during more productive periods, may help (to a small degree) offset degraded freshwater habitat conditions.

In an attempt to mitigate the loss of habitat, extensive hatchery programs have been implemented throughout the range of steelhead on the West Coast. While some of these programs have been successful in providing fishing opportunities, the impacts of these programs on native, naturally-reproducing stocks are not well understood. Competition, genetic introgression, and disease transmission resulting from hatchery introductions may significantly reduce the production and survival of native, naturally-reproducing steelhead. Furthermore, collection of native steelhead for hatchery broodstock purposes may result in additional negative impacts to small or dwindling natural populations. It is important to note, however, that artificial propagation could play an important role in steelhead recovery and that some hatchery populations of steelhead may be deemed essential for the recovery of threatened or endangered steelhead ESUs (see Proposed Determination). In addition, alternative uses of supplementation, such as for the creation of terminal fisheries, must be fully explored to try to limit negative impacts to remaining natural populations. This use must be tempered with the understanding that protecting native, naturally-reproducing steelhead and their habitats is critical to maintaining healthy, fully-functioning ecosystems.

Proposed Determination

The ESA defines an endangered species as any species in danger of extinction throughout all or a significant portion of its range, and a threatened species as any species likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range. Section 4(b)(1) of the ESA requires that the listing determination be based solely on the best scientific and commercial data available, after conducting a review of the status of the species and after taking into account those efforts, if any, being made to protect such species.

Based on results from its coastwide assessment, NMFS has determined that on the west coast of the United States, there are fifteen ESUs of steelhead which constitute ''species'' under the ESA. NMFS has determined that five ESUs are currently endangered (Central California Coast, South Central California Coast, Southern California, Central Valley, and Upper Columbia ESUs) and another five ESUs are currently threatened (Snake River Basin, lower Columbia River, Oregon Coast, Klamath Mountains Province, and northern California ESUs) and NMFS proposes to list them as such at this time. The geographic boundaries (i.e., the watersheds within which the members of the ESU spend their freshwater residence) for these ESUs are described under ''ESU Determinations.''

The Klamath Mountains Province ESU was proposed for listing under a previous determination (60 FR 14253, March 16, 1995). However, due to unresolved issues and practical considerations, NMFS believes it more prudent to make a final determination on Klamath Mountains Province steelhead in the context of final determinations for West Coast steelhead ESUs. NMFS has received comments on the previous proposal to list this ESU and will seek additional information that should help clarify the degree of risk faced by Klamath Mountains Province steelhead. The agency will make a final determination on this ESU concurrently with final listing determinations on all west coast steelhead ESUs.

NMFS has determined that steelhead in the Middle Columbia River ESU (the Columbia River Basin from Mosier Creek, OR, upstream to the Yakima River, WA) do not warrant listing. However, because there is sufficient concern regarding the health of steelhead in this region, NMFS is adding this ESU to its candidate species list. NMFS will conduct a thorough reevaluation of the status of this ESU before the final listing determination.

In all 10 ESUs identified as threatened or endangered, only native, naturally-reproducing steelhead are being proposed for listing. Prior to the final listing determination, NMFS will examine the relationship between hatchery and natural populations of steelhead in these ESUs, and assess whether any hatchery populations are essential for their recovery. This may result in the inclusion of specific hatchery populations as part of a listed ESU in NMFS' final determination.

In addition, NMFS is proposing to list only anadromous life forms of *O. mykiss* at this time due to uncertainties regarding the relationship between resident rainbow trout and steelhead. Prior to the final listing determination, NMFS will seek additional information on this issue and work with the U.S. Fish and Wildlife Service and fisheries comanagers to better define the relationship between resident and anadromous *O. mykiss* in the ESUs proposed for listing.

Conservation Measures

Conservation measures provided to species listed as endangered or threatened under the ESA include recognition, recovery actions, Federal agency consultation requirements, and prohibitions on taking. Recognition through listing promotes public awareness and conservation actions by Federal, state, and local agencies, private organizations, and individuals.

Several conservation efforts are underway that may reverse the decline of west coast steelhead and other salmonids. These include the Northwest Forest Plan (on Federal lands within the range of the northern spotted owl), Pacfish (on all additional Federal lands with anadromous salmonid populations), Oregon's Coastal Salmon Restoration Initiative, Washington's Wild Stock Restoration Initiative, California's Coastal Salmon Initiative and Steelhead Management Plan, NMFS' Proposed Recovery Plan for Snake River Salmon, and a Draft Recovery Plan for Sacramento Winter-run Chinook Salmon. NMFS is very encouraged by a number of these efforts and believes that they have or may constitute significant strides in the efforts in the region to develop a scientifically well grounded conservation plan for these stocks. NMFS intends to support and work closely with these efforts—staff and resources permitting—in the belief that they could have a substantial impact on a final decision on the need to list these stocks or on the type of final listing. The degree to which these conservation efforts are able to provide reliable, scientifically well grounded commitments through a variety of measures to provide for the conservation of these stocks will have a direct and substantial effect on any final listing determination of NMFS.

Section 7(a)(4) of the ESA requires that Federal agencies confer with NMFS on any actions likely to jeopardize the continued existence of a species proposed for listing and on actions likely to result in the destruction or adverse modification of proposed critical habitat. For listed species, section 7(a)(2) requires Federal agencies to ensure that activities they authorize, fund, or conduct are not likely to jeopardize the continued existence of a listed species or to destroy or adversely modify its critical habitat. If a Federal action may affect a listed species or its critical habitat, the responsible Federal agency must enter into consultation with NMFS.

Examples of Federal actions likely to affect steelhead include authorized land management activities of the U.S. Forest Service and U.S. Bureau of Land Management, as well as operation of hydroelectric and storage projects of the Bureau of Reclamation and U.S. Army Corps of Engineers (COE). Such activities include timber sales and harvest, hydroelectric power generation, and flood control. Federal actions, including the COE section 404 permitting activities under the Clean Water Act, COE permitting activities under the River and Harbors Act, Federal Energy Regulatory Commission licenses for non-Federal development and operation of hydropower, and Federal salmon hatcheries, may also require consultation.

Based on information presented in this proposed rule, general conservation measures that could be implemented to help conserve the species are listed below. This list does not constitute NMFS' interpretation of a recovery plan under section 4(f) of the ESA.

1. Measures could be taken to promote land management practices that protect and restore steelhead habitat. Land management practices affecting steelhead habitat include timber harvest, road building, agriculture, livestock grazing, and urban development.
2. Evaluation of existing harvest regulations could identify any changes necessary to protect steelhead populations.
3. Artificial propagation programs could be required to incorporate practices that minimize impacts upon native populations of steelhead.
4. Efforts could be made to ensure that existing and proposed dam facilities are designed and operated in a manner that will not adversely affect steelhead populations. For example, NMFS could require that fish passage facilities at dams effectively pass migrating juvenile and adult steelhead.
5. Water diversions could have adequate headgate and staff gauge structures installed to control and monitor water usage accurately. Water rights could be enforced to prevent irrigators from exceeding the amount of water to which they are legally entitled.
6. Irrigation diversions affecting downstream migrating steelhead trout could be screened. A thorough review of the impact of irrigation diversions on steelhead could be conducted.

NMFS recognizes that, to be successful, protective regulations and recovery programs for steelhead will need to be developed in the context of conserving aquatic ecosystem health. NMFS intends that Federal lands and Federal activities play a primary role in preserving listed populations and the ecosystems upon which they depend. However, throughout the range of all ten ESUs proposed for listing, steelhead habitat occurs and can be affected by activities on state, tribal or private land. Agricultural, timber, and urban management activities on nonfederal land could and should be conducted in a manner that avoids adverse effects to steelhead habitat.

NMFS encourages nonfederal landowners to assess the impacts of their actions on potentially threatened or endangered salmonids. In particular, NMFS encourages the formulation of watershed partnerships to promote conservation in accordance with ecosystem principles. These partnerships will be successful only if state, tribal, and local governments, landowner representatives, and Federal and nonfederal biologists all participate and share the goal of restoring steelhead to the watersheds.

Section 9 of the ESA prohibits certain activities that directly or indirectly affect endangered species. These prohibitions apply to all individuals, organizations, and agencies subject to

U.S. jurisdiction. Section 4(d) of the ESA allows the promulgation of protective regulations that modify or apply any or all of the prohibitions of section 9 to threatened species. Section 9 prohibits violations of protective regulations for threatened species promulgated under section 4(d).

At this time, NMFS proposes to adopt protective measures to prohibit ''taking,'' interstate commerce, and the other ESA prohibitions applicable to endangered species, with the exceptions provided under section 10 of the ESA, for the five ESUs of steelhead proposed as threatened herein. Under the ESA, the term ''take'' means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct. NMFS is proposing to extend the provisions of section 9 and section 10 to these ESUs to provide immediate protections to them upon final listing. However, prior to the final listing determination, NMFS will consider adopting specific regulations under section 4(d) that will apply to one or more ESUs of steelhead identified as threatened (see Public Comments Solicited). These regulations, promulgated pursuant to the Administrative Procedures Act, 5 U.S.C. 551 *et seq.*, may be in lieu of the Section 9 taking prohibition and Section 10 permit exception.

Sections 10(a)(1)(A) and 10(a)(1)(B) of the ESA provide NMFS with authority to grant exceptions to the ESA's ''taking'' prohibitions. Section 10(a)(1)(A) scientific research and enhancement permits may be issued to entities (Federal and non-Federal) conducting research that involves a directed take of listed species. A directed take refers to the intentional take of listed species. NMFS has issued section 10(a)(1)(A) research/ enhancement permits for other listed species (e.g., Snake River chinook salmon and Sacramento River winter-run chinook salmon) for a number of activities, including trapping and tagging, electroshocking to determine population presence and abundance, removal of fish from irrigation ditches, and collection of adult fish for artificial propagation programs.

Section 10(a)(1)(B) incidental take permits may be issued to non-Federal entities performing activities which may incidentally take listed species. The types of activities potentially requiring a section 10(a)(1)(B) incidental take permit include the operation and release of artificially propagated fish by state or privately operated and funded hatcheries, state or University research not receiving Federal authorization or funding, and the implementation of state fishing regulations. NMFS Policies on Endangered and Threatened Fish and Wildlife

On July 1, 1994, NMFS, jointly with the U.S. Fish and Wildlife Service, published a series of policies regarding listings under the ESA, including a policy for peer review of scientific data (59 FR 34270) and a policy to identify, to the maximum extent possible, those activities that would or would not constitute a violation of section 9 of the ESA (59 FR 34272).

Role of peer review: The intent of the peer review policy is to ensure that listings are based on the best scientific and commercial data available. Prior to a final listing, NMFS will solicit the expert opinions of three qualified specialists, concurrent with the public comment period. Independent peer reviewers will be selected from the academic and scientific community, Tribal and other native American groups, Federal and state agencies, and the private sector.

Identification of those activities that would constitute a violation of Section 9 of the ESA: The intent of this policy is to increase public awareness of the effect of this listing on proposed and ongoing activities within the species' range. NMFS will identify, to the extent known at the time of the final rule, specific activities that will not be considered likely to result in violation of section 9, as well as activities that will be considered likely to result in violation. NMFS believes that, based on the best available information, the following actions will not result in a violation of section 9:

(1) Possession of steelhead acquired lawfully by permit issued by NMFS pursuant to section 10 of the ESA, or by the terms of an incidental take statement pursuant to section 7 of the ESA.

(2) Federally approved projects that involve activities such as silviculture, grazing, mining, road construction, dam construction and operation, discharge of fill material, stream channelization or diversion for which consultation has been completed, and when such activity is conducted in accordance with any terms and conditions given by NMFS in an incidental take statement accompanied by a biological opinion.

Activities that NMFS believes could potentially harm the steelhead and result in ''take'', include, but are not limited to:

(1) Unauthorized collecting or handling of the species. Permits to conduct these activities are available for purposes of scientific research or to enhance the propagation or survival of the species.

(2) Unauthorized destruction/ alteration of the species' habitat such as removal of large woody debris or riparian shade canopy, dredging, discharge of fill material, draining, ditching, diverting, blocking, or altering stream channels or surface or ground water flow.

(3) Discharges or dumping of toxic chemicals or other pollutants (i.e., sewage, oil and gasoline) into waters or riparian areas supporting the species.

(4) Violation of discharge permits.

(5) Pesticide applications in violation of label restrictions.

(6) Interstate and foreign commerce (commerce across State lines and international boundaries) and import/ export without prior obtainment of an endangered species permit.

This list is not exhaustive. It is provided to give the reader some examples of the types of activities that may be considered by the NMFS as constituting a ''take'' of steelhead under the ESA and regulations. Questions regarding whether specific activities will constitute a violation of section 9, and general inquiries regarding prohibitions and permits, should be directed to NMFS (see **ADDRESSES**).

Critical Habitat

Section 4(a)(3)(A) of the ESA requires that, to the extent prudent and determinable, critical habitat be designated concurrently with the listing of a species. While NMFS has completed its initial analysis of the biological status of steelhead populations from Washington, Oregon, Idaho, and California, it has not performed the analysis (including economic analysis) necessary for designating critical habitat. Further, NMFS is placing a higher priority on listings than on critical habitat designations due to staffing and workload constraints resulting from the lifting of the recent listing moratorium. In most cases, the substantive protections of critical habitat designations are duplicative of those of listings, however, in cases in which critical habitat designation is deemed essential to the conservation of the species, such a designation could warrant a higher priority. It is NMFS' intention to develop and publish a critical habitat designation for West Coast steelhead as time and workload permit.

Public Comments Solicited

To ensure that the final action resulting from this proposal will be as accurate and effective as possible, NMFS is soliciting comments and suggestions from the public, other governmental agencies, the scientific community, industry, and any other interested parties. Public hearings will be held in several locations in the range of the proposed ESUs; details regarding locations, dates, and times will be published in a forthcoming Federal Register notice. NMFS recognizes that there are serious limits to the quality of information available, and, therefore, NMFS has executed its best professional judgment in developing this proposal. NMFS will appreciate any additional information regarding, in particular: (1) The relationship between rainbow trout and steelhead, specifically whether rainbow trout and steelhead populations in the same geographic area should be considered a single ESU; (2) biological or other relevant data concerning any threat to steelhead or rainbow trout; (3) the range, distribution, and population size of steelhead and rainbow trout in all identified ESUs; (4) current or planned activities in the subject areas and their possible impact on this species; (5) steelhead escapement, particularly escapement data partitioned into natural and hatchery components; (6) the proportion of naturally-reproducing fish that were reared as juveniles in a hatchery; (7) homing and straying of natural and hatchery fish; (8) the reproductive success of naturally-reproducing hatchery fish (i.e., hatchery-produced fish that spawn in natural habitat) and their relationship to the identified ESUs; (9) efforts being made to protect native, naturally-reproducing populations of steelhead and rainbow trout in Washington, Oregon, Idaho and California; and (10) suggestions for specific regulations under section 4(d) of the ESA that should apply to threatened steelhead ESUs. Suggested regulations may address activities, plans, or guidelines that, despite their potential to result in the incidental take of listed fish, will ultimately promote the conservation and recovery of threatened steelhead.

NMFS is also requesting quantitative evaluations describing the quality and extent of freshwater and marine habitats for juvenile and adult steelhead as well as information on areas that may qualify as critical habitat in Washington, Oregon, Idaho, and California for the proposed ESUs. Areas that include the physical and biological features essential to the recovery of the species should be identified. NMFS recognizes that there are areas within the proposed boundaries of some ESUs that historically constituted steelhead habitat, but may not be currently occupied by steelhead. NMFS is requesting information about steelhead in these currently unoccupied areas (in particular, for the Southern California and Central Valley ESUs) and whether these habitats should be considered essential to the recovery of the species or excluded from designation. Essential features include, but are not limited to: (1) Habitat for individual and population growth, and for normal behavior; (2) food, water, air, light, minerals, or other nutritional or physiological requirements; (3) cover or shelter; (4) sites for reproduction and rearing of offspring; and (5) habitats that are protected from disturbance or are representative of the historic geographical and ecological distributions of the species.

For areas potentially qualifying as critical habitat, NMFS is requesting information describing: (1) The activities that affect the area or could be affected by the designation, and (2) the economic costs and benefits of additional requirements of management measures likely to result from the designation.

The economic cost to be considered in the critical habitat designation under the ESA is the probable economic impact ‘‘of the [critical habitat] designation upon proposed or ongoing activities’’ (50 CFR 424.19). NMFS must consider the incremental costs specifically resulting from a critical habitat designation that are above the economic effects attributable to listing the species. Economic effects attributable to listing include actions resulting from section 7 consultations under the ESA to avoid jeopardy to the species and from the taking prohibitions under section 9 of the ESA. Comments concerning economic impacts should distinguish the costs of listing from the incremental costs that can be directly attributed to the designation of specific areas as critical habitat.

NMFS will review all public comments and any additional information regarding the status of the steelhead ESUs described herein and, as required under the ESA, will complete a final rule within 1 year of this proposed rule. The availability of new information may cause NMFS to reassess the status of steelhead ESUs. In particular, NMFS will conduct a thorough reevaluation of the status of the Middle Columbia River ESU before the final listing determination. Although NMFS has concluded that information available at the present time is not sufficient to demonstrate that a listing is warranted for this ESU, there is concern over the health of natural populations in this ESU.

NMFS is aware and strongly supportive of the current efforts by the states of Oregon, Washington, and California to develop effective and scientifically based conservation measures to address at-risk salmon and steelhead stocks. NMFS believes that these efforts, if successful, could serve as the central components of a broad conservation program that would provide a steady, predictable, and well grounded road to recovery and rebuilding of these stocks. NMFS intends to work closely with these efforts and those of local or regional watershed groups, as well as other involved Federal agencies, and hopes that this proposal will add greater impetus to those efforts.

References

A complete list of all references cited herein is available upon request (see **ADDRESSES** section).

Classification

The 1982 amendments to the ESA, in section 4(b)(1)(A), restrict the information that may be considered when assessing species for listing. Based on this limitation of criteria for a listing decision and the opinion in *Pacific Legal Foundation* v. *Andrus,* 675 F. 2d 825 (6th Cir. 1981), NMFS has categorically excluded all ESA listing actions from environmental assessment requirements of the National Environmental Policy Act under NOAA Administrative Order 216–6.

This proposed rule is exempt from review under E.O. 12866.

Dated: July 31, 1996.

C. Karnella,

Acting Program Management Officer, National Marine Fisheries Service.

List of Subjects

50 CFR Part 222

Administrative practice and procedure, Endangered and threatened wildlife, Exports, Imports, Reporting and recordkeeping requirements, Transportation.

50 CFR Part 227

Endangered and threatened species, Exports, Imports, Marine mammals, Transportation.

For the reasons set out in the preamble, 50 CFR parts 222 and 227 are proposed to be amended as follows:

PART 222—ENDANGERED FISH OR WILDLIFE

1. The authority citation of Part 222 continues to read as follows:

Authority: 16 U.S.C. 1531 *et seq.*

§ 222.23 [Amended]

2. In § 222.23, paragraph (a) is amended by adding the phrases ''Central California Coast steelhead (*Oncorhynchus mykiss*); South-Central California Coast steelhead (*Oncorhynchus mykiss*); Southern California steelhead (*Oncorhynchus mykiss*); Central Valley steelhead (*Oncorhynchus mykiss*); and Upper Columbia River steelhead (*Oncorhynchus mykiss*);'' immediately after the phrase ''Umpqua River cutthroat trout (*Oncorhynchus clarki clarki*)''.

PART 227—THREATENED FISH AND WILDLIFE

1. The authority citation for part 227 continues to read as follows:

Authority: 16 U.S.C. 1531 *et seq.*

2. In § 227.4, paragraphs (n), (o), (p), and (q) are added to read as follows:

§ 227.4 Enumeration of threatened species.

* * * * *

(n) Lower Columbia River steelhead (*Oncorhynchus mykiss*)

(o) Oregon Coast steelhead (*Oncorhynchus mykiss*)

(p) Northern California steelhead (*Oncorhynchus mykiss*)

(q) Snake River Basin steelhead (*Oncorhynchus mykiss*).

3. Section 227.21 is revised to read as follows:

§ 227.21 Threatened salmon.

(a) *Prohibitions.* The prohibitions of section 9 of the Act (16 U.S.C. 1538) relating to endangered species apply to threatened species of salmon listed in § 227.4 (f), (g), (j), (k), (l), (m), (n), (o), (p), and (q) except as provided in paragraph (b) of this section.

(b) *Exceptions.* The exceptions of section 10 of the Act (16 U.S.C. 1539) and other exceptions under the Act relating to endangered species, including regulations implementing such exceptions, also apply to the threatened species of salmon listed in § 227.4 (f), (g), (j), (k), (l), (m), (n), (o), (p), and (q). This section supersedes other restrictions on the applicability of parts 217 and 222 of this chapter, including, but not limited to, the restrictions specified in §§ 217.2 and 222.22(a) of this chapter with respect to the species identified in § 227.21(a).

[FR Doc. 96–20030 Filed 8–8–96; 8:45 am]
BILLING CODE 3510–22–P

EXHIBIT 2

Federal Register

Thursday,
January 5, 2006

Part IV

Department of Commerce

National Oceanic and Atmospheric Administration

50 CFR Parts 223 and 224

Endangered and Threatened Species: Final Listing Determinations for 10 Distinct Population Segments of West Coast Steelhead; Final Rule

DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

50 CFR Parts 223 and 224

[Docket No. 051216341–5341–01; I.D. No. 052104F]

RIN 0648–AR93

Endangered and Threatened Species: Final Listing Determinations for 10 Distinct Population Segments of West Coast Steelhead

AGENCY: National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration (NOAA), Commerce.

ACTION: Final rule.

SUMMARY: We, NOAA's National Marine Fisheries Service (NMFS), are issuing final determinations to list 10 Distinct Population Segments (DPSs) of West Coast steelhead (*Oncorhynchus mykiss*) under the Endangered Species Act (ESA) of 1973, as amended. We are listing one steelhead DPS in California as endangered (the Southern California steelhead DPS), and nine steelhead DPSs in California, Oregon, Washington, and Idaho as threatened (the South-Central California Coast, Central California Coast, California Central Valley, Northern California, Lower Columbia River, Upper Willamette River, Middle Columbia River, Upper Columbia River, and Snake River Basin steelhead DPSs). All 10 of these DPSs were previously listed as threatened or endangered species. The Upper Columbia River steelhead DPS, formerly listed as an endangered species, is now being listed as threatened.

DATES: The effective date of this rule is February 6, 2006.

ADDRESSES: NMFS, Protected Resources Division, 1201 NE Lloyd Boulevard, Suite 1100, Portland, Oregon 97232.

FOR FURTHER INFORMATION CONTACT: Craig Wingert, NMFS, Southwest Region, at (562) 980–4021, Dr. Scott Rumsey, NMFS, Northwest Region, Protected Resources Division, at (503) 872–2791, and Marta Nammack, NMFS, Office of Protected Resources, at (301) 713–1401. Reference materials regarding these determinations are available upon request or on the Internet at *http://www.nwr.noaa.gov.*

SUPPLEMENTARY INFORMATION:

Background

Policies for Delineating Species under the ESA

Section 3 of the ESA defines ‘‘species’’ as including ‘‘any subspecies of fish or wildlife or plants, and any distinct population segment of any species of vertebrate fish or wildlife which interbreeds when mature.’’ The term ‘‘distinct population segment’’ is not recognized in the scientific literature. In 1991 we issued a policy for delineating distinct population segments of Pacific salmon (56 FR 58612; November 20, 1991). Under this policy a group of Pacific salmon populations is considered an ‘‘evolutionarily significant unit’’ (ESU) if it is substantially reproductively isolated from other conspecific populations, and it represents an important component in the evolutionary legacy of the biological species. Further, an ESU is considered to be a ‘‘distinct population segment’’ (and thus a ‘‘species’’) under the ESA. In 1996, we and FWS adopted a joint policy for recognizing DPSs under the ESA (DPS Policy; 61 FR 4722; February 7, 1996). The DPS Policy adopts criteria similar to, but somewhat different from, those in the ESU Policy for determining when a group of vertebrates constitutes a DPS: The group must be discrete from other populations, and it must be significant to its taxon. A group of organisms is discrete if it is ‘‘markedly separated from other populations of the same taxon as a consequence of physical, physiological, ecological, and behavioral factors.’’ Significance is measured with respect to the taxon (species or subspecies) as opposed to the full species. Although the ESU Policy did not by its terms apply to steelhead, the DPS Policy states that NMFS will continue to implement the ESU Policy with respect to ‘‘Pacific salmonids’’ (which include *O. mykiss*). FWS, however, does not use our ESU policy in any of its ESA listing decisions. In a previous instance of shared jurisdiction over a species (Atlantic salmon), we and FWS used the DPS policy in our determination to list the Gulf of Maine DPS of Atlantic salmon as endangered (65 FR 69459; November 17, 2000). Given our shared jurisdiction over *O. mykiss,* and consistent with our approach for Atlantic salmon, we believe application of the joint DPS policy here is logical, reasonable, and appropriate for identifying DPSs of *O. mykiss.* Moreover, use of the ESU policy—originally intended for Pacific salmon—should not continue to be extended to *O. mykiss,* a type of salmonid with characteristics not typically exhibited by Pacific salmon. NMFS and FWS also intend to continue to evaluate application of the statutory term ‘‘distinct population segment’’ in a process outside the context of a species-specific listing.

Previous Federal ESA Actions Related to West Coast Steelhead

In 1996, we completed a comprehensive status review of West Coast steelhead (Busby *et al.*, 1996) that resulted in proposed listing determinations for 10 steelhead ESUs, five as endangered and five as threatened species (61 FR 41541; August 9, 1996). On August 18, 1997, we listed five of the ESUs, two as endangered (the Southern California and Upper Columbia River steelhead ESUs) and three as threatened (the South-Central California Coast, Central California Coast, and Snake River Basin steelhead ESUs) (62 FR 43937). On March 19, 1998, we listed the California Central Valley and Lower Columbia River steelhead ESUs as threatened. On March 25, 1999, we listed as threatened the Upper Willamette River and Middle Columbia River steelhead ESUs (64 FR 14517). We listed the Northern California steelhead ESU as threatened on June 7, 2000 (65 FR 36074). As a result of these listing determinations, there are currently 10 listed steelhead ESUs, two endangered (Southern California and Upper Columbia River) and eight threatened (South-Central California, Central California Coast, California Central Valley, Northern California, Upper Willamette River, Lower Columbia River, Middle Columbia River, and Snake River Basin).

In our August 18, 1997, steelhead listing determinations, we noted uncertainties about the relationship of resident and anadromous *O. mykiss,* yet concluded that the two forms are part of a single ESU where the resident and anadromous *O. mykiss* have the opportunity to interbreed (62 FR 43937, at 43941). FWS, the agency with ESA jurisdiction over resident *O. mykiss,* disagreed that resident fish should be included in the steelhead ESUs and advised that the resident fish not be listed (FWS, 1997; and 62 FR 43937, at 43941). Accordingly, we listed only the anadromous *O. mykiss* (steelhead) at that time (62 FR 43937, at 43951). That decision was followed in each of the subsequent steelhead listings described in the preceding paragraph.

In 2001, the U.S. District Court in Eugene, Oregon, set aside the 1998 threatened listing of the Oregon Coast coho ESU (*Alsea Valley Alliance* v. *Evans,* 161 F. Supp. 2d 1154 (D. Or. 2001)) (Alsea). In the Oregon Coast coho listing (63 FR 42587; August 10, 1998), we did not include 10 hatchery stocks determined to be part of the Oregon Coast coho ESU. The court upheld our policy of considering an ESU to be a DPS, but ruled that once we had delineated a DPS, the ESA did not allow listing only a subset of that DPS. In response to the *Alsea* decision and several listing and delisting petitions, we announced we would conduct an updated status review of 27 West Coast salmonid ESUs, including the 10 listed steelhead ESUs (67 FR 6215, February 11, 2002; 67 FR 48601, July 25, 2002; 67 FR 79898, December 31, 2002).

On June 14, 2004, we proposed to continue applying our ESU Policy to the delineation of DPSs of *O. mykiss*, and to list the 10 *O. mykiss* ESUs including the resident fish that co-occur with the anadromous form (69 FR 33102). We proposed to list one ESU in California as endangered (Southern California), and nine ESUs in California, Oregon, Washington, and Idaho as threatened (South-Central California, Central California Coast, California Central Valley, Northern California, Upper Willamette River, Lower Columbia River, Middle Columbia River, Snake River Basin, and Upper Columbia). In the proposed rule, we noted that the *Alsea* decision required listing of an entire DPS (ESU), in contrast to our prior steelhead-only listings, and stated the scientific principles and working assumptions that we used to determine whether particular resident groups were part of an *O. mykiss* ESU that included anadromous steelhead (69 FR 33102, at 33113). We proposed that where resident (rainbow trout) and anadromous (steelhead) *O. mykiss* occur in the same stream, they are not ''substantially reproductively isolated'' from one another and are therefore part of the same ESU.

Following an initial public comment period of 90 days, we twice extended the public comment period for an additional 36 and 22 days (69 FR 53031, August 31, 2004; 69 FR 61348, October 18, 2004), respectively. During the comment period, we received numerous comments disagreeing with our proposal to include resident populations in the *O. mykiss* ESUs (in general and for specific resident populations) and criticizing how we considered resident *O. mykiss* in evaluating the risk to the continued existence of the whole ESU.

On June 7, 2005, FWS wrote to NMFS (FWS, 2005), stating its concerns about the factual and legal bases for our proposed listing determinations for 10 *O. mykiss* ESUs, specifying issues of substantial disagreement regarding the relationship between anadromous and resident *O. mykiss*. On June 28, 2005, we published a notice in the **Federal Register** announcing a 6-month extension of the final listing determinations for the subject *O. mykiss* ESUs to resolve the substantial disagreement regarding the sufficiency or accuracy of the available data relevant to the determinations (70 FR 37219). As a result of the comments received, we re-opened the comment period on November 4, 2005, to receive comments on a proposed alternative approach to delineating ''species'' of West Coast *O. mykiss* (70 FR 67130). We proposed to depart from our past practice of applying the ESU Policy to *O. mykiss* stocks, and instead proposed to apply the DPS Policy in determining ''species'' of *O. mykiss* for listing consideration. We noted that within a discrete group of *O. mykiss* populations, the resident and anadromous life forms of *O. mykiss* remain ''markedly separated'' as a consequence of physical, physiological, ecological, and behavioral factors, and may therefore warrant delineation as separate DPSs. We solicited comment on whether our final listing determinations should delineate 10 steelhead-only DPSs, list one DPS in California as endangered (Southern California), and list the remaining nine DPSs in California, Oregon, Washington, and Idaho as threatened (South-Central California, Central California Coast, California Central Valley, Northern California, Upper Willamette River, Lower Columbia River, Middle Columbia River, Snake River Basin, and Upper Columbia). The public comment period on this proposed alternative approach closed on December 5, 2005.

Statutory Framework for ESA Listing Determinations

The ESA defines an endangered species as one that is in danger of extinction throughout all or a significant portion of its range, and a threatened species as one that is likely to become endangered in the foreseeable future throughout all or a significant portion of its range (sections 3(6) and 3(20), respectively). The statute requires us to determine whether any species is endangered or threatened because of any of the following five factors: the present or threatened destruction, modification or curtailment of its habitat or range; overutilization for commercial, recreational, scientific, or educational purposes; disease or predation; the inadequacy of existing regulatory mechanisms; or other natural or manmade factors affecting its continued existence (Section 4(a)(1)(A)–(E)). We are to make this determination based solely on the best available scientific information after conducting a review of the status of the species and taking into account any efforts being made by states or foreign governments to protect the species. The focus of our evaluation of the five statutory factors is to evaluate whether and to what extent a given factor represents a threat to the future survival of the species. The focus of our consideration of protective efforts is to evaluate whether and to what extent they address the identified threats and so ameliorate a species' risk of extinction. In making our listing determination, we must consider all factors that may affect the future viability of the species, including whether regulatory and conservation programs are inadequate and allow threats to the species to persist or worsen, or whether these programs are likely to mitigate threats to the species and reduce its extinction risk. The steps we follow in implementing this statutory scheme are to: (1) Delineate the species under consideration; (2) review the status of the species; (3) identify threats facing the species; (4) assess whether certain protective efforts mitigate these threats; and (5) predict the species' future persistence.

As noted above, as part of our listing determinations we must consider efforts being made to protect a species, and whether these efforts ameliorate the threats facing the species and reduce risks to its survival. Some protective efforts may be fully implemented, and empirical information may be available demonstrating their level of effectiveness in conserving the species. Other protective efforts are new, not yet implemented, or have not demonstrated effectiveness. We evaluate such unproven efforts using the criteria outlined in the Policy for Evaluating Conservation Efforts (''PECE'' 68 FR 15100; March 28, 2003) to determine their certainties of implementation and effectiveness.

Summary of Comments Received

We solicited public comment on the proposed listing determinations for West Coast *O. mykiss* for a total of 238 days (69 FR 33102, June 14, 2004; 69 FR 53031, August 31, 2004; 69 FR 61348, October 18, 2004; 70 FR 6840, February 9, 2005; 70 FR 37219, June 28, 2005; 70 FR 67130, November 4, 2005). In addition, we held eight public hearings in the Pacific Northwest, and six public hearings in California concerning the June 2004 West Coast salmon and steelhead proposed listing determinations (69 FR 53031, August 31, 2004; 69 FR 54647, September 9, 2004; 69 FR 61348, October 18, 2004). We solicited public comment again for 30 days on our proposed alternative approach to delineating DPSs of *O.*

mykiss (70 FR 67130; November 4, 2005).

A joint NMFS/FWS policy requires us to solicit independent expert review from at least three qualified specialists, concurrent with the public comment period (59 FR 34270; July 1, 1994). We solicited technical review of the scientific information underlying the June 2004 proposed listing determinations, including the proposed determinations for West Coast *O. mykiss*, from over 50 independent experts selected from the academic and scientific community, Native American tribal groups, Federal and state agencies, and the private sector.

In December 2004 the Office of Management and Budget (OMB) issued a Final Information Quality Bulletin for Peer Review (Peer Review Bulletin) establishing minimum peer review standards, a transparent process for public disclosure, and opportunities for public input. The OMB Peer Review Bulletin, implemented under the Information Quality Act (Public Law 106–554), is intended to ensure the quality of agency information, analyses, and regulatory activities and provide for a more transparent peer review process. We consider the scientific information used by the agency in developing the subject listing determinations for West Coast steelhead to be ''influential scientific information'' in the context of the OMB Peer Review Bulletin.

We believe the independent expert review under the joint NMFS/FWS peer review policy, and the comments received from several academic societies and expert advisory panels, collectively satisfy the Peer Review Bulletin's requirements for ''adequate [prior] peer review.'' We solicited technical review of the proposed hatchery listing policy and salmon and steelhead listing determinations from over 50 independent experts selected from the academic and scientific community, Native American tribal groups, Federal and state agencies, and the private sector. The individuals from whom we solicited review of the proposals and the underlying science were selected because of their demonstrated expertise in a variety of disciplines including: artificial propagation; salmonid biology, taxonomy, and ecology; genetic and molecular techniques and analyses; population demography; quantitative methods of assessing extinction risk; fisheries management; local and regional habitat conditions and processes; and conducting scientific analyses in support of ESA listing determinations. The individuals solicited represent a broad spectrum of perspectives and expertise and include those who have been critical of past agency actions in implementing the ESA for West Coast salmon and steelhead, as well as those who have been supportive of these actions. These individuals were not involved in producing the scientific information for our determinations and were not employed by the agency producing the documents. In addition to these solicited reviews, several independent scientific panels and academic societies provided technical review of the hatchery listing policy and proposed listing determinations, and the supporting documentation. Many of the members of these panels were individuals from whom we had solicited review. We thoroughly considered, and, as appropriate, incorporated the review comments into these final listing determinations.

In response to the requests for information and comments on the June 2004 proposed listing determinations, we received over 28,250 comments by fax, standard mail, and e-mail. The majority of the comments received were from interested individuals who submitted form letters or form e-mails and addressed general issues not specific to a particular ESU. Comments were also submitted by state and tribal natural resource agencies, fishing groups, environmental organizations, home builder associations, academic and professional societies, expert advisory panels, farming groups, irrigation groups, and individuals with expertise in Pacific salmonids. The majority of respondents focused on the consideration of hatchery-origin fish in ESA listing determinations, with only a few comments specifically addressing the *O. mykiss* ESUs under review. We also received comments from four of the independent experts from whom we had requested technical review of the scientific information underlying the June 2004 proposed listing determinations. The peer reviewers' comments did not specifically address the proposed determinations for the 10 *O. mykiss* ESUs. We received 14 comments in response to the 6-month extension of the final listing determinations for the 10 *O. mykiss* ESUs. The comments reflected a diversity of opinion and generally focused on whether resident populations should be included as part of *O. mykiss* ESUs, and the consideration of resident *O. mykiss* in assessing the extinction risk of ESUs including both resident and anadromous populations. We received 15 comments concerning our November 2005 proposed alternative approach to delineate and list 10 steelhead-only DPSs of West Coast *O. mykiss*. The majority of the comments were opposed to the proposed alternative approach, though others were supportive. Copies of the full text of comments received are available upon request (see **ADDRESSES** and **FOR FURTHER INFORMATION CONTACT**, above).

Below we address the comments received that directly pertain to the listing determinations for West Coast *O. mykiss*. The reader is referred to our June 2005 final hatchery listing policy (70 FR 37204; June 28, 2005) for a summary and discussion of general issues concerning: the inclusion and listing of hatchery programs as part of salmon and steelhead ESUs; and the consideration of artificial propagation in evaluating the extinction risk of salmon and steelhead ESUs. The reader is referred to our June 2005 final listing determinations for 16 salmon ESUs (70 FR 37160; June 28, 2005) for a summary and discussion of general issues related to: the interpretation and application of the hatchery listing policy in our review of the species' status under review; the consideration of efforts being made to protect the species; and amended protective regulations for threatened salmonids. The following summary of issues raised and our responses are organized into six general categories: (1) General comments on the consideration of resident *O. mykiss* in the determination of ''species;'' (2) general comments on the consideration of resident *O. mykiss* in assessing extinction risk; (3) comments regarding a specific ESU or DPS on the determination of species; (4) comments regarding a specific ESU or DPS on the assessment of extinction risk; (5) comments on the consideration of protective efforts; and (6) comments regarding public notice and opportunities for comment.

General Comments on the Consideration of Resident O. mykiss: Determination of Species

Comment 1: Several commenters felt that we lack sufficient site-specific information to justify our June 2004 proposed inclusion of resident rainbow trout as part of *O. mykiss* ESUs. These commenters felt that our proposal inappropriately extrapolated a few observations universally to all circumstances where resident and anadromous *O. mykiss* have overlapping distributions. Other commenters felt that rainbow trout and steelhead should be considered separate ESUs for biological reasons (differences in behavior, morphology, and ecology); or for policy or legal reasons (such as implementing the purposes of the ESA).

Response: Those commenters who noted the lack of site-specific information are correct—we relied on information about the reproductive exchange of some specific co-occurring rainbow trout and steelhead to conclude generally that where the two life forms co-occur, they are sufficiently reproductively related to satisfy our ESU policy. We continue to conclude that the best available scientific information suggests that co-occurring steelhead and rainbow trout are part of the same ESU, as we defined that concept in our ESU policy. Some of the concerns raised by these commenters have persuaded us to alter our approach to delineating DPSs of *O. mykiss*, and rely on the DPS policy rather than the ESU policy. Because we have decided to alter our approach, we do not address these comments in further detail.

Comment 2: Several commenters felt we failed to provide a rationale for departing from our long-standing practice of applying the ESU policy. The commenters felt that the choice to use the DPS policy appeared to be based on an arbitrary jurisdictional division between NMFS and FWS, rather than new scientific information supporting an alternative approach. The commenters felt that it is not appropriate to base species delineations on arbitrary divisions between government agencies and the apparent desire to preserve jurisdictional authorities. These commenters stressed that such determinations must be made based on the best available scientific information.

Other commenters supported the use of the DPS policy in delineating species of *O. mykiss*. They felt that consistency between NMFS and FWS would improve the public understanding of the listing process. They also felt that the DPS policy provides flexibility, affording a more practical consideration of resident populations, particularly above impassable dams, that do not warrant ESA protections.

Response: In our previous status reviews for West Coast *O. mykiss* we applied our ESU policy and concluded that, where they co-occur and have the opportunity to interbreed, the resident and anadromous life-history forms are part of a single ESU. FWS disagreed that resident *O. mykiss* should be included in the steelhead ESUs and recommended that only the anadromous fish be listed (FWS, 1997). Accordingly, we listed only the steelhead portion of the ESUs. The *Alsea* ruling informed us that this approach to implementing our jurisdiction over *O. mykiss* was invalid; once we have equated an ESU with a DPS, delineated an ESU, and determined that it warrants listing, we must include all components of the DPS (ESU) in the listing. In our June 2004 proposed listing determinations (69 FR 33102; June 14, 2004), we proposed to continue applying our ESU policy in delineating species of *O. mykiss* for listing consideration, consistent with our previous practice. Informed by the *Alsea* ruling, we proposed to list entire *O. mykiss* ESUs, including both the anadromous and resident components. FWS disagreed with our DPS delineations under the ESU policy, and questioned whether the proposed delineations are consistent with the DPS policy (FWS, 2005).

The preamble to the joint DPS policy acknowledged that ''the NMFS [ESU] policy is a detailed extension of this joint policy. Consequently, NMFS will continue to exercise its policy with respect to Pacific salmonids'' (61 FR 4722; February 7, 1996). FWS, however, does not use our ESU policy in any of its ESA listing decisions. In a previous instance of shared jurisdiction over a species (Atlantic salmon), we and FWS used the DPS policy in our determination to list the Gulf of Maine DPS of Atlantic salmon as endangered (65 FR 69459; November 17, 2000). Given our shared jurisdiction over *O. mykiss*, and consistent with our approach for Atlantic salmon, we believe application of the joint DPS policy here is logical, reasonable, and appropriate for identifying DPSs of *O. mykiss*. Moreover, use of the ESU policy—originally intended for Pacific salmon—should not continue to be extended to *O. mykiss*, a type of salmonid with characteristics not typically exhibited by Pacific salmon.

Comment 3: Two commenters argued that we are required to rely on the taxonomic distinctions established by the scientific community in making our species delineations. Commenters quoted NMFS' ESA implementing regulations stating that we ''shall rely on standard taxonomic distinctions and the biological expertise of the Department and the scientific community regarding the relevant taxonomic group'' (50 CFR 424.11(a)). The commenters noted that it is well established in the scientific literature that the resident and anadromous life forms of *O. mykiss* are members of the same taxonomic species, and where they co-occur they are genetically indistinguishable and represent a life-history polymorphism within a single interbreeding population. Several commenters also noted that a group of independent scientific experts (Hey *et al.*, 2005) recently empaneled by NMFS concluded: ''For * * * populations in which anadromous and resident fish appear to be exchanging genes and in which some parents produce progeny exhibiting both life history paths, the two life-history alternatives appear as a form of polymorphism. In these cases there is little justification for putting the resident and anadromous life-history types into different conservation units.''

Response: The fact that anadromous steelhead and resident rainbow trout are both part of the biological species taxonomists recognize as *O. mykiss* does not end the inquiry. The statute clearly contemplates listing subunits of species, by defining species to include ''subspecies * * * and any distinct population segment of any species * * *'' The ESA does not define the term ''distinct population segment,'' but it is clearly a subset of a taxonomic species. Nor does the ESA refer to conservation units. While we agree with the Hey *et al.* panel's conclusion that co-occurring resident and anadromous *O. mykiss* are part of a larger conservation unit (which we would consider an ESU), that also is not the end of the inquiry. The joint DPS policy takes a somewhat different approach from the ESU policy to identifying conservation units, which may result, in some cases, in the identification of different conservation units. There are also other potential approaches to delineating a DPS for purposes of the ESA (see Waples, 2005, in press). For reasons described in response to Comment 2, we are applying the DPS policy (see also the response to Comment 4 for additional discussion).

Comment 4: Some commenters felt that applying the DPS policy to *O. mykiss* should lead to the same result as the ESU policy, with the co-occurring rainbow trout and steelhead being considered part of the same DPS. The commenters felt that our application of the DPS policy overemphasizes inconsistent and qualitative phenotypic characteristics, and ignores scientific information regarding reproductive exchange and genetic similarity. These commenters cited several empirical studies documenting that resident and anadromous *O. mykiss* are similar genetically when they co-occur with no physical barriers to migration or interbreeding, and that individuals can occasionally produce progeny of the alternate life-history form. The commenters felt that the DPS policy clearly contemplates considering reproductive isolation as part of evaluating discreteness. The commenters noted that the DPS policy states as part of the discreteness criterion that quantitative measures of genetic discontinuity may provide evidence of discreteness.

The commenters also stressed that the ESA's definition of ''species'' focuses solely on reproductive exchange. (section 3(16) of the ESA defines the term species as including any ''distinct population segment of any species of vertebrate fish or wildlife which *interbreeds when mature*''; emphasis added). The commenters argued that the additional considerations provided in the DPS policy (including marked separation as a consequence of physical, physiological, ecological, and behavioral factors) are supplemental to the primary consideration of reproductive isolation required under the ESA.

Response: The ESA requirement that a group of organisms must interbreed when mature to qualify as a DPS is a necessary but not exclusive condition. Under the definition, although all organisms that belong to a DPS must interbreed when mature (at least on some time scale), not all organisms that share some reproductive exchange with members of the DPS must be included in the DPS. The DPS policy outlines other relevant considerations for determining whether a particular group should be delineated as a DPS (*i.e.*, ''marked separation'' as a consequence of physical, physiological, ecological or behavioral factors).

Although the DPS and ESU policies are consistent, they will not necessarily result in the same delineation of DPSs under the ESA. The statutory term ''distinct population segment'' is not used in the scientific literature and does not have a commonly understood meaning. NMFS' ESU policy and the joint DPS policy apply somewhat different criteria, with the result that their application may lead to different outcomes in some cases. The ESU policy relies on ''substantial reproductive isolation'' to delineate a group of organisms, and emphasizes the consideration of genetic and other relevant information in evaluating the level of reproductive exchange among potential ESU components. The DPS policy does not rely on reproductive isolation to determine ''discreteness,'' but on the marked separation of population groups as a consequence of biological factors.

Despite the apparent reproductive exchange between resident and anadromous *O. mykiss*, the two life forms remain markedly separated physically, physiologically, ecologically, and behaviorally. Steelhead differ from resident rainbow trout physically in adult size and fecundity, physiologically by undergoing smoltification, ecologically in their preferred prey and principal predators, and behaviorally in their migratory strategy. Where the two life forms co-occur, adult steelhead typically range in size from 40–72 cm in length and 2–5 kg body mass, while adult rainbow trout typically range in size from 25–46 cm in length and 0.5–2 kg body mass (Shapovalov and Taft, 1954; Wydoski and Whitney, 1979; Jones, 1984). Steelhead females produce approximately 2,500 to 10,000 eggs, and rainbow trout fecundity ranges from 700 to 4,000 eggs per female (Shapovalov and Taft, 1954; Buckley, 1967; Moyle, 1976; McGregor, 1986; Pauley *et al.*, 1986), with steelhead eggs being approximately twice the diameter of rainbow trout eggs or larger (Scott and Crossman, 1973; Wang, 1986; Tyler *et al.*, 1996). Steelhead undergo a complex physiological change that enables them to make the transition from freshwater to saltwater (smoltification), while rainbow trout reside in freshwater throughout their entire life cycle. While juvenile and adult steelhead prey on euphausiid crustaceans, squid, herring, and other small fishes available in the marine environment, the diet of adult rainbow trout is primarily aquatic and terrestrial insects and their larvae, mollusks, amphipod crustaceans, fish eggs, and minnows (LeBrasseur, 1966; Scott and Crossman, 1973; Wydoski and Whitney, 1979). These differences in diet are a function of migratory behavior and the prey communities available to resident and anadromous *O. mykiss* in their respective environments. Finally, steelhead migrate several to hundreds of miles from their natal streams to the ocean, and spend up to 3 years in the ocean migrating thousands of miles before returning to freshwater to spawn (Busby *et al.*, 1996). Some fluvial populations of rainbow trout may exhibit seasonal migrations of tens of kilometers outside of their natal watersheds, but rainbow trout generally remain associated with their natal drainages (Meka *et al.*, 1999). Given the marked separation between the anadromous and resident life-history forms in physical, physiological, ecological, and behavioral factors, we conclude that the anadromous steelhead populations are discrete from the resident rainbow trout populations within the ranges of the DPSs under consideration.

Comment 5: Several commenters were critical of the evidence we provided that co-occurring resident and anadromous *O. mykiss* are markedly separate (''discrete''). Commenters felt that we exaggerated and oversimplified the differences between anadromous and resident *O. mykiss,* and that much of the evidence presented in support of their ''marked separation'' is not illustrative of traits unique to a given life-history form. The commenters felt that the majority of the phenotypic differences cited are inconsistent, overlap considerably between the two life forms, and are predominantly caused by environmental factors.

Several commenters were critical of the physical factors we cited as evidence of marked separation between the two life forms. The commenters documented overlap in the size and fecundity ranges of resident and anadromous *O. mykiss* in the same watersheds, and concluded that our assertion that steelhead are generally larger and more fecund than rainbow trout does not hold true. The commenters felt that fish size and fecundity are largely a function of food supply, rather than being a trait inherent to anadromy. The commenters cited examples where, provided sufficient food resources, rainbow trout achieve similar sizes and fecundity as steelhead.

Commenters were critical of the ecological factors we cited. The commenters felt that it is inappropriate to distinguish between the two forms on the basis of diet, as it is a function of prey availability in different environments rather than reflecting intrinsic differences in prey preference. They noted that when steelhead and rainbow trout are in the same freshwater environment, individuals of similar size and life-history stage have similar prey preferences.

Commenters were critical of the behavioral factors we cited. The commenters argued that the two life forms are not ''markedly separated'' in terms of migratory behavior. The commenters cited several scientific studies documenting migratory behavior in non-anadromous *O. mykiss* including: movement within a river system (potadromy); movement from lakes into rivers for spawning (limnodromy); and movement to the estuary/lagoon for growth and maturation (partial anadromy). Although commenters generally acknowledge that only the anadromous form migrates to the open ocean, they contended that this does not represent a truly discrete difference. The commenters described the life history of the *O. mykiss* species as a continuum of migratory behaviors, with anadromous and resident fish representing points on this continuum.

Commenters were also critical of the physiological factors we cited. Commenters argued that resident and anadromous fish are not discrete physiologically throughout the majority of their life cycle, and smoltification is not entirely unique to anadromy. Commenters noted that some resident individuals may exhibit anadromy later in their life cycle, and other non-anadromous fish exhibit partial anadromy by migrating into estuaries for growth and maturation. Commenters also noted that some resident fish are capable of exhibiting anadromy later in their life cycle, as well as producing anadromous progeny that undergo smoltification.

Response: The fact that there is an overlap between co-occurring steelhead and rainbow trout in the physical, ecological, behavioral and physiological factors does not prevent them from satisfying the discreteness criterion under the DPS policy. While the commenters are correct that *O. mykiss* display a continuum of traits in these categories, at the end of that continuum steelhead are markedly separate in their extreme marine migration (leading to, or resulting from, marked separation in the other factors). As we stated in adopting the DPS policy, ''the standard adopted [for discreteness] does not require absolute separation of a DPS from other members of its species, because this can rarely be demonstrated in nature for any population of organisms. * * * [T]he standard adopted allows for some limited interchange among population segments considered to be discrete, so that loss of an interstitial population could well have consequences for gene flow and demographic stability of a species as a whole'' (61 FR 4722, at 4724; February 7, 1996).

Similarly, the ESU policy does not require absolute reproductive isolation, only sufficient isolation to allow evolutionarily important differences to accumulate (56 FR 58612, at 58618; November 20, 1991). In delineating ESUs, we have recognized that straying leads to some reproductive exchange among ESUs (particularly among populations at the geographic margins between ESUs), that biological entities do not divide along clear lines, and that professional judgment is required in drawing a line at the geographic edge of an ESU. Even among well-recognized taxonomic groupings, such as subspecies, there may be overlapping characteristics, and some reproductive exchange.

In developing the DPS policy we answered concerns that discreteness was an inappropriate criterion for delineating DPSs: ''With regard to the discreteness standard, the Services believe that logic demands a distinct population recognized under the Act be circumscribed in some way that distinguishes it from other representatives of its species. The standard established for discreteness is simply an attempt to allow an entity given DPS status under the Act to be adequately defined and described'' (61 FR 4721, at 4724; February 7, 1996). In the case of steelhead, there is a group of organisms that can be clearly distinguished by a variety of characteristics, particularly its marine migration.

With respect to the comment that resident and anadromous *O. mykiss* are genetically indistinguishable, we explained in adopting the DPS policy why we did not adopt genetic distinctness as the test of discreteness: ''The Services understand the Act to support interrelated goals of conserving genetic resources and maintaining natural systems and biodiversity over a representative portion of their historic occurrence. The draft policy was intended to recognize both these intentions, but without focusing on either to the exclusion of the other. Thus, evidence of genetic distinctness or of the presence of genetically determined traits may be important in recognizing some DPS's, but the draft policy was not intended to always specifically require this kind of evidence in order for a DPS to be recognized'' (61 FR 4721, at 4723; February 7, 1996).

Comment 6: Several commenters noted that in the June 2004 proposed listing determinations, resident populations included in *O. mykiss* ESUs were determined to have minor contributions to the viability of the ESUs. (In the proposed listing determinations we concluded that, despite the reduced risk to abundance for certain *O. mykiss* ESUs due to speculatively abundant rainbow trout populations, the collective contribution of the resident life-history form to the viability of an ESU as a whole is unknown and may not substantially reduce an ESU's risk of extinction (NMFS, 2004a; 69 FR 33102, June 14, 2004)). The commenters questioned why resident *O. mykiss* populations should be included in an ESU given that they have little, if any, contribution to the viability of the ESU.

Response: Although we have concluded that resident *O. mykiss* should not be included as part of the delineated steelhead DPSs (see response to Comment 4), we disagree with the commenters' basic argument that DPS delineations should depend upon the extent to which a potential component population contributes to the viability of the DPS. A population's contribution to DPS viability meets neither the reproductive isolation test of the ESU policy, nor the marked separation test of the DPS policy. Using such a test would lead to illogical results given the metapopulation structure of salmon and steelhead, where some components of an ESU or a DPS will (on average) contribute more to its viability, while other components will contribute less. The persistence of components with comparatively weaker contributions to viability may even depend upon their connectivity with other more productive components of the delineated species. These weaker components may nevertheless contribute in other important ways such as by increasing spatial distribution and reducing risks due to catastrophic events, or by exhibiting important traits to diversity of the species and conserving its ability to adapt to future environmental conditions.

Comment 7: One commenter asserted that we cannot apply the ESU policy in determining that resident and anadromous populations of *O. mykiss* are part of the same ESU, because NMFS does not have the legal jurisdiction under the ESA to list resident *O. mykiss* populations. The commenter noted that pursuant to the 1974 Memorandum of Understanding (MOU) regarding ESA jurisdictional responsibilities between FWS and NMFS, FWS has exercised ESA jurisdiction over resident *O. mykiss*, while NMFS has exercised jurisdiction over the anadromous life form.

Response: The commenter correctly highlights the issue of shared NMFS–FWS jurisdiction for *O. mykiss* ESUs including both resident and anadromous populations. In its 1997 letter responding to NMFS' proposal to include rainbow trout in *O. mykiss* ESUs, FWS objected to the NMFS' proposal and concluded rainbow trout and steelhead should not be considered part of the same DPS. In its June 7, 2005, letter recommending that the final listing determinations for the 10 *O. mykiss* ESUs under review be extended, FWS requested that we ensure that our delineation of *O. mykiss* ESUs complies with the DPS Policy. We agree, in this case, that it is appropriate that we depart from our past practice of applying the ESU Policy to *O. mykiss* stocks, and instead apply the joint DPS Policy in determining ''species'' where we share jurisdiction with FWS. This is consistent with our application of the DPS policy to delineate species of Atlantic salmon (*Salmo salar*) (65 FR 69459; November 17, 2000).

Comment 8: Commenters felt that our proposed approach was inconsistent with previous NMFS and FWS DPS determinations for non-salmonid fish species, which focused on migration rates between populations, evidence of reproductive exchange, and genetic differences (e.g., NMFS–FWS Gulf of Maine DPS for Atlantic salmon, 65 FR 69459, November 17, 2000; NMFS' recent DPS determination for the Cherry Point stock of Pacific Herring, 70 FR 33116, June 7, 2005). The Department of Interior (DOI) similarly expressed concern that the proposed approach may be inconsistent with its previous applications of the DPS policy for fish species under its jurisdiction (e.g., bull trout, *Salvelinus confluentus,* and coastal cutthroat trout *O. clarki clarki*). DOI offered a comparison with its 1999 listing determination for the Coastal-Puget Sound bull trout DPS (50 FR 58910) in which the resident, migratory, anadromous, amphidromous, fluvial, and adfluvial life-history forms, despite exhibiting distinct life-history strategies, were not found to be discrete because they interbreed. DOI noted that NMFS' previous determinations concluded that the two life forms interbreed, and where they co-occur are genetically more similar than they are to the same life form in another basin. DOI and other commenters felt that regardless of any ''marked separation'' in phenotypic traits, the documented reproductive exchange and genetic similarity between anadromous and resident fish requires that they be included as parts of the same DPS.

Response: The reference to our DPS determination for the Cherry Point stock of Pacific herring is inapposite, as we found that stock was discrete, but not significant. None of the commenters suggested that steelhead are insignificant to the *O. mykiss* species. Additionally, we disagree with the commenters that our finding regarding the discreteness criterion was based on evidence of reproductive exchange and genetic similarity rather than marked separation in biological factors. We determined that the Cherry Point herring stock was discrete despite evidence of migration and reproductive exchange with other herring stocks. We determined that the Cherry Point stock is markedly separated from other Pacific herring populations as a consequence of physical, physiological, ecological, or behavioral factors due to: (1) Its locally unique late spawn timing; (2) the locally unusual location of its spawning habitat on an exposed section of coastline; (3) its consistently large size-at-age and continued growth after maturation relative to other local herring stocks; and (4) its differential accumulation of toxic compounds relative to other local herring stocks, indicative of different rearing or migratory conditions for Cherry Point herring (70 FR 33116; June 7, 2005).

With respect to the Atlantic salmon, bull trout, and coastal cutthroat trout determinations, we acknowledge that their expression of a range of life histories may raise some of the same issues we confronted in delineating an anadromous-only DPS of *O. mkyiss.* We conclude, however, that there are important differences between *O. mykiss* and these species that warrant different treatment. In addition to expressing anadromy (the life-history pattern in which fish spend a large portion of their life cycle in the ocean and return to freshwater to breed), bull trout and coastal cutthroat trout express amphidromy (migration between fresh and salt water that is for feeding and overwintering, as well as breeding). While the anadromous and resident forms of *O. mykiss* differ clearly in ocean-migratory behavior and associated biological factors (see response to Comment 4), ocean-going migratory behavior and associated physical, physiological, and ecological factors are comparatively more variable among the life-history forms and life stages of bull trout and coastal cutthroat trout given their expression of amphidromy.

Comment 9: One commenter questioned whether the alternative approach of delineating and listing steelhead-only DPSs was permissible, given that the *Alsea* ruling held that the ESA does not allow listing a subset of a DPS. The commenter observed that in the past we had equated an ESU with the statutory ''distinct population segment,'' and we included resident and anadromous *O. mykiss* within the same ESU. The commenter argued that our past practice of applying the ESU policy had established what constitutes a DPS of *O. mykiss*, and that our proposal to not include resident populations in the listings for steelhead-only DPSs would violate the ESA.

Response: The commenter is correct that in our past listing determinations we made the policy choice to equate an ESU with the statutory term ''distinct population segment.'' The commenter is not correct, however, in asserting that an ESU (as that concept may be understood by conservation biologists) must necessarily be equated with the statutory term ''distinct population segment.'' We conclude that in the case of *O. mykiss*, an ESU may contain more than one DPS, because the different life history components display marked separation sufficient to justify delineating them separately for protection under the ESA.

While both the ESU and DPS policies represent permissible interpretations of the statutory term, we have decided that the best approach for *O. mykiss* is to apply the joint DPS policy (see the response to Comment 2). We have concluded that the proposed steelhead-only DPSs meet the criteria defined under our joint DPS policy (as outlined in the response to Comment 4) and are consistent with the ESA.

Comment 10: Two commenters were critical of our consideration of hatchery stocks in delineating steelhead DPSs. The commenters questioned whether our review of hatchery programs under the ESU policy (NMFS, 2003, 2004b, 2004c) directly informs considerations of ''discreteness'' and ''significance'' under the DPS policy. The commenters felt that we failed to explain how including hatchery stocks as part of the delineated species comports with our proposed application of the DPS policy. The commenters felt that under the proposed approach of determining discreteness based on marked separation in phenotypic traits, it seems reasonable that hatchery stocks would be considered discrete regardless of the life history and genetic similarities documented in our hatchery reviews.

Response: We disagree with the suggestion that application of the DPS rather than the ESU policy should lead to the universal conclusion that hatchery fish are not part of the same DPS as naturally spawning fish. We recognize that hatchery stocks, under some circumstances, may exhibit differences in physical, behavioral, and ecological traits; however, conservation hatchery stocks under certain circumstances may exhibit few appreciable differences from the local natural population(s). We think it is inappropriate to make universal conclusions about all hatchery stocks, but think their ''discreteness'' relative to local natural populations needs to be evaluated on a case-by-case basis.

In the Final Species Determinations section below, we discuss more fully how our June 2004 proposed ESU delineations inform our DPS delineations, in terms of geographic boundaries and in terms of which hatchery populations are part of the DPS. We acknowledge that our review of hatchery programs (NMFS, 2003, 2004b, 2004c) was conducted in the context of the ESU policy; however, we disagree that our findings and the information we evaluated do not inform our considerations of discreteness under the DPS policy. In evaluating the ''reproductive isolation'' of individual hatchery stocks in the context of the ESU policy, we lacked program-specific genetic data. As reasonable indicators of reproductive isolation and genetic similarity we relied on information including hatchery broodstock origin, hatchery management practices (e.g., the timing and location of release), and hatchery stock life-history characteristics (e.g., spawn timing, the size and age at maturity) relative to the local natural populations. We conclude that this information directly informs evaluations of marked separation as a consequence of physical, physiological, ecological, or behavioral factors.

Comment 11: Several commenters were critical of the proposed DPS delineations, asserting that they fail to provide a clearly distinguishable species delineation for the purposes of effectively and efficiently enforcing the ESA. The commenters were concerned that steelhead-only DPSs would generate confusion and have undesirable regulatory implications. Commenters noted that it is difficult if not impossible to distinguish between the two life forms throughout much of their life cycle when they co-occur. The commenters cited our June 2004 proposed rule in which we state that ''no suite of morphological or genetic characteristics has been found that consistently distinguishes between the two life-history forms'' (69 FR 33102, at 33113; June 14, 2004). Given the difficulty in distinguishing the two forms, commenters felt that we would either treat all juvenile resident *O. mykiss* as if they are listed, or we would deny needed protections for listed steelhead during the critical early life-history stages when they are indistinguishable from resident fish. Commenters felt that it will be impossible for us to quantify take of listed steelhead versus non-listed rainbow trout, and questioned how we could analyze the impact of actions on listed steelhead without considering the potential production of steelhead progeny by resident fish. Some commenters felt that the lack of a clearly enforceable standard further argues that resident and anadromous *O. mykiss* are not ''markedly separated.''

Response: As we acknowledged in our steelhead listings prior to the *Alsea* ruling, juvenile steelhead can be difficult to distinguish from resident rainbow trout. This does not dictate, however, that they should be included in the same DPS. The ESA authorizes prohibiting the take of an unlisted species if its appearance closely resembles that of a listed species (Section 4(e)). This is the tool that the ESA provides to deal with such situations where an unlisted species is difficult to distinguish from a listed one. In lieu of ''similarity of appearance'' protective regulations concerning resident trout that co-occur with listed steelhead stocks, the commenter is correct that we have presumed that all juvenile *O. mykiss* in streams where listed steelhead occur are listed juvenile steelhead. In a decade of implementing steelhead-only listings, we have confronted this issue successfully, working closely with state managers of rainbow trout fisheries to ensure their management of rainbow trout does not jeopardize steelhead. Continuing a listing of steelhead-only DPSs should not change that successful regulatory landscape.

Comments Regarding a Specific ESU or DPS: Determination of Species

Northern California and Central California Coast Steelhead

Comment 12: Several commenters expressed support for the proposed clarification of the Northern California and Central California Coast steelhead DPS boundaries. We received no comments opposed to the proposed changes.

Response: We have included these DPS boundary clarifications in the final species determinations (see Final Species Determinations section, below).

Comment 13: Several commenters disagreed with our proposal to include above-barrier resident *O. mykiss* populations from upper Alameda Creek in the Central California Coast *O. mykiss* ESU. Other commenters felt that resident *O. mykiss* populations in the Livermore-Amador Valley also should not be included in the ESU. The commenters were critical of the genetic data and analysis upon which we based our proposal, and felt that genetic similarity alone was insufficient to support the inclusion of these above-dam resident populations in the ESU.

Response: Under our final approach of delineating steelhead-only DPSs of *O. mykiss*, the resident populations, including those in Upper Alameda Creek and the Livermore-Amador Valley, are not considered part of the listed DPSs.

California Central Valley Steelhead

Comment 14: The California Department of Fish and Game (CDFG) disagreed with the defined spatial structure of the Central Valley *O. mykiss* ESU. It argued that the ESU should be split into two parts: one part north of the Sacramento-San Joaquin River Delta, and a second part that includes the Delta and the San Joaquin Basin. CDFG based its alternative ESU structure in large part on habitat conditions in the Delta, which it contends serve to reproductively isolate fish from the Sacramento and San Joaquin basins.

Comments submitted during the 6-month extension by the California-Nevada Chapter of the American Fisheries Society (AFS) disagreed with CDFG's recommended species determination. AFS scientists argued that the purported physical barrier to reproduction between the two basins (low dissolved oxygen levels in the lower San Joaquin River) is indicative of the severely degraded habitat conditions in the San Joaquin river system, but represents an ephemeral distributional barrier and not a substantial reproductive barrier. AFS scientists cited a recent genetic study that found no genetic differentiation between populations in the two basins, and concluded that there is no scientific basis for recognizing a distinction between the two river systems.

Response: We disagree with CDFG and believe we have correctly defined the spatial extent of the California Central Valley steelhead DPS. Previous genetic analyses indicate that Central Valley steelhead are distinct from coastal populations (see Busby *et al.*, 1996). More recent genetic data (Nielsen *et al.*, 2003) suggest that significant genetic population structure remains for steelhead populations in the Central Valley, but that very little of the genetic variation can be attributed to differences between populations in the Sacramento and San Joaquin river drainages. Ecologically, the Central Valley is substantially different from ecoregions inhabited by coastal *O. mykiss* populations, and ecological conditions in the Central Valley are generally similar between the Sacramento and San Joaquin river basins. Low dissolved oxygen conditions in the Stockton Deep Water Ship Channel and along other reaches of the lower San Joaquin River are problematic, and may serve to limit anadromous fish migration under certain conditions and times. However, we do not believe this ephemeral barrier results in reproductive isolation between populations of *O. mykiss* in the Sacramento and San Joaquin river basins, as evidenced by the available genetic information. In our view, the available genetic and ecological information indicates that steelhead populations in the Sacramento and San Joaquin river basins are not discrete and collectively are significant to the *O. mykiss* species, and therefore constitute a single DPS.

Snake River Basin Steelhead

Comment 15: Several commenters in Idaho disagreed with including the population of rainbow trout above Dworshak Dam on the North Fork Clearwater River (Idaho) in the Snake River Basin *O. mykiss* ESU. The commenters felt that resident *O. mykiss* above Dworshak Dam likely represent a composite of past hatchery stocking programs, hybridization with cutthroat trout, and native *O. mykiss*, and as such there is insufficient information to justify including the entire population of resident *O. mykiss* above Dworshak Dam in the Snake River Basin *O. mykiss* ESU.

Response: As noted in the response to Comment 13, resident populations, including above Dworshak Dam, are not part of the listed DPS.

General Comments on the Consideration of Resident O. mykiss: Assessment of Extinction Risk

Comment 16: Several commenters noted that we did not address the ESU membership of, or consider the potential risks and benefits to the viability of an ESU from, rainbow trout hatchery programs in the proposed listing determinations for *O. mykiss* ESUs. The commenters asserted that the vast majority of rainbow trout hatchery programs propagate domesticated, non-native, and in some instances genetically modified rainbow trout. The commenters felt that in some *O. mykiss* ESUs, such as the Snake River Basin and Upper Columbia River *O. mykiss* ESUs, the negative impacts of hatchery rainbow trout on native *O. mykiss* populations may be profound.

Response: We agree with the commenters that resident trout hatchery programs were not inventoried and assessed as part of the proposed listing determinations. In response, we conducted an inventory and assessment of hatchery programs that release rainbow trout in areas where steelhead or co-occurring native rainbow trout might be affected (NMFS, 2004b, 2005a). We have found that few hatchery rainbow trout stocks are released in the spawning and rearing areas for the *O. mykiss* ESUs under review. State and tribal managers have adopted wild salmonid policies that have largely eliminated releases of hatchery-produced rainbow trout in waters important to wild steelhead. Since the ESA listings of steelhead in 1997–2000, the vast majority of hatchery rainbow trout releases to support recreational fisheries are restricted to isolated ponds and lakes. Of the hatchery rainbow trout that are released, none are stocks that would be considered part of the *O. mykiss* ESUs reviewed. In the few instances where domesticated or genetically modified rainbow trout stocks are released into anadromous waters to support recreational fisheries, they likely do not have substantial adverse impacts on the local *O. mykiss* populations. The released stocks exhibit poor survival, are subject to high harvest rates in the recreational fisheries, and exhibit spawn timing isolating them reproductively from the local natural populations. In some instances, sterile ''triploid'' rainbow trout are released into anadromous waters, thereby eliminating the possibility for reproductive or genetic exchange with wild fish.

Comment 17: Some commenters contended that the District Court in *Alsea* ruled that once an ESU is defined, risk determinations should not discriminate among its components. The commenters described the risk of extinction as the chance that there will be no living representative of the species, and that such a consideration must not be biased toward a specific behavioral or life-history component. A few commenters felt that populations of rainbow trout have persisted in isolation over long periods of time, demonstrating that resident representatives of an *O. mykiss* ESU would persist in the foreseeable future, even if the anadromous life-history form was extirpated.

Response: We disagree that the *Alsea* ruling requires a particular approach to assessing extinction risk. The court ruled that if it is determined that a DPS warrants listing, all members of the defined species must be included in the listing. The court did not rule on how the agency should determine whether the species is in danger of extinction or likely to become so in the foreseeable future. Because we are listing steelhead-only DPSs, we do not address the contention that rainbow trout might continue to survive in isolation even if the anadromous life history were extirpated.

Comment 18: Several commenters disagreed with our conclusion that the Biological Review Team's (BRT's) extinction risk assessments directly inform risk evaluations for steelhead-only DPSs, and recommended that the BRT re-evaluate the extinction risk of the steelhead DPSs without considering resident *O. mykiss*. The commenters noted that some of the population data evaluated by the BRT included both life forms, particularly for the Southern California, South-Central California Coast, and Central California Coast ESUs. One commenter noted that for several ESUs the BRT concluded that the presence of speculatively abundant resident populations buffered the risk of extinction somewhat. The commenter felt that the BRT's extinction risk assessments likely underestimate the risk for a steelhead-only DPS, and that some of the proposed threatened determinations for *O. mykiss* ESUs may warrant revision as endangered for the delineated steelhead-only DPSs.

Response: As explained more fully in the response to Comment 19, the risk of extinction faced by the steelhead component of *O. mykiss* may be affected by the health and potential contributions of the resident component. We conclude that the BRT's risk assessments directly inform our determinations for steelhead-only DPSs for all ESUs, including the California ESUs cited by the commenters.

Comment 19: Several commenters felt that the extinction risk assessments for steelhead-only DPSs must consider the resident form. The commenters felt that the available scientific information demonstrates that the two life-history forms have inseparable demographic risks given that they interbreed and produce progeny of the alternate life form. Commenters asserted that the viability of steelhead populations in the foreseeable future depends on the continued presence of the resident form to buffer against periods of unfavorable ocean conditions and ephemeral blockages to fish passage. Commenters cited a recent report (Independent Science Advisory Board (ISAB), 2005–2) which concluded that ''the presence of both resident and anadromous life-history forms is critical for conserving the diversity of steelhead/rainbow trout populations.'' The commenters concluded that both life-history forms are essential to the individual and collective viability of resident and anadromous populations.

A few commenters contended that the presence of abundant co-occurring rainbow trout confers resilience to steelhead DPSs such that listing may not be warranted. These commenters felt that the ability of the resident life-history form to produce anadromous offspring makes it likely that the anadromous life-history form would be reestablished if extirpated. These commenters cited the recent report of NMFS' Recovery Science Review Panel (RSRP, 2004) which discussed the preliminary results of a study indicating that 17 percent of anadromous adults had resident mothers, as well as other studies indicating that isolated resident populations produce anadromous progeny that successfully smolt and return to spawn (*e.g.*, Thrower *et al.*, 2004).

The majority of commenters expressed skepticism that resident populations can maintain or re-establish declining or extirpated steelhead populations. These commenters cited recent expert advisory panel reports concluding that although the resident form is an important life-history strategy in some circumstances, the likelihood of long-term persistence is substantially compromised by the loss of anadromy. The commenters concluded that the best available information demonstrates precipitous declines and high levels of extinction risk for West Coast steelhead populations. One commenter cited a study (Nehlsen *et al.*, 1991) identifying 23 steelhead populations that have been extirpated and 75 steelhead populations that are at risk of extirpation. The commenter concluded that these observations contradict assertions that co-occurring rainbow trout can sustain or reestablish anadromous populations and ensure the viability over the long term.

Response: Because we have delineated steelhead-only DPSs, we do not directly address contentions about persistence of an entire *O. mykiss* ESU. We acknowledge, however, that in the context of steelhead-only DPS delineations, these comments correctly point out that we must consider whether and to what extent the presence of co-occurring rainbow trout affects the extinction risk of the steelhead DPSs under consideration. We conclude that available information for most of the *O. mykiss* under review does not support a conclusion that the resident populations are abundant. Even for those few ESUs that may have relatively abundant co-occurring rainbow trout, we conclude that while the resident form may mitigate somewhat the risks to the co-occurring steelhead, they do not change our conclusion about the risk of extinction of the DPSs under consideration. We base this conclusion on the work of the BRT and on information provided by peer reviewers and commenters during the comment period. The bulk of this information and analysis specifically addressed the question of the viability of the larger ESU, but the analysis was largely focused on the steelhead-only component. That analysis directly informs our conclusions about the effect of co-occurring rainbow trout on the extinction risk of the steelhead DPSs.

The best available scientific information does not demonstrate that an extirpated anadromous population can be re-established by a resident population. There is only one published report of anadromy developing from a resident population (Pascual *et al.*, 2001), and it is unclear whether this putative founding population was composed purely of resident genotypes (Behnke, 2002; Pascual *et al.*, 2002; Rossi *et al.*, 2004). Evolutionary theory and empirical evidence suggest that the ability of residents to contribute to anadromy quickly diminishes if the fitness of their anadromous progeny is low (NMFS, 2004a; Thrower *et al.*, 2004a, 2004b; RSRP, 2005). NMFS'' RSRP concluded that in cases where an anadromous run is extinct or not self-sustaining, there is no scientific justification for the claim that the long-term viability of an *O. mykiss* ESU or steelhead DPS could be maintained by the resident life-history form alone, or that a viable anadromous population could feasibly be reestablished from a pure resident population (RSRP, 2004). Moreover, for most of the *O. mykiss* under review, the available information does not suggest that the resident form is abundant (NMFS, 2004a).

For a variety of reasons the BRT concluded that the collective contribution of the resident life-history form to the persistence of a larger *O. mykiss* ESU is unknown and may not substantially reduce the overall extinction risks to the ESU in-total (NMFS, 2003b; 2004a). The two *O. mykiss* life-histories represent an adaptive ''bet-hedging'' strategy for sustaining reproductive potential despite high variability in physical and ecological conditions. Although the resident form can enable the larger *O. mykiss* ESU to endure short-term physical, environmental, and ecological barriers to anadromous migration, there is no evidence that resident fish can perform this function over the long term if the anadromous form is extirpated. It is also unclear to what extent resident populations depend on infusions from anadromous fish for their long-term persistence. The BRT's conclusion is supported by recent reports by the ISAB and NMFS' RSRP which recently concluded that anadromous *O. mykiss* contribute ''substantially and irreplaceably to any measure of *O. mykiss* productivity and viability'' (RSRP, 2004), and that ''the presence of both resident and anadromous life-history forms is critical for conserving the diversity of steelhead/rainbow trout populations and, therefore, the overall viability of ESUs'' (ISAB, 2005–2). The RSRP and ISAB underscored that ''resident populations by themselves should not be relied upon to maintain long-term viability of an [*O. mykiss*] ESU'' (RSRP, 2004), and that the ''likelihood of long-term persistence would be substantially compromised by the loss of anadromy in *O. mykiss* ESUs'' (ISAB, 2005–2).

Comment 20: Some commenters noted that physical, ecological, environmental, and habitat conditions have been greatly modified by human activities over the past 100 years and contended that due to these changes, areas that historically supported anadromous *O. mykiss* populations currently favor populations of rainbow trout. These commenters felt that observed declines in anadromous *O. mykiss* populations reflect an adaptive shift in the relative proportion of the resident and anadromous life-history forms. The commenters argued that rainbow trout populations have expanded to successfully occupy the niche vacated by anadromous populations, and that *O. mykiss* ESUs do not warrant ESA listing due to this demonstrated adaptive resiliency of the species.

Response: As noted in the response to Comment 19, contentions about persistence of an entire *O. mykiss* ESU are not directly relevant given that we have delineated steelhead-only DPSs. However, the presence of co-occurring rainbow trout is relevant to the extent that the resident life-form affects the extinction risk of the steelhead DPSs under consideration. The commenters do not provide data in support of their contention that the reduced abundance of steelhead represents an adaptive shift by the species to altered environmental conditions. An increase in the proportion of resident fish in certain *O. mykiss* populations could be the result of an adaptive life-history shift in response to changing environmental conditions (as suggested by the commenters), or the apparent increase in the prevalence of rainbow trout could simply be the result of declines in the abundance, productivity, and distribution of the anadromous form without a compensatory response in resident populations. The data necessary to evaluate the current status and trends of resident populations are generally lacking, and even more so are the historical data necessary to evaluate trends in the relative abundance and distribution of the two life-history forms. Even if an adaptive shift has occurred, as suggested by the commenters, there is insufficient information to support the contention that *O. mykiss* populations dependent upon the productivity of the resident life-history form are viable over the long term (see response to Comment 19, above). Regardless, many of the factors that have caused declines in anadromous *O. mykiss* populations (such as the loss/degradation of riparian habitat, degradation of water quality, loss/degradation of in-stream habitat structure and complexity, etc.) likely have had similarly adverse effects on co-occurring resident populations. As noted above in the response to Comment 19, the loss of the anadromous life-history form may increase the extinction risk of an *O. mykiss* ESU due to increased risks from catastrophic events, decreased reproductive potential, diminished spatial distribution, diminished connectivity among discrete habitat patches, and decreased diversity in adaptive traits.

Comments Regarding a Specific ESU or DPS: Assessment of Extinction Risk

California Central Valley Steelhead

Comment 21: In addition to disagreeing with the defined spatial structure of the Central Valley *O. mykiss* ESU, CDFG opposed our proposal to maintain ESA protections for this ESU. CDFG provided new information on the abundance of resident and hatchery *O. mykiss* in the Central Valley and argued that because of the combined high abundance, high productivity, broad spatial distribution, and genetic diversity of these populations that *O. mykiss* in the Sacramento River Basin do not warrant listing. CDFG conceded that *O. mykiss* in the Sacramento-San Joaquin Delta and San Joaquin River basin may warrant listing as threatened.

In comments submitted during the 6-month extension, a few commenters agreed with CDFG's conclusion that Central Valley steelhead populations are not at risk due to the presence of abundant rainbow trout populations and the stability of environmental conditions. These commenters acknowledged that conditions are much altered from historical conditions by the imposition of dams and changes in flow regime, but concluded that the existing environment selects for the resident life form and supports robust rainbow trout populations.

Other commenters argued that historical habitat loss and degradation remains to be addressed, and water management in the Sacramento-San Joaquin river systems poses significant threats to Central Valley *O. mykiss*, inclusive of both anadromous and resident populations. These commenters criticized CDFG's abundance estimates for: inappropriately extrapolating from areas above impassable dams not considered to be part of the ESU; inaccurately assuming a uniform distribution of fish within these systems by extrapolating from average density estimates; including an unquantifiable number of hatchery produced smolts in their analyses; and combining abundance estimates for different life-history stages. The commenters felt that CDFG's comments ignored that historical spawning and rearing habitats have been reduced in the Sacramento and San Joaquin river systems by more than 82 percent, and that CDFG appeared to downplay the loss of the San Joaquin basin as an historically important center of distribution.

Response: Under our adopted approach of delineating steelhead-only DPSs, CDFG's comments regarding resident *O. mykiss* populations do not affect our risk conclusion for the Central Valley steelhead DPS. Regardless, we disagree with CDFG's assertion that the presence of resident populations in the Sacramento River Basin substantially reduce risks to Central Valley *O. mykiss* populations. We acknowledge that resident forms of *O. mykiss* are widely distributed and possibly abundant in the Central Valley, particularly in the Sacramento River Basin and that the presence of these resident populations likely reduces risks to population abundance. However, the BRT described considerable uncertainty regarding whether and to what extent the resident form contributes to the productivity, spatial structure and diversity of *O. mykiss* metapopulations. As discussed in the response to Comment 19 it is unclear how long an *O. mykiss* population can persist if dependent entirely or mostly upon the productivity of resident fish in a dynamic freshwater environment, even if the resident forms are abundant. The BRT's concerns regarding the status of Central Valley steelhead are not based solely on the apparent continued decline in abundance, but also on evidence indicating the proportion of naturally produced fish is declining, the loss of the vast majority of historical spawning areas above impassable dams, continued impediments to fish passage, and the severe degradation of water quality and quantity conditions. Although altered habitat conditions may favor the resident life-history form in some areas, it is unclear whether such populations are sustainable over the long term (see response to Comment 19, above).

Middle Columbia River Steelhead

Comment 22: One commenter submitted an alternative viability analysis for Middle Columbia River steelhead that concludes that extinction risks are low for the wild populations throughout the Middle Columbia River (Cramer *et al.*, 2003). The report emphasizes the recent increases in abundance in 2001–2002, and asserts that all streams in the DPS share similar patterns of steelhead production, that hatchery-origin steelhead represent a small fraction of natural spawners and do not pose a threat to the DPS's productivity, and that rainbow trout and steelhead interbreed and produce progeny of the alternate life-history form.

Response: The information presented in Cramer *et al.* (2003) includes information from Cramer *et al.* (2002) that was provided to NMFS on April 1, 2002, as part of public comments received in response to our initial solicitation of information to support the status review updates (67 FR 6215; February 11, 2002). Cramer *et al.* (2002) focused on the status and trends of steelhead in the Yakima River subbasin, and Cramer *et al.* (2003) represents a subsequent submission that includes information for other major subbasins in the DPS. The information presented in Cramer *et al.* (2002) was evaluated by the BRT and considered in developing the proposed listing determination for the ESU. The supplemental material provided in Cramer *et al.* (2003) does not provide substantive additional data to what was available to and considered by the BRT. The BRT's assessments of extinction risk were based on long-term trends. A recent short-term increase in returns does not alleviate concerns regarding the long-term performance of the DPS, nor would it address concerns regarding the spatial distribution, connectivity, and diversity of populations within the DPS.

The conclusions made in the latter report are not inconsistent with the findings of the BRT. The report emphasizes recent increases in abundance and productivity, but, as noted above, the BRT concluded that there is insufficient certainty that the environmental conditions underlying recent encouraging trends will continue. The report also emphasizes the contributions of abundant and well distributed rainbow trout populations in the ESU in mitigating risks to the anadromous life-history form. As discussed in the response to Comment 19 (above), the BRT concluded that, despite the reduced risk to abundance for certain *O. mykiss* ESUs due to speculatively abundant resident fish, the collective contribution of the resident life-history form to the persistence of an *O. mykiss* ESU is unknown and may not substantially reduce the overall extinction risk to the ESU (NMFS, 2003b, 2004).

Upper Columbia River Steelhead

Comment 23: Several commenters opposed our proposal to change the listing status of the Upper Columbia River steelhead from endangered to threatened. The commenters noted that the majority opinion of the BRT (NMFS, 2003b) was that the ESU is ''in danger of extinction.'' The commenters disagreed with the finding of the Artificial Propagation Evaluation Workshop (NMFS, 2004c) (APEW) that the six hatchery programs in the ESU collectively mitigate the immediacy of extinction risk such that the ESU should be listed as threatened rather than endangered.

Response: The slight majority opinion of the BRT was that the ESU is ''in danger of extinction,'' although the substantial minority opinion was that the ESU is ''likely to become endangered in the foreseeable future.'' In evaluating the risks and benefits of the six hatchery programs included in the ESU, we concluded that these programs have: (1) A high certainty of implementation due to long-term agreements reached by Federal, state, tribal and local entities to ensure funding; and (2) a high certainty of effectiveness because they adhere to best professional practices, include extensive monitoring and evaluation efforts, and minimize the potential risks of artificial propagation. These programs have increased the number of natural spawners and thereby have increased the spatial distribution of spawning areas being used, although as yet the programs provide uncertain benefits to the abundance and productivity of the naturally spawned populations in the DPS. The careful design and implementation of these programs have been effective at conserving the diversity of the populations within the DPS. For these reasons we conclude that the hatchery programs in this ESU collectively mitigate the immediacy of extinction risk for Upper Columbia River steelhead in the short term (NMFS, 2004c).

Comments on the Consideration of Protective Efforts

California Central Valley Steelhead

Comment 24: Several commenters opposed our proposal to list steelhead in the California Central Valley as threatened. The commenters agreed with the BRT's majority opinion (NMFS, 2003b) and the conclusion of the APEW (NMFS, 2004c) after considering the benefits of hatchery programs, that the steelhead in the Central Valley are ''in danger of extinction.'' They disagreed that the habitat restoration efforts associated with the CALFED and the Central Valley Project Improvement Act (CVPIA) provide sufficient certainty of implementation and effectiveness (pursuant to PECE) to conclude that Central Valley steelhead should be listed as threatened rather than endangered.

Response: We disagree with the commenters and continue to believe that there are many protective efforts that have been implemented effectively, or are in the process of being implemented, throughout the California Central Valley that reduce risks to the DPS and support a threatened listing determination. These efforts were discussed in the proposed rule (69 FR 33102, at 33144; June 14, 2004) and include a wide range of habitat restoration efforts, changes in hatchery management, and limits on recreational harvest. As discussed further below, habitat improvement and planning efforts in the Central Valley conducted under the auspices of Federal and State programs, primarily CALFED and CVPIA, recently proposed monitoring and research activities regarding steelhead, and recently completed ESA section 7 consultations.

Significant Central-Valley-wide restoration efforts include the CALFED program and CVPIA, both comprehensive water management and restoration programs consisting of elements that potentially contribute toward ecosystem improvement and function as well as to the recovery of Central Valley steelhead. The CALFED program is a collaborative effort among 25 Federal and State agencies to improve water supplies in California and the health of the San Francisco Bay-Sacramento-San Joaquin River Delta watershed. The Ecosystem Restoration program of CALFED has invested more than $500 million on 415 projects aimed at improving and restoring ecosystems since its inception in 1997 (CALFED Bay-Delta Program, 2005, Annual Report: 2004). These actions include: fish screen and passage construction and planning projects; instream, floodplain, and riparian restoration projects; toxic studies and pollutant reduction efforts; monitoring for listed species; and instream flow augmentation. The CVPIA mandated changes in management of the Central Valley Project, particularly for the protection, restoration, and enhancement of fish and wildlife, and includes programs such as the Anadromous Fish Restoration Program, a water acquisition program, and a fish screen program. Wherever possible, CVPIA and CALFED programs are integrated to accomplish a single Central-Valley-wide restoration effort.

Approximately 70 percent of water diversions greater than 250 cfs in the Central Valley have now been screened or are planned to be screened. Notable efforts include the planning and/or construction of facilities at: Anderson-Cottonwood Irrigation District, Glenn Colusa Irrigation District, Princeton, Reclamation District 108, City of Sacramento, and Sutter Mutual Water District on the Sacramento River; the Banta Carbona and Patterson Irrigation Districts on the San Joaquin River; and numerous other screening projects in Suisun Marsh, the Sacramento-San Joaquin Delta, and tributaries throughout the Central Valley. Passage improvements and evaluations regarding common salmonid barriers such as Saeltzer Dam on Clear Creek and numerous barriers on Sacramento and San Joaquin tributaries are underway and are contributing to the improvement of habitat conditions for this DPS.

Restoration efforts such as spawning gravel augmentation, fine sediment removal activities, channel rehabilitation, riparian, floodplain, and wetland restoration have also contributed to improved habitat conditions for this DPS by restoring habitat function and quality. Watershed planning and restoration efforts are now underway in many of the Central Valley tributaries leading to the identification and potential elimination of factors limiting habitat restoration and population recovery. Large-scale restoration projects in Clear Creek in the Sacramento River Basin, and the Merced and Tuolumne Rivers in the San Joaquin Basin, are expected to restore ecological functions that benefit steelhead production. Efforts to restore spawning gravel supply and reduce fine sediment input in numerous Central Valley tributaries have likely contributed positively toward recent spawning success. Other elements of the CALFED program may also provide benefits to this DPS, although these benefits are not yet well demonstrated. These activities include water purchases through the Environmental Water Account program, efforts to reduce toxics and pollutants in Central Valley waters, community-based management efforts through the CALFED Watershed program, and improvements to channels and floodplains through the Conveyance and Levee programs.

Monitoring efforts for Central Valley steelhead have been implemented in selected tributaries in the Sacramento and San Joaquin basins in an effort to better understand life-history strategies, as well as to provide better estimates of steelhead abundance. These activities include redd surveys, snorkeling, angling, rotary screen trapping, and beach seining. Ongoing genetic research is expected to provide additional information about genetic relationships of populations within and between rivers and basins in the Central Valley. This information will help define the spatial and genetic structure of the Central Valley steelhead DPS. The long-term juvenile fish monitoring program by the Interagency Ecological Program in the Sacramento-San Joaquin Estuary, as well as Chinook salmon monitoring programs by Federal and state agencies and private entities in some tributaries, also may provide incidental catch information. While these efforts do not specifically target steelhead and are not found in all Central Valley watersheds, they are filling information gaps regarding Central Valley steelhead that will likely help with recovery assessments and planning. Despite current monitoring and research efforts, additional needs include a more comprehensive monitoring program, better anadromous fish abundance estimating methods, and a better understanding of the use, needs and availability of habitat in the Central Valley for steelhead populations. Finally, we have completed ESA section 7 consultations for construction and water operation projects in the Central Valley that provide substantial benefits to steelhead.

We believe that the protective efforts being implemented for this DPS provide sufficient certainty of implementation and effectiveness to alter the BRT's (NMFS, 2003b) and APEW's (NMFS, 2004c) assessments and support our conclusion that the Central Valley steelhead DPS in-total is not in danger of extinction, but rather is likely to become endangered in the foreseeable future throughout all or a significant portion of its range. Accordingly, we conclude that the Central Valley steelhead DPS continues to warrant listing as a threatened species.

Middle Columbia River *O. mykiss* ESU

Comment 25: The U.S. Forest Service (FS) and the Bureau of Land Management (BLM) felt that implementation of existing Land and Resource Management Plans (LRMPs) within the range of the Middle Columbia River steelhead will help ensure its long-term viability. Specifically, the agencies assert that the following conservation programs provide sufficient certainty of implementation and effectiveness to mitigate the risk of extinction for Middle Columbia River steelhead and warrant a new review of its status: (1) Continued implementation of the Northwest Forest Plan aquatic conservation strategy under current FS and BLM LRMPs; (2) continued implementation of the Pacfish aquatic conservation strategy under current FS and BLM LRMPs; (3) continued participation in the Interagency Implementation Team ensuring the effective monitoring, evaluation, and adaptive management of actions under the LRMPs; (4) continued implementation of Best Management Practices project design criteria, and standards and guidelines as specified in existing ESA section 7 biological opinions and concurrence letters, with a strong focus on forestry, grazing, mining, and recreational activities; and (5) continued collaboration with regional partners to identify and implement high-value restoration projects. The FS and BLM criticized the proposed listing determination for the Middle Columbia River *O. mykiss* ESU for not considering implementation of their aquatic conservation strategies under their current LRMPs, for not articulating why these and other conservation efforts were deemed insufficient to ameliorate risks to the ESU, and for not detailing the specific conservation measures necessary to address any insufficiencies.

In an April 15, 2005, letter to NMFS from the State of Oregon Governor's Natural Resource Office, Oregon provided additional information regarding efforts to protect Middle Columbia River steelhead in the Deschutes, John Day, and Walla Walla Rivers. Oregon noted changes in the management of the Wallowa Hatchery intended to reduce the straying of out-of-ESU hatchery fish into the Deschutes and lower John Day rivers. Oregon believes that, if successful, these management actions may substantially reduce the threat posed by straying hatchery fish in these basins and the resulting uncertainties in interpreting trends in abundance and productivity of the local populations. Oregon emphasized its continuing commitment to conservatively managing fisheries in the John Day River in support of conserving self-sustaining natural populations of native summer steelhead. Oregon also felt that commitments to improve flow management in the Walla Walla River Basin as part of the Oregon-Washington Walla Walla River Habitat Conservation Plan for steelhead and bull trout have resulted in improved flow conditions over the past 4 years, improved fish passage, and increases in available habitat. Oregon also noted habitat and fish passage improvement projects that have been completed and are being developed in the John Day River, Deschutes River, Walla Walla River, and Fifteenmile Creek basins. Oregon asserted that these and other protective efforts merit closer scrutiny under PECE before a final listing determination should be made for steelhead in the Middle Columbia River.

Response: In the proposed listing determination we noted encouraging trends in the recent abundance and productivity of the ESU, in part due to favorable freshwater conditions and marine survival. However, several populations remain well below viable levels (including populations in the Yakima River Basin, which was historically a major production center), and there is insufficient certainty that the environmental conditions underlying recent encouraging trends will continue. In proposing to maintain the ESU's threatened status, we listed 11 conservation measures and commitments that if implemented might substantially address key limiting factors, ensure the viability over the long term, and likely bring Middle Columbia River steelhead to the point where the protections of the ESA are no longer necessary. To affect the final listing determination for Middle Columbia River steelhead, we expressed interest in receiving firm commitments with a high certainty of implementation and effectiveness, including: (1) That the Bonneville Power Administration (BPA) will continue its funding of ESU-wide riparian zone and instream habitat restoration efforts, consistent with its Fish and Wildlife Program's portion of the subbasin and recovery plans being developed; (2) that the BLM will adhere to best management practices for grazing, mining, and recreational activities ESU-wide; (3) that the FS will adhere to best management practices for grazing, forestry, and mining activities ESU-wide; (4) that Washington Department of Fish and Wildlife (WDFW) will continue to manage fisheries conservatively in this ESU, and develop and implement a long-term approach that balances natural and hatchery production across the ESU; (5) that Oregon Department of Fish and Wildlife (ODFW) will continue to manage fisheries conservatively in this ESU (particularly in the John Day River subbasin), develop and implement management approaches to reduce the straying of out-of-basin stocks into Deschutes and John Day spawning areas, and develop and implement a long-term approach that balances natural and hatchery production across the ESU; (6) that the U.S. Bureau of Reclamation (BOR) provide passage and improve flow management below all its facilities in the Yakima River and the Umatilla River subbasins, provide fish passage into significant tributaries, and provide passage over at least two of its storage dams in the Yakima Basin; (7) that the Federal Energy Regulatory Commission (FERC) provide for passage in the Deschutes River subbasin above the Pelton/Round Butte complex, restore downstream water temperature regime to historical levels, and provide for upstream/downstream habitat enhancement and restoration; (8) that the U.S. Army Corps of Engineers (Corps) improve passage, screening and flow management in the Walla Walla River subbasin, and alter the flood operating rule for Mill Creek or alternatively screen the diversion into Bennington Lake; (9) that the Yakima Nation continue conservative hatchery and harvest management and adherence to best land management practices; (10) that the Confederated Tribes of the Umatilla Reservation continue conservative hatchery and harvest management; and (11) that the Confederated Tribes of the Warm Springs Reservation continue best land management practices in the Deschutes River subbasin. To date, the only items addressed are those summarized above by FS and BLM, the State of Oregon, and the 2003 Pelton Round Butte Project settlement agreement to provide for fish passage, research, and habitat enhancement (*see* discussion below).

We applaud FS' and BLM's continued commitments to implement LRMPs, adhere to established best management practices, and participate in monitoring and evaluation efforts. Although the Federal lands covered by the LRMPs are important components in conserving the ESU, these lands comprise a minority (approximately 28 percent) of the occupied stream reaches in the ESU. Populations in the Yakima, Klickitat, and Touchet Rivers remain well below their interim recovery target abundance levels, and in these streams Federal lands represent approximately 21 percent, four percent, and seven percent of the occupied stream reaches, respectively. Additionally, several of the key limiting factors within these basins (in particular fish passage and flow management in the Yakima River Basin) are outside FS' and BLM's authority to address. We are encouraged by FS' and BLM's commitment to continue to pursue high value restoration projects in the range of the DPS. However, with respect to our consideration of protective efforts, such general commitments lack the necessary certainty of implementation and effectiveness in that they do not identify specific actions and conservation objectives, do not include quantifiable performance measures, cannot guarantee the necessary funding and other resources, and lack sufficient authority to ensure the participation of all necessary parties.

In 2003 a settlement agreement was reached among the applicants and 21 intervenors in the FERC's relicensing of the Pelton Round Butte Project on the Deschutes River (central Oregon). The settlement agreement addresses project operations, natural resource protection, mitigation, and enhancement measures. The agreement will provide fish passage above the three-dam complex to over 150 miles (241 km) of spawning and rearing habitat for steelhead, as well as spring Chinook and sockeye salmon. Other measures include research on the augmentation of spawning gravels in the Lower Deschutes River, management of large woody debris entering the project reservoirs, altered flow management, and $21.5 million in funding for habitat enhancement projects. Fish passage is scheduled to begin in 2009, to be preceded by (as yet undetermined) habitat enhancement projects. If the provision of fish passage fails, funds that would otherwise support the operation and maintenance of the fish passage facility will be used for habitat restoration projects downstream of the project for the duration of the new license. The settlement agreement is reasonably certain to occur. However, scheduling delays have already occurred and are to be expected given the number of involved parties, the scale of the project, and the complexity of the engineering issues being addressed. We are optimistic that the passage improvements included in the settlement agreement will be effective. However, we cannot be certain that the provision of passage will be effective in reintroducing steelhead populations into currently blocked habitats in the Deschutes River. It is due to this uncertainty that contingencies were built into the settlement agreement for the potential failure of efforts to provide fish passage.

As with the above-mentioned protective efforts, we applaud the conservation measures described by Oregon to reduce stray rates into the Deschutes and John Day Rivers, conservatively manage fisheries in the John Day River, improve flow conditions in the Walla Walla River, and continue its collaboration in developing and implementing restoration projects. However, as Oregon acknowledges, there is considerable uncertainty as to whether the management actions for the Wallowa Hatchery will be effective in reducing the stray rates of out-of-DPS fish. The commitments to improve flow conditions in the Walla Walla River represent important contributions to addressing limiting factors in the subbasin; however, significant challenges remain. Additional water conservation measures, restoration of severely degraded riparian habitats, continued efforts to screen water diversions and improve fish passage, improvements in agricultural practices to benefit water quality, and hatchery reform efforts are needed to help ensure the conservation of the Walla Walla River steelhead population. As Oregon noted, the implementation of various habitat restoration activities is unclear given uncertainties in funding, technical assistance, necessary authorities, and voluntary participation.

The commitments addressed above represent valuable contributions to the conservation and recovery of the Middle Columbia River steelhead DPS. However, the FS' and BLM's commitments, the Pelton Round Butte Project settlement agreement, and the information provided by Oregon, alone are insufficient to substantially ameliorate risks to the DPS to the point that the protections afforded under the ESA are no longer necessary. As noted in the proposed listing determination and summarized above, we feel that continued and additional conservation efforts are necessary beyond those addressed in the commenters' commitments to substantively address factors limiting the recovery of the Middle Columbia River steelhead DPS.

Comments Regarding Public Notice and Opportunities for Public Comment

Comment 26: Several commenters expressed displeasure concerning the 30-day length of the public comment period regarding the proposed application of the joint DPS policy and delineation of steelhead DPSs. The commenters felt that additional time should have been allowed to comment given that the proposed approach represents a significant departure from NMFS' established application of the ESU policy, and poses potentially significant implications for West Coast steelhead management, conservation, and recovery planning. The commenters felt that NMFS' public notification of the new proposal was inadequate, and suspected that many interested and affected individuals, organizations, businesses, and municipalities are not aware of the new proposal. Commenters noted that a short 30-day public comment period for such a radical change in approach stands in stark contrast to the more than 200 days of public comment solicited concerning the June 2004 proposals, which generally affirmed the approach NMFS has used for the last 14 years. Two commenters requested that public hearings be held to allow for additional explanation and discussion of the proposed alternative approach.

Response: Commenters were provided extensive opportunity for comment from the initial publication of the proposed rule in June 2004 until the close of the final comment period on December 5, 2005. Following an initial time period of 90 days, we twice extended the comment period, for an additional 36 and 22 days (69 FR 53031, August 31, 2004; 69 FR 61348, October 18, 2004). During this extensive comment period, we received numerous comments urging us to find resident and anadromous *O. mykiss* to be separate ESUs. The comment period was then reopened for another 30 days on November 4, 2005, to receive comments on our proposed alternative approach to delineating the *O. mykiss* populations (70 FR 67130). We received 24 comments during this 30-day comment period, specific to the proposal to use the DPS policy. Prior to the reopening of the comment period on November 4, 2005, we also received comments on a possible change in approach to apply the DPS policy rather than the ESU policy. We believe that the 24 cogent, insightful comments we received during the 30-day comment period on our proposed use of the DPS policy is evidence that the time allotted for comment on this issue was sufficient. The approach used in this final rule—giving rainbow trout and steelhead separate treatment under the ESA—was fully vetted in the comments on the 2004 proposed rule.

Final Species Determinations

We first must determine whether the geographic boundaries established for *O. mykiss* ESUs (*see* 69 FR 33102; June 14, 2004) under the ESU policy are the appropriate boundaries for steelhead DPSs under the DPS policy. We conclude they are. Under the ESU policy, we delineated geographic boundaries based on considerations of both reproductive isolation and significance. The ESU boundaries were drawn around population groups the BRT found to be reproductively isolated from other conspecific populations and significant to the evolutionary legacy of the species. Reproductive isolation was generally not conclusively demonstrated with genetic data but rather inferred from information about the ecology, physiology and behavior of the population groups. The distinctions relied on to make geographic delineations of the ESUs in the 2004 proposed rule are equally applicable to finding discrete (markedly separate) groups of steelhead populations. Moreover, each of the ESUs delineated under the ESU policy occupies a unique ecological region. Occupation of a unique ecological region satisfies the DPS criterion for significance. Loss of any of the ESUs from its geographic area would also represent a significant gap in the range of the species.

Within these geographic boundaries, we further conclude that the anadromous life form is markedly separate from the resident life form, as discussed more fully in the responses to Comments. We therefore are delineating 10 steelhead-only DPSs, with geographic boundaries unchanged from those previously delineated for the West Coast *O. mykiss* ESUs (except as noted for an adjustment of the boundary between two of the California DPSs).

We next must determine whether any hatchery stocks are to be included in the steelhead-only DPSs. On June 28, 2005, we finalized a new policy for the consideration of hatchery-origin fish in ESA listing determinations (''Hatchery Listing Policy;'' 70 FR 37204). Under the Hatchery Listing Policy hatchery stocks are considered part of an ESU if they exhibit a level of genetic divergence relative to the local natural population(s) that is no more than what occurs within the ESU (70 FR 37204, at 37215; June 28, 2005). We conclude that the considerations that informed the Hatchery Listing Policy for ESUs are equally valid for the steelhead DPSs we are now delineating under the DPS policy. The Hatchery Listing Policy is based in part on the recognition that important components of the evolutionary legacy of West Coast salmon and steelhead can be found in hatchery stocks, and that many hatchery stocks are derived from, and not significantly diverged from, the naturally spawning stocks. We developed a test for including hatchery stocks in the ESU based upon a consideration of ''whether a particular hatchery stock reflects an ESU's 'reproductive isolation' and 'evolutionary legacy' '' (70 FR 37204, at 37208; June 28, 2005). We believe those tests are equally applicable to determining whether hatchery stocks reflect the discreteness and significance of steelhead DPSs. Consistent with the June 14, 2004, proposed listing determinations (69 FR 33102) and the recent final listing determinations for 16 West Coast salmon ESUs (70 FR 37160; June 28, 2005), hatchery stocks are included in a steelhead DPS if they are no more than moderately diverged from local, native populations in the watershed(s) in which they are released. The level of divergence for hatchery programs associated with the steelhead DPSs is reviewed in the 2003 Salmon and Steelhead Hatchery Assessment Group Report (NMFS, 2003) and the 2004 Salmonid Hatchery Assessment and Inventory Report (NMFS, 2004b). The DPS membership of hatchery programs included in the steelhead DPS descriptions below and summarized in Table 1 are unchanged from that proposed for the 10 *O. mykiss* ESUs (69 FR 33102; June 14, 2004).

Southern California Steelhead DPS

The Southern California Steelhead DPS includes all naturally spawned populations of steelhead in streams from the Santa Maria River, San Luis Obispo County, California (inclusive) to the U.S.-Mexico Border (62 FR 43937, August 18, 1997; 67 FR 21586, May 1, 2002). This DPS does not include any artificially propagated steelhead stocks that reside within the historical geographic range of the DPS.

South-Central California Coast Steelhead DPS

The South-Central California Coast steelhead DPS includes all naturally spawned populations of steelhead in streams from the Pajaro River (inclusive) to, but not including the Santa Maria River, California (62 FR 43937; August 18, 1997). This DPS does not include any artificially propagated steelhead stocks that reside within the historical geographic range of the DPS.

Central California Coast Steelhead DPS

The Central California Coast steelhead ESU was previously defined to include all naturally spawned populations of steelhead in California streams from the Russian River to Aptos Creek, and the drainages of San Francisco and San Pablo Bays eastward to the Napa River (inclusive), excluding the Sacramento-San Joaquin River Basin (62 FR 43937; August 18, 1997). Recent information, however, indicates that those portions of the ESU in San Francisco Bay and eastward towards the Central Valley were incorrectly described in the 1997 listing notice and need to be clarified. As part of the November 4, 2005, notice soliciting comment on the delineation and listing of steelhead-only DPSs (70 FR 67130), we proposed clarifying the definition of the Central California Coast steelhead DPS. We did not receive any comments opposing the inclusion of these streams, nor has any information been made available that would lead us to reconsider our proposal. Accordingly, we are defining the Central California Coast steelhead DPS to include all naturally spawned populations of steelhead in coastal streams from the Russian River (inclusive) to Aptos Creek (inclusive), and the drainages of San Francisco, San Pablo, and Suisun Bays eastward to Chipps Island at the confluence of the Sacramento and San Joaquin Rivers; and tributary streams to Suisun Marsh including Suisun Creek, Green Valley Creek, and an unnamed tributary to Cordelia Slough (commonly referred to as a Red Top Creek), exclusive of the Sacramento-San Joaquin River Basin of the California Central Valley.

Two artificial propagation programs are considered to be part of the DPS (Table 1): the Don Clausen Fish Hatchery, and Kingfisher Flat Hatchery/ Scott Creek (Monterey Bay Salmon and Trout Project) steelhead hatchery programs. We have determined that these artificially propagated stocks are no more divergent relative to the local natural population(s) than what would be expected between closely related natural populations within the DPS (NMFS, 2004b, 2004c).

California Central Valley Steelhead DPS

The California Central Valley steelhead DPS includes all naturally spawned populations of steelhead in the Sacramento and San Joaquin Rivers and their tributaries, excluding steelhead from San Francisco and San Pablo Bays and their tributaries (63 FR13347; March 19, 1998). Two artificial propagation programs are considered to be part of the DPS (Table 1): the Coleman NFH, and Feather River Hatchery steelhead hatchery programs. We have determined that these artificially propagated stocks are no more divergent relative to the local natural population(s) than what would be expected between closely related natural populations within the DPS (NMFS, 2004b, 2004c).

Northern California Steelhead DPS

The Northern California *O. mykiss* ESU was previously defined to include steelhead in California coastal river basins from Redwood Creek south to the Gualala River (inclusive) (65 FR 36074; June 7, 2000). Recently, however, we have discovered that there is a coastal section between the southern boundary of this DPS (the Gualala River) and the northern boundary of the Central California Coast steelhead DPS (the Russian River) that contains several small streams that support steelhead. No genetic or other information is currently available for determining which DPS includes these small streams. As part of the November 4, 2005, notice soliciting comment on the delineation and listing of steelhead-only DPSs (70 FR 67130), we proposed to include these small streams in this Northern California steelhead DPS on a conditional basis. We did not receive any comments opposing the inclusion of these streams, nor has any information been made available that would lead us to reconsider our proposal. Accordingly, the Northern California steelhead DPS is defined to include all naturally spawned populations of steelhead in California coastal river basins from Redwood Creek southward to, but not including, the Russian River.

Two artificial propagation programs are considered part of the DPS (Table 1): the Yager Creek Hatchery, and North Fork Gualala River Hatchery (Gualala River Steelhead Project) steelhead hatchery programs. We have determined that these artificially propagated stocks are no more divergent relative to the local natural population(s) than what would be expected between closely related natural populations within the DPS (NMFS, 2004b, 2004c, 2005a).

Upper Willamette River Steelhead DPS

The Upper Willamette River steelhead DPS includes all naturally spawned populations of winter-run steelhead in the Willamette River, Oregon, and its tributaries upstream from Willamette Falls to the Calapooia River (inclusive) (64 FR 14517; March 25, 1999). This DPS does not include any artificially propagated steelhead stocks that reside within the historical geographic range of the DPS. Hatchery summer-run steelhead occur in the Willamette Basin but are an out-of-basin stock that is not included as part of the DPS.

Lower Columbia River Steelhead DPS

The Lower Columbia River steelhead DPS includes all naturally spawned populations of steelhead in streams and tributaries to the Columbia River between the Cowlitz and Wind Rivers, Washington (inclusive), and the Willamette and Hood Rivers, Oregon (inclusive). Excluded are steelhead in the upper Willamette River Basin above Willamette Falls and steelhead from the Little and Big White Salmon Rivers in Washington (62 FR 43937; August 18, 1997). Ten artificial propagation programs are considered to be part of the DPS (Table 1): the Cowlitz Trout Hatchery (in the Cispus, Upper Cowlitz, Lower Cowlitz, and Tilton Rivers), Kalama River Wild (winter- and summer-run), Clackamas Hatchery, Sandy Hatchery, and Hood River (winter- and summer-run) steelhead hatchery programs. We have determined that these artificially propagated stocks are no more divergent relative to the local natural population(s) than what would be expected between closely related natural populations within the DPS (NMFS, 2004b, 2004c, 2005a).

Middle Columbia River Steelhead DPS

The Middle Columbia River steelhead DPS includes all naturally spawned populations of steelhead in streams from above the Wind River, Washington, and the Hood River, Oregon (exclusive), upstream to, and including, the Yakima River, Washington, excluding steelhead from the Snake River Basin (64 FR 14517; March 25, 1999). Seven artificial propagation programs are considered part of the DPS (Table 1): the Touchet River Endemic, Yakima River Kelt Reconditioning Program (in Satus Creek, Toppenish Creek, Naches River, and Upper Yakima River), Umatilla River, and the Deschutes River steelhead hatchery programs. We have determined that these artificially propagated stocks are no more divergent relative to the local natural population(s) than what would be expected between closely related natural populations within the DPS (NMFS, 2004b, 2004c, 2005a).

Upper Columbia River Steelhead DPS

The Upper Columbia River steelhead DPS includes all naturally spawned populations of steelhead in streams in the Columbia River Basin upstream from the Yakima River, Washington, to the U.S.-Canada border (62 FR 43937; August 18, 1997). Six artificial propagation programs are considered part of the DPS (Table 1): the Wenatchee River, Wells Hatchery (in the Methow and Okanogan Rivers), Winthrop NFH, Omak Creek, and the Ringold steelhead hatchery programs. We have determined that these artificially propagated stocks are no more divergent relative to the local natural population(s) than what would be expected between closely related natural populations within the DPS (NMFS, 2004b, 2004c, 2005a).

Snake River Basin Steelhead DPS

The Snake River Basin steelhead DPS includes all naturally spawned populations of steelhead in streams in the Snake River Basin of southeast Washington, northeast Oregon, and Idaho (62 FR 43937; August 18, 1997). Six artificial propagation programs are considered part of the DPS (Table 1): the Tucannon River, Dworshak NFH, Lolo Creek, North Fork Clearwater, East Fork

Salmon River, and the Little Sheep Creek/Imnaha River Hatchery steelhead hatchery programs. We have determined that these artificially propagated stocks are no more divergent relative to the local natural population(s) than what would be expected between closely related natural populations within the DPS (NMFS, 2004b).

TABLE 1.—LIST OF ARTIFICIAL PROPAGATION PROGRAMS INCLUDED IN DISTINCT POPULATION SEGMENTS (DPSS) OF WEST COAST STEELHEAD (ONCORHYNCHUS MYKISS)

Artificial Propagation Program(s) Included in Steelhead Distinct Population Segments (DPSs)	Run timing	Location (State)
Southern California Steelhead DPS		
n/a		
South-Central California Coast Steelhead DPS		
n/a		
Central California Coast Steelhead DPS		
Scott Creek/Monterey Bay Salmon and Trout Project, Kingfisher Flat Hatchery.	Winter	Big Creek, Scott Creek (California).
Don Clausen Fish Hatchery	Winter	Russian River (California).
California Central Valley Steelhead DPS		
Coleman National Fish Hatchery (NFH)	Winter	Battle Creek, Sacramento River (California).
Feather River Hatchery	Winter	Feather River (California).
Northern California Steelhead DPS		
Yager Creek Hatchery	Winter	Yager Creek, Van Duzen River (California).
North Fork Gualala River Hatchery/Gualala River Steelhead Project.	Winter	North Fork Gualala River (California).
Upper Willamette River Steelhead DPS		
n/a		
Lower Columbia River Steelhead DPS		
Cowlitz Trout Hatchery	Late Winter	Cispus River (Washington).
Cowlitz Trout Hatchery	Late Winter	Upper Cowlitz River (Washington).
Cowlitz Trout Hatchery	Late Winter	Tilton River (Washington).
Cowlitz Trout Hatchery	Late Winter	Lower Cowlitz River (Washington).
Kalama River Wild	Winter	Kalama River (Washington).
Kalama River Wild	Summer	Kalama River (Washington).
Clackamas Hatchery (ODFW stock #122)	Late Winter	Clackamas River (Oregon).
Sandy Hatchery (ODFW stock #11)	Late Winter	Sandy River (Oregon).
Hood River (ODFW stock #50)	Winter	Hood River (Oregon).
Hood River (ODFW stock #50)	Summer	Hood River (Oregon).
Middle Columbia River Steelhead DPS		
Touchet River Endemic	Summer	Touchet River (Washington).
Yakima River Kelt Reconditioning Program	Summer	Satus Creek (Washington).
Yakima River Kelt Reconditioning Program	Summer	Toppenish Creek (Washington).
Yakima River Kelt Reconditioning Program	Summer	Naches River (Washington).
Yakima River Kelt Reconditioning Program	Summer	Upper Yakima River (Washington).
Umatilla River (ODFW stock #91)	Summer	Umatilla River (Oregon).
Deschutes River (ODFW stock #66)	Summer	Deschutes River (Oregon).
Upper Columbia River Steelhead DPS		
Wenatchee River Steelhead	Summer	Wenatchee River (Washington).
Wells Hatchery Steelhead	Summer	Methow River (Washington).
Wells Hatchery Steelhead	Summer	Okanogan River (Washington).
Winthrop NFH Steelhead (Wells Steelhead)	Summer	Methow River (Washington).
Omak Creek Steelhead	Summer	Okanogan River (Washington).
Ringold Hatchery (Wells Steelhead)	Summer	Middle Columbia River (Washington).
Snake River Basin Steelhead DPS		
Tucannon River	Summer	Tucannon River (Washington).
Dworshak NFH	Summer	South Fork Clearwater River (Idaho).
Lolo Creek	Summer	Clearwater River (Idaho).
North Fork Clearwater	Summer	North Fork Clearwater River (Idaho).

TABLE 1.—LIST OF ARTIFICIAL PROPAGATION PROGRAMS INCLUDED IN DISTINCT POPULATION SEGMENTS (DPSS) OF WEST COAST STEELHEAD (ONCORHYNCHUS MYKISS)—Continued

Artificial Propagation Program(s) Included in Steelhead Distinct Population Segments (DPSs)	Run timing	Location (State)
East Fork Salmon River	Summer	East Fork Salmon River (Idaho).
Little Sheep Creek/Imnaha River Hatchery (ODFW stock # 29)	Summer	Imnaha River (Oregon).

Assessment of Species' Status

NMFS's Pacific Salmonid BRT (an expert panel of scientists from several Federal agencies including NMFS, FWS, and the U.S. Geological Survey) reviewed the viability and extinction risk of naturally spawning populations in the 10 steelhead DPSs that are the subject of this final rule (Good *et al.*, 2005). Although the ESUs reviewed by the BRT included co-occurring populations of resident *O. mykiss*, little or no population data are available for most resident *O. mykiss* populations. The BRT's findings regarding extinction risk are based on the status of the steelhead populations in the ESUs reviewed. Where available, the BRT incorporated information about resident populations into their analyses of extinction risk, and in some instances the BRT noted the presence of speculatively abundant resident populations. However, the BRT concluded that the contribution of the resident life-history form to the viability of an *O. mykiss* ESU in-total is unknown and may not substantially reduce extinction risks to an ESU in-total. Therefore, the BRT's extinction risk findings directly inform evaluations of extinction risk for the steelhead DPSs under consideration.

We assessed effects of hatchery programs on the extinction risk of a DPS in-total on the basis of the factors that the BRT determined are currently limiting the DPS (*e.g.*, abundance, productivity, spatial structure, and diversity) and how artificial propagation efforts within the DPS affect those factors. The APEW (NMFS, 2004c) reviewed the BRT's findings (NMFS, 2003; Good *et al.*, 2005), evaluated the Salmonid Hatchery Inventory and Effects Evaluation Report (NMFS, 2004b), and assessed the overall extinction risk of DPSs with associated hatchery stocks. Below we summarize the status information for the steelhead DPSs under consideration. The reader is referred to the BRT's report (Good *et al.*, 2005), the Salmonid Hatchery Inventory and Effects Evaluation Report (NMFS, 2004b), and the APEW Report (NMFS, 2004c) for more detailed descriptions of the viability of individual natural populations and hatchery stocks within these DPSs.

In its analysis of the status of the *O. mykiss* ESUs, the BRT voted on whether each was ''in danger of extinction,'' ''likely to become endangered in the foreseeable future,'' or ''not warranted.'' While these categories correspond to the statutory definitions of ''endangered'' or ''threatened,'' they do not amount to an agency determination that any of the entities under consideration are an endangered species or a threatened species under the ESA. To make the ESA determination, we also considered the extent to which hatchery populations affect the extinction risk assessed by the BRT as well as the effect of any protective efforts being made by any state or foreign nation.

Southern California Steelhead DPS

Assessing the extinction risk for Southern California steelhead is made difficult by the general lack of historical or recent data for this DPS, and the uncertainty generated by this paucity of information. The historical steelhead run for four of the major river systems within the range of the DPS is estimated to have been between 32,000 and 46,000 adults. Recent run size for the same four systems, however, has been estimated to be fewer than 500 total adults. Run sizes in river systems within the DPS are believed to range between less than five anadromous adults per year, to less than 100 anadromous adults per year. The available data are insufficient to estimate abundance levels or trends in productivity. Of 65 river drainages where steelhead are known to have occurred historically, between 26 and 52 percent are still occupied (uncertainty in this estimate is the result of the inaccessibility of 17 basins to population surveys). Colonization events of steelhead were documented during 1996–2002 in Topanga and San Mateo Creeks. These colonization events were represented by a few spawning adults or the observation of a single individual. Twenty-two basins are considered vacant, extirpated, or nearly extirpated due to dewatering or the establishment of impassable barriers below all spawning habitats. Except for the colonization of a small population in San Mateo Creek in northern San Diego County, steelhead appear to have been completely extirpated from nearly all systems in the southern portion of the range of the DPS from Malibu Creek to the Mexican border. Recently, documentation of the presence and spawning of steelhead in two streams south of Malibu Creek (in Topanga and San Mateo Creeks) prompted the extension of the DPS's boundaries to the U.S.-Mexico border in 2002 (67 FR 21586; May 1, 2002).

The BRT found extremely high risks to the abundance, productivity, spatial structure, and diversity of the DPS. Informed by this assessment, the strong majority opinion of the BRT was that the Southern California steelhead DPS is ''in danger of extinction.'' The minority opinion was that the DPS is ''likely to become endangered within the foreseeable future.'' There are no artificially propagated stocks of steelhead that mitigate the BRT's assessment that the DPS is ''in danger of extinction.''

South-Central California Coast Steelhead DPS

There is a paucity of abundance information for the South-Central California Coast steelhead DPS. Data are not available for the two largest river systems within the range of the DPS, the Pajaro and Salinas basins. These systems are much degraded and are expected to have steelhead runs reduced in size from historical levels. Data available for the Carmel River underscore the population's vulnerability to drought conditions, as well as its dependence on the intensive management of the river system. The most recent 5-year mean abundance of fish in the Carmel River is approximately 600 adults. Despite observed and inferred declines in abundance, the current spatial distribution of steelhead populations in the DPS does not appear to be much reduced from what occurred historically. Steelhead are present in approximately 86 to 95 percent of historically occupied streams (the uncertainty in the estimated occupancy is due to three streams that could not be accessed for population surveys). The BRT was concerned, however, that the larger Pajaro and Salinas basins are spatially and ecologically distinct from other populations in the DPS, such that further degradation of these areas will negatively impact the DPS's spatial structure and diversity. The BRT found high risks to the abundance, productivity, and the diversity of the DPS, and expressed concern particularly for the DPS's connectivity and spatial structure. Informed by this assessment, the strong majority opinion of the BRT was that the South-Central Coast steelhead DPS is ''likely to become endangered within the foreseeable future.'' The minority opinion was that the DPS is ''in danger of extinction.'' There are no artificially propagated stocks of steelhead that mitigate the BRT's assessment that the DPS is ''likely to become endangered within the foreseeable future.''

Central California Coast Steelhead DPS

There are no time series of population abundance data for the naturally spawning component of the Central California Coast steelhead DPS. The naturally spawning population in the largest river system in the DPS, the Russian River, is believed to have declined seven-fold since the mid-1960s. Juvenile density information is available for five ''representative'' populations, and each exhibits a decline in juvenile density over the last 8 years of available data. Predation by increasing numbers of California sea lions at river mouths and during the ocean phase was noted as a recent development also posing significant risk. Juvenile *O. mykiss* have been observed in approximately 82 percent of historically occupied streams, indicating that the DPS continues to be spatially well distributed. However, impassable dams have cut off substantial portions of spawning habitat in some basins, generating concern about the spatial structure of the naturally spawning component of the DPS. The BRT found moderately high risk to the abundance and productivity of the DPS, and comparatively less risk for the DPS's spatial structure and diversity. Informed by this risk assessment, the majority opinion of the BRT was that the naturally spawned component of the Central California Coast steelhead DPS is ''likely to become endangered within the foreseeable future.'' The minority opinion was that the DPS is ''in danger of extinction.''

Two artificial propagation programs are considered to be part of the Central California Coast steelhead DPS (Table 1; NMFS, 2004b, 2005a). Our assessment of the effects of these two artificial propagation programs on the viability of the DPS concluded that they decrease risk to some degree by contributing to increased abundance, but have neutral or uncertain effects on productivity, spatial structure or diversity of the DPS. Informed by the BRT's findings (Good *et al.*, 2005) and our assessment of the effects of artificial propagation programs (NMFS, 2004b, 2004c, 2005a), the APEW concluded that the Central California Coast steelhead DPS in-total is ''likely to become endangered in the foreseeable future'' (NMFS, 2004c).

California Central Valley Steelhead DPS

Little information is available regarding the viability of the naturally spawning component of the California Central Valley steelhead DPS. Steelhead spawning above the Red Bluff Diversion Dam (RBDD) have a small population size (the most recent 5-year mean is less than 2,000 adults) and exhibit strongly negative trends in abundance and productivity. However, there have not been any escapement estimates made for the area above RBDD since the mid 1990s. The only recent DPS-level estimate of abundance is a crude extrapolation from the incidental catch of out-migrating juvenile steelhead captured in a midwater-trawl sampling program for juvenile Chinook salmon below the confluence of the Sacramento and San Joaquin Rivers. The extrapolated abundance of naturally spawning female steelhead involves broad assumptions about female fecundity (number of eggs produced per female) and egg-to-smolt survival rates. Based on this extrapolation, it is estimated that on average during 1998–2000, approximately 181,000 juvenile steelhead were produced naturally each year in the Central Valley by approximately 3,600 spawning female steelhead. It is estimated that there were 1 to 2 million spawners in the Central Valley prior to 1850, and approximately 40,000 spawners in the 1960s. Although it appears that steelhead remain widely distributed in Sacramento River tributaries, the vast majority of historical spawning areas are currently above impassable dams. The BRT also expressed concern about the effects of significant production of out-of-DPS hatchery steelhead in the American (Nimbus Hatchery) and Mokelumne (Mokelumne River Hatchery) Rivers. The BRT found high risks to the abundance, productivity, and spatial structure of the DPS, and moderately high risk for the DPS's diversity. Informed by this risk assessment, the majority opinion of the BRT was that the naturally spawned component of the California Central Valley steelhead DPS is ''in danger of extinction.'' The minority opinion was that the naturally spawned component of the DPS is ''likely to become endangered within the foreseeable future.''

There are two artificial propagation programs considered to be part of the Central Valley steelhead DPS. Our assessment of the effects of these artificial propagation programs on the viability of the DPS concluded that they decrease risk to some degree by contributing to increased abundance of the DPS, but have a neutral or uncertain effect on the productivity, spatial structure and diversity of the DPS (NMFS, 2004b, 2004c, 2005a). Informed by the BRT's findings (Good *et al.*, 2005) and our assessment of the effects of artificial propagation programs (NMFS, 2004b, 2004c, 2005a), the APEW concluded that the presence of hatchery populations does not alter the BRT's conclusion that the California Central Valley steelhead DPS is ''in danger of extinction'' (NMFS, 2004c).

Northern California Steelhead DPS

There is little historical abundance information for the naturally spawning portion of the Northern California steelhead DPS. However, the available data (dam counts on the Eel and Mad Rivers) indicate a substantial decline from the abundance levels of the 1930s. The three available summer steelhead data sets exhibit recent 5-year mean abundance levels from three to 418 adults, and exhibit downward short- and long-term trends. The short- and long-term abundance trends for the one current winter steelhead data series show a slightly positive trend. However, the recent 5-year mean abundance level is extremely low (32 adults). The juvenile density data for six of 10 (putative) independent populations exhibit declining trends. Despite low abundance and downward trends, steelhead appear to be still widely distributed throughout this ESU. The BRT expressed concern about the DPS's diversity due to the low effective population sizes in the DPS, and concern over interactions with the Mad River Hatchery stock that is not considered to be part of the DPS. This hatchery program was terminated in 2004. Thus, potential genetic risks associated with propagation of this non-DPS stock will decline in the future. The BRT found high risk to the DPS's abundance, and moderately high risk for productivity. The DPS's spatial structure and diversity were of comparatively lower concern. Informed by this assessment, the majority opinion of the BRT was that the naturally spawned component of the Northern California steelhead DPS is ''likely to become endangered within the foreseeable future.'' The minority BRT opinion was split between the ''in danger of extinction'' and ''not in danger of extinction or likely to become endangered within the foreseeable future'' categories.

There are two small artificial propagation programs producing steelhead considered to be part of the Northern California steelhead DPS (Table 1; NMFS, 2004b, 2005a). Our assessment of the effects of these two artificial propagation programs on the viability of the DPS concluded that they may decrease risk to some degree by contributing to increased abundance of the DPS, but have a neutral or uncertain effect on the DPS's productivity, spatial structure and diversity (NMFS, 2004b, 2004c, 2005a). Informed by the BRT's findings (Good *et al.*, 2005) and our assessment of the effects of artificial propagation programs (NMFS, 2004b, 2004c, 2005a), the APEW concluded that the presence of the hatchery populations does not alter the BRT's conclusion that the Northern California steelhead DPS is ''likely to become endangered in the foreseeable future'' (NMFS, 2004c).

Upper Willamette River Steelhead DPS

The BRT was encouraged by significant increases in adult returns (exceeding 10,000 total fish) in 2001 and 2002 for the Upper Willamette River steelhead DPS. The recent 5-year mean abundance, however, remains low for an entire DPS (5,819 adults), and individual populations remain at low abundance. Long-term trends in abundance are negative for all populations in the DPS, reflecting a decade of consistently low returns during the 1990s. Short-term trends, buoyed by recent strong returns, are positive. Approximately one-third of the DPS's historically accessible spawning habitat is now blocked. Notwithstanding the lost spawning habitat, the DPS continues to be spatially well distributed, occupying each of the four major subbasins (the Mollala, North Santiam, South Santiam, and Calapooia Rivers). There is some uncertainty about the historical occurrence of *O. mykiss* in the Oregon Coastal Range drainages. Coastal cutthroat trout is a dominant species in the Willamette Basin, and thus *O. mykiss* is not expected to have been as abundant or widespread in this DPS as it is east of the Cascade Mountains. The BRT considered the cessation of the ''early'' winter-run hatchery program a positive sign in reducing risks to the DPS's diversity, but remained concerned that releases of non-native summer hatchery steelhead continue. The BRT found moderate risks to the DPS's abundance, productivity, spatial structure, and diversity. Based on this risk assessment, the majority opinion of the BRT was that the Upper Willamette River steelhead DPS is ''likely to become endangered within the foreseeable future.'' The minority BRT opinion was that the DPS is ''not in danger of extinction or likely to become endangered within the foreseeable future.'' There are no artificially propagated stocks of steelhead that mitigate the BRT's assessment that the DPS is ''likely to become endangered in the foreseeable future.''

Lower Columbia River Steelhead DPS

Some steelhead populations in the Lower Columbia River DPS, particularly summer-run populations, have shown encouraging increases in abundance in recent years. However, population abundance levels remain small (no population has a recent 5-year mean abundance greater than 750 spawners). The BRT could not conclusively identify a single population that is naturally viable. A number of populations have a substantial fraction of hatchery-origin spawners and are hypothesized to be sustained largely by hatchery production. Long-term trends in spawner abundance are negative for seven of nine populations for which there are sufficient data, and short-term trends are negative for five of seven populations. It is estimated that four historical populations have been extirpated or nearly extirpated, and only one-half of 23 historical populations currently exhibit appreciable natural production. Although approximately 35 percent of historical habitat has been lost within the range of this DPS due to the construction of dams or other impassable barriers, the DPS exhibits a broad spatial distribution in a variety of watersheds and habitat types. The BRT was particularly concerned about the impact on DPS diversity of the high proportion of hatchery-origin spawners in the DPS, the disproportionate declines in the summer steelhead life history, and the release of non-native hatchery summer steelhead in the Cowlitz, Toutle, Sandy, Lewis, Elochoman, Kalama, Wind, and Clackamas Rivers. The BRT found moderate risks to the ESU's abundance, productivity, spatial structure, and diversity. Informed by this assessment the majority opinion of the BRT was that the naturally spawned component of the Lower Columbia River steelhead DPS is ''likely to become endangered within the foreseeable future.'' The minority opinion was that the DPS is ''not in danger of extinction or likely to become endangered within the foreseeable future.''

There are 10 artificial propagation programs releasing hatchery steelhead that are considered to be part of this DPS (Table 1). Our assessment of the effects of artificial propagation concluded that these hatchery programs collectively do not substantially reduce the extinction risk of the DPS (NMFS, 2004b, 2004c, 2005a). Non-DPS hatchery programs in the Lower Columbia River remain a threat to the DPS's diversity. Collectively, artificial propagation programs may provide a slight beneficial effect to the DPS's abundance, spatial structure, and diversity, but uncertain effects to the DPS's productivity. Informed by the BRT's findings (Good *et al.*, 2005) and our assessment of the effects of artificial propagation programs on the viability of the DPS (NMFS, 2004b, 2004c, 2005a), the APEW concluded that the presence of the hatchery populations does not alter the BRT's conclusion that the Lower Columbia River steelhead DPS is ''likely to become endangered in the foreseeable future'' (NMFS, 2004c).

Middle Columbia River Steelhead DPS

The abundance of some natural populations in the Middle Columbia River steelhead DPS has increased substantially in recent years. The Deschutes and Upper John Day Rivers have recent 5-year mean abundance levels in excess of their respective interim recovery target abundance levels (NMFS, 2002). Due to an uncertain proportion of out-of-DPS strays in the Deschutes River, the recent increases in this population are difficult to interpret. (These interim recovery targets articulate the geometric mean of natural-origin spawners to be sustained over a period of 8 years or approximately two salmonid generations, as well as a geometric mean natural replacement rate greater than one). The Umatilla River's recent mean abundance is approximately 72 percent of its interim recovery target abundance level. The natural populations in the Yakima River, Klickitat River, Touchet River, Walla Walla River, and Fifteenmile Creek, however, remain well below their interim recovery target abundance levels. Long-term trends for 11 of the 12 production areas within the range of the DPS were negative, although it was observed that these downward trends are driven, at least in part, by a peak in returns in the middle to late 1980s, followed by relatively low escapement levels in the early 1990s. Short-term trends in the 12 production areas were mostly positive from 1990 to 2001. The continued low number of natural returns to the Yakima River (10 percent of the interim recovery target abundance level, historically a major production center for the DPS) generated concern among the BRT members. However, steelhead remain well distributed in the majority of subbasins within the range of the Middle Columbia River DPS. The presence of substantial numbers of out-of-basin (and largely out-of-DPS) natural spawners in the Deschutes River raised substantial concern regarding the genetic integrity and productivity of the native Deschutes population. The extent to which this straying is an historical natural phenomenon is unknown. The cool Deschutes River temperatures may attract fish migrating in the comparatively warmer Columbia River waters, thus inducing high stray rates. The BRT found moderate risks to the DPS's productivity, spatial structure, and diversity, with the greatest relative risk being attributed to the ESU's abundance. Informed by this assessment, the opinion of the BRT was closely divided between the ''likely to become endangered within the foreseeable future'' and ''not in danger of extinction or likely to become endangered within the foreseeable future'' categories.

There are seven hatchery steelhead programs considered to be part of the Middle Columbia River steelhead DPS. Our assessment of the effects of artificial propagation concluded that these hatchery programs collectively do not substantially reduce the extinction risk of the DPS (NMFS, 2004b, 2004c, 2005a). Informed by the BRT's findings (Good *et al.*, 2005) and our assessment of the effects of artificial propagation programs on the viability of the DPS (NMFS, 2004b, 2004c, 2005a), the APEW concluded that the presence of the hatchery populations does not alter the BRT's conclusion that the Middle Columbia River steelhead DPS in-total is ''likely to become endangered in the foreseeable future'' (NMFS, 2004c).

Upper Columbia River Steelhead DPS

Recent years have seen an encouraging increase in the number of naturally produced fish in the Upper Columbia River steelhead DPS. The 1996–2001 average return through the Priest Rapids Dam fish ladder (just below the upper Columbia steelhead production areas) was approximately 12,900 total adults (including both hatchery and natural origin fish), compared to 7,800 adults for 1992–1996. However, the recent 5-year mean abundances for naturally spawned populations in this DPS are 14 to 30 percent of their interim recovery target abundance levels. Despite increases in total abundance in the last few years, the BRT was frustrated by the general lack of detailed information regarding the productivity of natural populations. The BRT did not find data to suggest that the extremely low replacement rate of naturally spawning fish (0.25–0.30 at the time of the last status review in 1998) has appreciably improved. The predominance of hatchery-origin natural spawners (approximately 70 to 90 percent of adult returns) is a significant source of concern for the DPS's diversity and generates uncertainty in evaluating trends in natural abundance and productivity. Although the natural component of the anadromous run over Priest Rapids Dam has increased from an average of 1,040 (1992–1996) to 2,200 (1997–2001), this pattern is not consistent for other production areas within the ESU. The mean proportion of natural-origin spawners declined by 10 percent from 1992–1996 to 1997–2001. The BRT found high risk to the DPS's productivity, with comparatively lower risk to the DPS's abundance, diversity, and spatial structure. Informed by this risk assessment, the slight majority BRT opinion concerning the naturally spawned component of the Upper Columbia River steelhead DPS was in the ''in danger of extinction'' category, and the minority opinion was that the DPS is ''likely to become endangered within the foreseeable future.''

Six artificial propagation programs that produce hatchery steelhead in the Upper Columbia River Basin are considered to be part of the Upper Columbia River steelhead DPS. These programs are intended to contribute to the recovery of the DPS by increasing the abundance of natural spawners, increasing spatial distribution, and improving local adaptation and diversity (particularly with respect to the Wenatchee River steelhead). Research projects to investigate the spawner productivity of hatchery-reared fish are being developed. Some of the hatchery-reared steelhead adults that return to the basin may be in excess of spawning population needs in years of high survival conditions, potentially posing a risk to the naturally spawned populations in the DPS. The artificial propagation programs included in this DPS adhere to strict protocols for the collection, rearing, maintenance, and mating of the captive brood populations. The programs include extensive monitoring and evaluation efforts to continually evaluate the extent and implications of any genetic and behavioral differences that might emerge between the hatchery and natural stocks. Genetic evidence suggests that these hatchery stocks remain closely related to the naturally-spawned populations and maintain local genetic distinctiveness of populations within the DPS. Habitat conservation plans (HCPs, with the Chelan and Douglas Public Utility Districts) and binding mitigation agreements ensure that these programs will have secure funding and will continue into the future. These hatchery programs have undergone ESA section 7 consultation to ensure that they do not jeopardize the recovery of the DPS, and they have received ESA section 10 permits for production through 2007. Annual reports and other specific information reporting requirements are used to ensure that the terms and conditions as specified by NMFS are followed. These programs, through adherence to best professional practices, have not experienced disease outbreaks or other catastrophic losses.

Our assessment of the effects of artificial propagation on the DPS's extinction risk concluded that hatchery programs collectively mitigate the immediacy of extinction risk for the Upper Columbia River steelhead DPS in the short term, but that the contribution of these programs in the foreseeable future is uncertain (NMFS, 2004b, 2004c, 2005a). The within-DPS hatchery programs substantially increase total DPS returns, particularly in the Methow Basin where hatchery-origin fish comprise on average 92 percent of all returns. The contribution of hatchery programs to the abundance of naturally spawning fish is uncertain. The contribution of DPS hatchery programs to the productivity of the DPS is uncertain. Large numbers of hatchery-origin steelhead in excess of broodstock needs and limited habitat capacity may decrease the DPS's overall productivity. With increasing DPS abundance in recent years, naturally spawning hatchery-origin fish have expanded the spawning areas being used. Since 1996 efforts are being undertaken to establish the Wenatchee Basin programs separately from the Wells steelhead hatchery program. These efforts are expected to increase the DPS's diversity over time. There is concern that the high proportion of Wells Hatchery steelhead spawning naturally in the Methow and Okanogan basins may pose risks to the DPS' diversity by decreasing local adaptation. The Omak Creek program, although small in size, likely will increase population diversity over time. There has been concern that the early spawning components of the Methow and Wenatchee hatchery programs may represent a risk to the DPS's diversity. The recent transfer of these early-run components to the Ringold Hatchery on the mainstem Columbia River will benefit the diversity of the tributary populations, while establishing a genetic reserve on the mainstem Columbia River. Collectively, artificial propagation programs benefit DPS abundance and spatial structure, but have neutral or uncertain effects on the DPS's productivity and diversity. Benefits of artificial propagation are more substantial in the Wenatchee Basin for abundance, spatial structure, and diversity. Informed by the BRT's findings (Good *et al.*, 2005) and our assessment of the effects of artificial propagation programs (NMFS, 2004b, 2004c, 2005a), the APEW concluded that the presence of the hatchery populations alters the BRT's conclusion, and that the Upper Columbia River steelhead DPS in-total is ''likely to become endangered in the foreseeable future'' (NMFS, 2004c).

Snake River Basin Steelhead DPS

The paucity of information on adult spawning escapement for specific tributary production areas in the Snake River Basin steelhead DPS makes a quantitative assessment of viability difficult. All of the available data series are for Oregon populations; there are no data series available for the Idaho populations, which represent the majority of the DPS. Annual return estimates are limited to counts of the aggregate return over Lower Granite Dam, and spawner estimates for the Tucannon, Grande Ronde, and Imnaha Rivers. The 2001 Snake River steelhead return over Lower Granite Dam was substantially higher relative to the low levels seen in the 1990s; the recent 5-year mean abundance (14,768 natural returns) is approximately 28 percent of the interim recovery target level. The abundance surveyed in sections of the Grande Ronde, Imnaha, and Tucannon Rivers was generally improved in 2001. However, the recent 5-year abundance and productivity trends were mixed. Five of the nine available data series exhibit positive long- and short-term trends in abundance. The majority of long-term population growth rate estimates for the nine available series were below replacement. The majority of short-term population growth rates were marginally above replacement, or well below replacement, depending upon the assumption made regarding the effectiveness of hatchery fish in contributing to natural production. The BRT noted that the DPS remains spatially well distributed in each of the six major geographic areas in the Snake River Basin. The BRT was concerned that the Snake River Basin steelhead ''B-run'' (steelhead with a 2-year ocean residence and larger body size that are believed to be produced only in the Clearwater, Middle Fork Salmon, and South Fork Salmon Rivers) was particularly depressed. The BRT was also concerned about the predominance of hatchery produced fish in this DPS, the inferred displacement of naturally produced fish by hatchery-origin fish, and the potential impacts on the DPS's diversity. High straying rates exhibited by some hatchery programs generated concern about the possible homogenization of population structure and diversity within the Snake River Basin DPS. Recent efforts to improve the use of local broodstocks and release hatchery fish away from natural production areas, however, are encouraging. The BRT found moderate risks to the DPS's abundance, productivity, and diversity, and comparatively lower risk to the DPS's spatial structure. Informed by this risk assessment, the majority opinion of the BRT was that the naturally spawned component of the Snake River Basin steelhead DPS is ''likely to become endangered within the foreseeable future.'' The minority BRT opinion was split between the ''in danger of extinction'' and ''not in danger of extinction or likely to become endangered within the foreseeable future'' categories.

There are six artificial propagation programs considered to be part of the Snake River Basin steelhead DPS (Table 1). Our assessment of the effects of artificial propagation concluded that these hatchery programs collectively do not substantially reduce the extinction risk of the DPS (NMFS, 2004b, 2004c, 2005a). Informed by the BRT's findings (Good *et al.*, 2005) and our assessment of the effects of artificial propagation programs on the DPS's viability (NMFS, 2004b, 2004c, 2005a), the APEW concluded that the presence of the hatchery populations does not alter the BRT's conclusion that the Snake River Basin steelhead DPS is ''likely to become endangered in the foreseeable future'' (NMFS, 2004c).

Efforts Being Made To Protect West Coast Steelhead

Section 4(b)(1)(A) of the ESA requires the Secretary to make listing determinations solely on the basis of the best scientific and commercial data available after taking into account efforts being made to protect a species. Therefore, in making ESA listing determinations, we first assess a DPS's level of extinction risk and identify factors that have led to its decline. We then assess existing efforts being made to protect the species to determine if those measures ameliorate the risks faced by the DPS.

In the proposed rule addressing 10 *O. mykiss* ESUs, we reviewed protective efforts ranging in scope from regional conservation strategies to local watershed initiatives (see 69 FR 33102; June 14, 2004). We conclude that protective efforts collectively do not provide empirical evidence or sufficient certainty of implementation and effectiveness to substantially ameliorate the level of assessed extinction risk for all but one of the steelhead DPSs under consideration. For the California Central Valley, we concluded that conservation benefits from the CALFED, State Water Project, Central Valley Project, and California Endangered Species Act provide sufficient certainty of implementation and effectiveness to mitigate the immediacy of extinction risk facing the Central Valley steelhead DPS (see the June 14, 2004, proposed rule for a summary of the relevant protective efforts (69 FR 33102, at 33144) benefitting the California Central Valley DPS and a description of the proposed finding that these efforts mitigate the DPS's level of extinction risk (69 FR 33102, at 33163.))

While we acknowledge that many of the ongoing protective efforts for the other DPSs are likely to promote their conservation, many efforts are relatively recent, have yet to indicate their effectiveness, and few address conservation needs at scales sufficient to conserve entire DPSs. We will continue to encourage these and other future protective efforts, and we will continue to collaborate with tribal, Federal, state, and local entities to promote and improve efforts being made to protect the species.

Final Listing Determinations

Consideration of Factors Relevant to Listing

Section 4(a)(1) of the ESA and NMFS'' implementing regulations (50 CFR part 424) state that we must determine if a species is endangered or threatened because of any one or a combination of the following factors: (1) The present or threatened destruction, modification, or curtailment of its habitat or range; (2) overutilization for commercial, recreational, scientific, or educational purposes; (3) disease or predation; (4) inadequacy of existing regulatory mechanisms; or (5) other natural or man-made factors affecting its continued existence. We have previously detailed the impacts of various factors contributing to the decline of West Coast steelhead as part of our prior listing determinations (65 FR 36074, June 7, 2000; 64 FR 14517, March 25, 1999; 63 FR 42588, August 10, 1998; 63 FR 13347, March 19, 1998; 62 FR 43937, August 18, 1997), as well as in supporting technical reports (*e.g.*, Busby *et al.*, 1996; NMFS, 1996). There is no single factor solely responsible for the decline of West Coast steelhead stocks, and our prior listing determinations and technical reports concluded that all of the factors identified in section 4(a)(1) have played a role. Of these factors, the destruction and modification of habitat, overutilization for recreational purposes, and natural and man-made factors have been identified as the primary causes for the decline of West Coast steelhead. The following discussion briefly summarizes findings regarding threats across the range of West Coast steelhead. While these factors have been treated here in general terms, it is important to underscore that impacts from certain factors are more acute for specific DPSs.

1. The Present or Threatened Destruction, Modification, or Curtailment of its Habitat or Range

West Coast steelhead have experienced declines in the past several decades as a result of forestry, agricultural, mining, and urbanization activities that have resulted in the loss, degradation, simplification, and fragmentation of habitat. Water storage, withdrawal, conveyance, and diversions for agriculture, flood control, domestic, and hydropower purposes (especially in the Columbia River and Sacramento-San Joaquin River Basins) have greatly reduced or eliminated historically accessible habitat. Modification of natural flow regimes have resulted in increased water temperatures, changes in fish community structures, depleted flow necessary for migration, spawning, rearing, flushing of sediments from spawning gravels, reduced gravel recruitment and the transport of large woody debris. In addition to these indirect effects from dams and other water control structures, they have also resulted in increased direct mortality of adult and juvenile steelhead.

Natural resource use and extraction leading to habitat modification can have significant direct and indirect impacts to steelhead populations. Land use activities associated with logging, road construction, urban development, mining, agriculture, ranching, and recreation have significantly altered steelhead habitat quantity and quality. Associated impacts of these activities include: alteration of streambank and channel morphology; alteration of ambient stream water temperatures; degradation of water quality; elimination of spawning and rearing habitats; fragmentation of available habitats; elimination of downstream recruitment of spawning gravels and large woody debris; removal of riparian vegetation resulting in increased stream bank erosion; and increased sedimentation input into spawning and rearing areas resulting in the loss of channel complexity, pool habitat, suitable gravel substrate, and large woody debris. Studies indicate that in most western states, about 80 to 90 percent of the historic riparian habitat has been eliminated. Wetland and estuarine habitats have been reduced by approximately one-third in Washington and Oregon, and over 90 percent in California (Dahl, 1990; Jensen *et al.*, 1990; Barbour *et al.*, 1991; Tiner, 1991; Reynolds *et al.*, 1993). The condition of the remaining wetland habitats for West Coast steelhead is largely degraded, with many wetland areas at continued risk of loss or further degradation.

The loss and degradation of habitats and flow conditions has been identified as a threat to each of the 10 steelhead DPSs addressed in this notice. Although many historically harmful practices have been halted, much of the historical damage to habitats limiting West Coast steelhead stocks remains to be addressed, and the necessary restoration activities will likely require decades. Additionally, in some areas certain land-use practices continue to pose risks to the survival of local steelhead populations.

2. Overutilization for Commercial, Recreational, Scientific or Educational Purposes

Steelhead have been, and continue to be, an important recreational fishery throughout their range. There are no commercial fisheries for steelhead in the ocean, and they are only rarely taken there in fisheries targeting other species. The primary fisheries taking steelhead are tribal fisheries and (public) recreational fisheries. More than thirty Native American tribes have guaranteed rights to fish for steelhead under treaties with the U.S. Government. These tribal fisheries serve ceremonial and subsistence and commercial purposes. Recreational fishing for hatchery-origin steelhead is extremely popular along the West Coast. These fisheries are highly selective, and only visibly marked surplus hatchery-origin fish may be harvested.

As much as 50 percent of all fish in a given run can be intercepted in such fisheries. Mortality rates for naturally spawned fish that are caught and released in these fisheries are presumed to be low, but the actual rates are unknown, as is the level of illegal retention. In the Columbia River, steelhead fishing is regulated under Federal, tribal and state agreement. Under these agreements the total harvest rate for steelhead intended to spawn naturally has been limited to approximately 10 percent, except for Idaho B run steelhead where harvest rates are limited to below 20 percent (NMFS, 2005b). We have previously concluded that harvest is a major limiting factor for three of the 10 DPSs under review (NMFS, 2005c): the Snake River Basin, South-Central California Coast, and Southern California steelhead DPSs.

3. Disease or Predation

Infectious diseases constitute one of many factors that can influence adult and juvenile steelhead survival. Steelhead are exposed to numerous bacterial, protozoan, viral, and parasitic organisms in spawning and rearing areas, hatcheries, migratory routes, and marine environments. Specific diseases, such as bacterial kidney disease (BKD), ceratomyxosis, columnaris, furunculosis, infectious hematopoietic necrosis virus, redmouth and black spot disease, erythrocytic inclusion body syndrome, and whirling disease, among others, are present and are known to affect steelhead (Rucker *et al.*, 1953; Wood, 1979; Leek, 1987; Foott *et al.*, 1994). Very little current or historical information exists to quantify changes in infection levels and mortality rates attributable to these diseases for steelhead. However, studies have shown that naturally spawned fish tend to be less susceptible to pathogens than hatchery-reared fish (Buchanon *et al.*, 1983; Sanders *et al.*, 1992). Native salmon populations have co-evolved with specific communities of these organisms, but the widespread use of artificial propagation has introduced exotic organisms not historically present in a particular watershed. Habitat conditions such as low water flows and high temperatures can exacerbate susceptibility to infectious diseases. Aggressive hatchery reforms implemented in some areas have reduced the magnitude and distribution of hatchery fish releases, and consequently the interactions between hatchery- and natural-origin fish and the potential transmission of infectious diseases. Additionally, regulations controlling hatchery effluent discharges into streams have reduced the potential of pathogens being released into steelhead habitats.

Introduction of non-native species and modification of habitat have resulted in increased predator populations and salmonid predation in numerous river systems. Marine predation is also of concern in some areas, given the dwindling steelhead run-size in recent years. In general, predation rates on steelhead are considered by most investigators to be an insignificant contribution to the large declines observed in west coast populations. However, predation may significantly influence salmonid abundance in some local populations when other prey are absent and physical habitat conditions lead to the concentration of adults and juveniles. There is insufficient available information to suggest that the DPSs under consideration are in danger of extinction, or likely to become so in the foreseeable future, because of disease or predation.

4. The Inadequacy of Existing Regulatory Mechanisms

We reviewed existing regulatory mechanisms in the proposed rule as part of our evaluation of efforts being made to protect West Coast salmonids (69 FR 33102, at 33143; June 14, 2004). We noted several Federal, state, and local regulatory programs that have been successfully implemented to substantially reduce historical risks to West Coast steelhead DPSs (for example, the elimination of stocking hatchery rainbow trout in anadromous waters, and the conversion of many in-river recreational fisheries to catch-and-release only). The reader is referred to the proposed rule for a regional and state-by-state summary of these regulatory mechanisms. In particular, changes in regulations governing steelhead fisheries have significantly reduced the risks for many of the steelhead DPSs under consideration, although some DPSs continue to be harvested at significant rates. In addition, although there have been efforts to improve habitat conditions across the range of most of the DPSs under consideration, land use regulations across their range do not address continued threats from habitat degradation. Many of the DPSs are in danger of extinction, or threatened with endangerment, as a result of the inadequacy of existing regulatory mechanisms.

5. Other Natural or Manmade Factors Affecting Its Continued Existence

Variability in natural environmental conditions has both masked and exacerbated the problems associated with degraded and altered riverine and estuarine habitats. Floods and persistent drought conditions have reduced already limited spawning, rearing, and migration habitats. Furthermore, El Nino events and periods of unfavorable ocean-climate conditions can threaten the survival of steelhead populations already reduced to low abundance levels due to the loss and degradation of freshwater and estuarine habitats. However, periods of favorable ocean productivity and high marine survival can offset poor habitat conditions elsewhere and result in dramatic increases in population abundance and productivity (as was observed for some DPSs in recent years).

In an attempt to mitigate for lost habitat and reduced fisheries, extensive hatchery programs have been implemented throughout the range of steelhead on the West Coast. Most hatchery programs are designed to compensate for degraded habitat capacity and productivity, however, recently some hatcheries have been designed to assist in the conservation and recovery of natural populations. While some of the programs intended for mitigation purposes have been successful in providing fishing opportunities, many such programs have posed risks to the genetic diversity and long-term reproductive fitness of local natural steelhead populations. Potential threats to natural steelhead posed by hatchery programs include: excessive mortality of natural steelhead in fisheries targeting hatchery-origin steelhead; competition for prey and habitat; predation by hatchery-origin fish on younger natural fish; genetic introgression by hatchery-origin fish that spawn naturally and interbreed with local natural populations; disease transmission; degraded water quality and quantity, and impediments to fish passage imposed by hatchery facilities. Aggressive hatchery reform in some areas has halted historically harmful artificial propagation practices, and the use of conservation hatcheries may play an important role, under appropriate circumstances, in reestablishing depressed West Coast steelhead stocks. We have previously concluded that harmful hatchery practices still represent a major threat for the Southern California, California Central Valley, South-Central California Coast, Upper Willamette River, and Snake River Basin steelhead DPSs (NMFS, 2005c).

Final Conclusions Regarding ESA Listing Status

After reviewing the public comments received, independent expert reviewer comments, and other data available to us, we find that there is no substantive information that would cause us to reconsider the extinction risk assessments of the BRT (Good *et al.*, 2005) or the APEW Report's (NMFS, 2004c) conclusions regarding the contributions of hatchery programs to the viability of the subject DPSs. We conclude that the Southern California steelhead DPS is in danger of extinction throughout all or a significant portion of its range, and warrants listing as an endangered species. We conclude that the South-Central California Coast, Central California Coast, California Central Valley, Northern California, Lower Columbia River, Upper Willamette River, Middle Columbia River, Upper Columbia River, and Snake River Basin steelhead DPSs are likely to become endangered within the foreseeable future throughout all or a significant portion of their ranges. Accordingly, these nine ESUs warrant listing as threatened species.

Prohibitions and Protective Regulations

ESA section 9(a) take prohibitions (16 U.S.C. 1538(a)(1)(B)) apply to all species listed as endangered. In the case of threatened species, section 4(d) of the ESA leaves it to the Secretary's discretion whether and to what extent to extend the statutory 9(a) ''take'' prohibitions, and directs the agency to issue regulations it considers necessary and advisable for the conservation of the species. The 4(d) protective regulations may prohibit, with respect to threatened species, some or all of the acts which section 9(a) of the ESA prohibits with respect to endangered species. These 9(a) prohibitions and 4(d) regulations apply to all individuals, organizations, and agencies subject to U.S. jurisdiction.

Since 1997 we have promulgated a total of 29 ''limits'' to the ESA Section 9(a) ''take'' prohibitions for 19 threatened salmon and steelhead ESUs (62 FR 38479, July 18, 1997; 65 FR 42422, July 10, 2000; 65 FR 42485, July 10, 2000; 67 FR 1116, January 9, 2002). On June 28, 2005, as part of the final listing determinations for 16 West Coast salmon ESUs, we amended and streamlined the previously promulgated 4(d) protective regulations for threatened salmon and steelhead (70 FR 37160). We finalized an amendment to provide the necessary flexibility to ensure that fisheries and artificial propagation programs are managed consistently with the conservation needs of threatened salmon and steelhead. Under this change the section 4(d) protections apply to natural and hatchery fish with an intact adipose fin, but not to listed hatchery fish that have had their adipose fin removed prior to release into the wild. Additionally, we made several simplifying and clarifying changes to the ESA 4(d) protective regulations including updating an expired limit (section 223.203(b)(2)) providing a temporary exemption for ongoing research and enhancement activities with pending applications through December 2005, and extending the same set of 14 limits to all threatened salmon and steelhead. With respect to steelhead, the amended June 2005 4(d) rule applies to the steelhead being listed as threatened in the following eight DPSs: The South-Central California, Central California Coast, California Central Valley, Northern California, Upper Willamette River, Lower Columbia River, Middle Columbia River, and Snake River Basin steelhead DPSs.

Protective Regulations for the Upper Columbia River Steelhead DPS

The Upper Columbia River steelhead ESU is currently listed as endangered and subject to the section 9(a) take prohibitions. With the new listing of the Upper Columbia River steelhead DPS as a threatened species, the existing 4(d) protective regulations do not apply to this DPS. As part of the June 14, 2004, proposed threatened determination for the Upper Columbia River *O. mykiss* ESU (69 FR 33102), we also proposed extending to this ESU the amended 4(d) protective regulations that were subsequently finalized in June 2005 (70 FR 37160; June 28, 2005). We will finalize the protective regulations for the threatened Upper Columbia River steelhead DPS in a subsequent **Federal Register** notice.

Identification of Those Activities That Would Constitute a Violation of Section 9 of the ESA

We and the FWS published in the **Federal Register** on July 1, 1994 (59 FR 34272), a policy that we shall identify, to the maximum extent practicable at the time a species is listed, those activities that would or would not constitute a violation of section 9 of the ESA. The intent of this policy is to increase public awareness of the effect of this listing on proposed and ongoing activities within the species' range. At the time of the final rule, we must identify to the extent known specific activities that will not be considered likely to result in violation of section 9, as well as activities that will be considered likely to result in violation. We believe that, based on the best available information, the following actions will not result in a violation of section 9:

1. Possession of steelhead from any DPS that is listed as threatened or endangered that are acquired lawfully by permit issued by us pursuant to section 10 of the ESA, or by the terms of an incidental take statement issued pursuant to section 7 of the ESA; or
2. Federally funded or approved projects that involve activities such as silviculture, grazing, mining, road construction, dam construction and operation, discharge of fill material, stream channelization or diversion for which section 7 consultation has been completed, and when activities are conducted in accordance with any terms and conditions provided by us in an incidental take statement accompanying a biological opinion.

Activities that we believe could potentially ''harm'' steelhead (see 50 CFR 222.102) in the listed DPSs, and result in a violation of the section 9 take prohibition include, but are not limited to:

1. Land-use activities that adversely affect steelhead habitats for any listed DPS (*e.g.*, logging, grazing, farming, urban development, road construction in riparian areas and areas susceptible to mass wasting and surface erosion);
2. Destruction/alteration of the steelhead habitats for any listed DPS, such as removal of large woody debris and '''sinker logs''' or riparian shade canopy, dredging, discharge of fill material, draining, ditching, diverting, blocking, or altering stream channels or surface or ground water flow;
3. Discharges or dumping of toxic chemicals or other pollutants (*e.g.*, sewage, oil, gasoline) into waters or riparian areas supporting listed steelhead DPSs;
4. Violation of discharge permits;
5. Application of pesticides affecting water quality or riparian areas for listed steelhead DPSs;
6. Interstate and foreign commerce of steelhead from any of the listed DPSs and import/export of steelhead from any listed DPS without a threatened or endangered species permit;
7. Collecting or handling of steelhead from any of the listed DPSs. Permits to conduct these activities are available for purposes of scientific research or to enhance the conservation or survival of the species; or
8. Introduction of non-native species likely to prey on steelhead from any of the listed DPSs or displace them from their habitats.

This list is not exhaustive. It is intended to provide some examples of the types of activities that might be considered by us as constituting a take of steelhead in any of the listed DPSs under the ESA and its regulations. Questions regarding whether specific activities will constitute a violation of the section 9 take prohibitions and general inquiries regarding prohibitions and permits, should be directed to us (*see* ADDRESSES).

Effective Date of the Final Listing Determinations

Given the cultural, scientific, and recreational importance of West Coast steelhead, and the broad geographic range of these DPSs, we recognize that numerous parties may be affected by these final listing determinations. Therefore, to permit an orderly implementation of the consultation requirements associated with these determinations, the final listings will take effect on February 6, 2006.

Critical Habitat

On September 2, 2005, we issued final critical habitat designations for 19 West Coast salmon and steelhead ESUs, including the Southern California, South-Central California, Central California Coast, California Central Valley, Northern California, Upper Willamette River, Lower Columbia River, Middle Columbia River, Upper Columbia River, and Snake River Basin steelhead ESUs (70 FR 52488 and 52630). At the time of these final critical habitat designations for steelhead we had proposed including co-occurring resident *O. mykiss* as part of the ESUs; however, a Consent Decree governing the schedule for the final designations required that they be completed for the ESUs as they were listed as of August 15, 2005. As noted above in the ''Background'' section, the existing listings for steelhead ESUs promulgated between 1997–2000 include only the anadromous life-history form (for more detailed ESU-specific information the reader is referred to the summary of, and **Federal Register** citations for, the previous steelhead listing determinations provided in 69 FR 33102, June 14, 2004). Accordingly, the final critical habitat designations are restricted to the species' anadromous range, and are coextensive with the steelhead-only DPS delineations described in this notice. Whereas the final critical habitat designations may have warranted revision for the proposed *O. mykiss* ESUs including both the resident and anadromous life-history forms, the final critical habitat designations do not require revision for the proposed steelhead-only DPSs (NMFS, 2005d).

Classification

National Environmental Policy Act (NEPA)

ESA listing decisions are exempt from the requirements to prepare an environmental assessment or environmental impact statement under the NEPA. See NOAA Administrative Order 216–6.03(e)(1) and *Pacific Legal Foundation* v. *Andrus,* 675 F. 2d 825 (6th Cir. 1981). Thus, we have determined that the final listing determinations for the West Coast steelhead DPSs described in this document are exempt from the requirements of the NEPA of 1969.

Executive Order (E.O.) 12866, Regulatory Flexibility Act, and Paperwork Reduction Act

As noted in the Conference Report on the 1982 amendments to the ESA, economic impacts cannot be considered when assessing the status of a species. Therefore, the economic analysis requirements of the Regulatory Flexibility Act are not applicable to the final listing determinations described in this notice. In addition, this rule is exempt from review under E.O. 12866. This final determination does not contain a collection-of-information requirement for the purposes of the Paperwork Reduction Act.

E.O. 13084—Consultation and Coordination With Indian Tribal Governments

E.O. 13084 requires that if NMFS issues a regulation that significantly or uniquely affects the communities of Indian tribal governments and imposes substantial direct compliance costs on those communities, NMFS must consult with those governments or the Federal government must provide the funds necessary to pay the direct compliance costs incurred by the tribal governments. The final listing determinations described in this document do not impose substantial direct compliance costs on the communities of Indian tribal governments. Accordingly, the requirements of section 3(b) of E.O. 13084 do not apply to this final listing determination. Nonetheless, we will continue to inform potentially affected tribal governments, solicit their input, and coordinate on future management actions.

E.O. 13132—Federalism

E.O. 13132 requires agencies to take into account any federalism impacts of regulations under development. It includes specific consultation directives for situations where a regulation will preempt state law, or impose substantial direct compliance costs on state and local governments (unless required by statute). Neither of those circumstances is applicable to this final listing determination. In keeping with the intent of the Administration and Congress to provide continuing and meaningful dialogue on issues of mutual state and Federal interest, the proposed rule was provided to the relevant agencies in each state in which the subject species occurs, and these agencies were invited to comment.

References

A complete list of all references cited herein is available upon request (*see* **ADDRESSES**), or can be obtained from the Internet at: *http://www.nwr.noaa.gov.*

List of Subjects in 50 CFR Parts 223 and 224

Endangered and threatened species.

Authority: 16 U.S.C. 1531 *et seq.*

Dated: December 22, 2005.

James W. Balsiger,

Acting Deputy Assistant Administrator for Regulatory Programs, National Marine Fisheries Service.

■ For the reasons set out in the preamble, 50 CFR parts 223 and 224 are amended as follows:

PART 223—THREATENED MARINE AND ANADROMOUS SPECIES

■ 1. The authority citation for part 223 continues to read as follows:

Authority: 16 U.S.C. 1531–1543; subpart B, § 223.12 also issued under 16 U.S.C. 1361 *et seq.*

■ 2. In § 223.102, revise paragraphs (a)(14) though (a)(21) and add paragraph (a)(22) to read as follows:

§ 223.102 Enumeration of threatened marine and anadromous species.

* * * * *

(a) * * *

Species[1]		Where listed	Citation(s) for listing determination(s)	Citation for critical habitat designation
Common name	Scientific name			
		* * * * * * *		
(14) South-Central California Coast Steelhead.	*Oncorhynchus mykiss*	U.S.A., CA, Distinct Population Segment including all naturally spawned anadromous *O. mykiss* (steelhead) populations below natural and manmade impassable barriers in streams from the Pajaro River (inclusive) to, but not including the Santa Maria River, California.	62 FR 43937, Aug 18, 1997, Jan. 5, 2006.	70 FR 52488; September 2, 2005.

Species[1]		Where listed	Citation(s) for listing determination(s)	Citation for critical habitat designation
Common name	Scientific name			
(15) Central California Coast Steelhead.	*Oncorhynchus mykiss*	U.S.A., CA, Distinct Population Segment including all naturally spawned anadromous *O. mykiss* (steelhead) populations below natural and manmade impassable barriers in California streams from the Russian River (inclusive) to Aptos Creek (inclusive), and the drainages of San Francisco, San Pablo, and Suisun Bays eastward to Chipps Island at the confluence of the Sacramento and San Joaquin Rivers. Tributary streams to Suisun Marsh including Suisun Creek, Green Valley Creek, and an unnamed tributary to Cordelia Slough (commonly referred to as Red Top Creek), excluding the Sacramento-San Joaquin River Basin, as well as two artificial propagation programs: the Don Clausen Fish Hatchery, and Kingfisher Flat Hatchery/ Scott Creek (Monterey Bay Salmon and Trout Project) steelhead hatchery programs.	62 FR 43937, Aug. 18, 1997, Jan. 5, 2006.	70 FR 52488; September 2, 2005.
(16) California Central Valley Steelhead.	*Oncorhynchus mykiss*	U.S.A., CA, Distinct Population Segment including all naturally spawned anadromous *O. mykiss* (steelhead) populations below natural and manmade impassable barriers in the Sacramento and San Joaquin Rivers and their tributaries, excluding steelhead from San Francisco and San Pablo Bays and their tributaries, as well as two artificial propagation programs: the Coleman NFH, and Feather River Hatchery steelhead hatchery programs.	63 FR 13347; Mar. 19, 1998, Jan. 5, 2006.	70 FR 52488; September 2, 2005.
(17) Northern California Steelhead.	*Oncorhynchus mykiss*	U.S.A., CA, Distinct Population Segment including all naturally spawned anadromous *O. mykiss* (steelhead) populations below natural and manmade impassable barriers in California coastal river basins from Redwood Creek southward to, but not including, the Russian River, as well as two artificial propagation programs: the Yager Creek Hatchery, and North Fork Gualala River Hatchery (Gualala River Steelhead Project) steelhead hatchery programs.	65 FR 36074, June 7, 2000, Jan. 5, 2006.	70 FR 52488; September 2, 2005.
(18) Upper Willamette River Steelhead.	*Oncorhynchus mykiss*	U.S.A., OR, Distinct Population Segment including all naturally spawned anadromous *O. mykiss* (steelhead) populations below natural and manmade impassable barriers in the Willamette River, Oregon, and its tributaries upstream from Willamette Falls to the Calapooia River (inclusive).	62 FR 43937, Aug. 18, 1997, Jan. 5, 2006.	70 FR 52630; September 2, 2005.
(19) Lower Columbia River Steelhead.	*Oncorhynchus mykiss*	U.S.A., OR, WA, Distinct Population Segment including all naturally spawned anadromous *O. mykiss* (steelhead) populations below natural and manmade impassable barriers in streams and tributaries to the Columbia River between the Cowlitz and Wind Rivers, Washington (inclusive), and the Willamette and Hood Rivers, Oregon (inclusive), as well as ten artificial propagation programs: the Cowlitz Trout Hatchery (in the Cispus, Upper Cowlitz, Lower Cowlitz, and Tilton Rivers), Kalama River Wild (winter- and summer-run), Clackamas Hatchery, Sandy Hatchery, and Hood River (winter- and summer-run) steelhead hatchery programs. Excluded are *O. mykiss* populations in the upper Willamette River Basin above Willamette Falls, Oregon, and from the Little and Big White Salmon Rivers, Washington.	63 FR 13347, Mar. 19, 1998, Jan. 5, 2006.	70 FR 52630; September 2, 2005.

Species[1]		Where listed	Citation(s) for listing determination(s)	Citation for critical habitat designation
Common name	Scientific name			
(20) Middle Columbia River Steelhead.	*Oncorhynchus mykiss*	U.S.A., OR, WA, Distinct Population Segment including all naturally spawned anadromous *O. mykiss* (steelhead) populations below natural and manmade impassable barriers in streams from above the Wind River, Washington, and the Hood River, Oregon (exclusive), upstream to, and including, the Yakima River, Washington, excluding *O. mykiss* from the Snake River Basin, as well seven artificial propagation programs: the Touchet River Endemic, Yakima River Kelt Reconditioning Program (in Satus Creek, Toppenish Creek, Naches River, and Upper Yakima River), Umatilla River, and the Deschutes River steelhead hatchery programs.	57 FR 14517, Mar. 25, 1999, Jan. 5, 2006.	70 FR 52630; September 2, 2005.
(21) Snake River Basin Steelhead.	*Oncorhynchus mykiss*	U.S.A., OR, WA, ID, Distinct Population Segment including all naturally spawned anadromous *O. mykiss* (steelhead) populations below natural and manmade impassable barriers in streams in the Snake River Basin of southeast Washington, northeast Oregon, and Idaho, as well six artificial propagation programs: the Tucannon River, Dworshak NFH, Lolo Creek, North Fork Clearwater, East Fork Salmon River, and the Little Sheep Creek/Imnaha River Hatchery steelhead hatchery programs.	62 FR 43937, Aug. 18, 1997, Jan. 5, 2006.	70 FR 52630; September 2, 2005.
(22) Upper Columbia River Steelhead.	*Oncorhynchus mykiss*	U.S.A., WA, Distinct Population Segment including all naturally spawned anadromous *O. mykiss* (steelhead) populations below natural and manmade impassable barriers in streams in the Columbia River Basin upstream from the Yakima River, Washington, to the U.S.-Canada border, as well six artificial propagation programs: the Wenatchee River, Wells Hatchery (in the Methow and Okanogan Rivers), Winthrop NFH, Omak Creek, and the Ringold steelhead hatchery programs.	62 FR 43937, Aug. 18, 1997, Jan. 5, 2006.	70 FR 52630; September 2, 2005.

[1] Species includes taxonomic species, subspecies, distinct population segments (DPSs) (for a policy statement, see 61 FR 4722, February 7, 1996), and evolutionarily significant units (ESUs) (for a policy statement, *see* 56 FR 58612, November 20, 1991).

* * * * *

PART 224—ENDANGERED MARINE AND ANADROMOUS SPECIES

■ 3. The authority citation for part 224 continues to read as follows:

Authority: 16 U.S.C. 1531–1543 and 16 U.S.C. 1361 *et seq.*

■ 4. Amend the table in § 224.101(a) by:

■ a. Removing the row with the entry for Upper Columbia River steelhead; and

■ b. Revising the entry for Southern California Steelhead to read as follows:

§ 224.101 Enumeration of endangered marine and anadromous species.

* * * * *

(a) * * *

Species[1]		Where listed	Citation(s) for listing determination(s)	Citation for critical habitat designation
Common name	Scientific name			
*	*	* * *	*	*
Southern California Steelhead.	*Oncorhynchus mykiss*	U.S.A., CA, Distinct Population Segment including all naturally spawned anadromous *O. mykiss* (steelhead) populations below natural and manmade impassable barriers in streams from the Santa Maria River, San Luis Obispo County, California, (inclusive) to the U.S.-Mexico Border.	62 FR 43937, Aug. 18, 1997, Jan. 5, 2006.	70 FR 52488; September 2, 2005.
*	*	* * *	*	*

[1] Species includes taxonomic species, subspecies, distinct population segments (DPSs) (for a policy statement, see 61 FR 4722, February 7, 1996), and evolutionarily significant units (ESUs) (for a policy statement, see 56 FR 58612, November 20, 1991).

* * * * *

[FR Doc. 06–47 Filed 1–4–06; 8:45 am]

BILLING CODE 3510–22–P

EXHIBIT 3

DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

50 CFR Parts 222, 226, and 227

[Docket No. 980225050–8050–01; I.D. 022398C]

RIN 0648–AK65

Endangered and Threatened Species: Proposed Endangered Status for Two Chinook Salmon ESUs and Proposed Threatened Status for Five Chinook Salmon ESUs; Proposed Redefinition, Threatened Status, and Revision of Critical Habitat for One Chinook Salmon ESU; Proposed Designation of Chinook Salmon Critical Habitat in California, Oregon, Washington, Idaho

AGENCY: National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration (NOAA), Commerce.

ACTION: Proposed rule; proposed redefinition; proposed designation and revision of critical habitat; request for comments.

SUMMARY: NMFS completed a comprehensive status review of west coast chinook salmon (*Oncorhynchus tshawytscha,* or *O. tshawytscha*) populations in Washington, Oregon, Idaho, and California in response to petitions filed to list chinook salmon under the Endangered Species Act (ESA). Based on this review, NMFS identified a total of 15 Evolutionarily Significant Units (ESUs) of chinook salmon within this range, including two Snake River ESUs already listed under the ESA, one previously identified ESU (mid-Columbia River summer/fall run) for which no listing was proposed, and one population (Sacramento River winter run) that was listed as a ''distinct population segment'' prior to the formulation of the NMFS ESU policy. With respect to the 12 ESUs that are the subject of this proposed rule, NMFS has concluded that two ESUs are at risk of extinction and five ESUs are at risk of becoming endangered in the foreseeable future. NMFS also concluded that one currently listed ESU should be redefined to include additional chinook salmon populations and that this redefined ESU is at risk of becoming endangered in the foreseeable future. NMFS also concluded that four ESUs are not at risk of extinction nor at risk of becoming endangered in the foreseeable future. Finally, NMFS also renamed the previously identified Mid-Columbia River summer/fall-run ESU as the Upper Columbia River summer/fall-run ESU.

NMFS is now issuing a proposed rule to list two ESUs as endangered, five ESUs as threatened, and to redefine one currently listed ESU to include additional chinook populations, under the ESA. The endangered chinook salmon are located in California (Central Valley spring-run ESU) and Washington (Upper Columbia River spring-run ESU). The threatened chinook salmon are dispersed throughout California, Oregon, and Washington. They include the California Central Valley fall-run ESU, the Southern Oregon and California Coastal ESU, the Puget Sound ESU, the Lower Columbia River ESU, and the Upper Willamette River ESU. NMFS also proposes to redefine the Snake River fall-run chinook salmon ESU to include fall chinook salmon populations in the Deschutes River, and proposes to list this redefined ESU as a threatened species. This proposal does not affect the current definition and threatened status of the listed Snake River fall chinook salmon ESU.

In each ESU identified as threatened or endangered, only naturally spawned, non-introduced chinook salmon are proposed for listing. Prior to the final listing determinations, NMFS will examine the relationship between hatchery and natural populations of chinook salmon in these ESUs and assess whether any hatchery populations are essential for the recovery of the natural populations and thus will be listed.

NMFS is proposing to designate critical habitat for the chinook salmon ESUs newly proposed for listing within this notice, and for the Snake River fall-run ESU, proposing to revise its existing critical habitat. At this time, proposed critical habitat for these ESUs is the species' current freshwater and estuarine range, certain marine areas, and includes all waterways, substrate, and adjacent riparian zones below longstanding, impassible, natural barriers.

NMFS is requesting public comments on the issues pertaining to this proposed rule. NMFS is also requesting suggestions and comments on integrated local/state/tribal/Federal conservation measures that will achieve the purposes of the ESA to recover the health of chinook salmon populations and the ecosystems upon which they depend. Should the proposed listing be made final, NMFS will adopt protective regulations and a recovery plan under the ESA.

DATES: Comments must be received by June 8, 1998. NMFS will announce the dates and locations of public hearings in Washington, Oregon, Idaho, and California in a forthcoming **Federal Register** notice. Requests for additional public hearings must be received by April 23, 1998.

ADDRESSES: Comments on this proposed rule, requests for reference materials, and requests for public hearings should be sent to Chief, Protected Species Division, NMFS, 525 NE Oregon Street, Suite 500, Portland, OR 97232–2737.

FOR FURTHER INFORMATION CONTACT: Garth Griffin, 503–231–2005, Craig Wingert, 562–980–4021, or Joe Blum, 301–713–1401.

SUPPLEMENTARY INFORMATION:

Previous Federal ESA Actions Related to West Coast Chinook

West Coast chinook salmon have been the subject of many Federal ESA actions. In November 1985, NMFS received a petition to list Sacramento River winter-run chinook salmon from the American Fisheries Society (AFS). NMFS determined that the petitioned action might be warranted and announced it would conduct a review of the run's status (51 FR 5391, February 13, 1986). In its status review, NMFS determined that Sacramento River winter-run chinook salmon was a ''species'' for the purposes of the ESA, but based upon the conservation and restoration efforts by California and other Federal resource agencies, declined to list the winter-run chinook at that time (52 FR 6041, February 27, 1987). Subsequent low returns prompted NMFS to adopt an emergency rule listing Sacramento River winter-run chinook salmon as a threatened species under the ESA (54 FR 10260, August 4, 1989). NMFS then issued a proposed rule to list Sacramento River winter-run chinook as a threatened species under the ESA (55 FR 102260, March 20, 1990), and also published a second emergency rule listing the winter-run chinook as threatened to avoid any lapse in ESA protections while considering the proposed rule (55 FR 12191, April 2, 1990). On November 5, 1990, NMFS completed its listing determination for Sacramento River winter-run chinook, and published a final rule listing the run as a threatened species under the ESA (55 FR 46515).

In June 1991, AFS petitioned NMFS to reclassify the winter-run as an endangered species. Based on the information submitted by AFS, and after reviewing all other available data, NMFS determined that the petitioned action may be warranted, and announced its intention to review the status of the winter-run chinook (56 FR 58986, November 7, 1991), and then published a proposed rule to reclassify winter-run chinook salmon as endangered under the ESA (57 FR 27416, June 19, 1992). Critical habitat for Sacramento winter-run chinook salmon was designated on June 16, 1993 (58 FR 33212). After several extensions of the listing determination and the comment period, NMFS finalized its proposed rule and re-classified the winter-run chinook as an endangered species under the ESA (59 FR 440, January 4, 1994).

While NMFS was reviewing and reclassifying the status of Sacramento River chinook, NMFS also received a petition from Oregon Trout and five co-petitioners on June 7, 1990, to list Snake River spring/summer and fall chinook salmon as threatened species under the ESA. On September 11, 1990, NMFS determined that the petition presented substantial scientific information indicating that the proposed action may be warranted, and initiated a status review (55 FR 37342). NMFS published a proposed rule listing two Snake River chinook salmon runs as threatened under the ESA on June 27, 1991 (56 FR 29542 and 56 FR 29547). NMFS finalized its rule listing these Snake River chinook salmon runs as threatened species on April 22, 1992 (57 FR 14653).

Meanwhile, on June 3, 1993, American Rivers and 10 other organizations petitioned NMFS to add Mid-Columbia River summer chinook salmon to the list of endangered species. NMFS determined that this petition presented substantial scientific information indicating that the petitioned action may be warranted, and initiated a status review (58 FR 46944, September 3, 1993). Subsequently, NMFS determined that mid-Columbia River summer chinook salmon did not qualify as an ESU, and therefore was not a ‘‘distinct population segment’’ under the ESA (59 FR 48855, September 23, 1994). However, NMFS determined that mid-Columbia River summer chinook salmon were part of a larger ESU that included all late-run (summer and fall) Columbia River chinook salmon between McNary and Chief Joseph dams. NMFS also concluded that this ESU did not warrant listing as a threatened or endangered species (59 FR 48855, September 23, 1994).

Immediately prior to that determination, NMFS determined that a petition filed on March 14, 1994, by Professional Resources Organization-Salmon (PRO-Salmon) to list various populations of chinook salmon in Washington contained substantial scientific information indicating that the petitioned action may be warranted (59 FR 46808, September 12, 1994). NMFS then announced that it would commence a coast-wide status review of all west coast chinook salmon (59 FR 46808). Shortly after initiating this comprehensive coast wide status review for chinook and other salmon species, NMFS received a petition from Oregon Natural Resource Council and Dr. Richard Nawa on February 1, 1995, to list chinook salmon throughout its range. NMFS determined that this petition contained substantial scientific information indicating that the petitioned action may be warranted, and reconfirmed its intention to conduct a comprehensive coast wide status review of west coast chinook salmon (60 FR 30263, June 8, 1995).

In the intervening period between the two most recent petitions to list various populations of west coast chinook salmon, NMFS published an emergency rule on August 18, 1994 (59 FR 42529) after determining that the status of Snake River spring/summer-run and Snake River fall-run chinook salmon warranted reclassification as endangered, based on projected declines and low abundance levels of adult chinook salmon. Because emergency rules under the ESA have a maximum duration of 240 days (see 16 U.S.C. 1533(b)(7) and 50 CFR § 424.20(a)), NMFS published a proposed rule reclassifying listed Snake River spring/summer-run and Snake River fall-run chinook salmon ESUs as endangered on December 28, 1994 (59 FR 66784). Since publishing that proposed rule, a congressional moratorium on listing activities, a large ESA listing determination backlog and other delays prevented NMFS from completing its assessment of the proposed rule. During this period, abundance of both stocks of Snake River chinook salmon has increased. Based on these increases, along with improved management activities affecting these chinook salmon, NMFS concluded that the risks facing these chinook salmon ESUs are lower than they were at the time of the proposed rule, and thus NMFS withdrew the proposed reclassification (63 FR 1807, January 12, 1998).

During the coast wide chinook salmon status review initiated in September, 1994, NMFS assessed the best available scientific and commercial data, including technical information from Pacific Salmon Biological Technical Committees (PSBTCs) and interested parties in Washington, Oregon, Idaho, and California. The PSBTCs consisted primarily of scientists (from Federal, state, and local resource agencies, Indian tribes, industries, universities, professional societies, and public interest groups) possessing technical expertise relevant to chinook salmon and their habitats.

A NMFS Biological Review Team, composed of scientists from NMFS' Northwest and Southwest Fisheries Science Centers, NMFS' Northwest and Southwest Regional Offices, as well as a representative of the National Biological Service, completed a coast wide status review for chinook salmon [Memorandum to W. Stelle and W. Hogarth from M. Schiewe, December 18, 1997, Chinook Salmon Status Review Report]. The review (summary follows) evaluates the status of 15 chinook salmon ESUs in the four states. The complete results of NMFS' status review for chinook salmon populations will be published in a forthcoming NOAA Technical Memorandum (Myers et al., 1998).

Chinook Salmon Life History and Ecology

Chinook salmon (*O. tshawytscha*) are easily distinguished from other *Oncorhynchus* species by their large size. Adults weighing over 120 pounds have been caught in North American waters. Chinook salmon are very similar to coho salmon (*O. kisutch*) in appearance while at sea (blue-green back with silver flanks), except for their large size, small black spots on both lobes of the tail, and black pigment along the base of the teeth. Chinook salmon are anadromous and semelparous. This means that as adults, they migrate from a marine environment into the fresh water streams and rivers of their birth (anadromous) where they spawn and die (semelparous). Adult female chinook will prepare a spawning bed, called a redd, in a stream area with suitable gravel composition, water depth and velocity. Redds will vary widely in size and in location within the stream or river. The adult female chinook may deposit eggs in 4 to 5 ‘‘nesting pockets’’ within a single redd. After laying eggs in a redd, adult chinook will guard the redd from 4 to 25 days before dying. Chinook salmon eggs will hatch, depending upon water temperatures, between 90 to 150 days after deposition. Stream flow, gravel quality, and silt load all significantly influence the survival of developing chinook salmon eggs. Juvenile chinook may spend from 3 months to 2 years in freshwater after emergence and before migrating to estuarine areas as smolts, and then into the ocean to feed and mature. Historically, chinook salmon ranged as far south as the Ventura River, California, and their northern extent reaches the Russian Far East.

Among chinook salmon, two distinct races have evolved. One race, described as a ''stream-type'' chinook, is found most commonly in headwater streams. Stream-type chinook salmon have a longer freshwater residency, and perform extensive offshore migrations before returning to their natal streams in the spring or summer months. The second race is called the ''ocean-type'' chinook, which is commonly found in coastal streams in North America. Ocean-type chinook typically migrate to sea within the first three months of emergence, but they may spend up to a year in freshwater prior to emigration. They also spend their ocean life in coastal waters. Ocean-type chinook salmon return to their natal streams or rivers as spring, winter, fall, summer, and late-fall runs, but summer and fall runs predominate (Healey, 1991). The difference between these life history types is also physical, with both genetic and morphological foundations.

Juvenile stream- and ocean-type chinook salmon have adapted to different ecological niches. Ocean-type chinook salmon tend to utilize estuaries and coastal areas more extensively for juvenile rearing. The brackish water areas in estuaries also moderate physiological stress during parr-smolt transition. The development of the ocean-type life history strategy may have been a response to the limited carrying capacity of smaller stream systems and glacially scoured, unproductive, watersheds, or a means of avoiding the impact of seasonal floods in the lower portion of many watersheds (Miller and Brannon, 1982).

Stream-type juveniles are much more dependent on freshwater stream ecosystems because of their extended residence in these areas. A stream-type life history may be adapted to those watersheds, or parts of watersheds, that are more consistently productive and less susceptible to dramatic changes in water flow, or which have environmental conditions that would severely limit the success of subyearling smolts (Miller and Brannon, 1982; Healey, 1991). At the time of saltwater entry, stream-type (yearling) smolts are much larger, averaging 73–134 mm depending on the river system, than their ocean-type (subyearling) counterparts and are therefore able to move offshore relatively quickly (Healey, 1991).

Coastwide, chinook salmon remain at sea for 1 to 6 years (more commonly 2 to 4 years), with the exception of a small proportion of yearling males (called jack salmon) which mature in freshwater or return after 2 or 3 months in salt water (Rutter, 1904; Gilbert, 1912; Rich, 1920; Mullan *et al.*, 1992). Ocean- and stream-type chinook salmon are recovered differentially in coastal and mid-ocean fisheries, indicating divergent migratory routes (Healey, 1983 and 1991). Ocean-type chinook salmon tend to migrate along the coast, while stream-type chinook salmon are found far from the coast in the central North Pacific (Healey 1983 and 1991; Myers *et al.*, 1984). Differences in the ocean distribution of specific stocks may be indicative of resource partitioning and may be important to the success of the species as a whole.

There is a significant genetic influence to the freshwater component of the returning adult migratory process. A number of studies show that chinook salmon return to their natal streams with a high degree of fidelity (Rich and Holmes 1928; Quinn and Fresh, 1984; McIssac and Quinn, 1988). Salmon may have evolved this trait as a method of ensuring an adequate incubation and rearing habitat. It also provides a mechanism for reproductive isolation and local adaptation. Conversely, returning to a stream other than that of one's origin is important in colonizing new areas and responding to unfavorable or perturbed conditions at the natal stream (Quinn, 1993).

Chinook salmon stocks exhibit considerable variability in size and age of maturation, and at least some portion of this variation is genetically determined. The relationship between size and length of migration may also reflect the earlier timing of river entry and the cessation of feeding for chinook salmon stocks that migrate to the upper reaches of river systems. Body size, which is correlated with age, may be an important factor in migration and redd construction success. Roni and Quinn (1995) reported that under high density conditions on the spawning ground, natural selection may produce stocks with exceptionally large-sized returning adults.

Early researchers recorded the existence of different temporal ''runs'' or modes in the migration of chinook salmon from the ocean to freshwater. Freshwater entry and spawning timing are believed to be related to local temperature and water flow regimes (Miller and Brannon, 1982). Seasonal ''runs'' (*ie.*, spring, summer, fall, or winter) have been identified on the basis of when adult chinook salmon enter freshwater to begin their spawning migration. However, distinct runs also differ in the degree of maturation at the time of river entry, the thermal regime and flow characteristics of their spawning site, and their actual time of spawning. Egg deposition must occur at a time to ensure that fry emerge during the following spring when the river or estuary productivity is sufficient for juvenile survival and growth.

Other Life History Traits

Pathogen resistance is another locally adapted trait. Chinook salmon from the Columbia River drainage were less susceptible to *Ceratomyxa shasta*, an endemic pathogen, than stocks from coastal rivers where the disease is not known to occur (Zinn *et al.*, 1977). Alaskan and Columbia River stocks of chinook salmon exhibit different levels of susceptibility to the infectious hematopoietic necrosis virus (IHNV) (Wertheimer and Winton 1982). Variability in temperature tolerance between populations is likely due to selection for local conditions; however, there is little information on the genetic basis of this trait (Levings, 1993).

Consideration as a ''Species'' Under the ESA

To qualify for listing as a threatened or endangered species, the identified populations of chinook salmon must be considered ''species'' under the ESA. The ESA defines a ''species'' to include ''any subspecies of fish or wildlife or plants, and any distinct population segment of any species of vertebrate fish or wildlife which interbreeds when mature.'' NMFS published a policy (56 FR 58612, November 20, 1991) describing the agency's application of the ESA definition of ''species'' to anadromous Pacific salmonid species. NMFS' policy provides that a Pacific salmonid population will be considered distinct and, hence, a species under the ESA if it represents an ESU of the biological species. A population must satisfy two criteria to be considered an ESU, it must be reproductively isolated from other conspecific population units, and it must represent an important component in the evolutionary legacy of the biological species. The first criterion, reproductive isolation, need not be absolute, but must be strong enough to permit evolutionarily important differences to accrue in different population units. The second criterion is met if the population contributes substantially to the ecological and genetic diversity of the species as a whole. Guidance on the application of this policy is contained in a scientific paper ''Pacific Salmon (*Oncorhynchus* spp.) and the Definition of 'Species' under the Endangered Species Act'' (Waples, 1991) and a NOAA Technical Memorandum ''Definition of 'Species' Under the Endangered Species Act: Application to Pacific Salmon'' (NMFS F/NWC–194) which are available upon request (see **ADDRESSES**). The following sections describe the genetic, ecological, and life history characteristics, as well as human-induced genetic changes that NMFS assessed to determine the number and geographic extent of chinook salmon ESUs.

Reproductive Isolation

Genetic data provide useful indirect information on reproductive isolation because they integrate information about migration and gene flow over evolutionarily important time frames.

Genetic information obtained from allozyme, DNA, and chromosomal sampling indicate strong differentiation between chinook salmon ESUs, and were largely consistent with those described in previous studies of chinook salmon. Puget Sound populations of chinook salmon appear to constitute a genetically distinct group, a conclusion that is consistent with the results of Utter *et al.* (1989) and Marshall *et al.* (1995). In NMFS' analyses, Washington coastal populations appeared to form a genetically distinct group that was most similar to, but still distinct from, Oregon coastal populations. The Washington coastal group included the Hoko River population in the western part of the Strait of Juan de Fuca. Chinook salmon in the Elwha River, which also drains into the Strait of Juan de Fuca, were genetically intermediate between Puget Sound and Washington coastal populations.

Chinook salmon populations in the Columbia and Snake Rivers appear to be separated into two large genetic groups: those producing ocean-type outmigrants and those producing stream-type outmigrants. The first group includes populations in lower Columbia River tributaries, with both spring-run and fall-run (''tule'') life histories. These ocean-type populations exhibit a range of juvenile life history patterns that appear to depend on local environmental conditions. The Willamette River hatchery populations form a distinct subgroup within the lower Columbia River group. Ocean-type chinook salmon populations east of the Cascade Range Crest include both summer-and fall-run (''bright'') populations, and are genetically distinct from lower Columbia River ocean-type populations. Fall-run populations in the Snake River, Deschutes River, and Marion Drain (Yakima River) form a distinct subgroup.

The second major group of chinook salmon in the Columbia and Snake River drainage consists of spring- or summer-run fish. Based on analysis of genetic clusters, three relatively distinct subgroups appeared within these stream-type populations. One subgroup includes spring-run populations in the Klickitat, John Day, Deschutes, and Yakima Rivers of the mid-Columbia River. A second subgroup includes upper Columbia River spring-run chinook salmon in the Wenatchee and Methow Rivers, but also includes spring-run fish in the Grande Ronde River and Carson Hatchery. This is likely due to the releases of exotic Carson hatchery stock in these basins, rather than to natural genetic similarities. A third subgroup consists of Snake River spring- and summer-run populations in the Imnaha and Salmon Rivers, as well as those in the Rapid River and Lookingglass Hatcheries. The Klickitat River spring-run population appears to be genetically intermediate between upper and lower Columbia River groups.

All populations of chinook salmon south of the Columbia River drainage appear to consist of ocean-type fish. Populations along the north coast of Oregon form a genetically distinct group, consisting of populations north of and including the Elk River, except for the Rock Creek Hatchery spring-run population, which show greater genetic affinity to southern Oregon coastal populations. A southern coastal group includes populations south of the Elk River to and including populations in the lower Klamath River in northern California. However, Euchre Creek, which is located near the Rogue River and has been planted extensively with Elk River stock, is more similar to populations north of Cape Blanco. Upper Klamath River populations of chinook salmon are genetically distinct from other northern California, southern Oregon and California Central Valley populations.

Sacramento and San Joaquin River populations are genetically distinct from northern California coastal and Klamath River populations. Previous studies grouped populations in the Sacramento River with those in the San Joaquin River (Utter et al., 1989; Bartley and Gall, 1990; Bartley et al., 1992). However, Hedgecock et al. (1995), Banks (1996), and Nielsen (1995 and 1997) surveyed DNA markers and these results indicate that the winter, spring, fall, and late-fall runs may be genetically distinct from one another.

Genetic Changes Due to Human Activities

The effects of artificial propagation and other human activities such as harvest and habitat modification, can be relevant to ESA listing determinations in two ways. First, such activities can genetically change natural populations so much that they no longer represent an evolutionarily significant component of the biological species (Waples, 1991). For example, in 1991, NMFS concluded that, as a result of massive and prolonged effects of artificial propagation, harvest, and habitat degradation, the agency could not identify natural populations of coho salmon (*O. kisutch*) in the lower Columbia River that qualified for ESA listing consideration (56 FR 29553, June 27, 1991). Second, risks to the viability and genetic integrity of native salmon populations posed by human activities may contribute to their threatened or endangered status (Goodman, 1990; Hard et al., 1992). The severity of these effects on natural populations depends both on the nature of the effects (e.g., harvest rate, gear size, or type of hatchery practice) and their magnitude (e.g., duration of a hatchery program and number and life-history stage of hatchery fish involved).

For example, artificial propagation is a common practice to supplement chinook salmon stocks for commercial and recreational fisheries. However, in many areas, a significant portion of the naturally spawning population consists of hatchery-produced chinook salmon. In several of the chinook salmon ESUs, over 50 percent of the naturally spawning fish are from hatcheries. Many of these hatchery-produced fish are derived from a few stocks which may or may not have originated from the geographic area where they are released. However, in several of the ESUs analyzed, insufficient or uncertain information exists regarding the interactions between hatchery and natural fish, and the relative abundance of hatchery and natural stocks.

Artificial propagation is important to consider in ESA evaluations of anadromous Pacific salmonids for several reasons. First, although natural fish are the focus of ESU determinations, possible effects of artificial propagation on natural populations must also be evaluated. For example, stock transfers might change the genetic bases or phenotypic expression of life history characteristics in a natural population in such a way that the population might seem either less or more distinctive than it was historically. Artificial propagation can also alter life history characteristics such as smolt age and migration and spawn timing (e.g., Crawford, 1979, NRC 1996). Second, artificial propagation poses a number of risks to natural populations that may affect their risk of extinction or endangerment. Finally, if any natural populations are listed under the ESA, then it will be necessary to determine the ESA status of all associated hatchery populations. This latter determination would be made following a proposed listing and is not considered further in this document.

The impacts of hatchery activities on specific ESUs is discussed in the Status of Chinook Salmon ESUs and Summary of Factors Affecting the Species sections.

Ecological and Genetic Diversity

Several types of physical and biological evidence were considered in evaluating the contribution of chinook salmon from Washington, Oregon, Idaho, and California to the ecological and genetic diversity of the biological species throughout its range. Factors examined included: (1) The physical environment—geology, soil type, air temperature, precipitation, river flow patterns, water temperature, and vegetation; (2) biogeography—marine, estuarine, and freshwater fish distributions; and (3) life history traits—age at smolting, age at spawning, river entry timing, and spawning timing. An analysis of the physical environment and life history traits provides important insight into the ecological and genetic diversity of the species and can reflect unusual or distinctive adaptations that promote evolutionary processes.

The predominant differentiation in chinook salmon life history types is that between ocean- and stream-type chinook salmon. Ocean-type populations typically migrate to the ocean in their first year of life and spend most of their marine life in coastal waters, whereas stream-type populations migrate to sea as yearlings and often make extensive ocean migrations.

In some areas within the Columbia River Basin, stream- and ocean-type chinook salmon stocks spawn in relatively close proximity to one another but are separated by run timing. Stream-type chinook salmon include spring-run populations in the Columbia River and its tributaries east of the Cascade Crest, and spring- and summer-run fish in the Snake River and its tributaries. Ocean-type chinook salmon include fall-run chinook salmon in both the Columbia and Snake River Basins, summer-run chinook salmon from the Columbia River, and spring-run fish from the lower Columbia River. There are substantial genetic differences between stream- and ocean-type chinook salmon in both the Fraser and Columbia River Basins, and the genetic analyses show clearly that the two life history forms represent two major evolutionary lineages.

Adult run-time has also long been used to identify different temporal ‘‘races’’ of chinook salmon. In cases where the run-time differences correspond to differences between stream- and ocean-type fish (e.g., in the Columbia and Fraser River Basins), relatively large genetic differences (as well as ecological and life history differences) can be found between the different runs. In most coastal areas, however, life history and genetic differences between the runs are relatively modest, relative to the larger differences used in designating other ESUs. Although many populations have some fraction of yearling migrants, all the coastal populations are part of the ocean lineage, and spring- and fall-run fish are very similar in ocean distribution.

Among basins supporting only ocean-type chinook salmon, the Sacramento River system is somewhat unusual in that its large size and ecological diversity historically allowed for substantial spatial as well as temporal separation of different runs. Genetic and life history data both suggest that considerable differentiation among the runs has occurred in this basin. The Klamath River Basin, as well as chinook salmon in Puget Sound, shares some features of coastal rivers but historically also provided an opportunity for substantial spatial separation of different temporal runs. As discussed below, the diversity in run timing made identifying ESUs difficult in the Klamath and Sacramento River Basins.

NMFS considers differences in life history traits as a possible indicator of adaptation to different environmental regimes and resource partitioning within those regimes. The relevance of the ecologic and genetic basis for specific chinook salmon life-history traits as they pertain to each ESU is discussed in the brief summary that follows.

ESU Determinations

The ESU determinations described here represent a synthesis of a large amount of diverse information. In general, the proposed geographic boundaries for each ESU (i.e., the watersheds within which the members of the ESU are typically found) are supported by several lines of evidence that show similar patterns. However, the diverse data sets are not always entirely congruent (nor would they be expected to be), and the proposed boundaries are not necessarily the only ones possible. For example, in some cases (e.g., in the Middle Columbia River near the Cascade Crest), environmental changes occur over a transition zone rather than abruptly.

Based on the best available scientific and commercial information, NMFS has identified 15 ESUs of chinook salmon from Washington, Oregon, Idaho, and California, including 11 new ESUs, and one redefined ESU. The 15 ESUs are briefly described and characterized below. Genetic data (from studies of protein electrophoresis and DNA) were the primary evidence considered for the reproductive isolation criterion, supplemented by inferences about barriers to migration created by natural geographic features and human-induced changes resulting from artificial propagation and harvest. Factors considered to be most informative in evaluating ecological and genetic diversity include data pertaining to the physical environment, ocean conditions and upwelling, vegetation, estuarine and freshwater fish distributions, river entry, and spawning timing.

Most of the ESUs described below include multiple spawning populations of chinook salmon, and most also extend over a considerable geographic area. This result is consistent with NMFS’ species definition paper, which states that, in general, ‘‘ESUs should correspond to more comprehensive units unless there is clear evidence that evolutionarily important differences exist between smaller population segments’’ (Waples, 1991, p. 20). However, considerable diversity in genetic or life history traits or habitat features exists within most ESUs, and maintaining this diversity is critical to their overall health. The descriptions below briefly summarize some of the notable types of diversity within each ESU, and this diversity is considered in the next section in evaluating risk to the ESUs as a whole.

(1) Sacramento River Winter-Run ESU

This run was determined to be a distinct population segment by NMFS in 1987, prior to development of the NMFS species policy. The NMFS concluded that this run meets the criteria to be considered an ESU. It includes chinook salmon entering the Sacramento River from November to June and spawning from late-April to mid-August, with a peak from May to June. No other chinook salmon populations have a similar life history pattern. In general, winter-run chinook salmon exhibit an ocean-type life-history strategy, with smolts emigrating to the ocean after 5 to 9 months of freshwater residence (Johnson et al., 1992) and remaining near the coasts of California and Oregon. Winter-run chinook salmon also mature at a relatively young age (2–3 years old). DNA analysis indicates substantial genetic differences between winter-run and other chinook salmon in the Sacramento River.

Historically, winter-run populations existed in the Upper Sacramento, Pit, McCloud, and Calaveras Rivers. The spawning habitat for these stocks was primarily located in the Sierra Nevada Ecoregion (Omernik, 1987). Construction of dams on these rivers in the 1940s led to the extirpation of populations in the San Joaquin River Basin and displaced the Sacramento River population to areas below Shasta Dam.

(2) Central Valley Spring-Run ESU

Existing populations in this ESU spawn in the Sacramento River and its tributaries. Historically, spring chinook salmon were the dominant run in the Sacramento and San Joaquin River Basins (Clark, 1929), but native populations in the San Joaquin River have apparently all been extirpated (Campbell and Moyle, 1990). This ESU includes chinook salmon entering the Sacramento River from March to July and spawning from late August through early October, with a peak in September. Spring-run fish in the Sacramento River exhibit an ocean-type life history, emigrating as fry, subyearlings, and yearlings. Recoveries of hatchery chinook salmon implanted with coded-wire-tags (CWT) are primarily from ocean fisheries off the California and Oregon coast. There were minimal differences in the ocean distribution of fall- and spring-run fish from the Feather River Hatchery (as determined by CWT analysis); however, due to hybridization that may have occurred in the hatchery between these two runs, this similarity in ocean migration may not be representative of wild runs.

Substantial ecological differences in the historical spawning habitat for spring-run versus fall- and late-fall-run fish have been recognized. Spring chinook salmon run timing was suited to gaining access to the upper reaches of river systems (up to 1,500 m elevation) prior to the onset of prohibitively high water temperatures and low flows that inhibit access to these areas during the fall. Differences in adult size, fecundity, and smolt size also occur between spring- and fall/late fall-run chinook salmon in the Sacramento River.

No allozyme data are available for naturally spawning Sacramento River spring chinook salmon. A sample from Feather River Hatchery spring-run fish, which may have undergone substantial hybridization with fall chinook salmon, shows modest (but statistically significant) differences from fall-run hatchery populations. DNA data show moderate genetic differences between the spring and fall/late-fall runs in the Sacramento River; however, these data are difficult to interpret in the context of this broad status review because comparable data are not available for other geographic regions.

(3) Central Valley Fall/Late Fall-Run ESU

This ESU includes fall and late-fall chinook salmon spawning in the Sacramento and San Joaquin Rivers and their tributaries. These populations enter the Sacramento and San Joaquin Rivers from July through April and spawn from October through February.

Both runs are ocean-type chinook salmon, emigrating predominantly as fry and subyearlings and remaining off the California coast during their ocean migration.

Sacramento/San Joaquin Basin chinook salmon are genetically and physically distinguishable from all other coastal forms (Clark, 1929; Synder, 1931). Ecologically, the Central Valley also differs in many important ways from coastal areas. There were also a number of life-history differences noted between Sacramento and San Joaquin River Basin fall/late fall-run populations. In general, San Joaquin River populations tend to mature at an earlier age and spawn later in the year than Sacramento River populations. These differences could have been phenotypic responses to the generally warmer temperature and lower flow conditions found in the San Joaquin River Basin relative to the Sacramento River Basin. There was no apparent difference in the distribution of marine CWT recoveries from Sacramento and San Joaquin River hatchery populations, nor were there genetic differences between Sacramento and San Joaquin River fall/late fall-run populations (based on DNA and allozyme analysis) of a similar magnitude to that used in distinguishing other ESUs. This apparent lack of distinguishing life history and genetic characteristics may be due, in part, to large scale transfers of Sacramento River fall/late fall-run chinook salmon into the San Joaquin River Basin.

(4) Southern Oregon and California Coastal ESU

This ESU includes all naturally spawned coastal spring and fall chinook salmon spawning from Cape Blanco (inclusive of the Elk River) to the southern extent of the current range for chinook salmon at Point Bonita (the northern landmass marking the entrance to San Francisco Bay). The Cape Blanco region is a major biogeographic boundary for numerous species (e.g., steelhead and coho salmon). Chinook salmon spawn in several small tributaries to San Francisco Bay, however it is uncertain whether these small populations are part of this ESU, or wanderers from Central Valley chinook salmon ESUs.

Chinook salmon from the Central Valley and Klamath River Basin upstream from the Trinity River confluence are genetically and ecologically distinguishable from those in this ESU. Chinook salmon in this ESU exhibit an ocean-type life-history; ocean distribution (based on marine CWT recoveries) is predominantly off of the California and Oregon coasts. Life-history information on smaller populations, especially in the southern portion of the ESU, is extremely limited. Additionally, only anecdotal or incomplete information exists on abundance of several spring-run populations including, the Chetco, Winchuck, Smith, Mad, and Eel Rivers. Allozyme data indicate that this ESU is genetically distinguishable from the Oregon Coast, Upper Klamath and Trinity River, and Central Valley ESUs. This data also shows some divergence between chinook populations north and south of the Klamath River, but the available information is incomplete to describe chinook salmon south of the Klamath River as a separate ESU. Life history differences also exist between spring- and fall-run fish in this ESU, but not to the same extent as is observed in larger inland basins.

Ecologically, the majority of the river systems in this ESU are relatively small and heavily influenced by a maritime climate. Low summer flows and high temperatures in many rivers result in seasonal physical and thermal barrier bars that block movement by anadromous fish. The Rogue River is the largest river basin in this ESU and extends inland into the Sierra Nevada and Cascades Ecoregions.

(5) Upper Klamath and Trinity Rivers ESU

Included in this ESU are all Klamath River Basin populations from the Trinity River and the Klamath River upstream from the confluence of the Trinity River. These populations include both spring- and fall-run fish that enter the Upper Klamath River Basin from March through July and July through October and spawn from late August through September and September through early January, respectively. Body morphology (vertebral counts, lateral-line scale counts, and fin-ray counts) and reproductive traits (egg size and number) for populations from the Upper Klamath River differ from those of populations in the Sacramento River Basin. Genetic analysis indicated that populations from the Upper Klamath River Basin form a unique group that is quite distinctive compared to neighboring ESUs. The Upper Klamath River crosses the Coastal Range, Sierra Nevada, and Eastern Cascades Ecoregions, although dams prevent access to the upper river headwaters of the Klamath River in the Eastern Cascades Ecoregion.

Within the Upper Klamath River Basin, there are statistically significant, but fairly modest, genetic differences between the fall and spring runs. The majority of the spring- and fall-run fish emigrate to the marine environment primarily as subyearlings. Recoveries of CWTs indicate that both runs have a coastal distribution off of the California and Oregon coasts. There was no apparent difference in the marine distribution of CWT recoveries from fall-run (Iron Gate and Trinity River Hatcheries) and spring-run populations (Trinity River Hatchery).

NMFS was concerned that the only estimate of the genetic relationship between spring and fall runs in this ESU is from a comparison of hatchery stocks that may have undergone some introgression during hatchery spawning operations, thus blurring the distinguishable traits between spring- and fall-run chinook in this ESU. NMFS acknowledges that the ESU determination should be revisited if substantial new information from natural spring-run populations becomes available.

(6) Oregon Coast ESU

This ESU contains coastal populations of spring- and fall-run chinook salmon from the Elk River north to the mouth of the Columbia River. These populations exhibit an ocean-type life-history and mature at ages 3, 4, and 5. In contrast to the more southerly ocean distribution pattern shown by populations from the lower Columbia River and farther south, CWT recoveries from populations within this ESU are predominantly from British Columbia and Alaska coastal fisheries. There is a strong genetic separation between Oregon Coast ESU populations and neighboring ESU populations. This ESU falls within the Coastal Ecoregion and is characterized by a strong maritime influence, with moderate temperatures, high precipitation levels, and easy migration access.

(7) Washington Coast ESU

Coastal populations spawning north of the Columbia River and west of the Elwha River are included in this ESU. These populations can be distinguished from those in Puget Sound by their older age at maturity and more northerly ocean distribution. Allozyme data also indicate geographical differences between populations from this area and those in Puget Sound, the Columbia River, and the Oregon coast ESUs. Populations within this ESU are ocean-type chinook salmon and generally mature at age 3, 4, and 5. Ocean distribution for these fish is more northerly than that for the Puget Sound and Lower Columbia River ESUs. The boundaries of this ESU lie within the Coastal Ecoregion, which is strongly influenced by the marine environment: high precipitation, moderate temperatures, and easy migration access.

(8) Puget Sound ESU

This ESU encompasses all naturally spawned spring, summer and fall runs of chinook salmon in the Puget Sound region from the North Fork Nooksack River to the Elwha River on the Olympic Peninsula, inclusive. Chinook salmon in this area all exhibit an ocean-type life history. Although some spring-run chinook salmon populations in the Puget Sound ESU have a high proportion of yearling smolt emigrants, the proportion varies substantially from year to year and appears to be environmentally mediated rather than genetically determined. Puget Sound stocks all tend to mature at ages 3 and 4 and exhibit similar, coastally-oriented, ocean migration patterns. There are substantial ocean distribution differences between Puget Sound and Washington coast stocks, with CWT recoveries of Washington coastal chinook found in much larger proportions from Alaskan waters. The marine distribution of Elwha River chinook salmon most closely resembled other Puget Sound stocks, rather than Washington coast stocks.

The NMFS concluded that, on the basis of substantial genetic separation, the Puget Sound ESU does not include Canadian populations of chinook salmon. Allozyme analysis of North Fork and South Fork Nooksack River spring chinook salmon identified them as outliers, but most closely allied with other Puget Sound samples. DNA analysis identified a number of markers that appear to be restricted to either the Puget Sound or Washington coastal stocks. Some allozyme markers suggested an affinity of the Elwha River population with the Washington coastal stocks, while others suggested an affinity with Puget Sound stocks.

The boundaries of the Puget Sound ESU correspond generally with the boundaries of the Puget Lowland Ecoregion. Despite being in the rainshadow of the Olympic Mountains, the river systems in the western portion of Puget Sound maintain high flow rates due to the melting snowpack in the surrounding mountains. Temperatures tend to be moderated by the marine environment. The Elwha River, which is in the Coastal Ecoregion, is the only system in this ESU which lies outside the Puget Sound Ecoregion. Furthermore, the boundary between the Washington Coast and Puget Sound ESUs (which includes the Elwha River in the Puget Sound ESU) corresponds with ESU boundaries for steelhead and coho salmon. In life history and genetic attributes, the Elwha River chinook salmon appear to be transitional between populations from Puget Sound and the Washington Coast ESU.

(9) Lower Columbia River ESU

This ESU includes all naturally spawned chinook populations from the mouth of the Columbia River to the crest of the Cascade Range, excluding populations above Willamette Falls. Celilo Falls, which corresponds to the edge of the drier Columbia Basin Ecosystem and historically may have presented a migrational barrier to chinook salmon at certain times of the year, is the eastern boundary for this ESU. Not included in this ESU are ‘‘stream-type’’ spring chinook salmon found in the Klickitat River (which are considered part of the Mid-Columbia River spring-run ESU) or the introduced Carson spring-chinook salmon. ‘‘Tule’’ fall chinook salmon in the Wind and Little White Salmon Rivers are included in this ESU, but not introduced ‘‘upriver bright’’ fall chinook salmon populations in the Wind, White Salmon, and Klickitat Rivers. Available information suggests that spring chinook salmon presently in the Clackamas and Sandy Rivers are predominantly the result of introductions from the Willamette River ESU and are thus probably not representative of spring chinook salmon found historically.

In addition to the geographic features mentioned above, genetic and life-history data were important factors in defining this ESU. Populations in this ESU are considered ocean type. Some spring-run populations have a large proportion of yearling migrants, but this trend may be biased by yearling hatchery releases. Subyearling migrants were found to contribute to the escapement. CWT recoveries for Lower Columbia River ESU populations indicate a northerly migration route, but with little contribution to the Alaskan fishery. Populations in this ESU also tend to mature at age 3 and 4, somewhat younger than populations from the coastal, upriver, and Willamette ESUs. Ecologically, the Lower Columbia River ESU crosses several ecoregions: Coastal, Willamette Valley, Cascades and East Cascades.

(10) Upper Willamette River ESU

This ESU includes naturally spawned spring-run populations above Willamette Falls. Fall chinook salmon above the Willamette Falls are introduced and although they are naturally spawning, they are not considered a population for purposes of defining this ESU. Historic, naturally spawned populations in this ESU have an unusual life history that shares features of both the stream and ocean types. Scale analysis of returning fish indicate a predominantly yearling smolt life-history and maturity at 4 years of age, but these data are primarily from hatchery fish and may not accurately reflect patterns for the natural fish. Young-of-year smolts have been found to contribute to the returning 3 year-old year class. The ocean distribution is consistent with an ocean-type life history, and CWT recoveries occur in considerable numbers in the Alaskan and British Columbian coastal fisheries. Intra-basin transfers have contributed to the homogenization of Willamette River spring chinook salmon stocks; however, Willamette River spring chinook salmon remain one of the most genetically distinctive groups of chinook salmon in the Columbia River Basin.

The geography and ecology of the Willamette Valley is considerably different from surrounding areas. Historically, the Willamette Falls offered a narrow temporal window for upriver migration, which may have promoted isolation from other Columbia River stocks.

(11) Mid-Columbia River Spring-Run ESU

Included in this ESU are stream-type chinook salmon spawning in the Klickitat, Deschutes, John Day, and Yakima Rivers. Historically, spring-run populations from the Hood, Walla Walla, and Umatilla Rivers may have also belonged in this ESU, but these populations are now considered extinct. Chinook salmon from this ESU emigrate to the ocean as yearlings and apparently migrate far off-shore, as they do not appear in appreciable numbers in any ocean fisheries. The majority of adults spawn as 4-year-olds, with the exception of fish returning to the upper tributaries of the Yakima River, which return predominantly at age 5. Populations in this ESU are genetically distinguishable from other stream-type chinook salmon in the Columbia and Snake Rivers. Streams in this region drain desert areas east of the Cascades (Columbia Basin Ecoregion) and are ecologically differentiated from the colder, less productive, glacial streams of the upper Columbia River spring-run ESU and from the generally higher elevation streams of the Snake River.

(12) Upper-Columbia River Summer- and Fall-Run ESU

This ESU was first identified as the Mid-Columbia River summer/fall chinook salmon ESU. Previously, Waknitz et al. (1995) and NMFS (1994) identified an ESU that included all ocean-type chinook salmon spawning in areas between McNary Dam and Chief Joseph Dam (59 FR 48855, September 23, 1994). However, NMFS has now concluded that the boundaries of this ESU do not extend downstream from the Snake River. In particular, NMFS concluded that Deschutes River fall chinook salmon are not part of this ESU. The ESU status of the Marion Drain population from the Yakima River is still unresolved. NMFS also identified the importance of obtaining more definitive genetic and life history information for naturally spawning fall chinook salmon elsewhere in the Yakima River drainage.

Chinook salmon from this ESU primarily emigrate to the ocean as subyearlings but mature at an older age than ocean-type chinook salmon in the Lower Columbia and Snake Rivers. Furthermore, a greater proportion of CWT recoveries for this ESU occur in the Alaskan coastal fishery than is the case for Snake River fish. The status review for Snake River fall chinook salmon (Waples et al., 1991; NMFS, 1992) also identified genetic and environmental differences between the Columbia and Snake Rivers. Substantial life history and genetic differences distinguish fish in this ESU from stream-type spring chinook salmon from the mid- and upper-Columbia Rivers.

The ESU boundaries fall within part of the Columbia Basin Ecoregion. The area is generally dry and relies on Cascade Range snowmelt for peak spring flows. Historically, this ESU likely extended farther upstream; spawning habitat was compressed down-river following construction of Grand Coulee Dam.

(13) Upper Columbia River Spring-Run ESU

This ESU includes stream-type chinook salmon spawning above Rock Island Dam—that is, those in the Wenatchee, Entiat, and Methow Rivers. All chinook salmon in the Okanogan River are apparently ocean-type and are considered part of the Upper Columbia River summer- and fall-run ESU. These upper Columbia River populations exhibit classical stream-type life-history strategies: yearling smolt emigration with only rare CWT recoveries in coastal fisheries. These populations are genetically and ecologically well separated from the summer- and fall-run populations that exist in the lower parts of many of the same river systems.

Rivers in this ESU drain the east slopes of the Cascade Range and are fed primarily by snowmelt. The waters tend to be cooler and less turbid than the Snake and Yakima Rivers to the south. Although these fish appear to be closely related genetically to stream-type chinook salmon in the Snake River, NMFS recognized substantial ecological differences between the Snake and Columbia Rivers, particularly in the upper tributaries favored by stream-type chinook salmon. Allozyme data demonstrate even larger differences between spring chinook salmon populations from the mid- and upper-Columbia River.

Artificial propagation programs have had a considerable influence on this ESU. During the Grand Coulee Fish-Maintenance Project (GCFMP, 1939–1943), all spring chinook salmon reaching Rock Island Dam, including those destined for areas above Grand Coulee Dam, were collected and they or their progeny were dispersed into streams in this ESU (Fish and Hanavan, 1948). Some ocean-type fish were undoubtedly also incorporated into this program. Spring-run escapements to the Wenatchee, Entiat, and Methow Rivers were severely depressed prior to the GCFMP but increased considerably in subsequent years, suggesting that the effects of the program may have been substantial. Subsequently, widespread transplants of Carson stock spring chinook salmon (derived from a mixture of Columbia River and Snake River stream-type chinook salmon) have also contributed to erosion of the genetic integrity of this ESU.

In spite of considerable homogenization, this ESU still represents an important genetic resource, in part because it presumably contains the last remnants of the gene pools for populations from the headwaters of the Columbia River.

(14) Snake River Fall-Run ESU

This ESU, which includes ocean-type fish, was identified in an earlier status review (Waples et al., 1991; NMFS, 1992). In that status review and in a later review of mid-Columbia River summer chinook salmon (Waknitz et al., 1995), the ESU status of populations from Marion Drain and the Deschutes River was not resolved, so these issues were considered in the current review.

Both populations show a greater genetic affinity to Snake River fall chinook salmon than to other ocean-type Columbia River populations such as the Upper Columbia River summer/fall-run ESU. After evaluation, NMFS concluded that chinook salmon spawning in the Marion Drain could not be assigned to any historic or current ESU with any certainty.

However, after further review, NMFS has concluded that the Deschutes River chinook salmon population should be considered part of the Snake River fall-run ESU. The Deschutes River historically supported a population of fall chinook salmon, as evidenced by counts of fish at Sherars Falls in the 1940s. Genetic and life history data for the current population indicate a closer affinity to fall chinook salmon in the Snake River than to those in the Columbia River. Similarities were observed in the distribution of CWT ocean recoveries for Snake River and Deschutes River fall-run chinook salmon; however, information on Deschutes River fish was based on a limited number of releases over a relatively short time frame. CWT recovery data indicate that straying by non-native chinook salmon into the Deschutes River is very low and does not appear to be disproportionately influenced by Snake River fall-run chinook salmon (Hymer et al., 1992). Fall-run chinook populations from the John Day, Umatilla, and Walla Walla Rivers would also be included in this ESU, but are believed to have been extirpated.

(15) Snake River Spring- and Summer-Run ESU

This ESU, which includes populations of spring- and summer-run chinook salmon from the Snake River Basin (excluding the Clearwater River), was identified in a previous status review (Matthews and Waples, 1991; NMFS, 1992). These populations show modest genetic differences, but substantial ecological differences, in comparison with Mid- and Upper Columbia River spring- and summer-run chinook salmon populations. Populations from this ESU emigrate to the ocean as yearlings, mature at ages 4 and 5, and are rarely taken in ocean fisheries. The majority of the spawning habitat occurs in the Northern Rockies and Blue Mountains ecoregions.

Status of Chinook Salmon ESUs

The ESA defines the term ‘‘endangered species’’ as ‘‘any species which is in danger of extinction throughout all or a significant portion of its range.’’ The term ‘‘threatened species’’ is defined as ‘‘any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.’’ In previous status reviews (e.g., Weitkamp et al., 1995), NMFS has identified a number of factors that should be considered in evaluating the level of risk faced by an ESU, including: (1) Absolute numbers of fish and their spatial and temporal distribution; (2) current abundance in relation to historical abundance and current carrying capacity of the habitat; (3) trends in abundance; (4) natural and human-influenced factors that cause variability in survival and abundance; (5) possible threats to genetic integrity (e.g., from strays or outplants from hatchery programs); and (6) recent events (e.g., a drought or changes in harvest management) that have predictable short-term consequences for abundance of the ESU.

During the coastwide status review for chinook salmon, NMFS evaluated both qualitative and quantitative information to determine whether any proposed ESU is threatened or endangered according to the ESA. The types of information used in these assessments are described below, followed by a summary of results for each ESU.

Qualitative Evaluations

Qualitative assessments of the status of chinook salmon stocks have been published by agencies or conservation groups (Nehlsen et al., 1991; Higgins et al., 1992; Nickelson et al., 1992; WDF et al., 1993; Huntington et al., 1996). Nehlsen et al. (1991) considered salmonid stocks throughout Washington, Idaho, Oregon, and California and enumerated all stocks that they found to be extinct or at risk of extinction. Nehlsen et al. (1991) classified stocks as extinct, possibly extinct, at high risk of extinction, at moderate risk of extinction, or of special concern. They considered it likely that stocks at high risk of extinction have reached the threshold for classification as endangered under the ESA. Stocks were placed in this category if they had declined from historic levels and were continuing to decline, or had spawning escapements less than 200. Stocks were classified as at moderate risk of extinction if they had declined from historic levels but presently appear to be stable at a level above 200 spawners. They felt that stocks in this category had reached the threshold for threatened under the ESA. They classified stocks as of special concern if a relatively minor disturbance could threaten them, insufficient data were available for them, they were influenced by large releases of hatchery fish, or they possess some unique characteristic.

Higgins et al. (1992) used the same classification scheme as Nehlsen et al. (1991) but provided a more detailed review of some northern California salmonid stocks. In this review, their evaluation is relevant only to the Southern Oregon and California Coastal and Upper Klamath and Trinity Rivers ESUs.

Nickelson et al. (1992) rated wild coastal (excluding Columbia River Basin) Oregon salmon and steelhead stocks on the basis of their status over the past 20 years, classifying stocks as ‘‘healthy,’’ ‘‘depressed,’’ ‘‘of special concern,’’ or ‘‘unknown’’.

WDF et al. (1993) categorized all salmon and steelhead stocks in Washington on the basis of stock origin, production type, and status (‘‘healthy,’’ ‘‘depressed,’’ ‘‘critical,’’ or ‘‘unknown’’).

Huntington et al. (1996) surveyed the condition of healthy native or wild stocks of anadromous salmonids in the Pacific Northwest and California. Stocks were classified as healthy based upon abundance, self-sustainability, and not having been previously identified as at substantial risk of extinction. Healthy stocks were described at two levels: ‘‘adult abundance at least two-thirds as great as would be found in the absence of human impacts’’ (Level I); and ‘‘adult abundance between one-third and two-thirds as great as expected without human impacts’’ (Level II).

There are problems in applying results of these studies to ESA evaluations. A major problem is that the definition of ‘‘stock’’ or ‘‘population’’ varied considerably in scale among studies, and sometimes among regions within a study. Identified units range in size from large river basins (e.g., ‘‘Sacramento River’’ in Nehlsen et al., 1991), to minor coastal streams and tributaries. A second problem is the definition of categories used to classify stock status. Only Nehlsen et al. (1991) and Higgins et al. (1992) used categories intended to relate to ESA ‘‘threatened’’ or ‘‘endangered’’ status, and they applied their own interpretations of these terms to individual stocks, not to

ESUs as defined here. WDF *et al.* (1993) used general terms describing status of stocks that cannot be directly related to the considerations important in ESA evaluations. A third problem is the selection of stocks or populations to include in the review. Nehlsen et al. (1991) and Higgins *et al.* (1992) did not discuss stocks not perceived to be at risk, so it is difficult to determine the proportion of stocks they considered to be at risk in any given area. For chinook salmon, WDF *et al.* (1993) included only stocks considered to be substantially ''wild'' and included data only for the ''wild'' component for streams that have both hatchery and natural fish escaping to spawn, giving an incomplete evaluation of chinook salmon utilizing natural habitat.

Quantitative Evaluations

Quantitative evaluations of data included comparisons of current and historical abundance of chinook salmon, calculation of recent trends in escapement, and evaluation of the proportion of natural spawning attributable to hatchery fish. Historical abundance information for these ESUs is largely anecdotal. Time series data are available for many populations, but data extent and quality varied among ESUs. NMFS compiled and analyzed this information to provide several summary statistics of natural spawning abundance, including (where available) recent total spawning escapement, percent annual change in total escapement (both long-term and most recent ten years), recent naturally produced spawning escapement, and average percentage of natural spawners that were of hatchery origin.

Although this evaluation used the best data available, there are a number of limitations to these data, and not all summary statistics were available for all populations. For example, spawner abundance was generally not measured directly; rather, it often had to be estimated from catch (which itself may not always have been measured accurately) or from limited survey data.

Sport and commercial harvest impacts were compiled from a variety of sources. In presenting this information, NMFS has tried to maintain a clear distinction between harvest rates (usually calculated as catch divided by catch plus escapement for a cohort or brood year) and exploitation rates (age-specific rates of exploitation in individual fisheries).

Stream surveys for chinook salmon spawning abundance have been conducted by various agencies within most of the ESUs considered here. The methods and time-spans of the surveys vary considerably among regions, so it is difficult to assess the general reliability of these surveys as population indices. For most streams where these surveys are conducted, they are the best local indication of population trends.

Dam counts provide quantitative estimates of run size, but in most cases, these counts cannot be resolved to the individual population level and are subject to errors stemming from fallback, run classification, and unaccounted mortality. Run reconstructions providing estimates of both adult spawning abundance and fishery recruits are being prepared for many stream-type chinook salmon populations in the Columbia River Basin (Beamsderfer et al., 1997 draft report), but were not available in final form for this review.

As noted above, NMFS attempted to distinguish natural and hatchery production in these evaluations. Doing this quantitatively would require good estimates of the proportion of natural escapement that was of hatchery origin, and knowledge of the effectiveness of spawning by hatchery fish in natural environments. Unfortunately, this type of information is rarely available, and for most ESUs NMFS is limited to reporting whatever estimates of escapement of hatchery fish to natural systems that were made available.

Computed Statistics

To represent current run size or escapement where recent data were available, NMFS computed the geometric mean of the most recent five years reported, while trying to use only estimates that reflect the total abundance for an entire river basin or tributary, avoiding index counts or dam counts that represent only a small portion of available habitat.

Recent average abundance is reported as the geometric mean of the most recent 5 years of data. Where time-series data were not available, NMFS relied on recent estimates from state agency reports; time periods included in such estimates varied considerably.

Historic run size estimates from cannery pack data were made by converting the largest number of cases of cans packed in a single season to numbers of fish in the spawning run.

NMFS calculated recent trends from the most recent 10 years, using data collected after 1984 for series having at least 7 observations since 1984. No attempt was made to account for the influence of hatchery-produced fish on these estimates, so the estimated trends include the progeny of naturally spawning hatchery fish.

After evaluating patterns of abundance drawn on these quantitative and qualitative assessments, and evaluating other risk factors for chinook salmon from these ESUs, NMFS reached the following conclusions summarized below.

(1) Sacramento River Winter-Run ESU

Presently listed as endangered under the California and Federal Endangered Species Acts, this ESU has been extensively reviewed by NMFS (NMFS 1987, 1989, 1990a,b, 1994b). That information is only summarized and updated here.

Historically the winter run was abundant and comprised populations in the McCloud, Pit, Little Sacramento, and Calaveras Rivers. Construction of Shasta Dam in the 1940s eliminated access to all of the historic spawning habitat for winter-run chinook salmon in the Sacramento River Basin. Since then, the ESU has been reduced to a single spawning population confined to the mainstem Sacramento River below Keswick Dam (Reynolds *et al.*, 1993).

The fact that this ESU is comprised of a single population with very limited spawning and rearing habitat increases risk of extinction due to local catastrophe or poor environmental conditions. There are no other natural populations in the ESU to buffer it from natural fluctuations.

Because the Sacramento River winter-run ESU is currently listed as an endangered species, NMFS did not review its previous risk conclusion here.

(2) Central Valley Spring-Run ESU

Native spring chinook salmon have been extirpated from all tributaries in the San Joaquin River Basin, which represents a large portion of the historic range and abundance of the ESU as a whole. The only streams considered to have wild spring-run chinook salmon are Mill and Deer Creeks, and possibly Butte Creek (tributaries to the Sacramento River), and these are relatively small populations with sharply declining trends. Demographic and genetic risks due to small population sizes are thus considered to be high.

Habitat problems are the most important source of ongoing risk to this ESU. Spring-run fish cannot access most of their historical spawning and rearing habitat in the Sacramento and San Joaquin River Basins (which is now above impassable dams), and current spawning is restricted to the mainstem and a few river tributaries in the Sacramento River. The remaining spawning habitat accessible to fish is severely degraded. Collectively, these habitat problems greatly reduce the resiliency of this ESU to respond to additional stresses in the future. The general degradation of conditions in the Sacramento River Basin (including elevated water temperatures, agricultural and municipal diversions and returns, restricted and regulated flows, entrainment of migrating fish into unscreened or poorly screened diversions, and the poor quality and quantity of remaining habitat) has severely impacted important juvenile rearing habitat and migration corridors.

There appears to be serious concern for threats to genetic integrity posed by hatchery programs in the Central Valley. Most of the spring-run chinook salmon production in the Central Valley is of hatchery origin, and naturally spawning populations may be interbreeding with both fall/late fall- and spring-run hatchery fish. This problem is exacerbated by the increasing production of spring chinook salmon from the Feather River and Butte Creek Hatcheries, especially in light of reports suggesting a high degree of mixing between spring- and fall/late fall-run broodstock in the hatcheries. In addition, hatchery strays are considered to be an increasing problem due to the management practice of releasing a larger proportion of fish off station (into the Sacramento River delta and San Francisco Bay).

The only previous assessment of risk to stocks in this ESU is that of Nehlsen *et al.* (1991), who identified several stocks as being at risk or of special concern. Four stocks were identified as extinct (spring/summer-run chinook salmon in the American, McCloud, Pit, and San Joaquin (including tributaries) Rivers) and two stocks (spring-run chinook salmon in the Sacramento and Yuba Rivers) were identified as being at a moderate risk of extinction.

As discussed above, habitat problems were considered to be the most important source of ongoing risk to this ESU. However, NMFS is also quite concerned about threats to genetic integrity posed by hatchery programs in the Central Valley, as well as related harvest regimes that may not be allowing recovery of this at-risk population. Based on this risk, NMFS concluded that chinook salmon in this ESU are in danger of extinction.

(3) Central Valley Fall/Late Fall-Run ESU

Although total population abundance in this ESU is relatively high, perhaps near historic levels, NMFS identified several concerns regarding its status. The abundance of natural fall chinook salmon in the San Joaquin River Basin is low leading NMFS to conclude a large proportion of the historic range of this ESU is severely degraded. Habitat blockage is not as severe for fall/late fall-run chinook salmon as it is for winter- and spring-run chinook salmon in this region because most of fall/late fall-run spawning habitat was below dams constructed in the region. However, there has been a severe degradation of the remaining habitat, especially due to agricultural and municipal water use activities in the Central Valley (which result in point and non-point pollution, elevated water temperatures, diminished flows, and smolt and adult entrainment into poorly screened or unscreened diversions). Additionally, stray rates are high because many hatchery fish are released off-station to avoid adverse river conditions, resulting in a much larger proportion of hatchery chinook salmon present in the natural spawning population.

A mitigating factor for the overall risk to the ESU is that a few of the Sacramento and San Joaquin River Basin tributaries are showing recent, short-term increases in abundance. However, the streams supporting natural runs considered to be the least influenced by hatchery fish have the lowest abundance and the most consistently negative trends of all populations in the ESU. In general, high hatchery production combined with infrequent monitoring of natural production make assessing the sustainability of natural production problematic, resulting in substantial uncertainty in assessing the status of this ESU.

Other concerns facing chinook salmon in this ESU are the high ocean and freshwater harvest rates in recent years, which may be higher than is sustainable by natural populations given the productivity of the ESU under present habitat conditions. The mixed stock ocean salmon off California fisheries are managed to achieve spawning escapement goals for two main indicator stocks: Sacramento River fall chinook and Klamath River fall chinook. Harvest may be further constrained to meet NMFS' ESA requirements for listed species, including Sacramento River winter chinook, Central California Coastal and Southern Oregon/Northern California coho, and Snake River fall chinook. Since 1993, the need to address Indian fishing rights in the Klamath River Basin has required significant reductions in the ocean harvest rate on Klamath River fall chinook. As a result of the need to constrain ocean harvest rates on Klamath River fall chinook, commercial fisheries have not been allowed to harvest Central Valley stocks to the extent that would be permitted by the management goal for Sacramento River fall chinook alone (122,000 to 180,000 adult hatchery and natural spawners). Spawning escapements have been well above the goal range in recent years. A record number of adults (324,000) returned in 1997. The harvest rate on Central Valley stocks is indicated by the Central Valley Harvest Rate Index, which is computed as the chinook harvest south of Point Arena divided by the sum of the chinook harvest south of Point Arena and Central Valley adult chinook spawning escapement of the same year. This harvest rate index has averaged 0.73 over the past 10 years and declined somewhat in 1996 and 1997 to 0.64 and 0.66 respectively.

The only previous assessment of risk to stocks in this ESU is that of Nehlsen *et al.* (1991), who identified two stocks (San Joaquin and Cosumnes Rivers) as of special concern.

Even though total population abundance in this ESU is relatively high, perhaps near historical levels, the abundance of natural fall chinook salmon in the San Joaquin River Basin is low. Habitat problems were considered to be the most important source of ongoing risk to this ESU, although NMFS is extremely concerned about threats to genetic integrity posed by hatchery and harvest programs related to fall/late fall-run chinook salmon. Therefore, NMFS concluded that chinook salmon in this ESU are not presently in danger of extinction but are likely to become endangered in the foreseeable future.

(4) Southern Oregon and California Coastal ESU

This ESU contains chinook salmon from the Elk River, Oregon south to the northern cape forming San Francisco Bay. Chinook salmon spawning abundance in this ESU is highly variable among populations, with populations in California and spring-run chinook salmon throughout the ESU being of particular concern. There is a general pattern of downward trends in abundance in most populations for which data are available, with declines being especially pronounced in spring-run populations. The extremely depressed status of almost all coastal populations south of the Klamath River is an important source of risk to the ESU. NMFS has a general concern that no current information is available for many river systems in the southern portion of this ESU, which historically maintained numerous large populations. Although these California coastal populations do not form a separate ESU, they represent a considerable portion of genetic and ecological diversity within this ESU.

Habitat loss and/or degradation is widespread throughout the range of the ESU. The California Advisory Committee on Salmon and Steelhead Trout (CACSST) reported habitat blockages and fragmentation, logging and agricultural activities, urbanization, and water withdrawals as the most predominant problems for anadromous salmonids in California's coastal basins (CACSST, 1988). They identified associated habitat problems for each major river system in California. CDFG (1965, Vol. III, Part B) reported that the most vital habitat factor for coastal California streams was ''degradation due to improper logging followed by massive siltation, log jams, etc.'' They cited road building as another cause of siltation in some areas. They identified a variety of specific critical habitat problems in individual basins, including extremes of natural flows (Redwood Creek and Eel River), logging practices (Mad, Eel, Mattole, Ten Mile, Noyo, Big, Navarro, Garcia, and Gualala Rivers), and dams with no passage facilities (Eel, and Russian Rivers), and water diversions (Eel and Russian Rivers). Such problems also occur in Oregon streams within the ESU. The Rogue River Basin in particular has been affected by mining activities and unscreened irrigation diversions (Rivers, 1963) in addition to the problems resulting from logging and dam construction. Kostow (1995) estimated that one-third of spring chinook salmon spawning habitat in the Rogue River was inaccessible following the construction of Lost Creek Dam (River Kilometer (RKm) 253) in 1977. Recent major flood events (February 1996 and January 1997) have probably affected habitat quality and survival of juveniles within this ESU. Although NMFS has little information on these floods specific to this ESU, effects are probably similar to those discussed below for the Oregon and Washington Coastal Region.

Artificial propagation programs in the Southern Oregon and Coastal California ESU are less extensive than those in Klamath/Trinity or Central Valley ESUs. The Rogue, Chetco and Eel River Basins and Redwood Creek have received considerable releases, derived primarily from local sources. Current hatchery contribution to overall abundance is relatively low except for the Rogue River spring run. The hatchery-to-total run ratio of Rogue River spring chinook salmon, as measured at Gold Ray Dam (RKm 201), has exceeded 60% in some years (Kostow, 1995).

Previous assessments of stocks within this ESU have identified several stocks as being at risk or of concern. Nehlsen *et al.* (1991) identified seven stocks as at high extinction risk and seven stocks as at moderate extinction risk. Higgins *et al.* (1992) provided a more detailed analysis of some of these stocks, and identified nine chinook salmon stocks as at risk or of concern. Four of these stocks agreed with the Nehlsen et al. (1991) designations, while five fall chinook salmon stocks were either reassessed from a moderate risk of extinction to stocks of concern (Redwood Creek, Mad River, and Eel River) or were additions to the Nehlsen et al. (1991) list as stocks of special concern (Little and Bear Rivers). Fall chinook salmon in the Rogue River represent the only relatively healthy population(s) NMFS could identify in this ESU (Huntington *et al.*, 1996).

There is a general pattern of downward trends in abundance in most populations for which data are available, with declines being especially pronounced in spring-run populations within this ESU. The lack of population monitoring, particularly in the California portion of the range, led to a high degree of uncertainty regarding the status of these populations. NMFS concluded that the extremely depressed status of almost all coastal populations south of the Klamath River is an important source of risk to the ESU. Overall, NMFS concluded that chinook salmon in this ESU are likely to become endangered in the foreseeable future.

(5) Upper Klamath and Trinity Rivers ESU

The question of overall risk was difficult to evaluate because of the large disparity in the status of spring- and fall-run populations within the ESU. Spring-run chinook salmon were once the dominant run type in the Klamath-Trinity River Basin. Most spring-run spawning and rearing habitat was blocked by the construction of dams in the late 1800s and early 1900s in the Klamath River Basin, and in the 1960s in the Trinity River Basin. As a result of these and other factors, spring-run populations are at less than 10 percent of their historic levels, and at least 7 spring-run populations that once existed in the basin are now considered extinct. The remaining spring runs have relatively small population sizes and are isolated in just a few areas of the basin, resulting in genetic and demographic risks.

Fall-run chinook populations in this ESU are stable or increasing slightly. Substantial numbers of fall-run chinook salmon spawn naturally in many areas of the ESU. However, natural populations have frequently failed to meet modest spawning escapement goals despite active harvest management. In addition to habitat blockages, there continues to be severe degradation of remaining habitat due to mining, agricultural and forestry activities, and water storage and transfer. Furthermore, hatchery production in the basin is substantial, with considerable potential for interbreeding between natural and hatchery fish. NMFS is concerned that hatchery fish spawning naturally may mask declines in natural populations.

Previous assessments of stocks within this ESU have identified several stocks as being at risk or of concern. Nehlsen *et al.* (1991) identified seven stocks as extinct, two stocks (Klamath River spring chinook salmon and Shasta River fall chinook salmon) as at high extinction risk, and Scott River fall chinook salmon as of special concern. Higgins *et al.* (1992) provided a more detailed analysis of some of the stocks identified by Nehlsen *et al.* (1991), classifying three chinook salmon stocks as at risk. Additionally, three chinook salmon stocks were identified as of special concern. Of these, one (Scott River fall run) agreed with Nehlsen *et al.* (1991), while two were additions (Trinity River spring run and South Fork Trinity River fall run).

In summary, the question of overall risk was difficult to evaluate because of the large disparity in the status of spring- and fall-run populations within the ESU. However, NMFS has concluded that, because of the relative health of the fall-run populations, chinook salmon in this ESU are not at significant risk of extinction, nor are they likely to become endangered in the foreseeable future.

(6) Oregon Coast ESU

Production in this ESU is mostly dependent on naturally-spawning fish, and spring-run chinook salmon in this ESU are in relatively better condition than those in adjacent ESUs. Long-term trends in abundance of chinook salmon within most populations in this ESU are upward.

In spite of a generally positive outlook for this ESU, several populations are exhibiting recent and severe (>9 percent per year) short-term declines in abundance. In addition, there are several hatchery programs and Salmon and Trout Enhancement Programs (STEP) releasing chinook salmon throughout the ESU, and many of the fish released are derived from a single stock (Trask River). Most importantly, there is a lack of clear information on the degree of straying of these hatchery fish into naturally-spawning populations. There are also many populations within the ESU for which there are no abundance data; thus NMFS is concerned about the uncertain risk assessment given these data gaps. Finally, exploitation rates on chinook salmon from this ESU have been high in the past, and the level of harvest could be a significant source of risk if it continues at historically high rates. Also, freshwater habitats are generally in poor condition, with numerous problems such as low summer flows, high temperatures, loss of riparian cover, and streambed changes.

Previous assessments of stocks within this ESU have identified several as being at risk or of concern; however, the preponderance of stocks have been identified as healthy. Nehlsen *et al.* (1991) identified two stocks as at high extinction risk (South Umpqua River and Coquille River spring-run), one stock as at moderate extinction risk (Yachats River fall-run) and five stocks as of special concern. Of the 44 stocks within this ESU considered by Nickelson *et al.* (1992), 26 were identified as healthy, 2 as depressed (South Umpqua River and Coquille River spring chinook salmon), 7 as of special concern due to hatchery strays, and 9 of unknown status (4 of which they suggested may not be viable). Huntington *et al.* (1996) identified 18 stocks in their survey: 6 healthy Level I and 12 healthy Level II stocks.

Abundance of this ESU is relatively high, and fish are well distributed among numerous, relatively small river basins. Long-term trends in abundance of chinook salmon within most populations in this ESU are upward. NMFS has concluded that chinook salmon in this ESU are neither presently in danger of extinction nor are they likely to become endangered in the foreseeable future.

(7) Washington Coast ESU

Long-term trends in population abundance have been predominantly upward for the medium and larger populations but are sharply downward for several of the smaller populations. In general, abundance and trend indicators are more favorable for stocks in the northern portion of the ESU, and more favorable for fall-run populations than for spring- or summer-run fish. This disparity was a source of concern regarding the overall health of the ESU.

All basins are affected by habitat degradation, largely related to forestry practices. Tributaries inside Olympic National Park are generally in the best condition regarding habitat quality. Special concern was expressed regarding the status of spring-run populations throughout the ESU and fall-run populations in Willapa Bay and parts of the Grays Harbor drainage.

Hatchery production is substantial in several basins within the range of the ESU, and several populations are identified as being of composite production. There is considerable potential for hatchery fish to stray into natural populations, especially since some hatcheries are apparently unable to effectively attract returning adults. Hatchery influence is greatest in the southern part of the ESU region, especially in Willapa Bay, where there have been numerous introductions of stocks from outside of the ESU. Furthermore, the use of an exotic spring-run stock at the Sol Duc Hatchery was cited as a cause of concern.

Previous assessments of stocks within this ESU have identified several as being at risk or of concern, but more stocks have been identified as healthy than at risk. Nehlsen *et al.* (1991) identified one stock as extinct (Pysht River fall run), one as possibly extinct (Ozette River fall run), and one as at high risk of extinction (Wynoochee River spring run), although there is some question whether the Wynoochee River spring run ever existed (WDFW, 1997a). WDF *et al.* (1993) considered the status of 18 native stocks, and concluded that 11 were healthy, 4 were depressed, and 3 were unknown. Huntington *et al.* (1996) identified 12 stocks in their survey: 1 healthy Level I stock (Quillayute/Bogachiel River fall run) and 11 healthy Level II stocks.

Recent abundance has been relatively high, although it is less than estimated peak historical abundance in this region. Chinook salmon in this ESU are distributed among a relatively large number of populations, most of which are large enough to avoid serious genetic and demographic risks associated with small populations. NMFS concluded that chinook salmon in this ESU are not presently in danger of extinction nor are they likely to become endangered in the foreseeable future.

(8) Puget Sound ESU

Overall abundance of chinook salmon in this ESU has declined substantially from historical levels, and many populations are small enough that genetic and demographic risks are likely to be relatively high. Both long- and short-term trends in abundance are predominantly downward, and several populations are exhibiting severe short-term declines. Spring chinook salmon populations throughout this ESU are all depressed.

Habitat throughout the ESU has been blocked or degraded. In general, upper tributaries have been impacted by forest practices and lower tributaries and mainstem rivers have been impacted by agriculture and/or urbanization. Diking for flood control, draining and filling of freshwater and estuarine wetlands, and sedimentation due to forest practices and urban development are cited as problems throughout the ESU (WDF et al., 1993). Blockages by dams, water diversions, and shifts in flow regime due to hydroelectric development and flood control projects are major habitat problems in several basins. Bishop and Morgan (1996) identified a variety of important habitat issues for streams in the range of this ESU, including changes in flow regime (all basins), sedimentation (all basins), high temperatures (Dungeness, Elwha, Green/Duwamish, Skagit, Snohomish, and Stillaguamish Rivers), streambed instability (most basins), estuarine loss (most basins), loss of large woody debris (Elwha, Snohomish, and White Rivers), loss of pool habitat (Nooksack, Snohomish, and Stillaguamish Rivers), and blockage or passage problems associated with dams or other structures (Cedar, Elwha, Green/Duwamish, Snohomish, and White Rivers). The Puget Sound Salmon Stock Review Group (PFMC) provided an extensive review of habitat conditions for several of the stocks in this ESU (PFMC, 1997a). They concluded that reductions in habitat capacity and quality have contributed to escapement problems for Puget Sound chinook salmon, citing evidence of curtailment of tributary and mainstem habitat due to dams, and losses of slough and side-channel habitat due to diking, dredging, and hydromodification.

Nearly 2 billion fish have been released into Puget Sound tributaries since the 1950s. The preponderance of hatchery production throughout the ESU may mask trends in natural populations and makes it difficult to determine whether they are self-sustaining. This difficulty is compounded by the dearth of data pertaining to proportion of naturally-spawning fish that are of hatchery origin. There has also been widespread use of a limited number of hatchery stocks, resulting in increased risk of loss of fitness and diversity among populations. WDF *et al.* (1993) classified 11 out of 29 stocks in this ESU as being sustained, in part, through artificial propagation. The vast majority of these have been derived from local returning fall-run adults. Returns to hatcheries have accounted for over half of the total spawning escapement, although the hatchery contribution to spawner escapement is probably much higher than that, due to hatchery-derived strays on the spawning grounds. In the Stillaguamish River, summer chinook have been supplemented under a wild broodstock program for the last decade. In some years, returns from this program have comprised up to 30–50% of the natural spawners, suggesting that the unaided stock is not able to maintain itself (NWIFC, 1997). Almost all of the releases into this ESU have come from stocks within this ESU, with the majority of within ESU transfers coming from the Green River Hatchery or hatchery broodstocks that have been derived from Green River stock (Marshall *et al.,* 1995). The electrophoretic similarity between Green River fall-chinook salmon and several other fall chinook salmon stocks in Puget Sound (Marshall *et al.,* 1995) suggests that there may have been a significant effect from some hatchery transplants. Overall, the pervasive use of Green River stock throughout much of the extensive hatchery network that exists in this ESU may reduce the genetic diversity and fitness of naturally spawning populations.

Harvest impacts on Puget Sound chinook salmon stocks are quite high. Ocean exploitation rates on natural stocks averaged 56–59%; total exploitation rates average 68–83% (1982–89 brood years) (Pacific Salmon Commission (PSC), 1994). Total exploitation rates on some stocks have exceeded 90% (PSC, 1994).

Previous assessments of stocks within this ESU have identified several stocks as being at risk or of concern. Nehlsen et al. (1991) identified four stocks as extinct, four stocks as possibly extinct, six stocks as at high risk of extinction, one stock as a moderate risk (White River spring run), and one stock (Puyallup River fall run) as of special concern. WDF et al. (1993) considered 28 stocks within the ESU, of which 13 were considered to be of native origin and predominantly natural production. The status of these 13 stocks was: 2 healthy (Upper Skagit River summer run and Upper Sauk River spring run), 5 depressed, 2 critical (South-Fork Nooksack River spring/summer run and Dungeness River spring/summer run), and 4 unknown.

Overall abundance of chinook salmon in this ESU has declined substantially from historical levels, and both long-and short-term trends in abundance are predominantly downward. Several populations are exhibiting severe short-term declines. Spring chinook salmon populations throughout this ESU are all depressed. NMFS concluded that chinook salmon in this ESU are not presently in danger of extinction, but they are likely to become endangered in the foreseeable future.

(9) Lower Columbia River ESU

Apart from the relatively large and apparently healthy fall-run population in the Lewis River, production in this ESU appears to be predominantly hatchery-driven with few identifiable naturally spawned populations.

All basins are affected (to varying degrees) by habitat degradation. Major habitat problems are primarily related to blockages, forest practices, urbanization in the Portland and Vancouver areas, and agriculture in floodplains and low-gradient tributaries. Substantial chinook salmon spawning habitat has been blocked (or passage substantially impaired) in the Cowlitz (Mayfield Dam 1963, RKm 84), Lewis (Merwin Dam 1931, RKm 31), Clackamas (North Fork Dam 1958, RKm 50), Hood (Powerdale Dam 1929, RKm 7), and Sandy (Marmot Dam 1912, RKm 48; Bull Run River dams early 1900s) Rivers (WDF *et al.,* 1993; Kostow, 1995).

Hatchery programs to enhance chinook salmon fisheries abundance in the lower Columbia River began in the 1870s, expanded rapidly, and have continued throughout this century. Although the majority of the stocks have come from within this ESU, over 200 million fish from outside the ESU have been released since 1930. A particular concern at the present time is the straying by Rogue River fall chinook salmon, which are released into the lower Columbia River to augment harvest opportunities. Available evidence indicates a pervasive influence of hatchery fish on natural populations throughout this ESU, including both spring-and fall-run populations (Howell *et al.,* 1985; Marshall *et al.,* 1995). In addition, the exchange of eggs between hatcheries in this ESU has led to the extensive genetic homogenization of hatchery stocks (Utter *et al.,* 1989). The large numbers of hatchery fish in this ESU make it difficult to determine the proportion of naturally produced fish. In spite of the heavy impact of hatcheries, genetic and life history characteristics of populations in this ESU still differ from those in other ESUs. The loss of fitness and diversity within the ESU as an important concern.

Harvest rates on fall-run stocks are moderately high, with an average total exploitation rate of 65 percent (1982–89 brood years) (PSC, 1994). The average ocean exploitation rate for this period was 46 percent, while the freshwater harvest rate on the fall run has averaged 20 percent, ranging from 30 percent in 1991 to 2.4 percent in 1994. Harvest rates are somewhat lower for spring run stocks, with estimates for the Lewis River averaging 24 percent ocean and 50 percent total exploitation rates in 1982–89 (PSC, 1994). In inriver fisheries, approximately 15 percent of the lower river hatchery stock was harvested, 29 percent of the lower river wild stock was harvested, and 58 percent of the Spring Creek hatchery stock was harvested, while the average inriver exploitation rate on the stock as a whole was 29 percent during the 1991–1995 period (PFMC, 1996b).

Previous assessments of stocks within this ESU have identified several stocks as being at risk or of concern. Nehlsen *et al.* (1991) identified two stocks as extinct (Lewis River spring run and Wind River fall run), four stocks as possibly extinct, and four stocks as at high risk of extinction. WDF et al. (1993) considered 20 stocks within the ESU, of which only 2 (Lewis River and East Fork Lewis River fall runs) were considered to be of native origin, predominantly natural production, and healthy. Huntington *et al.* (1996) identified one healthy Level I stock in their survey (Lewis River fall run).

There have been at least six documented extinctions of populations in this ESU, and it is possible that extirpation of other native populations has occurred but has been masked by the presence of naturally spawning hatchery fish. Long-and short-term trends in abundance of individual populations are mostly negative, some severely so. About half of the populations comprising this ESU are very small, increasing the likelihood that risks due to genetic and demographic drift processes in small populations will be important. NMFS concluded that chinook salmon in this ESU are not presently in danger of extinction but are likely to become endangered in the foreseeable future.

(10) Upper Willamette River ESU

While the abundance of Willamette River spring chinook salmon has been relatively stable over the long term, and there is evidence of some natural production, it is apparent that at present production and harvest levels the natural population is not replacing itself. With natural production accounting for only ⅓ of the natural spawning escapement, it is questionable whether natural spawners would be capable of replacing themselves even in the absence of fisheries. While hatchery programs in the Willamette River Basin have maintained broodlines that are relatively free of genetic influences from outside the basin, they may have homogenized the population structure within the ESU. The introduction of fall-run chinook salmon into the basin and laddering of Willamette Falls have increased the potential for genetic introgression between wild spring-and hatchery fall-run chinook salmon, but there is no direct evidence of hybridization (other than an overlap in spawning times and spawning location) between these two runs. Prolonged artificial propagation of the majority of the production from this ESU may also have had deleterious effects on the ability of Willamette River spring chinook salmon to reproduce successfully in the wild.

Habitat blockage and degradation are significant problems in this ESU. Available habitat has been reduced by construction of dams in the Santiam, McKenzie, and Middle Fork Willamette River Basins, and these dams have probably adversely affected remaining production via thermal effects. Agricultural development and urbanization are the main activities that have adversely affected habitat throughout the basin (Bottom *et al.,* 1985, Kostow, 1995).

Another concern for this ESU is that commercial and recreational harvests are high relative to the apparent productivity of natural populations. The average total harvest mortality rate was estimated to be 72 percent in 1982–89, with a corresponding ocean exploitation rate of 24 percent (PSC, 1994). This estimate does not fully account for escapement, and ODFW is in the process of revising harvest rate estimates for this stock; revised estimates may average 57 percent total harvest rate, with 16 percent ocean and 48 percent freshwater components (Kostow,1995). The inriver recreational harvest rate (Willamette River sport catch/estimated run size) for the period from 1991 through 1995 was 33 percent (data from PFMC, 1996b).

The only previous assessment of risk to stocks in this ESU is that of Nehlsen *et al.* (1991), who identified the Willamette River spring-run chinook salmon as of special concern. They noted vulnerability to minor disturbances, insufficient information on population trend, and the special character of this stock as causes for concern.

NMFS concluded that chinook salmon in this ESU are not presently in danger of extinction but are likely to become endangered in the foreseeable future. Total abundance has been relatively stable at approximately 20,000 to 30,000 fish; however, recent natural escapement is less than 5,000 fish and has been declining sharply. Furthermore, it is estimated that about two-thirds of the natural spawners are first-generation hatchery fish, suggesting that the natural population is falling far short of replacing itself. Another concern for this ESU is that commercial and recreational harvest are high relative to the apparent productivity of natural populations.

(11) Middle Columbia River Spring-Run ESU

Total abundance of this ESU is low relative to the total basin area, and 1994–96 escapements have been very low. Several historical populations have been extirpated, and the few extant populations in this ESU are not widely distributed geographically. In addition, there are only two populations (John Day and Yakima Rivers) with substantial run sizes. However, these major river basins are predominantly comprised of naturally produced fish, and both of these exhibit long-term increasing trends in abundance. Additionally, recent analyses done as part of the PATH process indicates that productivity of natural populations in the Deschutes and John Day Rivers has been more robust than most other stream-type chinook salmon in the Columbia River (Schaller *et al.*, 1995).

Habitat problems are common in the range of this ESU. The only large blockage of spawning area for spring chinook salmon is at the Pelton/Round Butte dam complex on the Deschutes River, which probably eliminated a natural population utilizing the upper Deschutes River Basin (Kostow, 1995; Nehlsen, 1995). Spawning and rearing habitat are affected by agriculture including water withdrawals, grazing, and riparian vegetation management. Mainstem Columbia River hydroelectric development has resulted in a major disruption of migration corridors and affected flow regimes and estuarine habitat.

Hatchery production accounts for a substantial proportion of total escapement to the region. However, screening procedures at the Warm Springs River weir apparently minimize the potential for hatchery-wild introgression in the Deschutes River basin. Although straying is less of a problem with returning spring-run adults, the use of the composite, out-of-ESU Carson Hatchery stock to reestablish the Umatilla River spring run would be a cause for concern if fish from that program stray out of the basin.

Stocks in this ESU experience very low ocean harvest rates and only moderate instream harvest. Harvest rates have been declining recently (PSC, 1996).

Previous assessments of stocks within this ESU have identified several as being at risk or of concern. Nehlsen *et al.* (1991) identified five stocks as extinct, one as possibly extinct (Klickitat River spring chinook salmon), and one as of special concern (John Day River spring chinook salmon). WDF *et al.* (1993) considered five stocks within the ESU, of which three, all within the Yakima River Basin, were considered to be of native origin and predominantly natural production (Upper Yakima, Naches, and American Rivers). Despite increasing trends in these three stocks, these stocks and the two remaining (not native/natural) stocks were considered to be depressed on the basis of chronically low escapement numbers (WDF *et al.*, 1993).

Despite low abundances relative to estimated historical levels, long-term trends in abundance have been relatively stable, with an approximately even mix of upward and downward trends in populations. NMFS concluded that chinook salmon in this ESU are not presently in danger of extinction, nor is it likely to become endangered in the foreseeable future.

(12) Upper Columbia River Summer- and Fall-Run ESU

The status of this ESU was recently reviewed by NMFS (Waknitz *et al.*, 1995). In the earlier review, this ESU was determined to be neither at risk of extinction nor likely to become so. However, new data shows the proportion of naturally spawning summer chinook salmon of hatchery origin has been increasing rapidly in areas above Wells Dam. There is corresponding concern about the possible genetic and/or life-history consequences to the sustainability of natural populations in that area from the shift in hatchery releases from subyearlings to yearlings.

Nearly 38 million summer-run fish have been released from the Wells Dam Hatchery since 1967. Efforts to establish the Wells Dam summer-run broodstock removed a large proportion of the spawners (94 percent of the run in 1969) destined for the Methow River and other upstream tributaries (Mullan *et al.*, 1992). Additionally, a number of fall-run fish have been incorporated into the summer-run program, especially during the 1980s (Marshall et al., 1995). Large numbers of fall chinook salmon have been released into the mainstem Columbia River and into the Yakima River. Although no hatcheries operate on the Yakima River, releases of upriver bright fall-run chinook salmon into the lower Yakima River (below Prosser Dam) are thought to have overwhelmed local naturally spawning stocks (WDF *et al.*, 1993; Marshall *et al.*, 1995). Fall chinook salmon also spawn in the mainstem Columbia River; this occurs primarily in the Hanford Reach portion of the Columbia River, with additional spawning sites in the tailrace areas of mainstem dams. Upriver bright fall chinook salmon hatchery stocks represent a composite of stocks intercepted at various dams. This stock has also been released in large numbers by hatcheries on the mainstem Columbia River. Although the upriver bright stocks incorporated representatives from the mainstem spawning populations in the Hanford Reach and those displaced by the construction of Grand Coulee Dam and other mainstem dams, they have also incorporated individuals from the Snake River fall-run ESU (Howell *et al.*, 1985). The mixed genetic background of upriver bright stocks may result in less accurate homing (McIssac and Quinn 1988; Chapman *et al.*, 1994). However, the naturally spawning Hanford Reach fall-run population appears to stray at very low levels (Hymer *et al.*, 1992b).

Previous assessments of stocks within this ESU have identified several as being at risk or of concern. Nehlsen *et al.* (1991) identified six stocks as extinct, one as a moderate extinction risk (Methow River summer chinook salmon), and one as of special concern (Okanogan River summer chinook salmon). WDF *et al.* (1993) considered 10 stocks within the ESU, of which 3 were considered to be of native origin and predominantly natural production. The status of these three stocks was two healthy (Marion Drain and Hanford Reach fall-runs) and one depressed (Okanogan River summer-run). Huntington *et al.* (1996) identified one healthy Level I stock in their survey (Hanford Reach fall run).

In an earlier review, NMFS concluded that this ESU was not in danger of extinction, nor likely to become endangered in the foreseeable future. None of the information reviewed in this assessment provides a basis for NMFS to change this earlier conclusion. However, if negative trends in this ESU continue, NMFS will reevaluate the status of these chinook salmon.

(13) Upper Columbia River Spring-Run ESU

Access to a substantial portion of historical habitat was blocked by Chief Joseph and Grand Coulee Dams. There are local habitat problems related to irrigation diversions and hydroelectric development, as well as degraded riparian and instream habitat from urbanization and livestock grazing. Mainstem Columbia River hydroelectric development has resulted in a major disruption of migration corridors and affected flow regimes and estuarine habitat. Some populations in this ESU must migrate through nine mainstem dams.

Artificial propagation efforts have had a significant impact on spring-run populations in this ESU, either through hatchery-based enhancement or the extensive trapping and transportation activities associated with the GCFMP. Prior to the implementation of the GCFMP, spring-run chinook salmon populations in the Wenatchee, Entiat, and Methow Rivers were at severely depressed levels (Craig and Suomela, 1941). Therefore, it is probable that the majority of returning spring-run adults trapped at Rock Island Dam for use in the GCFMP were probably not native to these three rivers (Chapman et al., 1995). All returning adults were either directly transported to river spawning sites or spawned in one of the National Fish Hatcheries (NFHs) built for the GCFMP.

In the years following the GCFMP, several stocks were transferred to the NFHs in this area. Naturally spawning populations in tributaries upstream of hatchery release sites have apparently undergone limited introgression by hatchery stocks, based on CWT recoveries and genetic analysis (Chapman *et al.* 1995). Artificial propagation efforts have recently focused on supplementing naturally spawning populations in this ESU (Bugert, 1998), although it should be emphasized that these naturally spawning populations were founded by the same GCFMP homogenized stock. Furthermore, the potential for hatchery-derived non-native stocks to genetically impact naturally spawning populations exists, especially given the recent low numbers of fish returning to rivers in this ESU. Risks associated with interactions between wild and hatchery chinook salmon are a concern, because there continues to be substantial production of the composite, non-native Carson stock for fishery enhancement and hydropower mitigation.

Harvest rates are low for this ESU, with very low ocean and moderate instream harvest. Harvest rates have been declining recently (ODFW and WDFW, 1995).

Previous assessments of stocks within this ESU have identified several as being at risk or of concern. Nehlsen *et al.* (1991) identified six stocks as extinct. Due to lack of information on chinook salmon stocks that are presumed to be extinct, the relationship of these stocks to existing ESUs is uncertain. They are listed here based on geography and to give a complete presentation of the stocks identified by Nehlsen et al. (1991). WDF *et al.* (1993) considered nine stocks within the ESU, of which eight were considered to be of native origin and predominantly natural production. The status of all nine stocks was considered depressed. Populations in this ESU have experienced record low returns for the last few years.

Recent total abundance of this ESU is quite low, and escapements in 1994–1996 were the lowest in at least 60 years. At least 6 populations of spring chinook salmon in this ESU have become extinct, and almost all remaining naturally-spawning populations have fewer than 100 spawners. In addition to extremely small population sizes, both recent and long-term trends in abundance are downward, some extremely so. NMFS concluded that chinook salmon in this ESU are in danger of extinction.

(14) Snake River Fall-Run ESU

Snake River fall-run chinook salmon are currently listed as a threatened species under the ESA (57 FR 14653, April 22, 1992). As discussed above, NMFS concluded that the Snake River fall-run ESU also includes fall chinook salmon in the Deschutes River and, historically, populations from the John Day, Umatilla, and Walla Walla Rivers that have been extirpated in the twentieth century.

Almost all historical Snake River fall-run chinook salmon spawning habitat in the Snake River Basin was blocked by the Hells Canyon Dam complex; other habitat blockages have also occurred in Columbia River tributaries. Hydroelectric development on the mainstem Columbia and Snake Rivers continues to affect juvenile and adult migration. Remaining habitat has been reduced by inundation in the mainstem Snake and Columbia Rivers, and the ESU's range has also been affected by agricultural water withdrawals, grazing, and vegetation management.

The continued straying by non-native hatchery fish into natural production areas is an additional source of risk to the Snake River chinook salmon.

Assessing extinction risk to the newly-configured ESU is difficult because of the geographic discontinuity and the disparity in the status of the two remaining populations. NMFS also notes considerable uncertainty regarding the origins of fall chinook salmon in the lower Deschutes River and their relationship to fish in the upper Deschutes River. Historically, the

Snake River populations dominated production in this ESU; total abundance is estimated to have been about 72,000 in the 1930s and 1940s, and it was probably substantially higher before that. Production from the Deschutes River was presumably only a small fraction of historic production in the ESU. In contrast, recent (1990–96) returns of naturally spawning fish to the Deschutes River (about 6,000 adults per year) have been much higher than in the Snake River (5-year mean about 500 adults per year, including hatchery strays). The relatively recent extirpation of fall-run chinook in the John Day, Umatilla and Walla Walla Rivers is also a factor in assessing the risk to the overall ESU.

Long term trends in abundance are mixed—slightly upward in the Deschutes River and downward in the Snake River. Short-term trends in both remaining populations are upward. After considering the addition of the Deschutes River fall chinook populations to the listed Snake River fall-run chinook salmon ESU, NMFS concluded that the ESU as a whole is likely to become an endangered species within in the foreseeable future throughout all or a significant portion of its range, in spite of the relative health of the Deschutes River population.

(15) Snake River Spring- and Summer-Run ESU

This ESU has been extensively reviewed by NMFS (Matthews and Waples, 1991; NMFS, 1995b). The Snake River Spring and summer-run ESU is listed as a threatened species and NMFS did not review its previous risk conclusion here.

Summary of Factors Affecting the Species

Section 2(a) of the ESA states that various species of fish, wildlife, and plants in the United States have been rendered extinct as a consequence of economic growth and development untempered by adequate concern for ecosystem conservation. Section 4(a)(1) of the ESA and the listing regulations (50 CFR Part 424) set forth procedures for listing species. NMFS must determine, through the regulatory process, if a species is endangered or threatened based upon any one or a combination of the following factors: (1) The present or threatened destruction, modification, or curtailment of its habitat or range; (2) overutilization for commercial, recreational, scientific, or education purposes; (3) disease or predation; (4) inadequacy of existing regulatory mechanisms; or (5) other natural or human-made factors affecting its continued existence.

NMFS has prepared two supporting documents which address the factors that have led to the decline of chinook salmon and other salmonids. The first is entitled ‘‘Factors for Decline: A Supplement to the Notice of Determination for West Coast Steelhead’’ (NMFS, 1996). That report, available upon request (see **ADDRESSES**), concluded that all of the factors identified in section 4(a)(1) of the ESA have played a role in the decline of steelhead and other salmonids, including chinook salmon. The report identifies destruction and modification of habitat, overutilization for commercial and recreational purposes, and natural and human-made factors as being the primary reasons for the decline of west coast steelhead, and other salmonids including chinook salmon. The second document is a supplement to the document referred to above. This document, entitled ‘‘Factors Contributing to the Decline of West Coast Chinook Salmon: An Addendum to the 1996 West Coast Steelhead Factors for Decline Report’’ (NMFS, 1998 In prep.) discusses specific factors affecting chinook salmon. In this report, NMFS concludes that all of the factors identified in section 4(a)(1) of the ESA have played a role in the decline of chinook salmon, and other salmonids. The report identifies destruction and modification of habitat, overutilization for recreational purposes, and natural and human-made factors as being the primary reasons for the decline of chinook salmon.

The following discussion summarizes findings regarding factors for decline across the range of chinook salmon. While these factors have been treated here in general terms, it is important to underscore that impacts from certain factors are more acute for specific ESUs. For example, impacts from hydropower development are more pervasive for ESUs in the Columbia River Basin than for some coastal ESUs.

A. The Present or Threatened Destruction, Modification, or Curtailment of its Habitat or Range

Chinook salmon on the west coast of the United States have experienced declines in abundance in the past several decades as a result of loss, damage or change to their natural environment. Water diversions for agriculture, flood control, domestic, and hydropower purposes (especially in the Columbia River and Sacramento-San Joaquin Basins) have greatly reduced or eliminated historically accessible habitat, and degraded remaining habitat.

Forestry, agriculture, mining, and urbanization have degraded, simplified, and fragmented habitat. Studies indicate that in most western states, about 80 to 90 percent of the historic riparian habitat has been eliminated (Botkin *et al.*, 1995; Norse, 1990; Kellogg, 1992; California State Lands Commission, 1993). Washington and Oregon wetlands are estimated to have diminished by one-third, while California has experienced a 91 percent loss of its wetland habitat. Loss of habitat complexity and habitat fragmentation have also contributed to the decline of chinook salmon. For example, in national forests within the range of the northern spotted owl in western and eastern Washington, there has been a 58 percent reduction in large, deep pools due to sedimentation and loss of pool-forming structures such as boulders and large wood (Forest Ecosystem Management Assessment Team (FEMAT), 1993). Similarly, in Oregon, the abundance of large, deep pools on private coastal lands has decreased by as much as 80 percent (FEMAT, 1993). Sedimentation from extensive and intensive land use activities (timber harvests, road building, livestock grazing, and urbanization) is recognized as a primary cause of habitat degradation in the range of west coast chinook salmon.

B. Overutilization for Commercial, Recreational, Scientific or Educational Purposes

Historically, chinook salmon were abundant in many western coastal and interior waters of the United States. Chinook salmon have supported, and still support important tribal, commercial and recreational fisheries throughout their range, contributing millions of dollars to numerous local economies, as well as providing important cultural and subsistence needs for Native Americans. Overfishing in the early days of European settlement led to the depletion of many stocks of chinook and other salmonids even before extensive habitat degradation. However, following the degradation of many west coast aquatic and riparian ecosystems, exploitation rates were higher than many chinook populations could sustain. Therefore, harvest may have contributed to the further decline of some populations.

C. Disease or Predation

Introductions of non-native species and habitat modifications have resulted in increased predator populations in numerous rivers. Predation by marine mammals is also of concern in areas experiencing dwindling chinook salmon runsizes. However, salmonids appear to be a minor component of the diet of marine mammals (Scheffer and Sperry, 1931; Jameson and Kenyon, 1977; Graybill, 1981; Brown and Mate, 1983; Roffe and Mate, 1984; Hanson, 1993). Principal food sources are small pelagic schooling fish, juvenile rockfish, lampreys (Jameson and Kenyon, 1977; Roffe and Mate, 1984), benthic and epibenthic species (Brown and Mate, 1983) and flatfish (Scheffer and Sperry, 1931; Graybill, 1981). Predation may significantly influence salmonid abundance in some local populations when other prey are absent and physical conditions lead to the concentration of adults and juveniles (Cooper and Johnson, 1992).

Infectious disease is one of many factors that can influence adult and juvenile chinook salmon survival. Chinook salmon are exposed to numerous bacterial, protozoan, viral, and parasitic organisms in spawning and rearing areas, hatcheries, migratory routes, and the marine environment. Specific diseases such as bacterial kidney disease (BKD), ceratomyxosis, columnaris, furunculosis, infectious hematopoietic necrosis virus, redmouth and black spot disease, erythrocytic inclusion body syndrome, and whirling disease, among others, are present and are known to affect chinook salmon (Rucker *et al.*, 1953; Wood, 1979; Leek, 1987; Foott *et al.*, 1994; Gould and Wedemeyer, undated). Very little current or historical information exists to quantify changes in infection levels and mortality rates attributable to these diseases for chinook salmon. However, studies have shown that naturally spawned fish tend to be less susceptible to pathogens than hatchery-reared fish (Buchanon *et al.*, 1983; Sanders *et al.*, 1992). Native chinook salmon have evolved with certain of these organisms, but the widespread use of artificial propagation has introduced exotic organisms not historically present in particular watersheds. Scientific studies may indicate that chinook salmon are more susceptible to disease organisms than other salmonids. Habitat conditions such as low water flows and high temperatures can exacerbate susceptibility to disease.

D. The Inadequacy of Existing Regulatory Mechanisms

A variety of Federal, state, tribal, and local laws, regulations, treaties and measures affect the abundance and survival of west coast chinook salmon and the quality of their habitat. NMFS prepared a separate report entitled ''West Coast Steelhead Conservation Measures, A Supplement to the Notice of Determination for West Coast Steelhead Under the Endangered Species'' which summarizes many of these existing measures and their effect on steelhead and other salmonids, including chinook salmon. This report is available from NMFS (see **ADDRESSES** section). The following sections briefly discuss other regulatory measures designed to conserve chinook and other salmonids (see also Efforts Being Made to Protect West Coast Chinook Salmon and Conservation Measures sections).

1. Federal Land and Water Management

The Northwest Forest Plan (NFP) is a Federal management policy with important benefits for chinook salmon. While the NFP covers a very large area, the overall effectiveness of the NFP in conserving chinook salmon is limited by the extent of Federal lands and the fact that Federal land ownership is not uniformly distributed in watersheds within the affected ESUs. The extent and distribution of Federal lands limits the NFP's ability to achieve its aquatic habitat restoration objectives at watershed and river basin scales and highlights the importance of complementary salmon habitat conservation measures on nonfederal lands within the subject ESUs.

On February 25, 1995, the U.S. Forest Service and Bureau of Land Management adopted Implementation of Interim Strategies for Managing Anadromous Fish-producing Watersheds in eastern Oregon and Washington, Idaho, and portions of California (known as PACFISH). The strategy was developed in response to significant declines in naturally-reproducing salmonid stocks, including chinook salmon, and widespread degradation of anadromous fish habitat throughout Federal lands in Idaho, Washington, Oregon, and California outside the range of the northern spotted owl. Like the NFP, PACFISH is an attempt to provide a consistent approach for maintaining and restoring aquatic and riparian habitat conditions which, in turn, are expected to promote the sustained natural production of anadromous fish. However, as with the NFP, PACFISH is limited by the extent of Federal lands and Federal land ownership is not uniformly distributed in watersheds within all the affected ESUs.

Within the range of several chinook salmon ESUs (*i.e.*, Southern Oregon and California Coastal, Lower Columbia River, and Puget Sound), much of available chinook salmon habitat is covered by the requirements of the NFP. These existing conservation efforts have resulted in improvements in aquatic habitat conditions for salmonids within this region.

Since the adoption of the NFP, NMFS has consulted with the BLM and USFS on ongoing and proposed activities that may affect anadromous salmonids, including chinook salmon and their habitats. During this period of time, NMFS has reviewed thousands of activities throughout northern California, Oregon, and Washington and helped develop numerous programmatic biological assessments (BAs) with the BLM and the USFS. These BAs cover a wide range of management activities, including forest and/or resource area-wide routine and non-routine road maintenance, hazard tree removal, range allotment management, watershed and instream restoration, special use permits (*e.g.*, mining, ingress/egress), timber sale programs (*e.g.*, green tree, fuel reduction, thinning, regeneration, and salvage), and BLM's land tenure adjustment program. Numerous other project-specific BAs were also consulted and conferenced upon. These National Forest and BLM Resource Area-wide BAs include region-specific best management practices, all necessary measures to minimize impacts for all listed or proposed anadromous salmonids, monitoring, and environmental baseline checklists for each project. These BA's have resulted in a more consistent approach to management of Federal lands throughout the NFP and PACFISH areas.

2. Federal/State Land and Water Management in California

California's Central Valley chinook salmon have been the subject of many conservation efforts aimed at restoring the Sacramento and San Joaquin Rivers over several decades. Past efforts have generally been unsuccessful at reducing the risks facing Central Valley chinook salmon. Despite a long history of unproductive conservation and protection efforts, Federal, state and private stakeholders joined to urge Congressional passage of the Central Valley Project Improvement Act (CVPIA) in 1992, followed by the signing of the CALFED Bay-Delta Accord (Accord) in December 1994. The Bay-Delta Accord detailed interim measures for environmental protection and paved the way for the development of the long-term CALFED Bay-Delta Program. The CALFED Bay-Delta Program which began in June of 1995 is a planning effort between state and federal agencies for developing a long-range, comprehensive solution for the Bay-Delta Estuary and its watershed. Collectively, the CVPIA and CALFED Bay-Delta conservation programs may provide a comprehensive conservation response to the extensive ecologic problems facing at-risk salmonids. The CVPIA and the CALFED Bay-Delta Program are described in more detail in the Efforts Being Made to Protect West Coast Chinook Salmon section.

3. State Land Management

The California Department of Forestry and Fire Protection (CDF) enforces the State of California's forest practice rules (CFPRs) which are promulgated through the Board of Forestry (BOF). The CFPRs contain provisions that provide significant protection for chinook salmon if fully implemented. However, NMFS believes the CFPRs do not secure properly functioning riparian habitat. Specifically, the CFPRs do not adequately address large woody debris recruitment, streamside tree retention to maintain bank stability, and canopy retention standards that assure stream temperatures are properly functioning for all life stages of chinook salmon. The current process for approving Timber Harvest Plans (THPs) under the CFPRs does not include monitoring of timber harvest operations to determine whether a particular operation damaged habitat and, if so, how it might be mitigated in future THPs. The CFPR rule that permits salvage logging is also an area where better environmental review and monitoring could ensure better protection for chinook salmon. For these reasons, NMFS is working to improve the condition of riparian buffers in ongoing habitat conservation plan negotiations with private landowners.

The Oregon Forest Practices Act (OFPA), while modified in 1995 and improved over the previous OFPA, does not have implementing rules that adequately protect salmonid habitat. In particular, the current OFPA does not provide adequate protection for the production and introduction of large woody debris (LWD) to medium, small and non-fish bearing streams. Small non-fish bearing streams are vitally important to the quality of downstream habitats. These streams carry water, sediment, nutrients, and LWD from upper portions of the watershed. The quality of downstream habitats is determined, in part, by the timing and amount of organic and inorganic materials provided by these small streams (Chamberlin *et al.* in Meehan, 1991). Given the existing depleted condition of most riparian forests on non-Federal lands, the time needed to attain mature forest conditions, the lack of adequate protection for non-riparian LWD sources in landslide-prone areas and small headwater streams (which account for about half the wood found naturally in stream channels) (Burnett and Reeves, 1997 citing Van Sickle and Gregory, 1990; McDade *et al.*, 1990; and McGreary, 1994), and current rotation schedules (approximately 50 years), there is a low probability that adequate LWD recruitment could be achieved under the current requirements of the OFPA. Also, the OFPA does not adequately consider and manage timber harvest and road construction on sensitive, unstable slopes subject to mass wasting, nor does it address cumulative effects. These issues, and other concerns about the OFPA have been analyzed in detail in a recent document prepared by NMFS. The document, entitled ''A Draft Proposal Concerning Oregon Forest Practices'' was submitted to the Oregon Board of Forestry Memorandum of Agreement Advisory Committee and to the Oregon Governor's Office to advance potential improvements in Oregon forest practices (OFP) (NMFS OFP Draft, February 17, 1998).

The Washington Department of Natural Resources implements and enforces the State of Washington's forest practice rules (WFPRs) which are promulgated through the Forest Practices Board. These WFPRs contain provisions that can be protective of chinook salmon if fully implemented. This is possible given that the WFPRs are based on adaptive management of forest lands through watershed analysis, development of site-specific land management prescriptions, and monitoring. Watershed Analysis prescriptions can exceed WFPR minimums for stream and riparian protection. However, NMFS believes the WFPRs, including watershed analysis, do not provide properly functioning riparian and instream habitats. Specifically, the base WFPRs do not adequately address LWD recruitment, tree retention to maintain stream bank integrity and channel networks within floodplains, and chronic and episodic inputs of coarse and fine sediment that maintain habitats that are properly functioning for all chinook salmon life stages.

4. Dredge, Fill, and Inwater Construction Programs

The Army Corps of Engineers (COE) regulates removal/fill activities under section 404 of the Clean Water Act (CWA), which requires that the COE not permit a discharge that would ''cause or contribute to significant degradation of the waters of the United States.'' One of the factors that must be considered in this determination is cumulative effects. However, the COE guidelines do not specify a methodology for assessing cumulative impacts or how much weight to assign them in decision-making. Furthermore, the COE does not have in place any process to address the additive effects of the continued development of waterfront, riverine, coastal, and wetland properties.

5. Water Quality Programs

The Federal Clean Water Act (CWA), enforced in part by the Environmental Protection Agency (EPA), is intended to protect beneficial uses, including fishery resources. To date, implementation has not been effective in adequately protecting fishery resources, particularly with respect to non-point sources of pollution.

Section 303(d)(1)(C) and (D) of the CWA requires states to prepare Total Maximum Daily Loads (TMDLs) for all water bodies that do not meet State water quality standards. TMDLs are a method for quantitative assessment of environmental problems in a watershed and identifying pollution reductions needed to protect drinking water, aquatic life, recreation, and other use of rivers, lakes, and streams. TMDLs may address all pollution sources including point sources such as sewage or industrial plant discharges, and non-point discharges such as runoff from roads, farm fields, and forests.

The CWA gives state governments the primary responsibility for establishing TMDLs. However, EPA is required to do so if a state does not meet this responsibility. In California, as a result of recent litigation, the EPA has made a legal commitment guaranteeing that either EPA or the State will establish TMDLs that identify pollution reduction targets for 18 impaired river basins in northern California by the year 2007. California has made a commitment to establish TMDLs for approximately half the 18 river basins by 2007. The EPA will develop TMDLs for the remaining basins and has also agreed to complete all TMDLS if the State fails to meet its commitment within the agreed upon time frame.

State agencies in Oregon are committed to completing TMDLs for coastal drainages within 4 years, and all impaired waters within 10 years. Similarly ambitious schedules are being developed for Washington and California.

The ability of these TMDLs to protect chinook salmon should be significant in the long term; however, it will be difficult to develop them quickly in the short term and their efficacy in protecting chinook salmon habitat will be unknown for years to come.

E. Other Natural or Manmade Factors Affecting Its Continued Existence

Natural climatic conditions have exacerbated the problems associated with degraded and altered riverine and estuarine habitats. Persistent drought conditions have reduced already limited spawning, rearing and migration habitat. Climatic conditions appear to have resulted in decreased ocean productivity which, during more productive periods, may offset poor productivity caused by degraded freshwater habitat conditions.

In an attempt to mitigate the loss of habitat, extensive hatchery programs have been implemented throughout the range of west coast chinook salmon. While some of these programs have succeeded in providing fishing opportunities, the impacts of these programs on native, naturally-reproducing stocks are not well understood. Competition, genetic introgression, and disease transmission resulting from hatchery introductions may significantly reduce the production and survival of native, naturally-reproducing chinook salmon (NMFS, 1996a). Collection of native chinook salmon for hatchery broodstock purposes often harms small or dwindling natural populations. Artificial propagation may play an important role in chinook salmon recovery and some hatchery populations of chinook salmon may be deemed essential for the recovery of threatened or endangered chinook salmon ESUs (see Proposed Determination section).

In the past, non-native chinook salmon stocks have been introduced as broodstock in hatcheries and widely transplanted in many coastal rivers and streams throughout the range of the proposed chinook salmon ESUs (Bryant, 1994; Myers *et al*., 1998). Because of problems associated with this practice, California Department of Fish and Game (CDFG) developed its Salmon and Steelhead Stock Management Policy. This policy recognizes that such stock mixing is detrimental and seeks to maintain the genetic integrity of all identifiable California stocks of chinook salmon and other salmonids, as well as minimize interactions between hatchery and natural populations. To protect the genetic integrity of salmon and steelhead stocks, this policy directs CDFG to evaluate each salmon and steelhead stream and classify it according to its probable genetic source and degree of integrity.

Hatchery programs and harvest management have strongly influenced chinook salmon populations in the Central Valley, California ESU, the Puget Sound ESU, the Lower Columbia River ESU, the Upper Willamette ESU, and the Upper Columbia River spring-run ESU. Hatchery programs intended to compensate for habitat losses have masked declines in natural stocks and have created unrealistic expectations for fisheries.

The three state agencies (California Department of Fish and Game, Oregon Department of Fish and Wildlife, and the Washington Department of Fish and Wildlife) have adopted and are implementing natural salmonid policies designed to limit hatchery influences on natural, indigenous chinook salmon. While some limits have been placed on hatchery production of anadromous salmonids, more careful management of current programs and scrutiny of proposed programs is necessary in order to minimize impacts on listed species.

Efforts Being Made To Protect West Coast Chinook Salmon

Section 4(b)(1)(A) of the ESA requires the Secretary of Commerce to make listing determinations solely on the basis of the best scientific and commercial data available and after taking into account efforts being made to protect a species. Therefore, in making its listing determinations, NMFS first assesses chinook salmon status and identifies factors that have lead to its decline. NMFS then assesses existing conservation actions to determine if those measures ameliorate the risks faced by chinook salmon.

In judging the efficacy of existing conservation efforts, NMFS considers the following: (1) The substantive, protective, and conservation elements of such efforts; (2) the degree of certainty such efforts will be reliably implemented; and (3) the presence of monitoring provisions that permit adaptive management (NMFS 1996b). In some cases, conservation efforts may be relatively new and may not have had time to demonstrate their biological benefit. In such cases, provisions for adequate monitoring and funding of conservation efforts are essential to ensure intended conservation benefits are realized (see NMFS 1996b, see also 62 FR 24602–24607, May 6, 1997).

During a previous status review for west coast steelhead, NMFS reviewed an array of protective efforts for steelhead and other salmonids, including chinook salmon, ranging in scope from regional strategies to local watershed initiatives. NMFS summarized some of the major efforts in a document entitled ''Steelhead Conservation Efforts: A Supplement to the Notice of Determination for West Coast Steelhead Under the Endangered Species Act.'' (NMFS, 1996). This document is available upon request (see **ADDRESSES**).

Several more recently developed protective efforts have been directed towards the conservation of various salmonids and the watersheds supporting them. These efforts may affect recovery of chinook salmon in California, Oregon and Washington.

State of California Protective Measures for Central Valley Chinook

Spring- and fall/late fall-run chinook salmon in California's Central Valley are beginning to benefit from two major conservation initiatives that are under development and simultaneously being implemented to conserve and restore salmonid and other fishery resources in the rivers and streams of the Central Valley, including the Bay-Delta region. The first of these initiatives is the Central Valley Project Improvement Act (CVPIA) which Congress passed in 1992. The CVPIA is intended to remedy habitat and other problems associated with the construction and operation of the Bureau of Reclamation's (BOR) Central Valley Project. The CVPIA has two key habitat restoration features related to the recovery of chinook salmon in the Central Valley. First, it directs the Secretary of the Interior to develop and implement a program that makes all reasonable efforts to double natural production of anadromous fish in Central Valley streams (Section 3406(b)(1)) by the year 2002. The U.S. Fish and Wildlife Service (FWS) approached implementation of this CVPIA directive through development of the Anadromous Fish Restoration Program (AFRP). The AFRP contains a total of 172 actions and 117 evaluations. The Department of the Interior (DOTI) intends to finalize the AFRP in 1998 upon completion of the Programmatic Environmental Impact Statement, which is required by Section 3409 of the CVPIA. Secondly, the CVPIA annually dedicates up to 800,000 acre feet (AF) of water flows for fish, wildlife, and habitat restoration purposes (Section 3406(b)(2)), and provides for the acquisition of additional water to supplement the 800,000 AF (Section 3406(b)(3)). The FWS, in consultation with other Federal and State agencies, directs the use of these dedicated water flows.

On November 20, 1997, DOI released its final administrative proposal on the management of Section 340(b)(2) water and a set of flow-related actions for the use of so-called (b)(2) water during the next five years. These plans will be continuously updated to include new information, consistent with the adaptive management approach described in the AFRP. To make restoration efforts as efficient as possible, the AFRP has committed to coordinate restoration efforts with those developed and implemented by other groups or programs, including the CALFED Bay-Delta program.

Federal funding has been appropriated since 1995 to implement restoration projects identified through the AFRP planning and development process, or through complementary programs such as the CALFED Bay-Delta Program. In 1996, a total of $1.9 million was obligated for 11 restoration projects or evaluations identified through the AFRP planning process. These projects included restoration management planning efforts in the lower Tuolumne River, Deer Creek, and Butte Creek, modification of a fish ladder on the Yuba River, acquisition of riparian property and easements on Pine Creek and Big Chico Creek, water exchange pump and riparian restoration projects on Mill Creek, and several monitoring and evaluation projects. In 1997, $9.7 million was obligated for over 30 projects located throughout the Central Valley. The AFRP's projected budget for restoration projects in the Central Valley in 1998 is $8.2 million. The ARFP's 1998 work plan identifies 27 high priority projects for funding, and an additional 14 projects which will proceed contingent on additional funding. An estimated $20 million to $35 million will be spent on AFRP restoration actions per year for 25 years ($500 million to $875 million estimated total), most of which will be closely integrated with funding for habitat restoration activities as part of the CALFED Bay-Delta program.

During 1996 and 1997, the AFRP implemented several fish flow and habitat restoration actions using the CVPIA provisions. Specific actions included limiting Delta water exports for fisheries protection, closing the Delta Cross Channel gates to minimize the diversion of juvenile chinook salmon from the Sacramento River into the Delta, and modifying the operation of water project facilities in the Delta to evaluate the benefits of actions taken to protect juvenile chinook salmon. NMFS expects that similar fisheries protection measures will be implemented in 1998 depending on actual hydrological conditions.

The second and very ambitious initiative that benefits Central Valley spring and fall/late-fall chinook salmon is the CALFED Bay-Delta Program. In June 1994, state and Federal agencies signed a framework agreement that pledged all agencies to work together to formulate water quality standards to protect the Bay-Delta, coordinate state and Federal water project operations, and develop a long-term Bay-Delta restoration program. In December 1994, a diverse group of State and Federal agencies, water agencies and environmental organizations signed The Bay-Delta Accord which set out specific interim (3-year) measures for environmental protection, including protection for Central Valley chinook stocks. The CALFED Bay-Delta Program, which began in June, 1995, is charged with developing the long-term Bay-Delta solution and restoration program.

Three types of environmental protection and restoration measures are detailed in the 1994 Bay-Delta Accord: (1) The control of freshwater outflow in the Delta to improve estuarine conditions in the shallow-water habitat of the Bay-Delta estuary (Category I measures), (2) the regulation of water project operations and flows to minimize harmful environmental impacts of water exports (Category II measures), and (3) the funding and implementation of projects to address non-flow related factors affecting the Bay-Delta ecosystem such as unscreened diversions, physical habitat degradation, and pollution (Category III measures). Many of the Category I and II measures identified in the agreement were implemented by a Water Quality Control Plan that was adopted by the State Water Resources Control Board in 1995. Efforts were also initiated to implement Category III non-flow projects beginning in 1995 and these have continued to the present.

In 1995 and 1996, the Category III program approved a total of $21.1 million in funding for a large number of habitat restoration, fish screening, land acquisition, research and monitoring, watershed planning, and fish passage projects distributed throughout the Sacramento/San Joaquin River basins, their tributaries and the Bay-Delta system. Additional funding was provided for most of these projects from the CVPIA or other funding sources, and many constitute specific restoration actions identified in the draft Ecosystem Restoration Program Plan (ERPP) that is being developed as part of the comprehensive long-term CALFED Bay-Delta program. The total funding obligation for these projects exceeded $40 million. A description of these projects, the project proponent, the funding commitments, and the project status are described in a March 1997 summary document. In 1997, the CALFED Bay-Delta program announced its intention to fund a total of 51 additional projects using nearly $61 million in Category III funding. Additional funding of nearly $40 million was also available as a cost share for other projects if additional high priority projects could be identified. The selection of these 51 projects were intended to address specific stressors or factors for decline that were identified in the planning process leading to development of the ERPP. The vast majority of these funds (nearly 77 percent) were allocated to projects addressing floodplain/marsh plain changes and changes in river channel form. An additional 10 percent was targeted at entrainment problems, while 8 percent addressed water quality problems. Of the total funds committed to new projects, 87 percent will be expended for implementation projects, with the balance expended for watershed planning, monitoring, and research.

Central Valley spring and fall/late-fall chinook salmon have benefited from the expenditure of these restoration program funds through the placement of new fish screens, modifications of barriers to fish passage, and habitat restoration projects, and additional benefits are expected to accrue to these populations in the future as new projects are implemented. In the long-term, NMFS is hopeful that the CVPIA and CALFED Bay-Delta conservation programs described above can be focused and implemented to provide a comprehensive conservation response to the extensive habitat problems facing chinook salmon and other species in the Central Valley. To date, however, projects funded by these programs have focused on addressing habitat problems facing these and other species, and have placed an emphasis on problems associated with freshwater and ocean harvest or hatchery management practices. The CALFED Bay-Delta Program's draft ERPP acknowledges that current hatchery practices and freshwater and ocean harvest management practices are stressors (or risk factors) that are adversely affecting natural chinook salmon populations in the Central Valley. It also identifies general changes that may be needed to reduce the impacts of these stressors, and incorporates the need for improved harvest and hatchery management in its programmatic implementation plan. However, no Category III funding has been targeted at these problems to date, and a focused plan with both a near- and long-term implementation strategy to deal with these problems still needs to be developed. Many habitat restoration projects or activities identified in the ERPP have been funded and are in the process of being implemented as discussed above. Other components of the restoration plan will be carried out as part of its long-term implementation. NMFS is encouraged by the ecosystem planning and restoration strategy developed for chinook salmon in Central Valley and Bay-Delta ecosystem. However, several risk factors that have been identified by NMFS as adversely affecting chinook salmon in the Central Valley have not been adequately addressed, and plans for their implementation needs to be developed. These risk factors include large hatchery programs and practices that are adversely affecting natural populations of spring and fall/late-fall chinook salmon, and masking our ability to confidently assess the status of naturally spawning populations; and ocean and freshwater harvest rates on natural stocks of spring and fall/late-fall chinook salmon stocks (hatchery and natural) that may exceed the basin's ability to naturally sustain these ESUs.

Because the full scope and implementation strategy for the CALFED Bay-Delta Program's long-term restoration program have yet to be finalized and a focused strategy to address impacts from harvest and hatchery practices has yet to be adequately developed, NMFS believes that the conservation benefits provided for by the CALFED restoration program and other complementary programs are not currently sufficient to reduce the substantial risks facing Central Valley spring-run and fall/late fall-run chinook salmon. NMFS is committed to working closely with the State and the CALFED Bay-Delta Program to build on the draft ERPP and its implementation strategy to ensure that all risks to spring-run and fall/late fall-run chinook salmon, including those resulting from current hatchery and harvest practices, are properly addressed in the future.

State of Oregon Conservation Measures

In April 1996, the Governor of Oregon completed and submitted to NMFS a comprehensive conservation plan directed specifically at coho salmon stocks on the Coast of Oregon. This plan, termed the Oregon Plan for Salmon and Watersheds (OPSW) (formerly known as the Oregon Coastal Salmon Restoration Initiative) has recently been expanded to include conservation measures for coastal steelhead stocks (Oregon, 1998). For a detailed description of the OPSW, refer to the May 6, 1997, listing determination for Southern Oregon/ Northern California coho salmon (62 FR 24602–24606). The essential features of the OPSW include the following:

1. Identifies and addresses all factors for decline of coastal coho and steelhead, most notably, those factors relating to harvest, habitat, and hatchery activities.
2. State agencies whose activities affect salmon are held accountable for coordinating their programs in a manner that conserves and restores the species and their habitat.
3. Developed a framework for prioritizing conservation and restoration efforts.
4. Developed a comprehensive monitoring plan that coordinates Federal, state, and local efforts to improve current knowledge of freshwater and marine conditions, determine populations trends, evaluate the effects of artificial propagation, and rate the OPSW's success or failure in restoring the salmon.
5. Actions to conserve and restore salmon must be worked out by communities and landowners—those who possess local knowledge of problems and who have a genuine stake in the outcome.
6. The principle of adaptive management coordinates the prioritization, monitoring and implementation elements of this conservation plan. Through this process, there is an explicit mechanism for learning from experience, evaluating alternative approaches, and making needed changes in the programs and measures.
7. The Independent Multidisciplinary Science Team (IMST) provides an independent audit of the OPSW's strengths and weaknesses. The IMST assists the adaptive management process by compiling new information into an annual review of goals, objectives, and strategies, and by recommending changes.
8. The annual report made to the Governor, the legislature, and the public will help the agencies make the adjustments described for the adaptive management process.

While NMFS recognizes that many of the ongoing protective efforts are likely to promote the conservation of chinook and other salmonids, in the aggregate, they have not yet achieved chinook salmon conservation at a scale that is adequate to protect and conserve the eight ESUs proposed for listing (seven newly defined ESUs and one redefined ESU). NMFS believes that most existing efforts lack some of the critical elements needed to provide a high degree of certainty that the efforts will be successful. These elements include: (1) identification of specific factors for decline; (2) immediate measures required to protect the best remaining populations and habitats and priorities for restoration activities; (3) explicit and quantifiable objectives and time lines; (4) adequate and reliable funding; and (5) monitoring programs to determine the effectiveness of actions, including methods to measure whether recovery objectives are being met (NMFS Coastal Salmon Conservation: Working Guidance For Comprehensive Salmon Restoration Initiatives on the Pacific Coast, September 15, 1996).

The best available scientific information on the biological status of the species supports a proposed listing of eight chinook salmon ESUs under the ESA (see Proposed Determination). NMFS concludes that existing protective efforts at this time are inadequate to alter the proposed determination of threatened or endangered for these eight chinook salmon ESUs. However, during the period between publication of this proposed rule and publication of a final rule, NMFS will continue to solicit information regarding existing protective efforts (see Public Comments Solicited). NMFS also will work with Federal, state and tribal fisheries managers to evaluate and enhance the efficacy of the various salmonid conservation efforts.

Proposed Determination

The ESA defines an endangered species as any species in danger of extinction throughout all or a significant portion of its range, and a threatened species as any species likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range (16 U.S.C. § 1532(6) and (20)). Section 4(b)(1) of the ESA requires that the listing determination be based solely on the best scientific and commercial data available, after conducting a review of the status of the species and after taking into account those efforts, if any, being made to protect such species.

Based on results from its coastwide assessment, NMFS has concluded that on the west coast of the United States, there are 15 ESUs of chinook salmon which constitute ''species'' under the ESA, including 12 newly identified ESUs. After evaluating the status of these 12 ESUs, NMFS has determined that two ESUs (Central Valley spring-run and the Upper Columbia River spring-run ESUs) are in danger of extinction throughout all or a significant portion of their ranges. NMFS has also determined that five ESUs (Central Valley fall/late fall-run, Southern Oregon and California Coastal, Puget Sound, Lower Columbia River, Upper Willamette River ESUs) are likely to become an endangered species within the foreseeable future throughout all or a significant portion of their range. NMFS proposes to list these ESUs as such at this time.

The listed Snake River fall-run chinook salmon ESU is proposed to be redefined to include additional fall-run chinook populations from the Deschutes River. NMFS has determined this redefined ESU is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range. This proposed reclassification of the Snake River fall-run chinook salmon ESU does not affect the threatened status of the currently defined ESU (see 63 FR 1807, January 12, 1998).

NMFS has also renamed one ESU which was previously reviewed for listing. The Middle Columbia summer and fall-run ESU is renamed the Upper Columbia River summer and fall-run ESU to reflect the inclusion of the fall-run chinook salmon populations from the Columbia River above The Dalles Dam in the newly configured Snake River fall-run ESU. The geographic boundaries for these ESUs (i.e., the watersheds within which the members of the ESU spend their freshwater residence) are described under ''ESU Determinations.''

NMFS also proposes to designate critical habitat for each of the proposed chinook salmon ESUs, as described in the following section entitled Critical Habitat for Pacific Coast Chinook Salmon. Proposed critical habitat for each chinook salmon ESU proposed for listing has been characterized in that section, as well as in tables attached to this notice. Existing critical habitat for Snake River fall-run chinook salmon is proposed to be revised to include the geographic areas of the redefined Snake River fall-run ESU.

Only naturally spawned chinook salmon are being proposed for listing as threatened or endangered species in each of the 8 ESUs. Prior to the final listing determination, NMFS will examine the relationship between hatchery and natural chinook salmon populations in these ESUs, and assess whether any hatchery populations are essential for their recovery. This may result in the inclusion of specific hatchery populations as part of a listed ESU in NMFS' final determination.

Conservation Measures

Conservation measures that may apply to listed species as endangered or threatened under the ESA include conservation measures by tribes, states, local governments, and private organizations, Federal, tribal, and state recovery actions, Federal agency consultation requirements, prohibitions on taking, and recognition. Recognition through listing promotes public awareness and conservation actions by Federal, state, tribal, and local agencies, private organizations, and individuals.

Based on information presented in this proposed rule, general protective measures that could be implemented to help conserve the species are listed below. This list does not constitute NMFS' interpretation of a recovery plan under section 4(f) of the ESA.

1. Measures could be taken to promote land management practices that protect and restore chinook salmon habitat. Land management practices affecting chinook salmon habitat include timber harvest, road building, agriculture, livestock grazing, and urban development.

2. Evaluation of existing harvest regulations could identify any changes necessary to protect chinook salmon populations.

3. Artificial propagation programs could be required to incorporate practices that minimize adverse impacts upon native populations of chinook salmon.

4. Efforts could be made to ensure that existing and proposed dam facilities are designed and operated in a manner that will not adversely affect chinook salmon populations. For example, NMFS could require that fish passage facilities at dams effectively pass migrating juvenile and adult chinook salmon.

5. Water diversions could have adequate headgate and staff gauge structures installed to control and monitor water usage accurately. Water rights could be enforced to prevent irrigators from exceeding the amount of water to which they are legally entitled.

6. Irrigation diversions affecting downstream migrating chinook salmon could be screened. A thorough review of the impact of irrigation diversions on chinook salmon could be conducted.

NMFS recognizes that, to be successful, protective regulations and recovery programs for chinook salmon will need to be developed in the context of conserving aquatic ecosystem health. NMFS believes in some cases, Federal lands and Federal activities may bear a preponderance of the burden in preserving proposed populations and the ecosystems upon which they depend. However, throughout the range of the eight ESUs proposed for listing, chinook salmon habitat occurs and is affected by activities on state, tribal or private land. Agricultural, timber, and urban management activities on nonfederal land could and should be conducted in a manner that avoids adverse effects to chinook salmon habitat.

NMFS encourages nonfederal landowners to assess the impacts of their actions on potentially threatened or endangered salmonids. In particular, NMFS encourages the formulation of watershed partnerships to promote conservation in accordance with ecosystem principles. These partnerships will be successful only if state, tribal, and local governments, landowner representatives, conservationists, and Federal and nonfederal biologists all participate and share the goal of restoring chinook salmon to the watersheds.

Several conservation efforts are underway that may reverse the decline of west coast chinook salmon and other salmonids. These include the Northwest Forest Plan (on Federal lands within the range of the northern spotted owl), PACFISH (on all additional Federal lands with anadromous salmonid populations), Oregon's Plan for Salmon and Watersheds focussing on coho salmon and steelhead, Washington's Wild Stock Restoration Initiative, the Central Valley Project Improvement Act and the CALFED Bay-Delta Program (a joint effort by California and several Federal agencies to restore the Sacramento and San Joaquin River estuary), Wy-Kam-Ush-Mi Wa-Kish-Wit (The Spirit of the Salmon): The Columbia River Anadromous Fish Restoration Plan from the four Native American treaty tribes that configure the Columbia River Inter-tribal Fish Commission (CRITFC) (CRITFC, 1996), and NMFS'' Proposed Recovery Plan for Snake River Salmon, and a Draft Recovery Plan for Sacramento winter-run Chinook Salmon.

State of California Conservation Measures

As discussed in the section entitled Efforts Being Made to Protect West Coast Chinook Salmon above, the CALFED Bay-Delta program is developing a comprehensive long-term restoration plan and implementation strategy that is intended to restore the ecosystem health and improve water management for the beneficial uses of the Bay-Delta ecosystem. This planning effort is focused on addressing four critical resource areas: ecosystem quality, water quality, system integrity, and water supply reliability. In addition, substantial planning has been directed at developing alternatives for water conveyance and storage that are consistent with the objectives of the long-term plan. A draft Environmental Impact Statement/Environmental Impact Report (DEIS/EIR) is under development by the CALFED Bay-Delta Program that will assess the impacts of the entire CALFED Bay-Delta long-term plan and provide additional public opportunity for comment. The DEIS/EIR is expected to be released during the spring of 1998.

A major component of the long-term CALFED Bay-Delta Program is the Ecosystem Restoration Program Plan (ERPP) which is being developed to address the ecosystem quality element of the long-term plan. The draft ERPP is comprised of three components. The first component, Visions for Ecosystem Elements (CALFED Bay-Delta Program, ERPP Volume I, June 1997), presents the visions for ecological processes and functions, fish and wildlife habitats, and stressors that impair the health of the processes, habitats, and species. The second component, Visions for Ecological Zones (CALFED Bay-Delta Program, ERPP Volume II, July 1997), presents the visions for the 14 ecological zones and their respective ecological units throughout the Sacramento-San Joaquin River basins and Delta and contains implementation objectives, targets, and programmatic actions. The third component, Vision for Adaptive Management (CALFED Bay-Delta Program, ERPP Volume III, August 1997) provides the ERPP approach to adaptive management and contains the proposed plans to address indicators of ecological health, a monitoring program to acquire and evaluate the data needed regarding indicators, a program of focused research to acquire additional data needed to evaluate program alternatives and options, and the approach to phasing the implementation of the ERPP over its 25 year time span.

The draft ERPP addresses the Sacramento and San Joaquin Rivers, their upper watersheds, and the Bay-Delta ecosystem. Within this large geographic area, the ERPP identifies 14 ecological zones where the majority of restoration actions will occur. Ecosystem functions that are important to anadromous salmonids and that are addressed in the ERPP include: the quantity and quality of Central Valley streamflow and temperatures, natural sediment supply, stream meander corridor, natural floodplain, flood and watershed processes, Bay-Delta hydraulics and aquatic food chain, tidal and nontidal perennial aquatic habitat, sloughs, quantity and quality of estuarine, wetland, riverine, and riparian habitats. Environmental stressors, or risk factors, that are identified and addressed in the ERPP include: water diversions, quality and quantity of water, habitat blockages due to dams and other manmade structures, dredging and sediment disposal, gravel mining, encroachment of nonendemic species, predation and competition, contaminants, legal and illegal harvest, artificial fish propagation, and land disturbance.

The total cost for implementing the ERPP has been estimated at $1.5 billion, of which about half should be available through state Proposition 204 bonds and expected federal appropriations. These funds will be used to provide the initial infusion of funding to move the implementation of the ERPP forward. The ERPP implementation assumes that the $390 million identified in Proposition 204 will become available for expenditure after the CALFED Bay-Delta Program long-term restoration plan is formally adopted by the CALFED agencies through filing of a Record of Decision for the Federal EIS and certification of the EIR by the California Resources Agency by late 1998. The ERPP assumes that these funds will be encumbered and expended during the 25 year period of implementation which provides for a pro-rated availability of $15 million per year. Category III funding is assumed to complete the expenditure of $180 million during the first five years on actions identified for early implementation. Other sources of funding are expected to be available through Federal appropriations and through the CVPIA.

NMFS intends to continue working closely with the State of California through the CALFED Bay-Delta Program in their efforts to formulate a long-term restoration plan and an associated implementation strategy for the Bay-Delta ecosystem restoration. This habitat-focused conservation effort, if combined with State efforts addressing hatchery and harvest reform (i.e., reductions in hatchery production, increased marking of hatchery fish, changes in release practices to reduce straying, improved monitoring of escapement and stray rates, and reductions in ocean and freshwater harvest rates) could ameliorate the risks facing fall/late-fall chinook salmon stocks in the Central Valley. The degree to which these conservation efforts provide reliable, measurable and predictable reductions in the identified factors for decline, may provide NMFS with direct and substantial information pertinent to making final listing determinations for Central Valley chinook stocks.

In the San Joaquin River Basin, collaboration between water interests and State/Federal resources agencies has led to a scientifically-based adaptive fisheries management plan known as the Vernalis Adaptive Management Plan (VAMP). The VAMP proposes to use current knowledge to provide interim protections for San Joaquin fall-run chinook salmon smolts; to gather scientific information on the effects of various San Joaquin River flows and Delta water export rates on the survival of salmon smolts through the Delta; and to provide environmental benefits in the San Joaquin River tributaries, lower San Joaquin River, and Delta. This 12-year plan will be implemented through experimental flows in the San Joaquin Basin and operational changes at the Delta pumping plants during the peak salmon smolt outmigration period, approximately April 15 to May 15. Additional attraction flows for adult fall-run chinook upstream passage are targeted for October. In coordination with VAMP, the California Department of Water Resources will be installing and operating a barrier at the Head of Old River to improve the survival of juvenile chinook emigrating from the lower San Joaquin River. Although initial implementation of the VAMP is scheduled for spring 1998, negotiations regarding some aspects of the program continue. Although the VAMP does address flow conditions in the lower San Joaquin River during the spring smolt outmigration period, water quality concerns in the San Joaquin Basin still remain. NMFS expects that additional information regarding the long-term commitment of all participating parties to fully implement the plan will be available to prior to the final listing determination for Central Valley fall/late-fall chinook salmon.

State of California Conservation Measures for Coastal Chinook

In 1997, the California State legislature introduced and passed Senate Bill (SB) 271 which initiated a north coast salmonid habitat restoration program in California. This program is expected to provide significant benefits for coastal chinook salmon populations, in addition to other coastal salmonids beginning this year. SB 271 specifically created the Salmon and Steelhead Trout Restoration Account, and directed the California Department of Fish and Game (CDFG) to expend these funds on a wide range of watershed planning, on-the-ground habitat restoration projects, and other restoration-related efforts for the purpose of restoring anadromous salmonid populations in California's coastal watersheds, primarily north of San Francisco. SB 271 immediately transferred $3 million to the Account for CDFG to expend on the program in 1997 and 1998, and directed that $8 million be transferred to the Account annually for five years (beginning in fiscal year

1998–99 and continuing through fiscal year 2002–03) to continue funding this program. In total, SB 271 will provide $43 million in funding for north coast restoration projects over this six year period.

SB 271 requires that nearly 90 percent of the $43 million in funding be spent on project grants issued through CDFG's existing Fishery Restoration Grants Program, and allows CDFG to use the remaining funds for project contract administration activities and biological support staff necessary to achieve the restoration objectives of the legislation. SB 271 specifies that: (1) funded projects emphasize the development of coordinated watershed improvement activities, (2) the highest priority be given to funding projects that restore habitat for salmon and/or steelhead that are eligible for protection as listed or candidate species under the State or Federal ESA, and (3) funded projects treat causes of fish habitat degradation and be designed to restore the structure and function of fish habitat. In addition, SB 271 specifically allocates: (1) at least 65 percent of all Account funding for salmonid habitat protection and restoration projects, with at least 75 percent of that funding used for upslope watershed and riparian area protection and restoration activities, and (2) up to 35 percent of the Account funding for projects such as watershed evaluation, assessment, and planning, project monitoring and evaluations, support to watershed organizations, project maintenance and monitoring, private sector training, and watershed/fishery education.

In July 1997, California's Governor also signed Executive Order W–159–97 that created a Watershed Restoration and Protection Council (WPRC) that was charged with: (1) providing oversight of State activities aimed at watershed protection and enhancement including the conservation and restoration of anadromous salmonids in California, and (2) directing the development of a Watershed Protection Program which provides for anadromous salmonid conservation. In furtherance of implementing the Governor's Executive Order and the development of a Watershed Protection Program for anadromous salmonids, CDFG established and began implementing its own Watershed Initiative in 1997 and 1998. As described above, CDFG received $3 million in funding from SB 271 in 1997–98 which was used to fund its Watershed Initiative for coastal anadromous salmonids. These funds are currently in the process of being dispersed, together with a relatively limited amount of funds from other sources (e.g. Proposition 70, Proposition 99, Commercial Salmon Stamp Account, Steelhead Catch-Restoration Card, and Wildlife Conservation Board), in the form of grants through CDFG's Fishery Restoration Grants Program.

CDFG expects to allocate these grant funds as follows: (1) at least $1.3 million for watershed and riparian habitat restoration, (2) up to $425,000 for instream habitat restoration, and (3) up to $900,000 for watershed evaluation, assessment, planning, restoration project maintenance and monitoring, and a wide range of other activities. Other State agencies that have responsibilities as a result of the Governor's Executive Order are modifying existing budgets and preparing budget proposals for the upcoming fiscal year (1998–99) to assist in implementing the State's coastal watershed initiative. For fiscal year 1998–99, CDFG has submitted a Budget Change Proposal for its Watershed Initiative which calls for the expenditure of $8.0 million in SB 271 funds for: (1) eight new positions to assist in watershed planning efforts and grant proposal development ($1.0 million), and (2) habitat restoration and watershed planning projects in the form of grants ($7.0 million). CDFG anticipates that SB 271 funding will be expended in a similar manner and level through fiscal year 2002–03 to support the new staff resources created in the current year. The funding of these current and near term watershed planning and habitat restoration efforts is expected to provide significant benefits to chinook salmon stocks in California's coastal watersheds and in the Klamath/Trinity Basin. Over the next year, NMFS expects to work with the State in the development of its Watershed Protection Program and the implementation of its Watershed Initiative. NMFS is encouraged by their efforts and will consider them in its final listing determination for the Southern Oregon and California Coastal ESU.

State of Washington Conservation Measures

The State of Washington is currently in the process of developing a statewide strategy to protect and restore wild steelhead and other salmon and trout species. In May of 1997, Governor Gary Locke and other State officials signed a Memorandum of Agreement creating the Joint Natural Resources Cabinet (Joint Cabinet). This body is comprised of State agency directors or their equivalents from a wide variety of agencies whose activities and constituents influence Washington's natural resources. The goal of the Joint Cabinet is to restore healthy salmon, steelhead and trout populations by improving those habitats on which the fish rely. The Joint Cabinet's current activities include development of the Lower Columbia Steelhead Conservation Initiative (LCSCI), which is intended to comprehensively address protection and recovery of steelhead in the lower Columbia River area.

The scope of the LCSCI includes Washington's steelhead stocks in two transboundary ESUs that are shared by both Washington and Oregon. The initiative area includes all of Washington's stocks in the Lower Columbia River ESU (Cowlitz to Wind rivers) and the portion of the Southwest Washington ESU in the Columbia River (Grays River to Germany Creek). When completed, conservation and restoration efforts in the LCSCI area will form a comprehensive, coordinated, and timely protection and rebuilding framework. Benefits to steelhead and other fish species in the LCSCI area will also accrue due to the growing bi-state partnership with Oregon.

Advance work on the Initiative was performed by the Washington Department of Fish and Wildlife (WDFW). That work emphasized harvest and hatchery issues and related conservation measures. Consistent with creation of the Joint Cabinet, conservation planning has recently been expanded to include major involvement by other state agencies and stakeholders, and to address habitat and tributary dam/hydropower components.

The utility of the LCSCI is to provide a framework to describe concepts, strategies, opportunities, and commitments that will be critically needed to maintain the diversity and long term productivity of steelhead in the lower Columbia River for future generations. The initiative does not represent a formal watershed planning process; rather, it is intended to be complementary to such processes as they may occur in the future. The LCSCI details a range of concerns including natural production and genetic conservation, recreational harvest and opportunity, hatchery strategies, habitat protection and restoration goals, monitoring of stock status and habitat health, evaluation of the effectiveness of specific conservation actions, and an adaptive management structure to implement and modify the plan's trajectory as time progresses. It also addresses improved enforcement of habitat and fishery regulations, and strategies for outreach and education.

The LCSCI is currently a ''work-in-progress'' and will evolve and change over time as new information becomes available. Input will be obtained through continuing outreach efforts by local governments and stakeholders. Further refinements to strategies, actions, and commitments will occur using public and stakeholder review and input, and continued interaction with the State of Oregon, tribes, and other government entities, including NMFS. The LCSCI will be subjected to independent technical review. In sum, these input and coordination processes will play a key role in determining the extent to which the eventual conservation package will benefit wild steelhead.

NMFS intends to continue working with the State of Washington and stakeholders involved in the formulation of the LCSCI. Ultimately, when completed, this conservation effort may ameliorate risks facing many salmonid species in this region. In the near term, for steelhead and other listed species, individual components of the conservation effort may be utilized in promulgating protective regulations under section 4(d) of the ESA.

State of Oregon Conservation Measures

As discussed in the section entitled Efforts Being Made to Protect West Coast Chinook Salmon, the Governor of Oregon completed and submitted to NMFS a comprehensive conservation plan directed specifically at coho salmon and steelhead stocks on the Coast of Oregon. The OPSW contains conservation elements that may apply to the needs of chinook salmon in Oregon streams.

The elements of the OPSW most likely to benefit chinook salmon conservation include: (1) a framework for prioritizing conservation and restoration efforts; (2) a comprehensive monitoring plan that coordinates Federal, state, and local efforts to improve current knowledge of freshwater and marine conditions, determine populations trends, evaluate the effects of artificial propagation, and evaluate the OPSW's success or failure in restoring chinook salmon; (3) a recognition that actions to conserve and restore salmon must be worked out by communities and landowners—those who possess local knowledge of problems and who have a genuine stake in the outcome. Watershed councils, soil and water conservation districts, and other grassroots efforts are the vehicles for getting this work done; (4) an explicit mechanism for learning from experience, evaluating alternative approaches, and making needed changes in the programs and measures; (5) the IMST whose purpose is to provide an independent audit of the OPSW's strengths and weaknesses; and (6) a yearly report be made to the Governor, the legislature, and the public. This will help the agencies make the adjustments prescribed for the adaptive management process.

Native American Tribal Conservation Efforts

A comprehensive salmon restoration plan for Columbia Basin salmon was prepared by the Nez Perce, Warm Springs, Umatilla and Yakama Indian Nations. This plan, Wy-Kan-Ush-Mi Wa-Kish-Wit (The Spirit of the Salmon)(CRITFC, 1996) is more comprehensive than past draft recovery plans for Columbia River basin salmon in that it proposes actions to protect salmon not currently listed under the ESA. The tribal plan sets goals and objectives to meet the restoration needs of the fish, as well as some of the multiple needs of these sovereign nations. The plan also provides some guidance for management of tribal lands within the range of anadromous salmon. NMFS will work closely with the four tribes as conservation measures related to at-risk Columbia Basin salmonids are further developed and implemented.

NMFS is encouraged by these efforts and believes they may constitute significant strides in regional efforts to develop a scientifically well grounded conservation plan for these stocks, and for chinook salmon. NMFS intends to support and work closely with these efforts. The degree to which these conservation efforts are able to provide reliable, scientifically well grounded improvements through a variety of measures to provide for the conservation of these stocks may have a direct and substantial effect on any final listing determination of NMFS.

Prohibitions and Protective Measures

Section 4(d) of the ESA requires NMFS to issue regulations it finds necessary and advisable to provide for the conservation of a listed species. Section 9 of the ESA prohibits violations of protective regulations for threatened species promulgated under section 4(d). The 4(d) protective regulations may prohibit, with respect to threatened species, some or all of the acts which section 9(a) of the ESA prohibits with respect to endangered species. These 9(a) prohibitions and 4(d) regulations apply to all individuals, organizations, and agencies subject to U.S. jurisdiction. NMFS intends to have final 4(d) protective regulations in effect at the time of final listing determinations for eight proposed west coast chinook salmon ESUs. The process for completing the 4(d) rule will provide the opportunity for public comment on the proposed protective regulations.

In the case of threatened species, NMFS also has flexibility under section 4(d) to tailor protective regulations based on the contents of available conservation measures. Even though, in several ESUs, existing conservation efforts and plans are not sufficient to preclude the need for listings at this time, they are nevertheless valuable for improving watershed health and restoring fishery resources. In those cases where well-developed, reliable conservation plans exist, NMFS may choose to incorporate them into the recovery planning process, starting with the protective regulations. NMFS has already adopted 4(d) rules that exempt a limited range of activities from take prohibitions. For example, the interim 4(d) rule for the Southern Oregon/ Northern California coho (62 FR 24588, May 7, 1997) exempts habitat restoration activities conducted in accordance with approved plans and fisheries conducted in accordance with an approved state management plan. In the future, 4(d) rules may contain limited take prohibitions applicable to activities such as forestry, agriculture, and road construction when such activities are conducted in accordance with approved conservation plans.

These are all examples where NMFS may apply take prohibitions in light of the protections provided in a strong conservation program. There may be other circumstances as well in which NMFS would use the flexibility of section 4(d). For example, in some cases there may be a healthy population of salmon or steelhead within an overall ESU that is listed. In such a case, it may not be necessary to apply the full range of prohibitions available in section 9. NMFS intends to use the flexibility of the ESA to respond appropriately to the biological condition of each ESU and to the strength of programs to protect them.

Section 7(a)(4) of the ESA requires that Federal agencies confer with NMFS on any actions likely to jeopardize the continued existence of a species proposed for listing and on actions likely to result in the destruction or adverse modification of proposed critical habitat. For listed species, section 7(a)(2) requires Federal agencies to ensure that activities they authorize, fund, or conduct are not likely to jeopardize the continued existence of a listed species or to destroy or adversely modify its critical habitat. If a Federal action may affect a listed species or its critical habitat, the responsible Federal agency must enter into consultation with NMFS.

Examples of Federal actions likely to affect chinook salmon include authorized land management activities of the USFS and BLM, as well as operation of hydroelectric and storage projects of the BOR and COE. Such activities include timber sales and harvest, permitting livestock grazing, hydroelectric power generation, and flood control. Federal actions, including the COE section 404 permitting activities under the CWA, COE permitting activities under the River and Harbors Act, FERC licenses for non-Federal development and operation of hydropower, and Federal salmon hatcheries, may also require consultation.

Sections 10(a)(1)(A) and 10(a)(1)(B) of the ESA provide NMFS with authority to grant exceptions to the ESA's ''taking'' prohibitions. Section 10(a)(1)(A) scientific research and enhancement permits may be issued to entities (Federal and non-Federal) conducting research that involves a directed take of listed species. A directed take refers to the intentional take of listed species. NMFS has issued section 10(a)(1)(A) research/enhancement permits for currently listed chinook salmon (e.g., Snake River chinook salmon and Sacramento River winter-run chinook salmon) for a number of activities, including trapping and tagging, electroshocking to determine population presence and abundance, removal of fish from irrigation ditches, and collection of adult fish for artificial propagation programs.

Section 10(a)(1)(B) incidental take permits may be issued to non-Federal entities performing activities which may incidentally take listed species. The types of activities potentially requiring a section 10(a)(1)(B) incidental take permit include the operation and release of artificially propagated fish by state or privately operated and funded hatcheries, state or academic research not receiving Federal authorization or funding, the implementation of state fishing regulations, logging, road building, grazing, and diverting water into private lands.

NMFS Policies on Endangered and Threatened Fish and Wildlife

On July 1, 1994, NMFS, jointly with the U.S. Fish and Wildlife Service, published a series of policies regarding listings under the ESA, including a policy for peer review of scientific data (59 FR 34270) and a policy to identify, to the maximum extent possible, those activities that would or would not constitute a violation of section 9 of the ESA (59 FR 34272).

Role of Peer Review

The intent of the peer review policy is to ensure that listings are based on the best scientific and commercial data available. Prior to a final listing, NMFS will solicit the expert opinions of at least three qualified specialists, concurrent with the public comment period. Independent peer reviewers will be selected from the academic and scientific community, Native American tribal groups, Federal and state agencies, and the private sector.

Identification of Those Activities That Would Constitute a Violation of Section 9 of the ESA

NMFS and the FWS published in the **Federal Register** on July 1, 1994 (59 FR 34272), a policy that NMFS shall identify, to the maximum extent practicable at the time a species is listed, those activities that would or would not constitute a violation of section 9 of the ESA. The intent of this policy is to increase public awareness of the effect of this listing on proposed and ongoing activities within the species' range. At the time of the final rule, NMFS will identify to the extent known specific activities that will not be considered likely to result in violation of section 9, as well as activities that will be considered likely to result in violation. NMFS believes that, based on the best available information, the following actions will not result in a violation of section 9:

1. Possession of chinook salmon from any chinook salmon ESU listed as threatened which are acquired lawfully by permit issued by NMFS pursuant to section 10 of the ESA, or by the terms of an incidental take statement pursuant to section 7 of the ESA.
2. Federally funded or approved projects that involve activities such as silviculture, grazing, mining, road construction, dam construction and operation, discharge of fill material, stream channelization or diversion for which section 7 consultation has been completed, and when activities are conducted in accordance with any terms and conditions provided by NMFS in an incidental take statement accompanying a biological opinion.

Activities that NMFS believes could potentially harm chinook salmon in any of the proposed ESUs, and result in a violation of the section 9 take prohibition include, but are not limited to:

1. Land-use activities that adversely affect chinook salmon habitat in any proposed ESU (e.g., logging, grazing, farming, urban development, road construction in riparian areas and areas susceptible to mass wasting and surface erosion).
2. Destruction/alteration of the chinook salmon habitat in any proposed ESU, such as removal of large woody debris and ''sinker logs'' or riparian shade canopy, dredging, discharge of fill material, draining, ditching, diverting, blocking, or altering stream channels or surface or ground water flow.
3. Discharges or dumping of toxic chemicals or other pollutants (e.g., sewage, oil, gasoline) into waters or riparian areas supporting the chinook salmon in any proposed ESU.
4. Violation of discharge permits.
5. Pesticide applications.
6. Interstate and foreign commerce of chinook salmon from any of the proposed ESUs and import/export of chinook salmon from any ESU without a threatened or endangered species permit.
7. Collecting or handling of chinook salmon from any of the proposed ESUs. Permits to conduct these activities are available for purposes of scientific research or to enhance the propagation or survival of the species.
8. Introduction of non-native species likely to prey on chinook salmon in any proposed ESU or displace them from their habitat.

These lists are not exhaustive. They are intended to provide some examples of the types of activities that might or might not be considered by NMFS as constituting a take of chinook salmon in any of the proposed ESUs under the ESA and its regulations. Questions regarding whether specific activities will constitute a violation of the section 9 take prohibition, and general inquiries regarding prohibitions and permits, should be directed to NMFS (see **ADDRESSES**).

Critical Habitat

Section 4(a)(3)(A) of the ESA requires that, to the maximum extent prudent and determinable, NMFS designate critical habitat concurrently with a determination that a species is endangered or threatened. NMFS has determined that sufficient information exists to propose designating critical habitat for the seven proposed chinook salmon ESUs. NMFS will consider all available information and data in finalizing this proposal.

Use of the term ''essential habitat'' within this Notice refers to critical habitat as defined by the ESA and should not be confused with the requirement to describe and identify Essential Fish Habitat (EFH) pursuant to the Magnuson-Stevens Fishery

Conservation and Management Act, 16 U.S.C. 1801 *et seq.*

Definition of Critical Habitat

Critical habitat is defined in section 3(5)(A) of the ESA as ''(i) the specific areas within the geographical area occupied by the species * * * on which are found those physical or biological features (I) essential to the conservation of the species and (II) which may require special management considerations or protection; and (ii) specific areas outside the geographical area occupied by the species * * * upon a determination by the Secretary of Commerce (Secretary) that such areas are essential for the conservation of the species.'' (see 16 U.S.C. 1532(5)(A)). The term ''conservation,'' as defined in section 3(3) of the ESA, means '' * * * to use and the use of all methods and procedures which are necessary to bring any endangered species or threatened species to the point at which the measures provided pursuant to this Act are no longer necessary.'' (see 16 U.S.C. 1532(3)).

In proposing to designate critical habitat, NMFS considers the following requirements of the species: (1) Space for individual and population growth, and for normal behavior; (2) food, water, air, light, minerals, or other nutritional or physiological requirements; (3) cover or shelter; (4) sites for breeding, reproduction, or rearing of offspring; and, generally, (5) habitats that are protected from disturbance or are representative of the historic geographical and ecological distributions of this species (see 50 CFR 424.12(b)). In addition to these factors, NMFS also focuses on the known physical and biological features (primary constituent elements) within the designated area that are essential to the conservation of the species and may require special management considerations or protection. These essential features may include, but are not limited to, spawning sites, food resources, water quality and quantity, and riparian vegetation (see 50 CFR 424.12(b)).

Consideration of Economic and Other Factors

The economic and other impacts of a critical habitat designation will be considered and evaluated in this proposed rulemaking. NMFS will identify present and anticipated activities that may adversely modify the area(s) being considered or be affected by a designation. An area may be excluded from a critical habitat designation if NMFS determines that the overall benefits of exclusion outweigh the benefits of designation, unless the exclusion will result in the extinction of the species (see 16 U.S.C. 1533(b)(2)).

The impacts considered in this analysis are only those incremental impacts specifically resulting from a critical habitat designation, above the economic and other impacts attributable to listing the species or resulting from other laws and regulations. Since listing a species under the ESA provides significant protection to a species' habitat, the economic and other impacts resulting from the critical habitat designation, over and above the impacts of the listing itself, are minimal. In general, the designation of critical habitat highlights geographical areas of concern and reinforces the substantive protection resulting from the listing itself.

Impacts attributable to listing include those resulting from the ''take'' prohibitions contained in section 9 of the ESA and associated regulations. ''Take,'' as defined in the ESA, means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct (see 16 U.S.C. 1532(19)). Harm can occur through destruction or modification of habitat (whether or not designated as critical) that significantly impairs essential behaviors, including breeding, feeding, rearing, or migration.

Significance of Designating Critical Habitat

The designation of critical habitat does not, in and of itself, restrict human activities within an area or mandate any specific management or recovery actions. A critical habitat designation contributes to species conservation primarily by identifying important areas and by describing the features within those areas that are essential to the species, thus alerting public and private entities to the area's importance. Under the ESA, the only regulatory impact of a critical habitat designation is through the provisions of section 7. Section 7 applies only to actions with Federal involvement (e.g., authorized, funded, or conducted by a Federal agency) and does not affect exclusively state or private activities.

Under the section 7 provisions, a designation of critical habitat would require Federal agencies to ensure that any action they authorize, fund, or carry out is not likely to destroy or adversely modify designated critical habitat. Activities that destroy or adversely modify critical habitat are defined as those actions that ''appreciably diminish the value of critical habitat for both the survival and recovery'' of the species (see 50 CFR 402.02). Regardless of a critical habitat designation, Federal agencies must ensure that their actions are not likely to jeopardize the continued existence of the proposed species. Activities that jeopardize a species are defined as those actions that ''reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery'' of the species (see 50 CFR 402.02). Using these definitions, activities that would destroy or adversely modify critical habitat would also be likely to jeopardize the species. Therefore, the protection provided by a critical habitat designation generally duplicates the protection provided under the section 7 jeopardy provision. Critical habitat may provide additional benefits to a species in cases where areas outside the species' current range have been designated. When actions may affect these areas, Federal agencies are required to consult with NMFS under section 7 (see 50 CFR 402.14(a)), a requirement which may not have been recognized but for the critical habitat designation.

A designation of critical habitat provides a clear indication to Federal agencies as to when section 7 consultation is required, particularly in cases where the action would not result in immediate mortality, injury, or harm to individuals of a listed species (e.g., an action occurring within the critical area when a migratory species is not present). The critical habitat designation, describing the essential features of the habitat, also assists in determining which activities conducted outside the designated area are subject to section 7 (i.e., activities that may affect essential features of the designated area).

A critical habitat designation will also assist Federal agencies in planning future actions, since the designation establishes, in advance, those habitats that will be given special consideration in section 7 consultations. With a designation of critical habitat, potential conflicts between Federal actions and endangered or threatened species can be identified and possibly avoided early in the agency's planning process.

Another indirect benefit of a critical habitat designation is that it helps focus Federal, state, and private conservation and management efforts in such areas. Management efforts may address special considerations needed in critical habitat areas, including conservation regulations to restrict private as well as Federal activities. The economic and other impacts of these actions would be considered at the time of those proposed regulations and, therefore, are not considered in the critical habitat designation process. Other Federal, state, tribal and local management programs, such as zoning or wetlands and riparian lands protection, may also provide special protection for critical habitat areas.

Process for Designating Critical Habitat

Developing a proposed critical habitat designation involves three main considerations. First, the biological needs of the species are evaluated and habitat areas and features that are essential to the conservation of the species are identified. If alternative areas exist that would provide for the conservation of the species, such alternatives are also identified. Second, the need for special management considerations or protection of the area(s) or features is evaluated. Finally, the probable economic and other impacts of designating these essential areas as ''critical habitat'' are evaluated. After considering the requirements of the species, the need for special management, and the impacts of the designation, the proposed critical habitat is published in the **Federal Register** for comment. The final critical habitat designation, considering comments on the proposal and impacts assessment, is typically published within one year of the proposed rule. Final critical habitat designations may be revised, using the same process, as new information becomes available.

A description of the critical habitat, need for special management, impacts of designating critical habitat, and the proposed action are described in the following sections.

Critical Habitat of Pacific Coast Chinook Salmon

Biological information for proposed chinook salmon can be found in NMFS species' status reviews (Myers *et al.*, 1998; Waknitz *et al.*, 1995; Waples *et al.*, 1991); species life history summaries (Ricker, 1972; Taylor, 1991; Healey, 1991; Burgner, 1991); and in **Federal Register** notices of proposed and final listing determinations (55 FR 102260, March 20, 1990; 56 FR 29542 and 29544, June 27, 1991; 57 FR 36626, August 14, 1992; 57 FR 57051, December 2, 1992; 59 FR 42529, August 18, 1994; 59 FR 48855, September 23, 1994; 59 FR 66784, December 28, 1994; 63 FR 1807, January 12, 1998).

The current geographic range of chinook salmon from California, Oregon, Washington, and Idaho includes vast areas of the North Pacific Ocean, nearshore marine zone, and extensive estuarine and riverine areas. The marine distribution for stream-type chinook salmon includes extensive areas far from the coast in the central North Pacific. Ocean-type chinook salmon typically migrate along coastal waters. Coastal chinook populations originating from south of Cape Blanco tend to migrate south, while those chinook salmon populations originating in coastal streams north of Cape Blanco tend to migrate northerly (Bakun 1973, 1975; Nicholas and Hankin, 1988; Healey 1983 and 1991; Myers *et al.*, 1984).

In California, major estuaries and bays known to support Central Valley chinook salmon include San Francisco Bay, San Pablo Bay, and Suisun Bay. Within the Central Valley spring-run chinook salmon ESU, major rivers and estuaries known to support chinook salmon include the Sacramento River, American River, Feather River, Yuba River, and Deer, Mill, Butte, Clear and Antelope Creeks. Within California's Central Valley fall/late fall-run chinook salmon ESU, major rivers and estuaries known to support chinook salmon include the Sacramento River; its tributaries including but not limited to the American River, Feather River, Yuba River, and Deer, Mill, Battle and Clear Creeks; as well as the San Joaquin River and its tributaries, including but not limited to the Mokelumne, Consumnes, Stanislaus, Tuolumne and Merced Rivers. Within the California portion of the Southern Oregon and California Coastal chinook salmon ESU, major rivers, estuaries, and bays known to support chinook salmon include the Smith River, lower Klamath River, Mad River, Redwood Creek, Humboldt Bay, Eel River, Mattole River, and the Russian River. Many smaller streams in the California portion of this ESU also contain chinook salmon.

In Oregon, major rivers, estuaries, and bays known to support chinook salmon within the Oregon portion of the Southern Oregon and California Coastal chinook salmon ESU include the Rogue River and several of its tributaries, and the Pistol, Chetco and Winchuck Rivers. Within the range of the Oregon portion of the lower Columbia River chinook salmon ESU, major rivers, estuaries, and bays known to support chinook salmon include Youngs Bay, Klaskanine River, and the Clackamas, Sandy and Hood Rivers. Major rivers known to support chinook salmon within the upper Willamette River ESU include the Mollala River, North Santiam River and McKenzie River. Major rivers known to support chinook salmon within the Oregon portion of the Snake River fall-run chinook salmon ESU include the Deschutes River, the lower Grande Ronde River, the Imnaha River, and the Oregon portion of the Columbia and Snake Rivers.

In Washington, major rivers, estuaries, and bays known to support chinook salmon within the lower Columbia River ESU include the Grays River, Elochoman River, Kalama River, Lewis River, Washougal River and White Salmon River. Major rivers, estuaries, and bays known to support chinook salmon within the Puget Sound ESU include the Nooksack River, Skagit River and many of its tributaries, the Stilliguamish River, Snohomish River, Duwamish River, Puyallup River, and the Elwha River. Major estuarine, bay and marine areas known to support chinook salmon within the Puget Sound ESU also include the South Sound, Hood Canal, Elliott Bay, Possession Sound, Admiralty Inlet, Saratoga Passage, Rosario Strait, Strait of Georgia, Haro Strait, and the Strait of Juan De Fuca. Major rivers known to support chinook salmon within the upper Columbia River spring-run ESU include the Wenatchee River, Entiat River, and Methow River.

In parts of Oregon, Washington and Idaho, major rivers known to support chinook salmon within the Snake River fall-run ESU include the lower Grande Ronde River, the Columbia River, the Snake River, the lower Salmon River, and the lower Clearwater River below its confluence with Lolo Creek.

Many smaller rivers and streams in each ESU also provide essential spawning, rearing and estuarine habitat for chinook salmon, but use and access can be constrained by seasonal fluctuations in hydrologic conditions.

Defining specific river reaches that are critical for chinook salmon is difficult because of the current low abundance of the species and of our imperfect understanding of the species' freshwater distribution, both current and historical. This is due, in large part, to the lack of comprehensive sampling effort dedicated to monitoring the species.

In California, Oregon, Washington and Idaho, several recent efforts have been made to characterize the species' distribution (Healey, 1983 and 1991, Bryant and Olson, in prep.; The Wilderness Society (TWS), 1993; Bryant, 1994; McPhail and Lindsey 1970; Yoshiyama et al., 1996; Myers et al., 1998) or to identify watersheds important to at-risk populations of salmonids and resident fishes (FEMAT, 1993). However, the limited data across the range of all ESUs, as well as dissimilarities in data types within the ESUs, make it difficult to define this species' distribution at a fine scale. Chinook salmon, though considerably reduced in population size, are still distributed or have the potential for distribution throughout nearly all watersheds within the geographic range of each ESU. Notable exceptions are areas above several impassable dams (see Barriers Within the Species' Range).

Any attempt to describe the current distribution of chinook salmon must take into account the fact that existing populations and densities are a small fraction of historical levels. Many chinook salmon stocks are extremely depressed relative to past abundance and there are limited data to assess population numbers or trends. Several of these stocks are heavily influenced by hatcheries and apparently have little natural production in mainstem reaches.

Within the range of all chinook salmon ESUs, the species' life cycle can be separated into five essential habitat types: (1) Juvenile summer and winter rearing areas; (2) juvenile migration corridors; (3) areas for growth and development to adulthood; (4) adult migration corridors; and (5) spawning areas. Areas 1 and 5 are often located in small headwater streams, while areas 2 and 4 include these tributaries as well as mainstem reaches and estuarine zones. Growth and development to adulthood (area 3) occurs primarily in near- and off-shore marine waters, although final maturation takes place in freshwater tributaries when the adults return to spawn. Within all of these areas, essential features of chinook salmon critical habitat include adequate: (1) substrate, (2) water quality, (3) water quantity, (4) water temperature, (5) water velocity, (6) cover/shelter, (7) food, (8) riparian vegetation, (9) space, and (10) safe passage conditions. Given the vast geographic range occupied by each of these chinook salmon ESUs and the diverse habitat types used by the various life stages, it is not practical to describe specific values or conditions for each of these essential habitat features. However, good summaries of these environmental parameters and freshwater factors that have contributed to the decline of this and other salmonids can be found in reviews by CDFG, 1965; CACSST, 1988; Brown and Moyle, 1991; Bjornn and Reiser, 1991; Nehlsen *et al.*, 1991; Higgins *et al.*, 1992; California State Lands Commission (CSLC), 1993; Botkin *et al.*, 1995; NMFS, 1996; and Spence *et al.*, 1996.

At the time of this proposed rule, NMFS believes that chinook salmon's current freshwater, estuarine, and certain marine range encompasses all essential habitat features and is adequate to ensure the species' conservation. Therefore, designation of habitat areas outside the species' current range is not indicated. Habitat quality in this current range is intrinsically related to the quality of upland areas and of inaccessible headwater or intermittent streams which provide key habitat elements (e.g., large woody debris, gravel, water quality) crucial for chinook salmon in downstream reaches. NMFS recognizes that estuarine habitats are important for rearing and migrating chinook salmon and has included them in this designation. Marine habitats (i.e., oceanic or nearshore areas seaward of the mouth of coastal rivers) are also vital to the species, and ocean conditions are believed to have a major influence on chinook salmon survival (see review in Pearcy, 1992). In most cases, NMFS believes there is no need for special management consideration or protection of this habitat. In the case of the Puget Sound ESU, due to the unique combination of geographic features, proximity to a large number of rivers and streams supporting chinook salmon, and wide range of human activities occurring within Puget Sound's marine area, it appears to be necessary to include the marine areas described above. NMFS is not proposing to designate other critical habitat in marine areas at this time. If additional information becomes available that supports the inclusion of such areas, NMFS may revise this designation.

Based on consideration of the best available information regarding the species' current distribution, NMFS believes that the preferred approach to identifying the freshwater and estuarine portion of critical habitat is to designate all areas (and their adjacent riparian zones) accessible to the species within the range of each ESU. NMFS has taken this approach in previous critical habitat designations for other species (e.g., Snake River salmon, Umpqua River cutthroat trout, and proposed for two coho salmon ESUs) which inhabit a wide range of freshwater habitats, in particular small tributary streams (58 FR 68543, December 28, 1993; 63 FR 1388, January 9, 1998; 62 FR 62741, November 25, 1997). NMFS believes that adopting a more inclusive, watershed-based description of critical habitat is appropriate because it (1) recognizes the species' use of diverse habitats and underscores the need to account for all of the habitat types supporting the species' freshwater and estuarine life stages, from small headwater streams to migration corridors and estuarine rearing areas; (2) takes into account the natural variability in habitat use (e.g., some streams may have fish present only in years with plentiful rainfall) that makes precise mapping difficult; and (3) reinforces the important linkage between aquatic areas and adjacent riparian/upslope areas.

An array of management issues encompasses these habitats and their features, and special management considerations will be needed, especially on lands and streams under Federal ownership (see Activities that May Affect Critical Habitat and Need for Special Management Considerations or Protection sections). While marine areas are also a critical link in this cycle, NMFS does not believe that special management considerations are needed to conserve the habitat features in these areas. Hence, except for the Puget Sound ESU, only the freshwater and estuarine areas are being proposed for critical habitat at this time.

Barriers Within the Species' Range

Within the range of all threatened and endangered ESUs, chinook salmon face a multitude of barriers that limit the access of juvenile and adult fish to essential freshwater habitats. While some of these are natural barriers (e.g., waterfalls or high-gradient velocity barriers) that have been in existence for hundreds or thousands of years, more significant are the manmade barriers that have been created in the past century (CACSST, 1988; FEMAT, 1993; Botkin *et al.*, 1995; National Research Council, 1996). The extent of such barriers as culverts and road crossing structures that impede or block fish passage appears to be substantial. For example, of 532 fish presence surveys conducted in Oregon coastal basins during the 1995 survey season, nearly 15 percent of the confirmed ''end of fish use'' were due to human barriers, principally road culverts (OCSRI, 1997). Pushup dams/diversions and irrigation withdrawals also present significant barriers or lethal conditions (e.g., high water temperatures) to chinook salmon in California, Oregon, Washington and Idaho. However, because these manmade barriers can, under certain flow conditions, be surmounted by fish or present only a temporary/seasonal barrier, NMFS does not consider them to delineate the upstream extent of critical habitat.

Since these man-made impassible barriers are widely distributed throughout the range of each ESU, they can have a major downstream influence on chinook salmon. Such impacts can include the following: Depletion and storage of natural flows, which can drastically alter natural hydrological cycles; increase juvenile and adult mortality due to migration delays resulting from insufficient flows or habitat blockages; stranding of fish resulting from rapid flow fluctuations; entrainment of juveniles into poorly screened or unscreened diversions; and increased mortality resulting from increased water temperatures (CACSST, 1988; Bergren and Filardo, 1991; CDFG, 1991; Reynolds *et al.*, 1993; Chapman *et al.*, 1994; Cramer *et al.*, 1995; NMFS, 1996). In addition to these factors, reduced flows negatively affect fish habitats due to increased deposition of fine sediments in spawning gravels, decreased recruitment of large woody debris and spawning gravels, and encroachment of riparian and non-endemic vegetation into spawning and rearing areas, resulting in reduced available habitat (CACSST, 1988; FEMAT, 1993; Botkin *et al.*, 1995; NMFS, 1996). These dam-related factors will be effectively addressed through section 7 consultations and the recovery planning process.

Numerous hydropower and water storage projects have been built which block access to former spawning and rearing habitats used by chinook salmon, or alter the timing and quantity of waterflow to downstream river reaches. NMFS has identified a total of 44 dams within the range of the ESUs that currently block upstream or downstream passage for chinook salmon (see Hydrolic Unit Tables 10–17). Blocked habitat can constitute as much as 90 percent of the historic range of each ESU. While these blocked areas are proportionally significant in certain basins (e.g., California's Central Valley and the Snake River), NMFS concludes at this time that currently available habitat may be sufficient for the conservation of the affected chinook salmon ESUs. NMFS solicits comments and scientific information on this issue and will consider such information prior to issuing any final critical habitat designation. This may result in the inclusion of areas above some man-made impassible barriers in a future critical habitat designation. NMFS may also re-evaluate this conclusion during the recovery planning process and in section 7 consultations.

Need for Special Management Considerations or Protection

In order to assure that the essential areas and features are maintained or restored, special management may be needed. Activities that may require special management considerations for freshwater, estuarine, and marine life stages of proposed chinook salmon include, but are not limited to (1) land management; (2) timber harvest; (3) point and non-point water pollution; (4) livestock grazing; (5) habitat restoration; (6) irrigation water withdrawals and returns; (7) mining; (8) road construction; (9) dam operation and maintenance; and (10) dredge and fill activities. Not all of these activities are necessarily of current concern within every watershed, estuary, or marine area; however, they indicate the potential types of activities that will require consultation in the future. No special management considerations have been identified for proposed chinook salmon while they are residing in the ocean environment, except as noted for the Puget Sound ESU.

Activities That May Affect Critical Habitat

A wide range of activities may affect the essential habitat requirements of proposed chinook salmon (see Summary of Factors for Decline section above for a more in-depth discussion). These activities include water and land management actions of Federal agencies, including the USFS, BLM, COE, BOR, the Federal Highway Administration (FHA), the EPA, and the Federal Energy Regulatory Commission (FERC) and related or similar actions of other federally regulated projects and lands, including livestock grazing allocations by the USFS and BLM; hydropower sites licensed by the FERC; dams built or operated by the COE or BOR; timber sales conducted by the USFS and BLM; road building activities authorized by the FHA, USFS, and BLM; and mining and road building activities authorized by the states of California, Oregon, Washington, and Idaho. Other actions of concern include dredge and fill, mining, and bank stabilization activities authorized or conducted by the COE. Additionally, actions of concern could include approval of water quality standards and pesticide labeling and use restrictions administered by the EPA.

The Federal agencies that will most likely be affected by this critical habitat designation include the USFS, BLM, BOR, COE, FHA, EPA, and FERC. This designation will provide these agencies, private entities, and the public with clear notification of critical habitat designated for proposed chinook salmon and the boundaries of the habitat and protection provided for that habitat by the section 7 consultation process. This designation will also assist these agencies and others in evaluating the potential effects of their activities on proposed chinook salmon and their critical habitat and in determining when consultation with NMFS is appropriate.

Expected Economic Impacts

The economic impacts to be considered in a critical habitat designation are the incremental effects of critical habitat designation above the economic impacts attributable to either listing or to laws and regulations other than the ESA (see Consideration of Economic and Other Factors section of this notice). Incremental impacts result from special management activities in areas outside the present distribution of the proposed species that have been determined to be essential to the conservation of the species. However, NMFS has determined that the species' present freshwater, estuarine, as well as certain marine areas within the species' range, contains sufficient habitat for conservation of the species. Therefore, the economic impacts associated with this critical habitat designation are expected to be minimal.

USFS, BLM, BOR, and the COE manage areas of proposed critical habitat for the proposed chinook salmon ESUs. The COE and other Federal agencies that may be involved with funding or permits for projects in critical habitat areas may also be affected by this designation. Because NMFS believes that virtually all ''adverse modification'' determinations pertaining to critical habitat would also result in ''jeopardy'' conclusions, designation of critical habitat is not expected to result in significant incremental restrictions on Federal agency activities. Critical habitat designation will, therefore, result in few, if any, additional economic effects beyond those that may have been caused by listing and by other statutes.

Public Comments Solicited

NMFS has exercised its best professional judgement in developing this proposal to list eight chinook salmon ESUs and designate their critical habitat under the ESA. To ensure that the final action resulting from this proposal will be as accurate and effective as possible, NMFS is soliciting comments and suggestions from the public, other governmental agencies, the scientific community, industry, and any other interested parties. NMFS will appreciate any additional information regarding, in particular: (1) the biological or other relevant data concerning any threat to chinook salmon; (2) the range, distribution, and population size of chinook salmon in all identified ESUs; (3) current or planned activities in the subject areas and their possible impact on this species; (4) chinook salmon escapement, particularly escapement data partitioned into natural and hatchery components; (5) the proportion of naturally-reproducing fish that were reared as juveniles in a hatchery; (6) homing and straying of natural and hatchery fish; (7) the reproductive success of naturally-reproducing hatchery fish (i.e., hatchery-produced fish that spawn in natural habitat) and their relationship to the identified ESUs; (8) efforts being made to protect native, naturally-reproducing populations of chinook salmon in Washington, Oregon, Idaho and California; and (9) suggestions for specific regulations under section 4(d) of the ESA that should apply to threatened chinook salmon ESUs. Suggested regulations may address activities, plans, or guidelines that, despite their potential to result in the take of listed fish, will ultimately promote the conservation and recovery of threatened chinook salmon.

NMFS is also requesting quantitative evaluations describing the quality and extent of freshwater, estuarine, and marine habitats for juvenile and adult chinook salmon as well as information on areas that may qualify as critical habitat in Washington, Oregon, Idaho, and California for the proposed ESUs. Areas that include the physical and biological features essential to the recovery of the species should be identified. NMFS recognizes that there are areas within the proposed boundaries of some ESUs that historically constituted chinook salmon habitat, but may not be currently occupied by chinook salmon. NMFS is requesting information about chinook salmon in these currently unoccupied areas (in particular) and whether these habitats should be considered essential to the recovery of the species, or else be excluded from designation. Essential features include, but are not limited to: (1) Habitat for individual and population growth, and for normal behavior; (2) food, water, air, light, minerals, or other nutritional or physiological requirements; (3) cover or shelter; (4) sites for reproduction and rearing of offspring; and (5) habitats that are protected from disturbance or are representative of the historic geographical and ecological distributions of the species.

For areas potentially qualifying as critical habitat, NMFS is requesting information describing: (1) The activities that affect the area or could be affected by the designation, and (2) the economic costs and benefits of additional requirements of management measures likely to result from the designation.

The economic cost to be considered in the critical habitat designation under the ESA is the probable economic impact ‘‘of the [critical habitat] designation upon proposed or ongoing activities’’ (50 CFR 424.19). NMFS must consider the incremental costs specifically resulting from a critical habitat designation that are above the economic effects attributable to listing the species. Economic effects attributable to listing include actions resulting from section 7 consultations under the ESA to avoid jeopardy to the species and from the taking prohibitions under section 9 of the ESA. Comments concerning economic impacts should distinguish the costs of listing from the incremental costs that can be attributed to the designation of specific areas as critical habitat.

NMFS will review all public comments and any additional information regarding the status of the chinook salmon ESUs described herein and, as required under the ESA, will complete a final rule within 1 year of this proposed rule. The availability of new information may cause NMFS to reassess the status of chinook salmon ESUs, or to reassess the geographic extent of critical habitat.

Joint Commerce-Interior ESA implementing regulations state that the Secretary ‘‘shall promptly hold at least one public hearing if any person so requests within 45 days of publication of a proposed regulation to list * * * or to designate or revise critical habitat.’’ (see 50 CFR 424.16(c)(3)). Public hearings on the proposed rule will be scheduled and announced in a forthcoming **Federal Register** Notice. These hearings will provide the opportunity for the public to give comments and to permit an exchange of information and opinion among interested parties. NMFS encourages the public’s involvement in such ESA matters. Written comments on the proposed rule may also be submitted to Garth Griffin (see **ADDRESSES** and **DATES**).

References

A complete list of all cited references is available upon request (see **ADDRESSES**).

Classification

The 1982 amendments to the ESA, in section 4(b)(1)(A), restrict the information that may be considered when assessing species for listing. Based on this limitation of criteria for a listing decision and the opinion in *Pacific Legal Foundation* v. *Andrus*, 675 F. 2d 825 (6th Cir. 1981), NMFS has categorically excluded all ESA listing actions from environmental assessment requirements of the National Environmental Policy Act under NOAA Administrative Order 216–6.

NMFS has also determined that an Environmental Assessment or an Environmental Impact Statement, as defined under the authority of the National Environmental Policy Act of 1969, need not be prepared for this critical habitat designation. See *Douglas County* v. *Babbitt*, 48 F.3D 1495 (9th Cir. 1995), cert. denied, 116 S.Ct. 698 (1996).

The Assistant Administrator for Fisheries, NOAA (AA), has determined that this rule is not significant for purposes of E.O. 12866.

NMFS is proposing to designating only the current range of this species as critical habitat. The current range encompasses a wide range of habitats, including small tributary reaches, as well as mainstem, off-channel, estuarine and marine areas. Areas excluded from this proposed designation include historically occupied areas above impassible dams, and headwater areas above impassable natural barriers (e.g., long-standing, natural waterfalls). NMFS has concluded that at the time of this proposal, currently inhabited areas within the range of west coast chinook salmon are the minimum habitat necessary to ensure conservation and recovery of the species.

Since NMFS is designating the current range of the listed species as critical habitat, this designation will not impose any additional requirements or economic effects upon small entities, beyond those which may accrue from section 7 of the ESA. Section 7 requires Federal agencies to ensure that any action they carry out, authorize, or fund is not likely to jeopardize the continued existence of any listed species or result in the destruction or adverse modification of critical habitat (16 U.S.C. Sec. 1536(a)(2)). The consultation requirements of section 7 are nondiscretionary and are effective at the time of species’ listing. Therefore, Federal agencies must consult with NMFS and ensure their actions do not jeopardize a species once it is listed, regardless of whether critical habitat is designated.

In the future, if NMFS determines that designation of habitat areas outside the species’ current range is necessary for conservation and recovery, NMFS will analyze the incremental costs of that action and assess its potential impacts on small entities, as required by the Regulatory Flexibility Act. Until that time, a more detailed analysis would be premature and would not reflect the true economic impacts of the proposed action on local businesses, organizations, and governments.

Accordingly, the Assistant General Counsel for Legislation and Regulation of the Department of Commerce has certified to the Chief Counsel for Advocacy of the Small Business Administration that the proposed rule, if adopted, would not have a significant economic impact of a substantial number of small entities, as described in the Regulatory Flexibility Act.

This rule does not contain a collection-of-information requirement for purposes of the Paperwork Reduction Act.

At this time NMFS is not promulgating protective regulations pursuant to ESA section 4(d). In the future, prior to finalizing its 4(d) regulations for these threatened ESUs, NMFS will comply with all relevant NEPA and RFA requirements.

The AA has determined that the proposed listing and designation is consistent, to the maximum extent practicable, with the approved Coastal Zone Management Program of the States of California, Oregon, and Washington. This determination has been submitted for review by the responsible state agencies under section 307 of the Coastal Zone Management Act.

List of Subjects

50 CFR Part 222

Administrative practice and procedure, Endangered and threatened wildlife, Exports, Imports, Reporting and record-keeping requirements, Transportation.

50 CFR Part 226

Endangered and threatened species.

50 CFR Part 227

Endangered and threatened species, Exports, Imports, Marine mammals, Transportation.

Dated: February 26, 1998.

Rolland A. Schmitten,

Assistant Administrator for Fisheries, National Marine Fisheries Service.

For the reasons set out in the preamble, 50 CFR parts 222, 226, and 227 are amended to read as follows:

PART 222—ENDANGERED FISH OR WILDLIFE

1. The authority citation of part 222 continues to read as follows:

Authority: 16 U.S.C. 1531–1543; subpart D, § 222.32 also issued under 16 U.S.C. 1361 *et seq.*

2. In § 222.23, paragraph (a) is amended by removing the second sentence and by adding five sentences in its place to read as follows:

§ 222.23 Permits for scientific purposes or to enhance the propagation or survival of the affected endangered species.

(a) * * * The species listed as endangered under either the Endangered Species Conservation Act of 1969 or the Endangered Species Act of 1973 and currently under the jurisdiction of the Secretary of Commerce are: Shortnose sturgeon (*Acipenser brevirostrum*); Totoaba (*Cynoscian macdonaldi*), Snake River sockeye salmon (*Oncorhynchus nerka*), Umpqua River cutthroat trout (*Oncorhynchus clarki clarki*); Southern California steelhead (*Oncorhynchus mykiss*), which includes all naturally spawned populations of steelhead (and their progeny) in streams from the Santa Maria River, San Luis Obispo County, California (inclusive) to Malibu Creek, Los Angeles County, California (inclusive); Upper Columbia River steelhead (*Oncorhynchus mykiss*), which includes the Wells Hatchery stock and all naturally spawned populations of steelhead (and their progeny) in streams in the Columbia River Basin upstream from the Yakima River, Washington, to the United States—Canada Border; Central Valley spring-run chinook salmon (*Oncorhynchus tshawytscha*), which includes all naturally spawned populations of chinook (and their progeny) in the Sacramento River and its tributaries in California. Also included are river reaches and estuarine areas of the Sacramento-San Joaquin Delta, all waters from Chipps Island westward to Carquinez Bridge, including Honker Bay, Grizzly Bay, Suisun Bay, and Carquinez Strait, all waters of San Pablo Bay westward of the Carquinez Bridge, and all waters of San Francisco Bay (north of the San Francisco/Oakland Bay Bridge) from San Pablo Bay to the Golden Gate Bridge. Excluded are areas above specific dams identified in Table 10 of this part or above longstanding, naturally impassable barriers (i.e., natural waterfalls in existence for at least several hundred years); Upper Columbia River spring-run chinook salmon (*Oncorhynchus tshawytscha*), which includes all naturally spawned populations of chinook (and their progeny) in all river reaches accessible to chinook salmon in Columbia River tributaries upstream of the Rock Island Dam and downstream of Chief Joseph Dam in Washington, excluding the Okanogan River. Also included are river reaches and estuarine areas in the Columbia River from a straight line connecting the west end of the Clatsop jetty (south jetty, Oregon side) and the west end of the Peacock jetty (north jetty, Washington side) upstream to Chief Joseph Dam in Washington. Excluded are areas above specific dams identified in Table 16 of this part or above longstanding, naturally impassable barriers (i.e., natural waterfalls in existence for at least several hundred years); Sacramento River winter-run chinook salmon (*Oncorhynchus tshawytscha*); Western North Pacific (Korean) gray whale (*Eschrichtius robustus*), Blue whale (*Balaenoptera musculus*), Humpback whale (*Megaptera novaeangliae*), Bowhead whale (*Balaena mysticetus*), Right whales (*Eubalaena* spp.), Fin or finback whale (*Balaenoptera physalus*), Sei whale (*Balaenoptera borealis*), Sperm whale (*Physeter catodon*); Cochito (*Phocoena Sinus*), Chinese river dolphin (*Lipotes vexillifer*); Indus River dolphin (*Platanista minor*); Caribbean monk seal (*Monachus tropicalis*); Hawaiian monk seal (*Monachus schauinslandi*); Mediterranean monk seal (*Monachus monachus*); Saimaa seal (*Phoca hispida saimensis*); Steller sea lion (*Eumetopias jubatus*), western population, which consists of Steller sea lions from breeding colonies located west of 144° W. long.; Leatherback sea turtle (*Dermochelys coriacea*); Pacific hawksbill sea turtle (*Eretmochelys imbricata bissa*); Atlantic hawksbill sea turtle (*Eretmochelys imbricata imbricata*); and Atlantic ridley sea turtle (*Lepidochelys kempii*). * * *

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PART 226—DESIGNATED CRITICAL HABITAT

3. The authority citation for part 226 continues to read as follows:

Authority: 16 U.S.C. 1533.

4. Section 226.28 is added to subpart C to read as follows:

§ 226.28 Central Valley spring-run chinook salmon (*Oncorhynchus tshawytscha*), Central Valley fall/late fall-run chinook salmon (*Oncorhynchus tshawytscha*), Southern Oregon and California coastal chinook salmon (*Oncorhynchus tshawytscha*), Puget Sound chinook salmon (*Oncorhynchus tshawytscha*), Lower Columbia River chinook salmon (*Oncorhynchus tshawytscha*), Upper Willamette River chinook salmon (*Oncorhynchus tshawytscha*), Upper Columbia River spring-run chinook salmon (*Oncorhynchus tshawytscha*), Snake River fall-run chinook salmon (*Oncorhynchus tshawytscha*).

Critical habitat consists of the water, substrate, and adjacent riparian zone of accessible estuarine and riverine reaches, as well as some marine areas, in hydrologic units and counties identified in Tables 10 through 17 of this part for all of the chinook salmon ESUs listed above. Accessible reaches are those within the historical range of the ESUs that can still be occupied by any life stage of chinook salmon. Inaccessible reaches are those above longstanding, naturally impassable barriers (i.e., natural waterfalls in existence for at least several hundred years) and specific dams within the historical range of each ESU identified in Tables 10 through 17 of this part. Adjacent riparian zones are defined as those areas within a slope distance of 300 ft (91.4 m) from the normal line of high water of a stream channel or adjacent off-channel habitats (600 ft or 182.8 m, when both sides of the channel are included). Hydrologic units are those defined by the Department of the Interior (DOI), U.S. Geological Survey (USGS) publication, ''Hydrologic Unit Maps, Water Supply Paper 2294, 1986,'' and the following DOI, USGS, 1:500,000 scale hydrologic unit maps: State of California (1978), State of Idaho (1981), State of Oregon (1974), and State of Washington (1974) which are incorporated by reference. This incorporation by reference was approved by the Director of the Office of the Federal Register in accordance with 5 U.S.C. 552(a) and 1 CFR part 51. Copies of the USGS publication and maps may be obtained from the USGS, Map Sales, Box 25286, Denver, CO 80225. Copies may be inspected at NMFS, Protected Resources Division, 525 NE Oregon St., Suite 500, Portland, OR 97232–2737, or NMFS, Office of Protected Resources, 1315 East-West Highway, Silver Spring, MD 20910, or at the Office of the Federal Register, 800 North Capitol Street, NW., Suite 700, Washington, DC.

(a) *Central Valley Spring-run chinook salmon (Oncorhynchus tshawytscha) geographic boundaries.* Critical habitat is designated to include all river reaches accessible to chinook salmon in the Sacramento River and its tributaries in California. Also included are river reaches and estuarine areas of the Sacramento-San Joaquin Delta, all waters from Chipps Island westward to Carquinez Bridge, including Honker Bay, Grizzly Bay, Suisun Bay, and Carquinez Strait, all waters of San Pablo Bay westward of the Carquinez Bridge, and all waters of San Francisco Bay (north of the San Francisco/Oakland Bay Bridge) from San Pablo Bay to the Golden Gate Bridge. Excluded are areas above specific dams identified in Table 10 of this part or above longstanding, naturally impassable barriers (i.e., natural waterfalls in existence for at least several hundred years).

(b) *Central Valley Fall/Late Fall-run chinook salmon (Oncorhynchus tshawytscha) geographic boundaries.* Critical habitat is designated to include all river reaches accessible to chinook salmon in the Sacramento and San Joaquin Rivers and their tributaries in California. Also included are river reaches and estuarine areas of the Sacramento-San Joaquin Delta, all waters from Chipps Island westward to Carquinez Bridge, including Honker Bay, Grizzly Bay, Suisun Bay, and Carquinez Strait, all waters of San Pablo Bay westward of the Carquinez Bridge, and all waters of San Francisco Bay (north of the San Francisco/Oakland Bay Bridge from San Pablo Bay to the Golden Gate Bridge. Excluded are areas upstream of the Merced River and areas above specific dams identified in Table 11 of this part or above longstanding, naturally impassable barriers (i.e., natural waterfalls in existence for at least several hundred years).

(c) *Southern Oregon and California Coastal chinook salmon (Oncorhynchus tshawytscha) geographic boundaries.* Critical habitat is designated to include all river reaches and estuarine areas accessible to chinook salmon in the drainages of San Francisco and San Pablo Bays, westward to the Golden Gate Bridge, and includes all estuarine and river reaches accessible to proposed chinook salmon on the California and southern Oregon coast to Cape Blanco (inclusive). Excluded are the Klamath and Trinity Rivers upstream of their confluence. Also excluded are areas above specific dams identified in Table 12 of this part or above longstanding, naturally impassable barriers (i.e., natural waterfalls in existence for at least several hundred years).

(d) *Pudget Sound chinook salmon (Oncorhynchus tshawytscha) geographic boundaries.* Critical habitat is designated to include all marine, estuarine and river reaches accessible to chinook salmon in Puget Sound. Puget Sound marine areas include South Sound, Hood Canal, and North Sound to the international boundary at the outer extent of the Strait of Georgia, Haro Strait and the Straits of Juan De Fuca to a straight line extending north from the west end of Freshway Bay, inclusive. Excluded are areas above specific dams identified in Table 13 of this part or above longstanding, naturally impassable barriers (i.e., natural waterfalls in existence for at least several hundred years).

(e) *Lower Columbia River Chinook Salmon (Oncorhynchus tshawytscha) Geographic boundaries.* Critical habitat is designated to include all river reaches accessible to chinook salmon in Columbia River tributaries between the Grays and White Salmon Rivers in Washington and the Willamette and Hood Rivers in Oregon, inclusive. Also included are river reaches and estuarine areas in the Columbia River from a straight line connecting the west end of the Clatsop jetty (south jetty, Oregon side) and the west end of the Peacock jetty (north jetty, Washington side) upstream to The Dalles Dam. Excluded are areas above specific dams identified in Table 14 of this part or above longstanding, naturally impassable barriers (i.e., natural waterfalls in existence for at least several hundred years).

(f) *Upper Willamette River chinook salmon (Oncorhynchus tshawytscha) geographic boundaries.* Critical habitat is designated to include all river reaches accessible to chinook salmon in the Willamette River and its tributaries above Willamette Falls. Also included are river reaches and estuarine areas in the Columbia River from a straight line connecting the west end of the Clatsop jetty (south jetty, Oregon side) and the west end of the Peacock jetty (north jetty, Washington side) upstream to and including the Willamette River in Oregon. Excluded are areas above specific dams identified in Table 15 of this part or above longstanding, naturally impassable barriers (i.e., natural waterfalls in existence for at least several hundred years).

(g) *Upper Columbia River Spring-run Chinook salmon (Oncorhynchus tshawytscha) Geographic boundaries.* Critical habitat is designated to include all river reaches accessible to chinook salmon in Columbia River tributaries upstream of the Rock Island Dam and downstream of Chief Joseph Dam in Washington, excluding the Okanogan River. Also included are river reaches and estuarine areas in the Columbia River from a straight line connecting the west end of the Clatsop jetty (south jetty, Oregon side) and the west end of the Peacock jetty (north jetty, Washington side) upstream to Chief Joseph Dam in Washington. Excluded are areas above specific dams identified in Table 16 of this part or above longstanding, naturally impassable barriers (i.e., natural waterfalls in existence for at least several hundred years).

(h) *Snake River Fall-run Chinook Salmon (Oncorhynchus tshawytscha) Geographic boundaries.* Critical habitat is designated to include all river reaches accessible to chinook salmon in the Columbia River from The Dalles Dam upstream to the confluence with the Snake River in Washington (inclusive). Critical habitat in the Snake River includes its tributaries in Idaho, Oregon, and Washington (exclusive of the upper Grande Ronde River and the Wallowa

River in Oregon, the Clearwater River above its confluence with Lolo Creek in Idaho, and the Salmon River upstream of its confluence with French Creek in Idaho). Also included are river reaches and estuarine areas in the Columbia River from a straight line connecting the west end of the Clatsop jetty (south jetty, Oregon side) and the west end of the Peacock jetty (north jetty, Washington side) upstream to The Dalles Dam. Excluded are areas above specific dams identified in Table 17 of this part or above longstanding, naturally impassable barriers (i.e., natural waterfalls in existence for at least several hundred years).

5. Tables 10 through 17 are added to part 226 to read as follows:

TABLE 10 TO PART 226.—HYDROLOGIC UNITS AND COUNTIES[1] Containing Critical Habitat for Endangered Central Valley, California Spring-Run Chinook Salmon, and Dams/Reservoirs Representing the Upstream Extent of Critical Habitat

Hydrologic unit name	Hydrologic unit No.	Counties contained in hydrologic unit and within range of ESU	Dams (reservoirs)
San Pablo Bay	18050002	San Mateo, CA, Alameda (CA), Contra Costa (CA), Marin (CA), Somona (CA), Napa (CA), Solano (CA).	San Pablo Reservoir.
San Francisco Bay	18050004	Santa Clara (CA), San Mateo (CA), Alameda (CA), Contra Costa (CA), Marin (CA).	
Coyote	18050003	Santa Clara (CA), San Mateo (CA), Alameda (CA)	Calavera Reservoir.
Suisun Bay	18050001	Contra Costa (CA), Solano (CA), Napa (CA)	
Lower Sacramento	18020109	Solano (CA), Sacramento (CA), Yolo (CA), Placer (CA), Sutter (CA).	
Lower American	18020111	Sacramento (CA), El Dorado (CA), Placer (CA)	Nimbus Dam.
Upper Coon-Upper Auburn	18020127	Placer (CA)	
Lower Bear	18020108	Placer (CA), Sutter (CA), Yuba (CA)	Camp Far West Dam.
Lower Feather	18020106	Sutter (CA), Yuba (CA), Butte (CA)	Oroville Dam.
Lower Yuba	18020107	Yuba (CA)	Englebright Dam.
Lower Butte	18020105	Sutter (CA), Butte (CA), Colusa (CA), Glenn (CA)	
Sacramento-Stone Corral	18020104	Yolo (CA), Colusa (CA), Sutter (CA), Glenn (CA), Butte (CA).	
Upper Butte	18020120	Butte (CA), Tehama (CA)	
Sacramento-Lower Thomes	18020103	Glenn (CA), Butte (CA), Tehama (CA)	Black Butte Dam.
Mill-Big Chico	18020119	Butte (CA), Tehama (CA), Shasta (CA)	
Upper Elder-Upper Thomes	18020114	Tehama (CA)	
Cottonwood Headwaters	18020113	Tehama (CA), Shasta (CA)	
Lower Cottonwood	18020102	Tehama (CA), Shasta (CA).	
Sacramento-Lower Cow-Lower Clear	18020101	Tehama (CA), Shasta (CA)	Keswick Dam, Shasta Dam.
Upper Cow-Battle	18020118	Tehama (CA), Shasta (CA)	Whiskeytown Dam.
Sacramento-Upper Clear	18020112	Shasta (CA)	

[1] Some counties have very limited overlap with estuarine, riverine and riparian habitats indentified as critical habitat for this ESU. Consult USGS hydrologic unit maps (available from USGS) to determine specific county and basin boundaries.

TABLE 11 TO PART 226.—HYDROLOGIC UNITS AND COUNTIES[1] CONTAINING CRITICAL HABITAT FOR THREATENED CENTRAL VALLEY, CALIFORNIA FALL-RUN CHINOOK SALMON, AND DAMS/RESERVOIRS REPRESENTING THE UPSTREAM EXTENT OF CRITICAL HABITAT

Hydrologic unit name	Hydrologic unit No.	Counties within hydrologic unit and within range of ESU	Dams (reservoirs)
San Pablo Bay	18050002	San Mateo, CA, Alameda (CA), Contra Costa (CA), Marin (CA), Somona (CA), Napa (CA), Solano (CA).	San Pablo Reservoir.
San Francisco Bay	18050004	Santa Clara (CA), San Mateo (CA), Alameda (CA), Contra Costa (CA), Marin (CA).	
Coyote	18050003	Santa Clara (CA), San Mateo (CA), Alameda (CA)	Calavera Reservoir.
Suisun Bay	18050001	Contra Costa (CA), Solano (CA), Napa (CA)	
San Joaquin Delta	18040003	Stanislaus (CA), San Joaquin (CA), Alameda (CA), Contra Costa (CA), Sacramento (CA).	
Middle San Joaquin-Lower Merced-Lower Stanislaus.	18040002	Merced (CA), Stanislaus (CA), San Joaquin (CA)	Crocker Diversion La Grange.
Lower Calaveras-Mormon Slough	18040004	Stanislaus (CA), San Joaquin (CA), Calaveras (CA)	New Hogan.
Lower Consumnes-Lower Mokelumne	18040005	San Joaquin (CA), Calaveras (CA), Amador (CA), Sacramento (CA), El Dorado (CA).	Camanche.
Upper Consumnes	18040013	Sacramento (CA), Amador, (CA), El Dorado (CA)	
Lower Sacramento	18020109	Solano (CA), Sacramento (CA), Yolo (CA), Placer (CA), Sutter (CA).	
Lower American	18020111	Sacramento (CA), El Dorado (CA), Placer (CA)	Nimbus.
Upper Coon-Upper Auburn	18020127	Placer (CA).	
Lower Bear	18020108	Placer (CA), Sutter (CA), Yuba (CA)	Camp Far West.
Lower Feather	18020106	Sutter (CA), Yuba (CA), Butte (CA)	Oroville.
Lower Yuba	18020107	Yuba (CA)	Englebright.
Lower Butte	18020105	Sutter (CA), Butte (CA), Colusa (CA), Glenn (CA)	

TABLE 11 TO PART 226.—HYDROLOGIC UNITS AND COUNTIES[1] CONTAINING CRITICAL HABITAT FOR THREATENED CENTRAL VALLEY, CALIFORNIA FALL-RUN CHINOOK SALMON, AND DAMS/RESERVOIRS REPRESENTING THE UPSTREAM EXTENT OF CRITICAL HABITAT

Hydrologic unit name	Hydrologic unit No.	Counties within hydrologic unit and within range of ESU	Dams (reservoirs)
Sacramento-Stone Corral	18020104	Yolo (CA), Colusa (CA), Sutter (CA), Glenn (CA), Butte (CA).	
Upper Butte	18020120	Butte (CA), Tehama (CA).	
Sacramento-Lower Thomes	18020103	Glenn (CA), Butte (CA), Tehama (CA)	Black Butte.
Mill-Big Chico	18020119	Butte (CA), Tehama (CA), Shasta (CA)	
Upper Elder-Upper Thomes	18020114	Tehama (CA).	
Cottonwood Headwaters	18020113	Tehama (CA), Shasta (CA).	
Lower Cottonwood	18020102	Tehama (CA), Shasta (CA).	
Sacramento-Lower Cow-Lower Clear	18020101	Tehama (CA), Shasta (CA).	Keswick Dam Shasta.
Upper Cow-Battle	18020118	Tehama (CA), Shasta (CA)	Whiskeytown.
Sacramento-Upper Clear	18020112	Shasta (CA).	

[1] Some counties have very limited overlap with estuarine, riverine and riparian habitats indentified as critical habitat for this ESU. Consult USGS hydrologic unit maps (available from USGS) to determine specific county and basin boundaries.

TABLE 12 TO PART 226.—HYDROLOGIC UNITS AND COUNTIES[1] CONTAINING CRITICAL HABITAT FOR THREATENED SOUTHERN OREGON AND CALIFORNIA COASTAL CHINOOK SALMON; DAMS/RESERVOIRS REPRESENTING THE UPSTREAM EXTENT OF CRITICAL HABITAT

Hydrologic unit name	Hydrologic unit No.	Counties contained in hydrologic unit and within range of ESU	Dams (reservoirs)
Tomales-Drakes Bay	18050005	Marin (CA), Somona (CA)	Kent Lake Dam Nicasio Reservoir.
Bodega Bay	18010111	Marin (CA), Sonoma (CA).	
Russian	18010110	Somona (CA), Mendocino (CA)	Lake Mendocino.
Gualala-Salmon	18010109	Somona (CA), Mendocino (CA).	
Big-Navarro-Garcia	18010108	Mendocino (CA).	
Upper Eel	18010103	Mendocino (CA), Lake (CA), Glenn (CA), Trnity (CA).	
Middle Fork Eel	18010104	Mendocino (CA), Trinity (CA), Humboldt (CA)	Lake Pillsbury.
Lower Eel	18010105	Mendocino (CA), Humboldt (CA).	
South Fork Eel	18010106	Mendocino (CA), Humboldt (CA).	
Mattole	18010107	Lake (CA), Mendocino (CA).	
Mad-Redwood	18010102	Humboldt (CA), Trinity (CA).	
Lower Klamath	18010209	Humboldt, (CA), Del Norte (CA), Siskiyou (CA).	
Smith	18010101	Del Norte (CA), Curry (OR).	
Chetco	17100312	Curry (OR), Del Norte (CA).	
Sixes	17100306	Curry (OR), Coos (OR).	
Illinois	17100311	Josephine (OR), Del Norte (CA).	
Lower Rogue	17100310	Curry (OR), Josephine (OR) Jackson (OR).	
Applegate	17100309	Josephine (OR), Jackson (OR) Del Norte (CA)	Applegate Dam.
Middle Rogue	17100308	Jackson (OR), Douglas (OR)	Savage Rapids Dam.
Upper Rogue	17100307	Jackson (OR), Klamath (OR)	Lost Creek Dam.

[1] Some counties have very limited overlap with estuarine, riverine and riparian habitats indentified as critical habitat for this ESU. Consult USGS hydrologic unit maps (available from USGS) to determine specific county and basin boundaries.

TABLE 13 TO PART 226—HYDROLOGIC UNITS AND COUNTIES[1] CONTAINING CRITICAL HABITAT FOR THREATENED PUGET SOUND CHINOOK SALMON, AND DAMS/RESERVOIRS REPRESENTING THE UPSTREAM EXTENT OF CRITICAL HABITAT

Hydrologic unit name	Hydrologic unit No.	Counties contained in hydrologic unit and within range of ESU	Dams (reservoirs)
Nisqually	17110015	Pierce (WA), Thurston (WA).	
Deschutes	17110016	Thurston (WA), Lewis (WA).	
Puyallup	17110014	Pierce (WA), King (WA).	
Duwamish	17110013	King (WA), Pierce (WA)	Howard Hanson.
Lake Washington	17110012	King (WA), Snohomish (WA)	Cedar Falls Dam.
Puget Sound	17110019	Thurston (WA), Mason (WA), Kitsap (WA), Pierce (WA), King (WA), Snohomish (WA), Jefferson (WA), Skagit (WA).	
Skokomish	17110017	Mason (WA), Jefferson (WA), Grays Harbor (WA)	Cushman Dam.
Hood Canal	17110018	Mason (WA), Jefferson (WA), Kitsap (WA).	
Snoqualmie	17110010	King (WA), Snohomish (WA)	Tolt Dam.
Skyhomish	17110009	King (WA), Snohomish (WA).	
Snohomish	17110011	Snohomish (WA).	
Stillaguamish	17110008	Snohomish (WA), Skagit (WA).	

TABLE 13 TO PART 226—HYDROLOGIC UNITS AND COUNTIES[1] CONTAINING CRITICAL HABITAT FOR THREATENED PUGET SOUND CHINOOK SALMON, AND DAMS/RESERVOIRS REPRESENTING THE UPSTREAM EXTENT OF CRITICAL HABITAT—Continued

Hydrologic unit name	Hydrologic unit No.	Counties contained in hydrologic unit and within range of ESU	Dams (reservoirs)
Sauk	17110006	Snohomish (WA), Skagit (WA).	
Upper Skagit	17110005	Skagit (WA), Whatcom (WA).	
Lower Skagit	17110007	Skagit (WA), Snohomish (WA).	
Nooksack	17110004	Skagit (WA), Whatcom (WA).	
Fraser	17110001	Whatcom (WA).	
Strait of Georgia	17110002	Skagit (WA), Whatcom (WA).	
San Juan Islands	17110003	San Juan (WA).	
Dungeness-Elwha	17110020	Jefferson (WA), Clallam (WA)	Elwha Dam.
Crescent-Hoko	17110021	Clallam (WA).	

[1] Some counties have very limited overlap with estuarine, riverine and riparian habitats indentified as critical habitat for this ESU. Consult USGS hydrologic unit maps (available from USGS) to determine specific county and basin boundaries.

TABLE 14 TO PART 226.—HYDROLOGIC UNITS AND COUNTIES[1] CONTAINING CRITICAL HABITAT FOR THREATENED LOWER COLUMBIA RIVER CHINOOK SALMON, AND DAMS/RESERVOIRS REPRESENTING THE UPSTREAM EXTENT OF CRITICAL HABITAT

Hydrologic unit name	Hydrologic unit No.	Counties within hydrologic unit and within range of ESU	Dams (reservoirs)
Lower Columbia	17080006	Pacific (WA), Wahkiakum (WA), Clatsop (OR).	
Lower Columbia-Clatskanie	17080003	Wahkiakum (WA), Cowlitz (WA), Skamania (WA), Clatsop (OR), Columbia (OR).	
Lower Cowlitz	17080005	Cowlitz (WA), Lewis (WA), Skamania (WA)	Mayfield Dam.
Lewis	17080002	Cowlitz (WA), Clark (WA), Skamania (WA), Klickitat (WA).	Merwin Dam, Yale Dam Cougar Dam.
Lower Columbia-Sandy	17080001	Clark (WA), Skamania (WA), Multnomah (OR), Clackamas (OR).	Bull Run Dam.
Lower Willamette	17090012	Columbia (OR), Multnomah (OR), Clackamas (OR).	
Clackamas	17090011	Clackamas (OR), Marion (OR)	Oak Grove Dam.
Middle Columbia—Hood	17070105	Hood River (OR), Wasco (OR), Klickitat (WA), Skamania (WA).	Condit Dam.

[1] Some counties have very limited overlap with estuarine, riverine and riparian habitats indentified as critical habitat for this ESU. Consult USGS hydrologic unit maps (available from USGS) to determine specific county and basin boundaries.

TABLE 15 TO PART 226.—HYDROLOGIC UNITS AND COUNTIES[1] CONTAINING CRITICAL HABITAT FOR THREATENED UPPER WILLAMETTE RIVER CHINOOK SALMON, AND DAMS/RESERVOIRS REPRESENTING THE UPSTREAM EXTENT OF CRITICAL HABITAT

Hydrologic unit name	Hydrologic unit No.	Counties within hydrologic unit and within range of ESU	Dams (reservoirs)
Lower Columbia	17080006	Pacific (WA), Wahkiakum (WA), Clatsop (OR).	
Lower Columbia-Clatskanie	17080003	Wahkiakum (WA), Cowlitz (WA), Skamania (WA), Clatsop (OR), Columbia (OR).	
Lower Columbia-Sandy	17080001	Clark (WA), Skamania (WA), Multnomah (OR), Clackamas (OR).	
Lower Willamette	17090012	Columbia (OR), Multnomah (OR), Clackamas (OR).	
Tualatin	17090010	Yamhill (OR), Washington (OR), Tillamook (OR), Clakamas (OR), Multnomah (OR), Columbia (OR).	
Middle Willamette	17090007	Polk (OR), Marion (OR), Yamhill (OR), Washington (OR), Clakamas (OR).	
Yamhill	17090008	Lincoln (OR), Polk (OR), Yamhill (OR), Tillamook (OR), Washington (OR).	
Molalla-Pudding	17090009	Marion (OR), Clakamas (OR).	
North Santiam	17090005	Marion (OR), Linn (OR).	
Upper Willamette	17090003	Polk (OR), Benton (OR), Lane (OR), Linn (OR), Lincoln (OR).	
South Santiam	17090006	Linn (OR)	Green Peter Dam, Foster Dam.
McKenzie	17090004	Lane (OR), Linn (OR)	Cougar Dam.
Middle Fork Willamette	17090001	Lane (OR), Douglas (OR)	Dexter Dam.
Coast Fork Willamette	17090002	Lane (OR), Douglas (OR).	

[1] Some counties have very limited overlap with estuarine, riverine and riparian habitats indentified as critical habitat for this ESU. Consult USGS hydrologic unit maps (available from USGS) to determine specific county and basin boundaries.

TABLE 16 TO PART 226—HYDROLOGIC UNITS AND COUNTIES[1] CONTAINING CRITICAL HABITAT FOR ENDANGERED UPPER COLUMBIA RIVER SPRING-RUN CHINOOK SALMON, AND DAMS/RESERVOIRS REPRESENTING THE UPSTREAM EXTENT OF CRITICAL HABITAT

Hydrologic unit name	Hydrologic unit No.	Counties contained in hydrologic unit and within range of ESU	Dams (reservoirs)
Lower Columbia	17080006	Pacific (WA), Wahkiakum (WA), Clatsop (OR)	
Lower Columbia-Clatskanie	17080003	Wahkiakum (WA), Cowlitz (WA), Skamania (WA), Clatsop (OR), Columbia (OR).	
Lower Columbia-Sandy	17080001	Clark (WA), Skamania (WA), Multnomah (OR), Clackamas (OR).	Bull Run Dam.
Middle Columbia-Hood	17070105	Hood River (OR), Wasco (OR), Klickitat (WA), Skamania (WA).	Condit Dam.
Middle Columbia-Lake Wallula	17070101	Gilliam (OR), Morrow (OR), Sherman (OR), Umatilla (OR), Benton (A), Klickitat (WA), Walla Walla (WA).	
Upper Columbia-Priest Rapids	17020016	Benton (WA), Franklin (WA), Grant (WA)	
Upper Columbia—Entiat	17020010	Chelan (WA), Douglas (WA), Grant (WA), Kittias (WA)	
Wenatchee	17020011	Chelan (WA).	
Chief Joseph	17020005	Chelan (WA), Douglas (WA), Okanogan (WA)	Chief Joseph.
Methow	17020008	Okanogan (WA).	
Okanogan	17020006	Okanogan (WA).	
Similkameen	17020007	Okanogan (WA).	

[1] Some counties have very limited overlap with estuarine, riverine and riparian habitats indentified as critical habitat for this ESU. Consult USGS hydrologic unit maps (available from USGS) to determine specific county and basin boundaries.

TABLE 17 TO PART 226—HYDROLOGIC UNITS AND COUNTIES[1] CONTAINING CRITICAL HABITAT FOR THREATENED SNAKE RIVER FALL-RUN CHINOOK SALMON, AND DAMS/RESERVOIRS REPRESENTING THE UPSTREAM EXTENT OF CRITICAL HABITAT

Hydrologic unit name	Hydrologic unit No.	Counties contained in hydrologic unit and within range of ESU	Dams (reservoirs)
Lower Columbia	17080006	Pacific (WA), Wahkiakum (WA), Clatsop (OR).	
Lower Columbia-Clatskanie	17080003	Wahkiakum (WA), Cowlitz (WA), Skamania (WA), Clatsop (OR), Columbia (OR).	
Lower Columbia-Sandy	17080001	Clark (WA), Skamania (WA), Multnomah (OR), Clackamas (OR).	Bull Run Dam.
Middle Columbia-Hood	17070105	Hood River (OR), Wasco (OR) Klickitat (WA), Skamania (WA).	Condit Dam.
Middle Columbia-Lake Wallula	17070101	Gilliam (OR), Morrow (OR), Sherman (OR), Umatilla (OR), Benton (A), Klickitat (WA), Walla Walla (WA).	
Lower Deschutes	17070306	Jefferson (OR), Wasco (OR), Sherman (OR)	Pelton Dam Round Butte.
Trout	17070307	Crook (OR), Jefferson (OR), Wasco (OR)	
Lower John Day	17070204	Crook (OR), Wheeler (OR), Jefferson (OR), Grant (OR), Gilliam (OR), Morrow (OR) Sherman (OR), Wasco (OR).	
Upper John Day	17070201	Wheeler (OR), Grant (OR), Harney (OR)	
North Fork—John Day	17070202	Grant (OR), Wheeler (OR), Morrow (OR), Umatilla (OR).	
Middle Fork—John Day	17070203	Grant (OR).	
Willow	17070104	Morrow (OR), Gilliam (OR).	
Umatilla	17070103	Morrow (OR), Umatilla (OR).	
Walla Walla	17070102	Umatilla (OR), Wallowa (OR), Walla Walla (WA), Columbia (WA).	
Lower Snake	17060110	Franklin (WA), Columbia (WA), Walla Walla (WA)	
Lower Snake-Tucannon	7060107	Columbia (WA), Whitman (WA) Garfield (WA), Asotin (WA).	
Lower Snake—Asotin	17060103	Wallowa (OR), Garfield (WA), Asotin (WA) Nez Perce (ID).	
Lower Salmon	17060209	Valley (ID), Idaho (ID), Lewis (ID), Nez Perce (ID)	
Clearwater	17060306	Nez Perce (ID), Lewis (ID), Clearwater (ID) Latah (ID).	
Lower Grande Ronde	17060106	Union (OR), Wallowa (OR), Columbia (WA), Garfield (WA), Asotin (WA).	
Imnaha	17060102	Baker (OR), Union (OR), Wallowa (OR), Columbia (WA), Walla Walla (WA).	
Hells Canyon	17060101	Wallowa (OR), Idaho (ID)	Hells Canyon, Oxbow Dam Brownlee.

[1] Some counties have very limited overlap with estuarine, riverine and riparian habitats identified as critical habitat for this ESU. Consult USGS hydrologic unit maps (available from USGS) to determine specific county and basin boundaries.

PART 227—THREATENED FISH AND WILDLIFE

6. The authority citation for part 227 continues to read as follows:

Authority: 16 U.S.C. 1531–1543; subpart B, § 227.12 also issued under 16 U.S.C. 1361 *et seq.*

7. In § 227.4, paragraph (g) is revised, paragraph (p) is added and reserved, and paragraphs (q) through (u) are added to read as follows:

§ 227.4 Enumeration of threatened species.

* * * * *

(g) Snake River fall-run chinook salmon (*Oncorhynchus tshawytscha*). Includes all naturally spawned populations of chinook salmon (and their progeny) from the Columbia River and its tributaries upstream from a transitional point between Washington and Oregon east of the Hood River and the White Salmon River, to its confluence with the Snake River, and also includes the Snake River and its tributaries upstream to Hells Canyon Dam. These tributaries include the lower Grande Ronde, Imnaha, lower Salmon and lower Clearwater Rivers in parts of Oregon, Washington and Idaho.

* * * * *

(p) [Reserved]

(q) Central Valley fall/late fall-run chinook salmon (*Oncorhynchus tshawytscha*). Includes all naturally spawned populations of chinook salmon (and their progeny) in the Sacramento and San Joaquin River Basins and their tributaries, east of Carquinez Strait, California.

(r) Southern Oregon and California coastal chinook salmon (*Oncorhynchus tshawytscha*). Includes all naturally spawned populations of chinook salmon (and their progeny) from rivers and streams between Cape Blanco, Oregon south to the northern entrance of San Francisco Bay, California.

(s) Puget Sound chinook salmon (*Oncorhynchus tshawytscha*). Includes all naturally spawned populations of chinook salmon (and their progeny) from rivers and streams flowing into Puget Sound including the Straits of Juan De Fuca from the Elwha River, eastward, including rivers and streams flowing into Hood Canal, South Sound, North Sound and the Strait of Georgia in Washington.

(t) Lower Columbia River chinook salmon (*Oncorhynchus tshawytscha*). Includes all naturally spawned populations of chinook salmon (and their progeny) from the Columbia River and its tributaries from its mouth at the Pacific Ocean upstream to a transitional point between Washington and Oregon east of the Hood River and the White Salmon River, and includes the Willamette River to Willamette Falls, Oregon.

(u) Upper Willamette River chinook salmon (*Oncorhynchus tshawytscha*). Includes all naturally spawned spring-run populations of chinook salmon (and their progeny) in the Willamette River, and its tributaries, above Willamette Falls, Oregon.

[FR Doc. 98–5484 Filed 3–2–98; 2:49 pm]
BILLING CODE 3510–22–P

EXHIBIT 4

DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

50 CFR Parts 223

[Docket No. 990303060–9231–03; I.D. 022398C]

RIN 0648–AM54

Endangered and Threatened Species; Threatened Status for Two Chinook Salmon Evolutionarily Significant Units (ESUs) in California

AGENCY: National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration (NOAA), Commerce.

ACTION: Final rule; notice of determination.

SUMMARY: Previously, NMFS completed a comprehensive status review of west coast chinook salmon (*Oncorhynchus tshawytscha*) populations in Washington, Oregon, Idaho, and California and identified 15 ESUs within this range. After soliciting additional data to resolve scientific disagreements, NMFS now issues a final rule to list two ESUs as threatened under the Endangered Species Act (ESA). The Central Valley spring-run ESU was originally proposed as endangered, but new information indicates that the ESU should instead be considered a threatened species. The California Coastal ESU was originally proposed as threatened, as part of a larger Southern Oregon and California Coastal ESU, but new information supports a threatened listing for a revised ESU consisting of California coastal chinook salmon populations from Redwood Creek (Humboldt County) south through the Russian River. Other coastal populations to the north of this ESU (and originally proposed as threatened) are now considered part of a separate Southern Oregon and Northern California Coastal ESU that does not warrant listing at this time.

NMFS is also making final listing determinations for two other chinook salmon ESUs originally proposed as threatened. It has considered new information about the Central Valley fall and late fall-run ESU and has determined that listing is not warranted at this time, but it will consider it a candidate species. In the case of the proposed ESU expansion for threatened Snake River fall-run chinook salmon, NMFS has determined that the ESU does not include Deschutes River populations and that listing this latter population is not warranted at this time.

In the two ESUs identified as threatened, only naturally spawned populations of chinook salmon are listed. At this time, no hatchery populations are deemed essential for recovery in either of the two listed ESUs, so no hatchery populations are part of this final listing determination.

NMFS intends to issue protective regulations under section 4(d) of the ESA for these threatened ESUs. Even though NMFS is not now issuing protective regulations for the threatened ESUs, Federal agencies are required under section 7 to consult with NMFS if any activity they authorize, fund, or carry out may affect listed chinook salmon in these ESUs.

DATES: Effective November 15, 1999.

ADDRESSES: Branch Chief, NMFS, Northwest Region, Protected Resources Division, 525 NE. Oregon St., Suite 500, Portland, OR 97232–2737; Assistant Regional Administrator, Protected Resources Division, NMFS, Southwest Region, 501 West Ocean Blvd., Suite 4200, Long Beach, CA 90802-4213; Salmon Coordinator, Office of Protected Resources, NMFS, 1315 East-West Highway, Silver Spring, MD 20910.

Reference materials regarding this listing determination can also be obtained from the internet at www.nwr.noaa.gov.

FOR FURTHER INFORMATION CONTACT: Garth Griffin at (503) 231–2005, Craig Wingert at (562) 980–4021, or Chris Mobley at (301) 713–1401.

SUPPLEMENTARY INFORMATION:

Species Background

Chinook salmon are anadromous and semelparous, i.e., as adults they migrate from the marine environment into the freshwater rivers and streams of their birth (anadromous) where they spawn and die (semelparous). They are the largest of the Pacific salmon species and are distributed in freshwater and marine areas from California to Asia. The four ESUs considered in this determination spawn and rear in coastal and interior rivers in California and Oregon and forage in vast nearshore and marine zones of the North Pacific Ocean. More detailed biological information for west coast chinook salmon can be found in species' status assessments by NMFS (Matthews and Waples, 1991; Waples *et al*., 1991; NMFS, 1995; Waknitz *et al*., 1995; Myers *et al*., 1998; NMFS, 1998a; NMFS, 1999a), Oregon Department of Fish and Wildlife (ODFW, 1991; Nickelson *et al*., 1992; Kostow *et al*., 1995), California Department of Fish and Game (CDFG)(Clark, 1929; CDFG, 1965; Hallock and Fry, 1967; Reynolds *et al*., 1993; Yoshiyama *et al*., 1996), and for species life history summaries (Miller and Brannon, 1982; Healey, 1991), and in previous **Federal Register** documents (56 FR 29542, June 27, 1991; 63 FR 11482, March 9, 1998).

Previous Federal ESA Actions Related to West Coast Chinook Salmon

Descriptions of previous Federal ESA actions pertaining to west coast chinook salmon are summarized in the proposed rule (63 FR 11482, March 9, 1998), and recent final rule (63 FR 14308, March 24, 1999) for several chinook salmon ESUs. NMFS initially announced its intention to conduct a coastwide review of chinook salmon status in response to a petition to list several Puget Sound chinook salmon stocks on September 12, 1994 (59 FR 46808). Having received on February 1, 1995, a more comprehensive petition from the Oregon Natural Resources Council and from Dr. Richard Nawa, NMFS reconfirmed its intention to conduct a coastwide review (60 FR 30263, June 8, 1995). During that review, NMFS requested public comment and assessed the best available scientific and commercial data, including technical information from Pacific Salmon Biological Technical Committees (PSBTCs) and from other interested parties. The PSBTCs consisted primarily of scientists (from Federal, state, and local resource agencies, Indian tribes, industries, universities, professional societies, and public interest groups) possessing technical expertise relevant to chinook salmon and their habitats. The NMFS Biological Review Team (BRT), composed of staff from NMFS' Northwest, Southwest, and Auke Bay Fisheries Science Centers, Northwest and Southwest Regions, as well as staff from the National Biological Survey, reviewed and evaluated scientific information provided by the PSBTCs and other sources. Early drafts of the BRT review were distributed to state and tribal fisheries managers and peer reviewers who are experts in the field to ensure that NMFS' evaluation was as accurate and complete as possible. The BRT then incorporated all comments into the coastwide chinook salmon status review.

Based on the results of the completed status report on west coast chinook salmon (Myers *et al*., 1998), NMFS identified 15 ESUs of chinook salmon from Washington, Oregon, Idaho, and California, including 11 new ESUs, and 1 redefined ESU (63 FR 11482, March 9, 1998). After assessing information concerning chinook salmon abundance, distribution, population trends, and risks and after considering efforts being made to protect chinook salmon, NMFS determined that several chinook salmon ESUs did not warrant listing under the ESA. The chinook salmon ESUs not requiring ESA protection included the Upper Klamath and Trinity River ESU, Oregon Coast ESU, Washington Coast ESU, Middle Columbia River spring-run ESU, and Upper Columbia River summer- and fall-run ESU.

Also based on this evaluation, and after considering efforts being made to protect chinook salmon, NMFS proposed that seven chinook salmon ESUs warranted listing as either endangered or threatened species under the ESA. The chinook salmon ESUs proposed as endangered species included California Central Valley spring-run and Washington's Upper Columbia River spring-run chinook salmon. The chinook salmon ESUs proposed as threatened species included California Central Valley fall and late fall-run, Southern Oregon and California Coastal, Puget Sound, Lower Columbia River, and Upper Willamette River spring-run chinook salmon. Additionally, NMFS found that fall-run chinook salmon from the Deschutes River in Oregon shared a strong genetic and life history affinity to currently listed Snake River fall-run chinook. Based on this affinity, NMFS proposed to revise the existing listed Snake River fall-run ESU to include fall-run chinook salmon in the Deschutes River. The resulting revised ESU would be listed as threatened.

Following these proposed listings, NMFS conducted 21 public hearings within the range of the proposed chinook salmon ESUs in California, Oregon, Washington, and Idaho. NMFS accepted and reviewed public comments solicited during a 112-day public comment period. Also during the comment period, NMFS solicited peer and co-manager review of NMFS' proposal and received comments and new scientific information concerning the status of the chinook salmon ESUs proposed for listing. NMFS also received information regarding the relationship of existing hatchery stocks to native populations in each ESU. This new information was evaluated by NMFS' BRT and published in an updated status review for these chinook salmon entitled ''Status Review Update for West Coast Chinook Salmon (*Oncorhynchus tshawytscha*) from Puget Sound, Lower Columbia River, Upper Willamette River, and Upper Columbia River Spring-run ESUs.'' (NMFS, 1998a).

Based on these public hearings, comments, and additional technical meetings with Indian tribes and the states, NMFS found that listing was warranted for four ESUs (Upper Columbia River spring-run, Puget Sound, Lower Columbia River, and Upper Willamette River spring-run ESUs) (63 FR 14308, March 24, 1999). However, substantial scientific disagreements precluded the agency from making final determinations for California's Central Valley spring-run and Central Valley fall and late fall-run, Southern Oregon and California Coastal, and Snake River fall-run ESUs. Therefore, in accordance with section 4(b)(6)(B)(i) of the ESA, NMFS extended the period for making final determinations for these ESUs by 6 additional months (63 FR 14329, March 24, 1999).

During the 6 month period, NMFS received new scientific information concerning the boundaries, population structure, and status of the deferred ESUs and met with the affected states, Indian Tribes, and Federal co-managers. This new information was considered by NMFS' BRT, and NMFS has now completed an updated status review that analyzes this new information as well as the ESU status of existing hatchery stocks (NMFS, 1999a). Based on this updated status review and other information, NMFS now issues its final determinations for these four proposed ESUs. Copies of NMFS' updated status review reports and related documents are available upon request (see **ADDRESSES**).

Summary of Comments and Information Received in Response to the Proposed Rule

NMFS held 21 public hearings in California, Oregon, Idaho, and Washington to solicit comments on this and other salmonid listing proposals (63 FR 16955, April 7, 1998; 63 FR 30455, June 4, 1998). During the 112-day public comment period, NMFS received nearly 300 written comments regarding the west coast chinook salmon proposed rule. A number of comments addressed issues pertaining to the proposed critical habitat designation for west coast chinook salmon. NMFS will address these comments in a forthcoming **Federal Register** document announcing the agency's conclusions about critical habitat for all listed chinook salmon ESUs.

NMFS also sought new data and analyses from tribal, state, and Federal co-managers and met with them to formally discuss technical issues associated with the deferred chinook salmon ESUs. This new information and analysis were considered by NMFS' BRT in its re-evaluation of ESU boundaries and species' status; this information is discussed in an updated status review report for these chinook salmon ESUs (NMFS, 1999a).

In addition to soliciting and reviewing public comments, NMFS sought peer review of its listing proposals. On July 1, 1994, NMFS, jointly with the U.S. Fish and Wildlife Service (FWS), published a series of policies regarding listings under the ESA, including a policy for peer review of scientific data (59 FR 34270). In accordance with this policy, NMFS solicited 13 individuals to take part in a peer review of its west coast chinook salmon proposed rule. All individuals solicited are recognized experts in the field of chinook salmon biology and represent a broad range of interests, including Federal, state, and tribal resource managers and academia. Four individuals took part in the peer review of this action; new information and comments provided by the public and comments from peer reviewers were considered by NMFS' BRT and are summarized in the updated status review documents (NMFS, 1998a; NMFS, 1999a). Copies of these documents are available upon request (see **ADDRESSES**).

A summary of comments received in response to the proposed rule follows.

Issue 1: Sufficiency and Accuracy of Scientific Information and Analysis

Comment 1: Some commenters questioned the sufficiency and accuracy of data NMFS employed in the listing proposal. In contrast, peer reviewers commented that the agency's status review was both credible and comprehensive, even though they may not have concurred with all of NMFS' conclusions.

Response: Section 4(b)(1)(A) of the ESA requires that NMFS make its listing determinations solely on the basis of the best available scientific and commercial data, after reviewing the status of the species and taking into account any efforts being made to protect such species. NMFS believes that information contained in the agency's status review (Myers *et al.*, 1998), together with more recent information obtained in response to the proposed rule (NMFS, 1998a; NMFS, 1999a), represents the best scientific and commercial information presently available for the chinook salmon ESUs addressed in this final rule. NMFS has made every effort to conduct an exhaustive review of all available information and has solicited information and opinion from all interested parties, including peer reviewers as described previously. If new data become available to change these conclusions, NMFS will act accordingly.

Comment 2: Several of the comments received suggested that the ESA does not provide for the creation of ESUs and that ESUs do not correspond to species, subspecies, or distinct population segments (DPSs) that are specifically identified in the ESA. Further, NMFS' use of genetic information (allozyme- or DNA-derived) to determine ESU boundaries was criticized by several commenters. It was argued that allozyme-based electrophoretic data cannot be used to imply either evolutionary significance or local adaptation. Other commenters indicated that NMFS used genetic distances inconsistently in determining the creation of ESUs. Several commenters argued that there was insufficient scientific information presented to justify the establishment of the chinook salmon ESUs discussed. Information was lacking concerning a number of ''key'' criteria for defining ESUs, such as phenotypic differences, evolutionary significance, or ecological significance of various chinook populations. Commenters contended that NMFS did not find any life history, habitat, or phenotypic characteristics that were unique to any of the ESUs discussed. Disagreement within the BRT regarding ESU delineations was also given as a reason for challenging the proposed listing decision.

Response: General issues relating to ESUs, DPSs, and the ESA have been discussed extensively in past **Federal Register** documents as described in this paragraph. Regarding application of its ESU policy, NMFS relies on its policy describing how it will apply the ESA definition of ''species'' to anadromous salmonid species published in 1991 (56 FR 58612, November 20, 1991). More recently, NMFS and FWS published a joint policy, that is consistent with NMFS' policy, regarding the definition of ''distinct population segments'' (DPSs)(61 FR 4722, February 7, 1996). The earlier policy is more detailed and applies specifically to Pacific salmonids and, therefore, was used for this determination. This policy indicates that one or more naturally reproducing salmonid populations will be considered to be distinct and, hence, a species under the ESA, if they represent an ESU of the biological species. To be considered an ESU, a population must satisfy two criteria: (1) It must be reproductively isolated from other population units of the same species, and (2) it must represent an important component in the evolutionary legacy of the biological species. The first criterion, reproductive isolation, needs not be absolute but must have been strong enough to permit evolutionarily important differences to occur in different population units. The second criterion is met if the population contributes substantially to the ecological or genetic diversity of the species as a whole. Guidance on applying this policy is contained in a NOAA Technical Memorandum entitled ''Definition of 'Species' Under the Endangered Species Act: Application to Pacific Salmon'' (Waples, 1991) and in a more recent scientific paper by Waples (1995).

The National Research Council (NRC) has recently addressed the issue of defining species under the ESA (NRC, 1995). Its report found that protecting DPSs is soundly based on scientific evidence, and recommends applying an ''Evolutionary Unit'' (EU) approach in describing these segments. The NRC report describes the high degree of similarity between the EU and ESU approaches (differences being largely a matter of application between salmon and other vertebrates), and concludes that either approach would lead to similar DPS descriptions most of the time.

ESUs were identified using the best available scientific and commercial information. As discussed in the status review, genetic data were used primarily to evaluate the criterion regarding reproductive isolation, not evolutionary significance. In some cases, there was a considerable degree of confidence in the ESU determinations; in other cases, more uncertainty was associated with this process. Similarly, the risk analysis necessarily involved a mixture of quantitative and qualitative information and scientific judgement. NMFS' process for conducting its risk assessment has evolved over time as the amount and complexity of information has changed, and NMFS continues to seek and incorporate comments and suggestions to improve this process. NMFS believes that there is evidence to support the identification of DPSs for chinook salmon. The chinook salmon status reviews describe a variety of characteristics that support the ESU delineations for this species, including ecological and life history parameters. NMFS also assessed available genetic data for the proposed ESUs and concludes that sufficient genetic differences existed between these and adjacent ESUs to support separate delineations. As described later in this notice, new information has resulted in significant changes in the configurations of some proposed ESUs.

Issue 2: Status Assessments for Chinook Salmon ESUs

Comment 3: Some comments suggested that risk assessments were made in an arbitrary manner and that NMFS did not rely on the best available science. Several commenters questioned NMFS' methodology for determining whether a given chinook salmon ESU warranted listing. In some cases, such commenters also expressed opinions regarding whether listing was warranted for a particular chinook salmon ESU.

Response: Throughout the status review of west coast chinook salmon, NMFS has solicited and evaluated the best available scientific and commercial data for the species. The agency believes that this review, coupled with considerable input from the public, comanagers, peer reviewers, and other species experts, clearly demonstrates that the listing determinations are not arbitrary but instead are based on an open and rigorous scientific assessment. Section 3 of the ESA defines the term ''endangered species'' as ''any species which is in danger of extinction throughout all or a significant portion of its range.'' The term ''threatened species'' is defined as ''any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.'' NMFS has identified a number of factors that should be considered in evaluating the level of risk faced by an ESU, including: (1) absolute numbers of fish and their spatial and temporal distribution; (2) current abundance in relation to historical abundance and current carrying capacity of the habitat; (3) trends in abundance; (4) natural and human-influenced factors that cause variability in survival and abundance; (5) possible threats to genetic integrity (e.g., from strays or outplants from hatchery programs); and (6) recent events (e.g., a drought or changes in harvest management) that have predictable short-term consequences for abundance of the ESU. A more detailed discussion of the status of individual ESUs is provided later in this document under Issues 5 through 8.

Issue 3: Factors Contributing to the Decline of West Coast Chinook Salmon

Comment 4: Some comments identified factors for decline that were either not identified in the status review or which they believed were not given sufficient weight in the risk analysis. Other commenters contended that recent declines in chinook salmon abundance were related to natural factors such as predation and changes in ocean productivity. Furthermore, these commenters contend that NMFS did not show how the present declines were significantly different from natural variability in abundance, nor that abundances were below the current carrying capacity of the marine environment and freshwater habitat.

Response: The status review did not attempt to exhaustively identify factors for decline, except insofar as they contributed directly to the risk analysis. Nevertheless, NMFS agrees that a multitude of factors, past and present, have contributed to the decline of west coast chinook salmon. Many of the identified factors were specifically cited as risk agents in NMFS's status review (Myers *et al*., 1998) and listing proposal (63 FR 11482, March 9, 1998). NMFS recognizes that natural environmental fluctuations have likely played a role in the species' recent declines. However, NMFS believes other human-induced impacts (e.g., harvest in certain fisheries, artificial propagation, and widespread habitat modification) have played an equally significant role in the decline of chinook salmon.

NMFS' status review briefly addressed the impact of adverse marine conditions and climate change, but concluded that there is considerable uncertainty regarding the role of these factors in chinook salmon abundance. At this time, we do not know whether these climate conditions represent a long-term shift in conditions that will continue into the future or short-term environmental fluctuations that can be expected to reverse soon. A recent review by Hare *et al.* (1999) suggests that these conditions could be part of an alternating 20– to 30-year long regime pattern. These authors concluded that, while at-risk salmon stocks may benefit from a reversal in the current climate/ ocean regime, fisheries management should continue to focus on reducing impacts from harvest and artificial propagation and improving freshwater and estuarine habitats.

NMFS believes there is ample evidence to suggest that the elimination and degradation of freshwater habitats have contributed to the decline of these chinook salmon ESUs. The past destruction, modification, and curtailment of freshwater habitat was reviewed in a recent NMFS coastwide assessment for steelhead (NMFS, 1996), and, more recently, for chinook salmon (NMFS, 1998b). Many of the identified risks and conclusions apply specifically to these chinook salmon. Examples of habitat alterations affecting chinook salmon include: water withdrawal, conveyance, storage, and flood control (resulting in insufficient flows, stranding, juvenile entrainment, and increased stream temperatures); and logging and agriculture (resulting in loss of large woody debris, sedimentation, loss of riparian vegetation, and habitat simplification)(NMFS, 1996; Spence *et al*., 1996; Myers *et al*., 1998; NMFS, 1998b). These human-induced impacts in freshwater ecosystems have likely reduced the species' resiliency to natural factors for decline such as drought and poor ocean conditions. A critical next step in restoring listed chinook salmon will be identifying and ameliorating specific factors for decline at both the ESU and population level.

With respect to predation issues raised by some commenters, NMFS has recently published reports describing the impacts of California sea lions and Pacific harbor seals upon salmonids and on the coastal ecosystems of Washington, Oregon, and California (NMFS, 1997 and 1999b). These reports conclude that in certain cases where pinniped populations co-occur with depressed salmonid populations, salmon populations may experience severe impacts due to predation. An example of such a situation is at the Ballard Locks, Washington, where sea lions are known to consume significant numbers of adult winter steelhead. These reports further conclude that data regarding pinniped predation are quite limited and that substantial additional research is needed to fully address this issue. Existing information on the seriously depressed status of many salmonid stocks is sufficient to warrant actions to remove pinnipeds in areas of co-occurrence where pinnipeds prey on depressed salmonid populations (NMFS, 1997 and 1999b).

Issue 4: Consideration of Existing Conservation Measures

Comment 5: Several comments expressed concerns about NMFS' reliance and characterization of the efficacy of the Northwest Forest Plan (NFP), citing significant differences in management practices between various Federal land management agencies. Numerous commenters noted that an array of state and Federal conservation measures were underway for this and other species (particularly in California) and asked that NMFS give them more consideration in its listing determination.

Response: In the listing proposal, NMFS noted that the NFP requires specific management actions on Federal lands, including actions in key watersheds in southern Oregon and northern California that comply with special standards and guidelines designed to preserve their refugia functions for at-risk salmonids (i.e., watershed analysis must be completed prior to timber harvests and other management actions, road miles should be reduced, no new roads can be built in roadless areas, and restoration activities are prioritized). In addition, the most significant element of the NFP for anadromous fish is its Aquatic Conservation Strategy (ACS), a regional-scale aquatic ecosystem conservation strategy that includes: (1) Special land allocations (such as key watersheds, riparian reserves, and late-successional reserves) to provide aquatic habitat refugia; (2) special requirements for project planning and design in the form of standards and guidelines; and (3) new watershed analysis, watershed restoration, and monitoring processes. These ACS components collectively ensure that Federal land management actions achieve a set of nine ACS objectives that strive to maintain and restore ecosystem health at watershed and landscape scales to protect habitat for fish and other riparian-dependent species and resources and to restore currently degraded habitats. NMFS will continue to support the NFP strategy and address Federal land management issues via ESA section 7 consultations in concert with this strategy.

Additional consideration was given to various conservation efforts in California and elsewhere within the range of proposed chinook ESUs that have been implemented or are expected to be initiated. See ''Efforts Being Made to Protect West Coast Chinook Salmon'' later in this document.

Comment 6: Several comments expressed concern over the need to list these chinook salmon ESUs and the effects of these listings on Indian resources, programs, land management, and associated Trust responsibilities. Particular concern was expressed about the effects of listing Deschutes River chinook salmon on tribal fishing for this and other species.

Response: NMFS acknowledges that ESA listings may impact Indian resources, programs, land management and associated Trust responsibilities. NMFS will continue to work closely with affected Indian tribes through government to government consultation as harvest and other management issues arise and will continue to support the development of sound, strong tribal and state conservation efforts to restore listed chinook salmon and other west coast salmon populations.

Issue 5: ESU Delineation and Status of Central Valley Spring-run Chinook Salmon

Comment 7: Some commenters questioned this ESU's configuration and felt that NMFS was inconsistent in separating spring and fall runs in the Central Valley. A peer reviewer stated that the genetic information presented was not sufficient to justify the creation of a separate spring-run chinook salmon ESU. The majority of commenters agreed that this ESU is currently at risk, but there were disparate views as to whether the risks warranted an endangered listing under the ESA. For example, one commenter believed that Central Valley spring-run populations have remained stable (although at low levels of abundance) and that current fluctuations are consistent with natural terrestrial and ocean productivity cycles. This commenter suggested that information on cohort replacement rates, the level of interaction between fall and spring runs, and the impact of various factors relating to the survival of emigrating juveniles and returning adults need to be further investigated before a listing determination can be made. Another commenter felt that listing was warranted, but that a threatened status was more appropriate, given the relatively stable population sizes for most spring-run fish over the last 20 years and the increasing abundance found in Butte Creek.

Recent large returns to Butte Creek prompted a number of comments specific to spring-run chinook salmon in this Sacramento River tributary. One commenter suggested that the recent increases were due to high flows through the Sutter Bypass during the recent wet years. Spring-run adults returning to the upper Sacramento River would be attracted to the Bypass and routed up into Butte Creek. Therefore, the commenters contend that spring-run fish currently spawning in Butte Creek represent an amalgamation of fish from the upper Sacramento River and its tributaries. Another commenter believed that NMFS incorrectly suggested that the Butte Creek populations were the product of hatchery releases. Similarly, two commenters presented genetic information that indicates that the spring-run chinook salmon population in Butte Creek is not the result of strays from the Feather River Hatchery as was speculated by NMFS. They also noted that the 1998 abundance estimate for the Butte Creek spring run is approximately 19,000 spawners and that, if these fish are included in the total abundance estimate for the Central Valley spring-run chinook salmon ESU, there is a several fold increase in abundance.

Several commenters cited specific factors for decline that impact the fall run: predation by non-native species, dam and reservoir operations, catastrophic stranding, incorporation of naturally produced salmon into hatchery broodstocks, and competition and predation by hatchery chinook salmon and steelhead on naturally produced chinook salmon. Some contended that a variety of existing conservation efforts aimed at addressing factors for decline (e.g., the Bay-Delta Accord, CALFED, and harvest and hatchery reforms) were sufficient to prevent this ESU from becoming extinct. In addition, some commenters believed that significant benefits would accrue to spring-run chinook salmon as a result of the State of California's ESA listing for the species, as well as actions by NMFS and the Pacific Fishery Management Council (PFMC) to protect winter-run chinook salmon. Others disagreed with these contentions and asserted that efforts had clearly failed to adequately protect chinook salmon in the Central Valley.

Since the initial status review, NMFS has received new data and information which have helped resolve the scientific uncertainties associated with the proposed listing for this ESU (NMFS, 1999a), and are summarized as follows.

Response - ESU Delineation: NMFS recently analyzed new genetic data collected for California chinook salmon. In 1998 and 1999, NMFS, CDFG, FWS, and the U.S. Forest Service (USFS) collected samples of spawned adult chinook salmon from 13 rivers and hatcheries in the Central Valley and Klamath River Basin. The new samples were analyzed along with allozyme data for California and southern Oregon chinook salmon that were previously used in the NMFS coastwide status review (Myers *et al.*, 1998). The population structure revealed by the new analysis of allozyme data was consistent with the delineations of major genetic groups described in previous genetic studies of California and southern Oregon chinook salmon (Utter *et al.*, 1989; Bartley *et al.*, 1992; Myers *et al.*, 1998). The most genetically divergent group of samples was from the Central Valley. Within the Central Valley, the most genetically divergent sample was from the Coleman National Fish Hatchery (CNFH) winter-run population. Spring-run chinook salmon sampled from Deer and Butte Creeks were distinct from the winter-run fish sample and also from samples of fall- and late fall-run chinook salmon from the Central Valley. The Deer Creek and Butte Creek samples were genetically distinct from each other. The sample of spring-run chinook salmon from the Feather River Hatchery was genetically intermediate between spring- and fall-run samples and most similar to the sample of Feather River Hatchery fall-run chinook salmon. Samples of fall-run and late fall-run populations formed a diverse subcluster that included samples from both Sacramento and San Joaquin populations.

Banks *et al.* (1999) studied 5 to 11 microsatellite loci in 41 samples to assess genetic diversity among winter-, spring-, fall-, and late fall-run chinook salmon in California's Central Valley. Five homogeneous subpopulations were found: (1) wild and hatchery broodstock winter run, (2) wild spring run from Deer and Mill Creeks, (3) wild spring run from Butte Creek, (4) wild and hatchery fall run, and (5) wild and hatchery late-fall run. Winter-run samples were the most genetically divergent. Butte Creek spring-run chinook salmon were the next most divergent, followed by spring-run samples from Deer and Mill Creeks. Fall and late-fall runs were separated by a very small genetic distance. It is noteworthy that the sample of Butte Creek spring-run fish did not show evidence of introgression from Feather River hatchery fall-run stock. However, fewer alleles and lower heterozygosities in both winter-run and Butte Creek spring-run samples indicate that these populations may have experienced past reductions in population size.

Banks *et al.* (1999) used five microsatellite loci to investigate genetic relationships among 11 fall- and spring-run chinook salmon populations in the Klamath River and to compare these populations to chinook salmon from the Central Valley. Despite extensive sampling and analysis, no homogeneous population pools were found. Overall, Klamath River Basin populations were differentiated from Central Valley populations, and winter-run chinook salmon were genetically distinct and did not cluster with other populations.

Nielsen *et al.* (1994) and Nielsen (1995) examined mitochondrial DNA (mtDNA) variation in 14 samples of chinook salmon from Central Valley rivers and hatcheries and one sample from Guadalupe River, a southern tributary of San Francisco Bay. Nielsen *et al.* (1999) concluded that their data support their earlier conclusions (Nielsen *et al.*, 1994) that fall, late fall, spring, and winter runs of Central Valley chinook salmon show consistently significant differences for the mtDNA locus, indicating infrequent straying and limited gene flow among the temporal spawning runs.

Kim *et al.* (1999) examined genetic variation in winter-, spring-, fall-, and late fall-run adult chinook salmon taken from the upper Sacramento River between 1991 and 1995. An analysis of population structure indicated that winter-run chinook salmon were the most genetically distinct, while fall- and late fall-run samples were closely related to each other. Spring-run samples were genetically intermediate between the winter and fall and late-fall runs. A sample of Butte Creek spring-run chinook salmon was genetically similar to Sacramento River mainstem spring-run samples.

Ecological and life history information for this ESU was also re-evaluated, particularly historical and current information concerning Butte Creek populations. Yoshiyama *et al.* (1996) reported that spring, fall, and probably late-fall runs of chinook salmon historically utilized Butte Creek. Gold mining, logging activities, and irrigation withdrawals have all had a considerable impact on habitat quality (Clark, 1929; Hanson *et al.*, 1940). In 1917, two diversion dams were constructed by Pacific Gas and Electric. The Centerville Diversion Dam eliminated access to the upper watershed (Mills and Ward, 1996). Clark (1929) reported that the fall-run fish had declined dramatically and that summer flows in the lower river had been reduced by irrigation withdrawals. There was no mention of the status of a spring run. A survey by Hanson *et al.* (1940) reported that much of the upper watershed had been logged, and that mining operations continued to impact the river flow, and that ''none of the flow of Butte Creek except perhaps a little seepage reaches the Sacramento River during this summer.

Yoshiyama *et al.* (1996) reported that Butte Creek spring-run chinook salmon enter the creek in February through April (compared with May or June for Feather River spring-run chinook salmon). USFS monitoring (which began in 1930) indicated that flows in Butte Creek peak during the February to June period (peaks vary from 1,000 to over 10,000 cubic feet per second (cfs), with a maximum of 25,000 cfs in 1997), but are below 100 cfs during much of the remainder of the year (U.S. Geological Survey, 1999). Although Butte Creek originates in the Sierra Nevada Mountains (2000 m), spring-run adults spawn at a relatively low altitude (300 m), in part because of the absence of passage at the Centerville Dam. Yoshiyama *et al.* (1996) were uncertain if spring-run chinook salmon historically migrated above a 7.6 m waterfall located near the Centerville Dam. Spring-run chinook salmon spawn in September. Juveniles emigrate primarily as fry (December to March) and may rear in the Sacramento River Delta for extended periods (Baracco, 1996). Fall-run chinook salmon are reported to spawn further downstream, below the Parrot-Phelam Dam (Yoshiyama *et al.*, 1996).

Based on a re-assessment of information relevant to the configuration of this ESU, NMFS reiterates its previous decisions that the spring-run populations in the Central Valley constitute a distinct ESU and that the extirpated spring-run populations in the southern portion of this ESU may have constituted their own ESU (based on ecological and biogeographical data). NMFS considered several issues related to the configuration of the Central Valley spring-run chinook salmon ESU. The genetic data indicate that spring-run fish spawning in Butte Creek are not the progeny of Feather River Hatchery spring-run releases, but represent a naturally spawning population distinct from both Feather River fish and spring-run chinook salmon in Deer and Mill Creeks. Further sampling and analysis of mainstem Sacramento River spring-run fish (the only remaining known population that is not presently genetically described) are potentially important to understanding the relationship among Central Valley spring-run chinook salmon populations. Furthermore, NMFS is concerned that hatchery operations at the Feather River Hatchery may have resulted in the hybridization of spring- and fall-run fish. However, NMFS concludes that the Feather River spring run may retain ''spring-run'' life history characteristics and concludes it is still part of this ESU.

Response - ESU Status: NMFS also examined updated risk information for this ESU. Abundance of spring-run chinook salmon has increased in several streams since 1996, the most recent year considered in the previous risk evaluation by NMFS. The Feather River population abundance has been fairly constant at 3,000 to 7,000 fish per year spawning naturally. The 5-year geometric mean abundance of spring-run chinook salmon in the Feather River increased from 4,260 fish through 1996 to 5,013 through 1998. CDFG and other fisheries biologists familiar with Central Valley runs believe that the so-called spring-run fish in the Feather River are not likely to be representative of the historically wild spring-run fish because of the introgression between wild spring-run populations and hatchery spring- and fall-run chinook salmon (CDFG, 1998a). Three streams, Deer, Mill, and Butte Creeks, which contain naturally spawning populations of spring-run chinook salmon in this ESU, have also shown increases in mean abundance. The 5-year geometric mean abundance in Deer Creek increased from 564 through 1997 to 805 through 1998, and, in Mill Creek, the mean abundance increased from 252 through 1996 to 346 through 1998.

The most impressive change in status since the previous NMFS risk evaluation for this ESU was the continuing strong return of spring chinook to Butte Creek. In 1998, 20,259 spring-run chinook salmon returned to the creek, 2.7 times greater than the 1995 parental cohort of 7,500 fish resulting in a 5-year geometric mean abundance of 2,302 fish. The dissimilarity in genetic composition (Banks *et al.*, 1999; Kim *et al.*, 1999) and lack of concordance of trends in abundance (CDFG, 1998b) of Butte Creek and Feather River spring chinook suggest that the recent large escapements of spring chinook to Butte Creek are not the result of fish straying from the Feather River.

The spawning population of spring-run chinook salmon in the mainstem Sacramento River above Red Bluff Diversion Dam has continued to decline in abundance since the previous risk evaluation. The 5-year geometric mean abundance through 1998 is estimated to be around 300 fish, down from a mean of 435 through 1996. CDFG discussed sporadic reports of spring-run chinook salmon in Antelope, Cottonwood, and Big Chico Creeks, but the infrequent occurrence of these fish indicates that they do not represent self-sustaining populations (CDFG, 1998a).

After reviewing additional scientific information regarding the status of this ESU, NMFS concludes that the Central Valley spring-run chinook salmon ESU is not currently at risk of extinction but is likely to become endangered in the foreseeable future. NMFS is encouraged by the increase in abundance in Deer and Butte Creeks. Next to Butte Creek, the largest population of spring-run chinook salmon in the ESU is in the Feather River, and NMFS has concerns regarding the extensive introgression with fall-run fish in the hatchery population. The prospects for using the Feather River stock for conservation purposes in this ESU are unclear. The complete extirpation of the spring run from the San Joaquin River and the loss of historical spawning habitat above the dams in the Sacramento River Basin have resulted in a greatly reduced distribution of spring-run fish in the Central Valley. The primary reasons for the change in the risk evaluation from ''presently in danger of extinction'' previously proposed by NMFS were the increase in abundance of Butte Creek fish in recent years and the genetic evidence that the spring chinook salmon in Butte Creek are not of hatchery origin.

NMFS also notes a number of recent events that may have improved conditions for the Central Valley spring-run chinook salmon ESU, including reduced ocean and in-river harvest levels, the Federal listing of winter-run chinook salmon and Central Valley steelhead, the state listing of spring-run chinook salmon, and the habitat improvements occurring under the CALFED program. NMFS has considered the impacts of various conservation efforts affecting this ESU under the section ''Efforts Being Made to Protect West Coast Chinook Salmon'' of this document.

Issue 6: ESU Delineation and Status of Central Valley Fall and Late Fall-run Chinook Salmon

Comment 8: The vast majority of public comments on these four chinook salmon listing proposals involved NMFS' assessment of the Central Valley fall and late fall-run ESU. While some commenters agreed with NMFS' listing proposal, most did not agree that this ESU warranted listing as a threatened species. Others believed that NMFS' risk assessment may have been significantly influenced by six recent drought years. One commenter asserted that Central Valley chinook salmon populations have historically undergone extreme fluctuations in abundance due to environmental fluctuations and that NMFS did not adequately take these fluctuations (and the ability of the natural populations to recover) into account when assessing the risk of extinction. Several commenters also highlighted the high overall escapement level for this ESU and felt that there was not sufficient evidence to justify a listing. One commenter asserted that the small river systems that flow into San Francisco Bay did not historically support chinook salmon. Another did not agree that the San Joaquin River Basin constituted a significant portion of the ESU and felt that the depressed nature of San Joaquin fall-run stocks was not an adequate basis for a listing. Others believed that the ESU should be split into two ESUs. Several commenters cited specific factors for decline that impact the fall run: predation by non-native species, dam and reservoir operations, catastrophic stranding, incorporation of naturally produced salmon into hatchery broodstocks, and competition and predation by hatchery chinook salmon and steelhead on naturally produced chinook salmon.

Issues related to hatchery-produced chinook salmon in this ESU were particularly common. Many commenters felt that NMFS did not conclusively show that hatchery-produced fish were a risk to naturally-produced fish. Some felt that NMFS needed to provide a method for distinguishing hatchery and natural production, and justify the exclusion of hatchery fish from the risk determination (given that the majority of the broodstock originated from within the ESU). One commenter argued that, in many instances, hatchery and naturally spawning fish have co-mingled for generations, hence the fish are genetically indistinguishable and effectively represent one population. In many cases the persistence of naturally spawning fish has been dependent on the continued operation of the hatchery program. Under these conditions, the commenter contended, hatchery abundances should be included in the assessment of the risk of extinction for an ESU. Another suggested that, if hatchery impacts were great, NMFS should conclude that the Central Valley fall and late fall-run chinook salmon ESU was similar to the Lower Columbia River coho salmon ESU and exclude the Central Valley chinook salmon ESU from consideration for listing. One commenter argued that NMFS needed to identify which hatchery populations are in the ESU and which are not before making any conclusions on the status of this ESU. Another included data that indicated a rising proportion of coded-wire tag (CWT) fish being recovered in tributaries to the San Joaquin River; these CWT estimates did not take into account the contribution of unmarked hatchery-reared fish. In determining the risks facing this ESU, one commenter suggested that NMFS use the San Joaquin Basin populations as a benchmark. Still another called for more genetic sampling to determine whether the San Joaquin River Basin should be established as a separate ESU.

Finally, numerous commenters highlighted the importance of taking into account habitat restoration programs that are underway throughout the Central Valley and asserted that recent run sizes for the San Joaquin Basin have been increasing partly because of improvements in habitat conditions (e.g., gravel, temperature, and flows). Some believed that demonstrable habitat improvements had and would result from the CALFED program and that these results were predictable given the definitive nature of the program and the guaranteed nature of the funding. However, other commenters were skeptical that these efforts would be sufficient to reduce the risks facing this ESU. Key elements of the programs cited by commenters involved modified flow regimes, improved passage facilities, improved hatchery and harvest practices, and improved monitoring. In addition, some commenters believed that significant benefits would accrue to fall- and late fall-run chinook salmon as a result of the State of California's ESA listing for the spring run, as well as of actions by NMFS and the PFMC to protect winter-run chinook salmon.

Since the initial status review, NMFS has received new data and information which have helped resolve the scientific uncertainties associated with the proposed listing for this ESU (NMFS, 1999a), and are summarized as follows.

Response - ESU Delineation: NMFS recently analyzed new genetic data collected for California chinook salmon. In 1998 and 1999, NMFS, CDFG, FWS, and USFS collected samples of spawned adult chinook salmon from 13 rivers and hatcheries in the Central Valley and Klamath River Basin. The new samples were analyzed along with allozyme data for California and southern Oregon chinook salmon that were previously used in the NMFS coastwide status review (Myers *et al*., 1998). The population structure revealed by the new analysis of allozyme data was consistent with the delineations of major genetic groups described in previous genetic studies of California and southern Oregon chinook salmon (Utter *et al*., 1989; Bartley *et al*., 1992; Myers *et al*., 1998). The most genetically divergent group of samples was from the Central Valley. Within the Central Valley, the most genetically divergent sample was from the CNFH winter-run population. Spring-run chinook salmon sampled from Deer and Butte Creeks were distinct from the winter-run fish sample and also from samples of fall- and late fall-run chinook salmon from the Central Valley. The Deer Creek and Butte Creek samples were genetically distinct from each other. The sample of spring-run chinook salmon from the Feather River Hatchery was genetically intermediate between spring- and fall-run samples and most similar to the sample of Feather River Hatchery fall-run chinook salmon. Samples of fall- and late fall-run populations formed a diverse subcluster that included samples from both Sacramento and San Joaquin populations.

Microsatellite DNA variation has also been used in recent studies to examine genetic relationships among populations of chinook salmon in California. Nielsen *et al.* (1994) found significant heterogeneity among fall-run hatchery stocks and also among naturally spawning fall-run populations but there was no significant geographic structure at the basin level for wild fall-run chinook salmon. However, comparisons of wild fall-run carcasses and hatchery stocks suggest that naturally spawning fall-run fish in several basins retain some degree of genetic distinctiveness not found in hatcheries. Allele-frequencies for carcass collections made on the American, Tuolumne, Merced, and Feather Rivers were significantly different from samples of hatchery populations found within the same drainage. The Merced and Mokelumne Rivers were found to be most similar to hatchery populations on their respective rivers. The heterogeneity comparisons for some wild fall-run carcass collections may have been biased by small sample sizes. Fall-run hatchery populations were differentiated from populations of other run times but samples of wild fall-run populations were not compared to populations of winter, spring, or late-fall runs. Naturally spawning late fall-run fish were differentiated in allozyme analysis from all other populations including CNFH late fall-run salmon. The naturally spawning late fall-run population was most genetically similar to either winter-run fish or the CNFH late fall-run population, depending on the genetic distance measure used. Nei's measure of genetic distance indicated that late fall-run populations were most similar to hatchery fall-run populations.

Banks *et al.* (1999) used five microsatellite loci to investigate genetic relationships among 11 fall- and spring-run chinook salmon populations in the Klamath River and to compare these populations to chinook salmon from the Central Valley. Despite extensive sampling and analysis, no homogeneous population pools were found. Klamath River Basin populations were differentiated from Central Valley populations, and winter-run chinook salmon were genetically distinct and did not cluster with other populations.

Nielsen *et al.* (1994) and Nielsen (1995) examined mtDNA variation in 14 samples of chinook salmon from Central Valley rivers and hatcheries and 1 sample from the Guadalupe River, a southern tributary of San Francisco Bay. Nielsen *et al.* (1999) concluded that their data support their earlier conclusions (Nielsen *et al.*, 1994) that fall, late-fall, spring, and winter runs of Central Valley chinook salmon show consistently significant differences for the mtDNA locus, indicating infrequent straying and limited gene flow among the temporal spawning runs. Nielsen *et al.* (1999) concluded that additional sampling is needed to test for significant genetic differences among natural spawning and hatchery populations of fall-run chinook salmon. A sample of chinook salmon from Guadalupe River showed significant haplotype frequency differences from samples of the four spawning runs in the Central Valley, primarily due to a haplotype (CH9) found in 2 fish in the Guadalupe River. This haplotype has not been observed in fish from the Central Valley but has been found in samples of Russian River chinook salmon. The remaining 27 samples from the Guadalupe River could not be differentiated from the chinook salmon in the Merced and Feather River hatcheries through the use of mtDNA.

Kim *et al.* (1999) examined genetic variation in winter-, spring-, fall-, and late fall-run adult chinook salmon taken from the upper Sacramento River between 1991 and 1995. An analysis of population structure indicated that winter-run chinook salmon were the most genetically distinct, while fall- and late fall-run samples were closely related to each other. Spring-run samples were genetically intermediate between the winter and fall/late- fall runs. A sample of Butte Creek spring-run chinook salmon was genetically similar to Sacramento River mainstem spring-run samples.

NMFS also re-examined ecological and life history information for this ESU. The San Joaquin River Basin includes the Mokelumne, Consumnes, Calaveras, Stanislaus, Tuolumne, and Merced Rivers. Historically, salmon also utilized the Kings River during years of high precipitation (Yoshiyama *et al.*, 1996). Ecologically, the Consumnes and Calaveras are distinct from the other San Joaquin River Basin tributaries in that their flows are influenced by rainfall rather than snow melt. Historically, fall-run chinook salmon were present in all of the basins, and there is some evidence that a late-fall run may have existed in the Mokelumne River (Yoshiyama *et al.*, 1993). Furthermore, Reynolds *et al.* (1993) described a ''winter-run'' population that spawned in the Calaveras River from 1972 to 1984; however, this population appears to have been extirpated, and its relationship with other temporal runs in the Central Valley was never established. Impassible dams and water withdrawals have severely reduced the quantity and quality of salmon habitat. Presently, only 45 percent of the total historical chinook salmon habitat is accessible (not including habitat in the Kings River Basin). Much of the habitat lost would have been utilized by spring-run chinook salmon; however, water conditions in the remaining habitat have degraded. Ecologically, rivers in the San Joaquin (including the Mokelumne River) and American River Basins experience peak flows in May, fed primarily by snow melt from the Sierra Nevada Range. Geologically, the Sierra Nevada Range is very different from the volcanic structure of the Cascades that constitute the headwaters for most rivers in the northern portion of the Central Valley.

There is little historical information concerning the life history characteristics of fall-run chinook salmon in the San Joaquin River Basin. Fall-run chinook salmon in the San Joaquin River Basin enter fresh water in late September or October (depending on water conditions) and spawn in November and December, with some spawning continuing into January. The mean date of entry (for the years 1974 to 1995) into the trap at the Merced River Fish Facility is October 21. In 1939, Hatton (1940) reported that the date of river entry for the fall run varied from early and mid-October for the Tuolumne and Merced Rivers, early November for the Mokelumne River, and early December for the Consumnes River. The majority of juveniles emigrate during their first winter (January to March). The run and spawn timing currently exhibited by fall-run fish in the San Joaquin River Basin may not reflect historical timing due, in part, to changes in river flow and temperature conditions over the last century. However, it is clear that the environmental conditions in the San Joaquin River represent the extreme of chinook salmon temperature tolerance. In the 1870s, salmon were observed migrating through the San Joaquin River in July and August (which were probably the historical spring-run chinook salmon) when water temperatures were in excess of 26 degrees Centigrade (U.S. Fish Commission, 1876). Despite an apparent tolerance to high water temperature conditions, San Joaquin River Basin chinook salmon populations continued to deteriorate until only the late portion of the fall run was able to ascend the tributaries (Clark, 1929).

The age at maturation for fall-run chinook salmon varies considerably from year to year due to differential survival of emigrating juveniles and returning adults related to water conditions. Most notably, a number of female San Joaquin River fall-run chinook salmon mature after only 2 years (Myers *et al*., 1998).

Based on a re-assessment of information relevant to the configuration of this ESU, NMFS maintains that the original description proposed for the Central Valley fall and late fall-run chinook salmon ESU is valid. NMFS believes that the new genetic information on spring-run and winter-run populations in the Central Valley further reinforces the previous decision to establish ESUs for the winter and spring runs distinct from the fall- and late-fall run (Myers *et al*., 1998). NMFS also maintains the agency's previous conclusion that Central Valley fall and late- fall runs are in the same ESU.

NMFS considered the possible existence of a distinct fall/late fall-run ESU in the southern portion of the existing ESU (i.e., San Joaquin River and tributaries). The agency believes that ecological differences in the northern and southern Central Valley were large enough to have historically supported two ESUs of fall- and late fall-run chinook salmon, with fish from the American, Mokelumne, Stanislaus, Tuolumne, Merced, and San Joaquin River Basins in the southern ESU and fish from areas north of the American River in a northern ESU. Allozyme analysis indicated that samples of hatchery and naturally spawning fall-run chinook salmon from the American River and San Joaquin River Basin formed a cluster within the general grouping of Central Valley chinook salmon populations.

The status of chinook salmon spawning in tributaries to San Francisco Bay was also considered. The presence of chinook salmon adults and juveniles (including observed spawning activities) has been recorded in a number of rivers and creeks draining into San Francisco Bay (Leidy, 1984; Myers *et al*., 1998; San Francisco Estuary Project, 1998; Jones, 1999, unpubl. data). However, NMFS was unable to establish if any of these populations were self-sustaining. Although the historical relationship between chinook salmon spawning in San Francisco Bay tributaries and the coastal and Central Valley ESUs is not known, present day adults may have originated from the numerous off-site releases of Central Valley hatchery fall-run chinook salmon into the delta or San Francisco Bay. Additional information on genetic and life history traits for San Francisco Bay chinook salmon and their relationships with Central Valley and coastal chinook salmon populations is necessary to resolve this issue.

Response - ESU Status: NMFS also examined updated risk information for this ESU. Trends in abundance of fall- and late fall-run chinook salmon in this ESU continue to be mixed, but natural spawning abundance is quite high (5-year geometric mean was 190,000 natural spawners for the Sacramento River Basin). The number of mainstem fall-run spawners continues to decline in the upper Sacramento River, as indicated by counts at Red Bluff Diversion Dam (5-year geometric mean abundance through 1996 was 78,996 fish, and mean abundance through 1998 was 26,092 fish). The dam counts represent the total number of fall-run chinook salmon returning to that portion of the river, including hatchery fish. Available evidence suggests that at least 20 to 40 percent of these natural spawners are of hatchery origin (Heberer, 1999). The other Sacramento River Basin streams showing continued declines in abundance of fall-run chinook salmon are Deer and Mill Creeks (short-term trend in abundance through 1998 was –10 percent per year for Mill Creek, long-term trend in abundance through 1998 was –2.8 percent per year for Deer Creek). All other streams for which there are abundance data show increases in abundance over the past 10 years. As discussed in the BRT report (Myers *et al*., 1998), many of the streams with high abundance of fall-run chinook salmon in this ESU are influenced by hatchery programs (especially the Feather and American Rivers and Battle Creek), so the contribution of those populations to the overall persistence of the wild component of the ESU is not clear.

The late-fall component of the Sacramento River run continues to have low, but perhaps stable abundances. Recent estimates up to 1992, when Red Bluff Diversion Dam counts were still accurate, ranged from 6,700 to 9,700. Estimates from 1993 to 1997 were essentially incomplete due to the inability to monitor fish at the Red Bluff Diversion Dam. Beginning in 1998, carcass surveys again allowed a reasonable estimate to be made, and the 1998 abundance estimate (9,717 fish) seems comparable to the early 1990s. Nevertheless, there is considerable uncertainty in estimating the recent trend in abundance due to changes in estimation methods.

Populations of fall-run chinook salmon in the San Joaquin River Basin have exhibited synchronous population booms and busts and currently appear to be on an upward trend in abundance. Aside from a negative short-term trend in abundance in the Stanislaus River (–6.2 percent per year through 1998), the other tributaries to the San Joaquin River are exhibiting increases in abundance over the most recent 10 years. Lindley (NMFS, unpubl. data) developed a series of models relating recruitment of fall chinook in the Tuolomne and Stanislaus Rivers to various factors to see if there was a simple explanation for the high variability in recruitment. Explanatory variables examined included spring river flow, ocean harvest, hatchery releases, sea surface temperature, and spawning stock. The model providing the best fit to empirical data was a logistic growth (stock-recruit) model with the carrying capacity parameter a linear function of river flow during the downstream juvenile migration period (Lindley, NMFS, unpubl. data). The apparent dependency of stock-recruitment relationships on flow does not rule out the potential influences of other factors (e.g., hatchery production) on variability in recruitment (Lindley, NMFS, unpubl. data).

The influence of hatchery fish on natural production in the San Joaquin River Basin is not clear. As in the rest of the Central Valley, the nature of CWT applications and insufficient sampling of natural spawners make quantitative estimation of hatchery influence difficult.

After reviewing additional scientific and commercial information regarding the status of this ESU, NMFS concludes that the Central Valley fall and late fall-run chinook salmon ESU is not presently in danger of extinction, nor is it likely to become so in the foreseeable future. The change in the risk evaluation was due primarily to the increases in abundance in Central Valley streams. The number of natural spawners is quite high (190,000 fish) and numerous streams have seen increases during the past 10 years, with some exceptions. The recent upward trends in fall-run chinook salmon populations in the San Joaquin tributaries are also encouraging, but NMFS is concerned about the high variation in abundance and its strong correspondence with human and naturally impacted flow regimes. The late fall-run chinook salmon escapement appears to be higher than it has been in recent years, but NMFS is concerned about the uncertainty in the escapement estimates.

The major sources of continued threats to the chinook salmon in this ESU are habitat degradation (primarily water withdrawals and stream shifts), water quality, loss of riparian and estuarine habitat, and the influence of hatchery fish. NMFS believes that several recent actions are likely to mitigate the threats facing chinook salmon in the Central Valley fall and late fall-run chinook salmon ESU, including harvest reductions, the listing of winter-run chinook salmon and steelhead under the Federal ESA, the listing of spring-run chinook salmon under the California ESA (CESA), improvements in water flow and habitat conditions resulting from development and implementation of restoration projects as part of the CALFED and Central Valley Project Improvement Act (CVPIA) programs, implementation of the Vernalis Adaptive Management Plan (VAMP) in the San Joaquin River Basin, and the recently initiated comprehensive review of hatchery programs in the Central Valley by CDFG and FWS. NMFS has considered the impacts of various conservation efforts affecting this ESU under the section ‘‘Efforts Being Made to Protect West Coast Chinook Salmon’’ of this document.

Issue 7: ESU Delineation and Status of Southern Oregon and California Coastal Chinook Salmon

Comment 9: Many commenters, disputing the proposed boundaries for this ESU, questioned NMFS’ rationale for a separate Upper Klamath and Trinity River chinook salmon ESU within the range of the larger Southern Oregon and California Coastal ESU. For example, one commenter disputed the southern border of the ESU and asserted that there is no definitive proof that chinook salmon populations existed in any of the San Francisco Bay tributaries. Furthermore, they stated that native chinook salmon were now extinct in the Russian River and that the ESU’s boundary should extend no farther south than to the limit of extant chinook salmon populations. Another commenter believed that the chinook salmon population in the Russian River was never historically abundant. Several commenters suggested that this ESU be divided into two ESUs, but the suggested configurations varied. Some believed that the existing ESU should be split south of the Klamath River while others believed that the split should be north of the Klamath River. Still another believed that the ESU should be split north of the Eel River. Finally, some commenters believed that NMFS should adopt ESU configurations more similar to those for coho salmon or steelhead, both of which have multiple ESUs within the range of the Southern Oregon and California Coastal chinook salmon ESU. Most commenters suggesting alternative ESU configurations believed that chinook salmon in the ‘‘transboundary’’ region of Oregon and California would not require protection under the ESA.

Some commenters and peer-reviewers felt that, in a number of cases where spring- and fall-run chinook salmon were included in the same ESU, separate ESUs should have been established. These recommendations were substantiated with information on ecological differences in spring- and fall-run spawning and juvenile rearing habitat. Furthermore, it was argued that separation in spawning time and location provided a significant amount of reproductive isolation, even in those systems where dams had restricted access to historical spring-run spawning habitat. Several of the commenters highlighted these ecological and life history differences in those ESUs where genetic data were limited or lacking. Furthermore, the commenters stated that the lumping of different runs was inconsistent, given the creation of distinct fall- and spring-run ESUs in the Central Valley of California.

Several commenters highlighted the benefits from various restoration programs underway in the range of the proposed ESU (e.g., the NFP and Oregon Coastal Salmon Restoration Initiative), while others expressed little confidence in the adequacy of existing conservation efforts. One commenter described risks to chinook salmon in the Eel River Basin by the introduction of the Sacramento pikeminnow (*Ptychocheilus grandis*) in the late 1970s, noting increases in the number of pikeminnow in the Eel River Basin which corresponded with declines in chinook salmon during the 1980s and 1990s. Another commenter suggested that NMFS had underestimated the impact of predators (such as cormorants) on chinook salmon populations in the range of the proposed ESU.

Since the initial status review, NMFS has received new data and information which have helped resolve the scientific uncertainties associated with the proposed listing for this ESU (NMFS, 1999a), and are summarized as follows.

Response - ESU Delineation: NMFS recently analyzed new genetic data for California chinook salmon. In 1998 and 1999, NMFS, CDFG, FWS, and USFS collected samples of spawned adult chinook salmon from 13 rivers and hatcheries in the Central Valley and Klamath River Basin. The new samples were analyzed along with allozyme data for California and southern Oregon chinook salmon that were previously used in the NMFS coastwide status review (Myers *et al*., 1998). The population structure revealed by the new analysis of allozyme data was consistent with the delineations of major genetic groups described in previous genetic studies of California and southern Oregon chinook salmon (Utter *et al*., 1989; Bartley *et al*., 1992; Myers *et al*., 1998). The most genetically divergent group of samples was from the Central Valley. The remaining samples formed two large genetic groups composed of samples from the Klamath River Basin and those from coastal rivers. The single sample from the lower Klamath River, Blue Creek, was included in the cluster of coastal samples. The samples from coastal rivers were further differentiated into two subclusters of samples from rivers south of the Klamath River and from those to the north (including Blue Creek).

Several subclusters appeared within the samples of chinook salmon from the Klamath River Basin. The sample from Blue Creek in the lower Klamath River was the most genetically distinct of all the samples from the Klamath River Basin. Samples from the Trinity and Salmon Rivers (both fall- and spring-run populations) clustered separately from samples from rivers farther upstream.

Nielsen *et al*. (1994) reported that mtDNA haplotypes from some of the fall-run chinook salmon smolts captured in 1993 and 1994 from the Russian River did not match haplotypes from the Russian River hatchery (Warm Springs Hatchery) population; in fact, there was a rare haplotype that was found only in chinook salmon from the Russian and Guadalupe (San Francisco Bay) Rivers. In 1999, several naturally produced chinook salmon juveniles were collected in the Russian River Basin by the Sonoma County Water Agency, and a subset of these were genetically analyzed by the Bodega Bay Marine Laboratory (Banks, 1999, unpubl. data).

Banks *et al*. (1999) used five microsatellite loci to investigate genetic relationships among 11 fall- and spring-run chinook salmon populations in the Klamath River and to compare these populations to chinook salmon from the Central Valley. Results revealed two large clusters with Klamath River Basin populations differentiated from Central Valley populations. Within the Klamath River Basin, Blue Creek from the lower Klamath River was the most genetically divergent population and was found to be more similar to southern Oregon and California coastal chinook populations than to upper Klamath/Trinity River populations. The most upstream populations from the Klamath River (Scott River, Shasta River, and Iron Gate Hatchery) were differentiated from subclusters of fall- and spring-run populations in the Trinity and Salmon Rivers.

Little new information on life history traits is available for this ESU. Comparisons of the timing of adult chinook salmon passage over dams on the Mad River (Sweasey Dam) and South Fork Eel River (Benbow Dam) in 1948 to 1949 (Murphy and Shapovalov, 1950) does not reveal a shift in run timing when compared with recent information presented in Myers *et al.* (1998), indicating that introductions of out-of-basin stocks have had little observable impact. A review of ocean distribution information collected from 1986 to 1989 (Gall *et al.*, 1989) suggests that there may be geographic and timing differences in the ocean distribution of chinook salmon from the Smith River and southern Oregon relative to Eel River and other coastal stocks.

There was little information available on the southern limit of self-sustaining chinook populations in this ESU. Cobb (1930) discussed the existence of fall-run populations in the Noyo and Mattole Rivers; furthermore, the Noyo River fall-run population was large enough to sustain a small fishery early in this century. Clark (1940) estimated that the salmon catch in the Eel River during 1916 was nearly 450,000 kg, and 32,000 kg in the Mad River during 1918. Snyder (1908) described the presence of chinook salmon in the Russian River; however, Shapavalov (1944) made no mention of the presence of chinook salmon in the Russian River. In October of 1972, a number of salmon (no identification of the species was possible) were observed spawning in the Russian River below Dry Creek (Holman, 1972).

Within San Francisco Bay there are a number of streams where chinook salmon have been observed (Jones, 1999). Spawning chinook salmon or redds have been observed in the Guadalupe River, Napa River, Petaluma River, Walnut Creek, and Green Valley Creek (Jones, 1999). There is very little information on the origin or sustainability of chinook salmon ‘‘populations’’ in these systems. South of San Francisco Bay, chinook salmon have historically been documented in the San Lorenzo and Pajaro Rivers (Snyder, 1913) and in the Ventura River (Jordan and Gilbert, 1881). However, it is unclear if coastal populations south of the Russian River were historically persistent or if they were merely colonized by more northerly populations on an intermittent basis during favorable climatic periods (Myers *et al.*, 1998). Recently, adult chinook salmon have also been observed in Scott Creek, but in low numbers and only on an intermittent basis (Streig, Monterey Bay Salmon & Trout Project, pers. comm.). Currently, there are no known persistent populations of chinook salmon on the coast south of San Francisco Bay.

Based on a re-assessment of information relevant to the configuration of this ESU, NMFS concludes that the proposed Southern Oregon and California Coastal chinook salmon ESU should be split into two ESUs: a Southern Oregon and Northern California Coastal chinook salmon ESU, extending from Euchre Creek through the Lower Klamath River (inclusive), and a California Coastal chinook salmon ESU, extending from Redwood Creek south through the Russian River (inclusive). This new ESU boundary is similar to that designated between Klamath Mountains Province and Northern California steelhead ESUs. At this time, NMFS concludes that the Russian River Basin presently contains the most southern persistent population of chinook salmon on the California coast.

NMFS reconsidered the reconfiguration of this proposed ESU based on a number of issues. The acquisition of new genetic samples from the Central Valley, California coastal streams, and Upper Klamath and Trinity Rivers made possible a new analysis indicating distinct clusters of coastal populations north and south of the Klamath River. The genetic distances between these clusters correspond roughly to the differences observed between Central Valley spring- and fall and late fall-run chinook salmon ESUs, and the Washington and Oregon coast chinook salmon ESUs.

Ecological differences between the northern and southern portions of the Southern Oregon and California Coastal chinook salmon ESU were also discussed. Rivers to the north (especially the Rogue River) tended to be larger than those to the south. River flows in the northern portion tend to peak in January, while those to the south peak in February (Myers *et al.*, 1998). Annual precipitation is considerably higher in the northern portion than in the south. These geographic and ecological differences may be responsible for the presence of a limited proportion of yearling outmigrants (less than 10 percent) in the northern portion of the ESU compared with the apparent absence of yearling outmigrants in the southern portion. Furthermore, soils in the southern portion are highly erodible, causing high silt loads that result in berms which close off the mouths of many of the rivers during summer low flows. River conditions in most of these coastal basins, especially in the south, have very limited temporal windows for adult access and juvenile emigration. Given these conditions, it is unlikely that substantial differences in the life history traits normally measured (e.g., run timing, spawn timing, juvenile emigration) could evolve among most rivers in the northern and southern portions of the proposed ESU. However, NMFS did consider the presence of spring-run chinook salmon in the northern portion of the ESU, Rogue and Smith Rivers, as a further indicator of geographic and life history differences (although there may have historically been a spring run in the Eel River). Finally, there was some ocean harvest information that indicated differences in the migration pattern of populations from the northern (Rogue and Smith Rivers) and southern (Eel River) portions of the proposed ESU (Gall *et al.*, 1989).

Response - ESU Status: New abundance information was provided by several commenters and co-managers for a number of streams in the Southern Oregon and Northern California Coastal chinook salmon ESU (Howard and Albro, 1997; Howard, 1998 and 1999; USFS, 1997 and 1999; Waldvogel, 1997 and 1999; Yurok Tribal Fisheries Program, 1997 and 1999; ODFW, 1999). Recent total estimated escapement of fall- and spring-run chinook salmon in Oregon streams is close to 100,000 fish. The largest run of fall chinook salmon in the ESU occurs in the Rogue River, and ODFW recently has revised its estimates of abundance to average over 51,000 fish in the run during the most recent 5 years. In addition, ODFW estimated that the escapement of fall chinook to the Chetco River in 1995 and 1996 was 8,500 and 3,500 fish, respectively. In spite of the high estimated abundances in the Chetco River, between 31 and 58 percent of those naturally spawning fish were estimated to be of hatchery origin.

Although trends in abundance are mixed over the long term, most short-term trends in abundance of fall chinook salmon are positive in the smaller coastal streams in the ESU. Spawning ground surveys from a number of smaller coastal and tributary streams from Euchre Creek to the Smith River show declines in abundance from the late 1970s through the early 1990s, but recently, the peak counts predominantly show increases. In addition to adult counts, downstream migrant trapping generally shows increases in production in fall chinook juveniles over the last 4 years in the Pistol and Winchuck Rivers and in Lobster Creek, a tributary to the lower Rogue River. Short- and long-term trends in abundance for the Rogue River fall chinook are declining, but as mentioned above, the overall run size is still large.

Northern coastal California streams support small, sporadically monitored populations of fall-run chinook salmon. Trends in fall chinook salmon abundance in those California streams that are monitored are mixed; in general, the trends tend to be more negative in streams that are farther south along the coast (i.e., populations in the Eel, Mattole, and Russian Rivers). Estimates of absolute population abundance are not available for most populations in the California portion of the region encompassing this ESU.

The release of hatchery fall chinook salmon into some southern Oregon coastal streams recently has been reduced or discontinued. Releases of fall chinook salmon into the lower Rogue River were reduced to 75,000 smolts and 75,000 unfed fry, and the Chetco River program recently was reduced to 150,000 smolts. ODFW also has provided NMFS with new estimates of the percentage of hatchery fall chinook salmon spawning naturally in the Chetco River. In 1995 and 1996, the percentage of naturally spawning hatchery fish was 31 and 58 percent, respectively. During those same years, the estimated numbers of naturally spawning adults returning to the Chetco River were 8,530 and 3,561 fall chinook salmon, respectively.

Most spring-run chinook salmon in this ESU continue to be distributed in a few populations that are declining in abundance. The run size of spring-run chinook salmon in the Rogue River above Gold Ray Dam has averaged 7,709 over the last 5 years, and the estimated percentage of hatchery fish in the run has ranged from 25 to 30 percent over that time period. The Smith River contains the only known populations of spring-run chinook salmon on the California coast, and those runs continue to decline in the Middle Fork, but are increasing in the South Fork. ODFW believes that spring-run chinook populations in the Smith River probably have always been small, based on in-river fishery landings, historical cannery records, and the judgement of local biologists.

In the California Coastal chinook salmon ESU, fall chinook salmon occur in relatively low numbers in northern streams and, only sporadically, in streams in the southern portion of the ESU's range. Estimates of absolute population abundance are not available for most populations in this ESU. The 5-year geometric mean abundance of fall chinook passing Cape Horn Dam on the upper Eel River is 36 fish, but those counts are considered to be a small and variable fraction of the run in the Eel River.

Trends in fall chinook salmon abundance in those California streams that are monitored are mixed; in general, the trends tend to be more negative in streams that are farther south along the coast (i.e., populations in the Eel, Mattole, and Russian Rivers). Trends in abundance in several tributaries in the Redwood Creek drainage have been monitored since 1995; these numbers will be useful in assessing the status of chinook salmon in those streams in the future. Trends in abundance in the Mad River Basin have been declining over the long term, but they are showing signs of increase in recent years. Peak index counts and carcass surveys have been conducted since the mid-1960s in Sprowl and Tomki Creeks, both tributaries to the Eel River. The long-term trend in abundance in Sprowl Creek is –4.4 percent per year, but recent years show increases. In contrast, both the long- and short-term trends in abundance in Tomki Creek are severely declining. Shorter-term monitoring has occurred in other Eel River tributaries since the late 1980s; abundance in Hollow Tree and Redwood Creeks has been declining precipitously. Recent monitoring of index areas in the Mattole and Russian River Basins indicates declining trends in abundance, with the exception of the increasing abundance at the Coyote Valley Fish Facility on the Russian River from 1992 to 1998. Hatchery chinook salmon occur in the Russian and North Fork Mad Rivers, but the contribution of hatchery fish to natural spawning escapements is not known.

After reviewing additional scientific and commercial information regarding the status of these revised ESUs, NMFS concludes that the revised California Coastal chinook salmon ESU is likely to become endangered in the foreseeable future. Most of NMFS' concerns regarding the status of this ESU are related to abundance and trends/productivity risks. NMFS believes that widespread declines in abundance of chinook salmon relative to historical levels and the present distribution of small populations with sometimes sporadic occurrences contribute to the risks faced by this ESU. Overall, NMFS is concerned about the paucity of information on the presence or abundance of chinook salmon in the geographic area encompassing this ESU. The abundance data series are short-term for most of the streams in this ESU, and there are no current data for the long time series at Benbow Dam for the population that may have been historically the largest (South Fork Eel River).

NMFS believes that habitat degradation and water withdrawals in the river drainages in coastal California have contributed to the continued reduction in abundance and distribution of chinook salmon in this ESU. Smaller coastal drainages, such as the Noyo, Navarro, Garcia, and Gualala Rivers, likely supported chinook salmon runs historically, but they contain few or no fish today. The Russian River probably contains some natural production, but the origin of those fish is not clear because of a number of non-native introductions of hatchery fish over the last century. NMFS is concerned about the possible extinction of the spring run in the upper Eel River, which represents an important loss of life history diversity in this ESU.

NMFS believes that the following factors are likely to have improved the conditions for chinook salmon in the California Coastal chinook salmon ESU: Reductions in the Klamath Management Zone (KMZ) and Central Valley harvest index, the listing of coho salmon and steelhead under the Federal ESA, changes in harvest regulations by the States of Oregon and California to protect coho salmon and steelhead, improvements in stream water quality due to enhanced enforcement of Clean Water Act standards, and changes in timber and land-use practices resulting from completed Habitat Conservation Plans (HCPs).

In contrast, NMFS concludes that chinook salmon in the revised Southern Oregon and Northern California Coastal chinook salmon ESU are not presently in danger of extinction, nor are they likely to become so in the foreseeable future. NMFS is encouraged by the overall numbers of chinook salmon in this ESU and by the recent increases in abundance in many of the smaller coastal streams. In addition to the large runs returning to the Rogue River, chinook salmon appear to be well distributed in a number of coastal streams throughout the geographic region encompassing this ESU. Although many of the new data sets received by NMFS are of short duration, NMFS is encouraged by recent efforts by the co-managers to improve monitoring of chinook salmon in this region. Risks associated with the presence of hatchery fish in this ESU are relatively low; nevertheless, NMFS is concerned about the high percentages of naturally spawning hatchery fish in the Chetco River and in the spring-run chinook salmon population in the Rogue River. In addition, the restricted distribution of spring-run chinook salmon to the Rogue and Smith River Basins and their significant decline in the Rogue River could represent an important threat to the total diversity of fish in this ESU.

NMFS believes several factors are likely to have improved the conditions for chinook salmon in the Southern Oregon and Northern California Coastal chinook salmon ESU, including reductions in the KMZ troll fishery, the ESA listing of coho salmon, changes in harvest regulations by the States of Oregon and California to protect naturally produced coho salmon and steelhead, and changes in timber and land-use practices on Federal public lands resulting from the NFP. NMFS has considered the impacts of various conservation efforts affecting this ESU under the section ''Efforts Being Made to Protect West Coast Chinook Salmon'' of this document.

Issue 8: ESU Delineation and Status of Snake River Fall Chinook Salmon

Comment 10: Several commenters, including state and tribal co-managers, disagreed with the inclusion of the Deschutes River fall-run chinook salmon in this ESU. They argued that the Deschutes River and Snake River Basins are ecologically distinct. Furthermore, the geographic distance between these basins would preclude any significant genetic exchange, especially if one considers the historical spawning distribution of Snake River chinook salmon. There were a number of scenarios given to explain the genetic similarity between the Deschutes River and Snake River fall-run populations. One scenario suggested that, with the loss of the majority of their historical spawning habitat, the existing Snake River fall-run chinook salmon ESU no longer represented the historical population. An alternative view was that the genetic differences among all ocean-type chinook salmon above the Dalles Dam were relatively small and that the clustering of populations was subject to possible bias depending on the procedures used. It was also stressed that the existing allozyme information was acquired after the Columbia River Basin had undergone considerable alterations (mainstem dam construction) and many of the native populations had been extirpated. It was also suggested that the marine CWT recovery information for the Deschutes River fall run was potentially biased due to the limited number of tags recovered and the limited number of broodyears that were tagged. Two commenters asserted that an ocean-type summer run existed (and may still exist) in the Deschutes River, and this would evolutionarily link the Deschutes River ocean-type fish more closely with ocean-type fish in the Upper Columbia River summer- and fall-run chinook salmon ESU. Some reviewers suggested that all ocean-type chinook salmon above the historical location of Celilo Falls should be considered one ESU. The most commonly suggested alternative ESU configuration included the Deschutes River and the now extinct populations that were in the John Day, Umatilla, and Walla Walla Rivers as a separate ESU.

Several other commenters challenged the NMFS exclusion of hatchery fish abundances from the risk assessment. They argued that, in many instances, hatchery and naturally spawning fish have co-mingled for generations. These fish are genetically indistinguishable and effectively represent one population. In many cases, the persistence of naturally spawning fish has been dependent on the continued operation of the hatchery program. Under these conditions, they contend, hatchery abundances should be included in the risk assessment for an ESU.

Since the initial status review, NMFS has received new data and information which have helped resolve the scientific uncertainties associated with the proposed listing for this ESU (NMFS, 1999a), and are summarized as follows.

Response - ESU Delineation: The Confederated tribes of the Warm Springs Reservation (CTWSRO) provided NMFS with a preliminary report of genetic studies of fall-run chinook salmon in the Deschutes River (CTWSRO, 1999). Both allozyme and mtDNA loci were used to determine if the Deschutes fall chinook population is more genetically and demographically related to the Snake River fall chinook populations than to any other population in the Columbia Basin. The authors concluded from the mtDNA and allozyme data that there is little or no geographic organization of the fall-run genetic data and no compelling evidence to support adding the Deschutes River to the Snake River fall-run chinook salmon ESU.

The similarity in life history traits between the Deschutes and Snake River fall-run populations was an important factor in the proposed ESU designation incorporating these two geographically separated basins into one ESU. Since the time of the proposed rule, NMFS has reviewed additional information on ecological and life history traits for this ESU and a CTWSRO analysis of information previously reviewed by the BRT (CTWSRO, 1999). Similarities in ocean distribution, as reflected by CWT recoveries, were observed for wild Deschutes River fall-run and Snake River fall-run chinook salmon. Analysis by CTWSRO (1999) indicates that there was a strong correlation (0.95) in the ocean distributions of Deschutes River and Snake River fish; however, there were equally strong similarities between Deschutes River fish and fall-run fish from a number of lower Columbia River basins. The correlation between the distribution of ocean recoveries for the Deschutes River fall-run and that for upriver ''bright'' fall-run chinook salmon (i.e. Hanford Reach, Priest Rapids) was much weaker (0.61). Because only 35,000 Deschutes River fall-run fish were tagged during each of 3 broodyears (1977 to 1979), and of these only 79 tags were recovered in the ocean fishery, CTWSRO (Patt, 1999) cautioned the use of this information to establish the ESU configuration.

Age structure information was also used in the initial NMFS decision to group fall-run chinook salmon in the same ESU. In the Coastwide Status Review (Myers *et al.*, 1998) similarities were observed between the Deschutes River and Snake River fall-run populations, relative to Hanford Reach and other upper Columbia River fall-run populations. Age structure for the Deschutes River, Snake River (using Lyons Ferry return data), and Hanford Reach fall-run fish was determined using scale data from several broodyears in the late 1970s and 1980s. CTWSRO (Patt, 1999) also presented run reconstructions provided by Howard Schaller (ODFW). For the Deschutes and Hanford Reach data series, this information, based on scales recovered from returning adults, age-length indices, and CWT recoveries, represented a more complete description of the populations concerned than was presented in Myers *et al.* (1998). However, the Snake River age structure data were not based on the direct measurement of Snake River fish, but rather derived from an index of upriver bright stocks. It was advised that considerable caution be used in employing the Snake River age structure data in any comparisons (Schaller, ODFW, pers. comm.).

Spawn timing differences presented by CTWSRO (1999) indicated that Deschutes River fish spawn primarily in October (in contrast to the November peak spawning cited in Myers *et al.*, 1998), rather than in early and mid-November for fall-run chinook salmon in the Snake River and Hanford Reach of the Columbia River (Myers *et al.*, 1998). This earlier timing may be related to water conditions in the Deschutes River or may be an indicator of the integration of a historical summer run into the fall run. A review of historical information indicated that fall-run chinook in the Snake River near Salmon Falls (Rkm 922) arrived on the spawning grounds in late August and September and that ripe fish were caught in the fishery in early October (Evermann, 1896). Spawning was nearly complete by the end of October. Differences in the spawning time of present day and historical Snake River fall-run chinook salmon populations may be a response to different temperature and flow regimes in the lower river (the current accessible habitat) or may indicate the extirpation of the earlier, upriver, spawning populations from the ESU.

Fecundity estimates provided an additional life history trait for comparison. Myers *et al.* (1998) cited average fecundity values for Deschutes River fall-run chinook salmon of 4,439 eggs per female, and for Lyons Ferry Hatchery fish (Snake River) 3,102 eggs per female (adjusted to 4,011 eggs per female at a standard length of 740 mm). Fecundity estimates (Howell *et al.*, 1985) for wild Snake River fall-run chinook salmon (trapped at Oxbow Dam) of 4,276 (1961 to 1969) and 4,185 eggs per female (1977 to 1983) were similar to Deschutes River fish, but do not include spawner sizes and are difficult to compare.

Meristic data were also reviewed to assess the similarities of the fall-run stocks under consideration. Of the traits analyzed by Schreck *et al.* (1986), only lateral line scale counts were potentially useful in discriminating among the Deschutes, Snake, and mainstem Columbia River (Hanford Reach) populations. Deschutes River fall-run chinook salmon exhibited a lower mean lateral scale count (136.6) compared with the fall-run fish from Hanford Reach (140.6) and the Snake River (Lyons Ferry Hatchery) (143.3). The Deschutes River lateral line scale counts most closely resembled those from several fall-run populations in the Lower Columbia River (below the location of Celilo Falls); however, these differences may not be statistically significant.

Little documentation is available on the existence of a summer run in the Deschutes River Basin. This issue is relevant to the discussion on ESU configuration due to the ocean-type life history expressed by summer-run fish in the Upper Columbia River and the stream-type life history expressed by summer-run fish in the Snake River Basin. If, as has been asserted by Patt (1999), the summer run in the Deschutes River Basin exhibited an ocean-type life history, it would provide an evolutionary link with the upper Columbia River ocean-type stocks.

Information presented by CTWSRO (1999) indicates that there was a significant temporal separation in the arrival of spring-run and summer/fall-run adults at the Pelton Dam Trap (River kilometer (Rkm) 161). Jonasson and Lindsay (1988), Beaty (1996), and Lichatowich (1998) have suggested that summer-run fish existed in the Deschutes River. Whether these summer-run fish historically spawned above the present site of Pelton Dam or above Sherars Falls, which reportedly was impassable during low summer flows early in this century, is not known although both scenarios would have provided for the geographic separation of summer and fall runs. In the 1960s, three returning adults that were tagged while passing Bonneville Dam during July were later recovered in the Metolius River, tributary to the Deschutes River at Rkm 178 (Galbreath, 1966). However, Nehlsen (1995) cited several personal communications which indicate that fall spawning fish were not observed in the Deschutes River Basin above the site of Pelton Dam. Analysis of downstream juvenile migrants (1959 to 1962) through the Pelton project did not detect any subyearling migrants (which would be consistent with the presence of ocean-type fish). Analysis of mtDNA variability from fish sampled at Sherars Falls and the Pelton Dam Trap suggests that genetic differences exist among adults collected at the two sampling locations (CTWSRO, 1999). It has been suggested that the genetic differences are indicative of a vestigial run of summer-run fish that have retained the propensity to migrate farther upstream than do fall-run fish. However, Jonasson and Lindsey (1988) state that there is no correlation between the date of ascending Sherars Falls and the date or location of subsequent spawning. Furthermore, analysis of scales from adults sampled at Sherars Falls in 1978 indicated that stream-type fish constituted 31.2, 25, 4.4, and 2.2 percent of the run passing the Falls in July, August, September, and October, respectively (Aho *et al.*, 1979). During 1979, the percentage of stream-type fish sampled at Pelton Trap during this same period dropped to 14 and 5.5 percent for July and August, respectively. The possibility exists that many of the fish sampled in the mtDNA study (especially at the Pelton Trap) were stream-type fish; further analysis of allozyme variation may resolve this issue.

Ecological differences among the Deschutes River Basin, the upper Columbia River Basin, and the Snake River Basin (especially historical fall-run spawning areas in the upper mainstem Snake River) were reviewed previously (Waples *et al.*, 1991; Myers *et al.*, 1998). Although the mainstem Columbia River and the lower reaches of its tributaries (including the Snake River) are all in the Columbia River Basin Ecoregion (Omernick and Gallant, 1986), the upper Snake River (above the Hells Canyon Dam complex) flows through three different ecoregions. Irving and Bjornn (1981) indicated that prior to 1958 the major spawning area for Snake River fall-run chinook salmon was in a 30–mile section between Swan Falls Dam and Marsing, Idaho, and historically, fall-run chinook salmon spawning extended as far upstream as Shoshone Falls (Howell *et al.*, 1985). Historically, most of the fall-run chinook spawning would have taken place in the Snake River Basin/High Desert Ecoregion.

Fall-run chinook salmon populations in the John Day, Umatilla, and Walla Walla Rivers were thought to have been extirpated (Kostow, 1995). However, there have been recent reports of chinook salmon spawning in the lower mainstem John Day River, but there is no information to establish the source of these fish or whether they were reproductively successful.

Based on its re-assessment of information relevant to the configuration of this ESU, NMFS believes that the proposed ESU configuration, combining ocean-type fish in the Snake and Deschutes River Basins into one ESU, was not supported by the information available. The agency concludes that the Deschutes River summer- and fall-run fish should be considered in a separate ESU, rather than be grouped with either the Snake River fall-run or Upper Columbia River summer- and fall-run chinook salmon ESUs. There is considerable uncertainty on the historical configuration of this new ESU, specifically whether it included fall-run populations in the John Day, Umatilla, and Walla Walla Rivers.

In reaching this conclusion, NMFS considered several scenarios for the configuration of the Snake River fall-run chinook salmon ESU and the potential reconfiguration of the Upper Columbia River summer- and fall-run chinook salmon ESU. NMFS identified four potential configurations: (1) The grouping of all ocean-type chinook salmon above the historical site of Celilo Falls into one ESU, (2) the configuration in the proposed rule, with Deschutes River summer- and fall-run chinook salmon being grouped with the existing Snake River fall-run chinook salmon ESU and a separate Upper Columbia River summer- and fall-run chinook salmon ESU, (3) the grouping of Deschutes River summer- and fall-run chinook salmon with other ocean-type mainstem and tributary spawners in the Upper Columbia River summer- and fall-run chinook salmon ESU and a separate Snake River fall-run chinook salmon ESU, and (4) the creation of a new Deschutes River chinook salmon ESU, which may or may not have included the extirpated populations that existed in the John Day, Umatilla, and Walla Walla Rivers, along with the existing Snake River fall-run and Upper Columbia River summer- and fall-run chinook salmon ESUs.

There is considerable uncertainty regarding the importance of ecological and geographic factors in providing the basis for reproductive isolation and local adaptation. For example, because the mainstem Columbia River (above Celilo Falls) and the lower reaches of its tributaries are all in the Columbia River Basin Ecoregion, there is an ecological link for the majority of the existing spawning populations of ocean-type fish. Historically, mainstem and tributary spawners may have formed a continuum of populations throughout the upper Columbia River and, to a lesser extent, the Snake River. Furthermore, genetic and life history differences are modest (or the interpretations of the existing data are ambiguous) among ocean-type chinook salmon populations above Celilo Falls, suggesting that perhaps all of the populations are part of a single ESU. Another viewpoint is that the three lines of evidence (genetics, ecology, life history) used in the 1991 status review (Waples *et al.*, 1991) to determine that Snake and Upper Columbia fall chinook salmon are in separate ESUs are still valid. In addition, the historical spawning distribution of most of the Snake River fall-run populations was well separated from Columbia River fall-run chinook salmon (Irving and Bjornn, 1981). NMFS considered all of these factors and believes that none of the new information gives sufficient cause to group all upriver bright fall-run chinook salmon into one ESU.

NMFS reviewed the evidence for including Deschutes River fall-run chinook salmon in the Snake River fall-run chinook salmon ESU. Data provided by co-managers on genetics and ocean recoveries of CWTs were important elements of this review. NMFS is uncertain of the assertion made by CTWSRO (1999) that genetic samples from the Grande Ronde and Clearwater Rivers were representative of Snake River populations. Spawning surveys indicated that prior to 1990, redd counts in the Grande Ronde River were at or near zero, with counts in the Clearwater River numbering in the low tens of redds (Irving and Bjornn, 1981; Howell *et al.*, 1985; Garcia *et al.*, 1999). Recent increases in redd counts in the Snake River Basin, above Lower Granite Dam, have coincided with a large influx of non-Snake River fish (Production Advisory Committee, 1998). NMFS believes that the weight of the genetic evidence, from a number of different sources, indicates a closer relationship of Deschutes River fish with Snake River fish than with Columbia River fish. Data from CWT studies also show Deschutes River fall-run chinook salmon have an ocean distribution and age at capture more similar to Snake River (both Lyons Ferry Hatchery fish and wild Snake River fish) than to Columbia River upriver bright fall-run populations. Additionally, if (as has been suggested by ODFW) the Deschutes River fall-run population was part of a larger historical ESU that included the John Day, Umatilla, and Walla Walla Rivers, these intermediate populations could have provided a link between the Deschutes and Snake River Basins. However, the ecological distinctiveness of the historical Snake River, Umatilla and Walla Walla Rivers, and Deschutes River spawning habitats argues against their being included in the same ESU; for example, the Deschutes River is a spring-fed stream with relatively stable water temperature, which is very different from the mainstem Snake River.

NMFS' re-consideration on the grouping of Deschutes River and Upper Columbia River summer- and fall-run populations focused on the historical distribution of mainstem spawners in the Columbia River, which extended more or less continuously from Celilo Falls to Kettle Falls, thus providing a link between different tributary populations, including the Deschutes River. In contrast, the center of fall-run spawning activity in the Snake River Basin was far removed from the confluence of the Snake and Columbia Rivers. Environmental features of the Deschutes and upper Columbia Rivers are more similar over this entire area than either is to the upper Snake River Basin. Tributary spawners in the Yakima, Wenatchee, and Okanogan Rivers are already included in the Upper Columbia River summer- and fall-run chinook salmon ESU, so it is possible to include Deschutes River ocean-type chinook salmon with the other upper river tributaries as well. NMFS also considered the possible ocean-type life history of the Deschutes River summer run. If that is the case, then the relationship between summer- and fall-run fish in the Deschutes River would resemble the Upper Columbia River, where summer- and fall-run fish are in the same ESU, rather than that in the Snake River, where the summer- and fall-run fish are from different evolutionary lineages.

After weighing the best available information, NMFS reaffirms the conclusion of previous status reviews that found that Snake River and Upper Columbia River ocean-type fish are in separate ESUs. There is remaining uncertainty about the ESU affinities of the Deschutes River population. The scenario with the Deschutes River population in a separate ESU from the Snake River fall-run and Upper Columbia River summer- and fall-run chinook salmon ESUs is probably the most compelling, but arguments can also be made for including the Deschutes River in the Upper Columbia or Snake River chinook salmon ESUs. One of the factors that influenced NMFS to identify three separate ESUs was the lack of conclusive evidence for including the Deschutes River in either of the existing ESUs.

Under the assumption that the Deschutes River population is in a separate ESU from Upper Columbia or Snake River fish, NMFS was unable to resolve the historical extent of that ESU. The major uncertainty centers on the ESU status of historical populations from the John Day, Umatilla, and Walla Walla Rivers, which have been extirpated. The lack of biological information for these historical populations makes a determination of their ESU status difficult. The Deschutes River is distinctive enough ecologically to have supported its own ESU; however, it is reasonable to believe that the historical ESU also included ocean-type populations in tributaries at least as far upstream as the confluence with the Snake River. NMFS believes it is highly likely that all mainstem Columbia River spawners above Celilo Falls historically were part of what is now termed the Upper Columbia River summer- and fall-run chinook salmon ESU. The agency also believes that all ocean-type chinook salmon in the Deschutes River (in particular, any vestigial summer-run fish that may exist) are part of the same ESU as the Deschutes River fall-run population.

Response - ESU Status: As discussed previously, NMFS concludes that the Snake River fall-run chinook salmon ESU should remain unchanged, but is unable to conclude with certainty the ESU affinity of the Deschutes River population. Updated information on the abundance of fall-run chinook salmon in the Deschutes River indicates that the run continues to increase in number—the most recently estimated 5-year geometric mean abundance is over 16,000 fish, and the short-term trend in abundance has been increasing by 18 percent per year (Pacific States Marine Fisheries Commission, 1999). However, there is considerable uncertainty associated with the run-size estimates of chinook salmon in the Deschutes River (Beaty, 1996). The population estimate is based on aerial redd surveys above and below Sherars Falls and on a mark-recapture survey for fish passing above Sherars Falls. The expansion estimate is based on an estimate of the number of adults per redd for the entire river, calculated using the mark-recapture data for fish above the falls. Since the late 1970s, the distribution of spawners has shifted from the bulk of the spawning occurring from above to below Sherars Falls. The total number of redds below the falls has not significantly declined since 1972, but the redd counts above the falls have declined dramatically over that time period (Beaty, 1996). The shift in relative abundance of spawning adults above and below Sherars Falls has resulted in an expansion estimate based on mark-recapture studies on an increasingly small proportion of the total population in the river. The errors in run-size estimation for the Deschutes River have become so high that the overall estimate of run size is not reliable. Because of the problems associated with the run-size estimates, NMFS considered the trends in redd counts to be a relatively more reliable indicator of the status of the Deschutes River chinook salmon population. Nevertheless, there is reportedly high inter-annual variation in the quality of redd counts due to visibility problems during aerial surveys (Beaty, 1996), so even the redd count data are not completely reliable.

Counts of chinook salmon at Pelton trap on the Deschutes River have declined since the late 1950s. The 5-year geometric mean abundance of fish at the trap is 81, and the short term trend in abundance is declining by over 6 percent per year. These fish may be representative of a remnant summer run of chinook salmon (CTWSRO, 1999). The percentage of hatchery chinook salmon in the Deschutes River continues to be very low, as reported in more detail in the historical information obtained at the time of the original NMFS status review (Myers *et al.*, 1998).

The estimated abundance of fall-run chinook salmon in the Snake River has been increasing over the most recent 10 years (5-year geometric mean abundance was 565 naturally produced fish, increasing by 13.7 percent per year.) Redd counts from streams in the Snake River Basin starting in the mid 1980s to 1990s show mostly increasing trends in abundance, although the estimated population sizes continue to be very small.

NMFS believes that the new information does not substantially change the risk assessments for the Snake River and Upper Columbia River chinook salmon ESUs, and the status of these ESUs was not reconsidered. Evaluation of the status of the ESU that includes the Deschutes River is difficult because the historical and current extent of the ESU is not well characterized. For this reason, NMFS did not attempt a formal extinction risk analysis for this ESU. However, the agency did review abundance, trend, and other information for the Deschutes River population and concludes that ocean-type chinook salmon in the Deschutes River do not appear to be in danger of extinction, nor are they likely to become so in the foreseeable future.

NMFS remains concerned about the uncertainty in the abundance estimates for fall- and summer-run chinook salmon in the Deschutes River. Uncertainty about the true population status centers primarily around different indicators of status emerging from the analysis of redd counts (declining sharply in the upper basin; stable in the lower basin) and run size estimates based on expansion of mark-recapture studies (which indicate a relatively large and increasing population). The only conclusion NMFS can make from the data is that the numbers of chinook salmon above Sherars Falls have been severely declining since the mid-1970s, while the population below the falls appears to be stable. The shift in the proportion of the total Deschutes River fall-run chinook salmon run spawning above and below Sherars Falls has resulted in unreliable expansion estimates for escapement both above and below the falls. In addition, the change in the estimated ratio of the number of adults per redd over time represents a significant problem for interpreting the expansion procedure used to generate the abundance estimates. NMFS is hopeful that recent efforts by the CTWSRO and ODFW to conduct more extensive mark-recapture studies in the lower river will improve escapement estimates.

NMFS also was concerned about the severe decline and possible extinction of the summer-run chinook salmon in the Deschutes River. The significant reduction in this life history form would represent an important loss to the historical diversity in this ESU. The uncertainty associated with the geographic boundaries containing the historical ESU added to the overall uncertainty in the risk evaluation. The historical run sizes of fall-run chinook salmon in the Umatilla, John Day, and Walla Walla Rivers are not well known, and the numbers of fall-run chinook salmon present today are very low and do not represent naturally self-sustaining runs. If fall-run chinook salmon that historically occurred in those streams are considered to be part of the Deschutes River chinook salmon ESU, a higher extinction risk may be appropriate for the current ESU because extinction of the ESU would have occurred over a significant portion of its range.

Summary of Factors Affecting Chinook Salmon

Section 4(a)(1) of the ESA and NMFS' listing regulations (50 CFR part 424) set forth procedures for listing species. The Secretary of Commerce (Secretary) must determine, through the regulatory process, if a species is endangered or threatened based upon any one or a combination of the following factors: (1) The present or threatened destruction, modification, or curtailment of its habitat or range; (2) overutilization for commercial, recreational, scientific, or educational purposes; (3) disease or predation; (4) inadequacy of existing regulatory mechanisms; or (5) other natural or human-made factors affecting its continued existence.

The factors threatening naturally spawned chinook salmon throughout its range are numerous and varied. The present depressed condition is the result of several long-standing, human-induced factors (e.g., habitat degradation, water diversions, harvest, and artificial propagation) that serve to exacerbate the adverse effects of natural environmental variability from such factors as drought, floods, and poor ocean conditions.

As noted earlier, NMFS received numerous comments regarding the relative importance of various factors contributing to the decline of chinook salmon. A summary of various risk factors and their roles in the decline of west coast chinook salmon was presented in NMFS' March 9, 1998, proposed rule (63 FR 11482), as well as in several ''Factors for Decline'' reports published in conjunction with proposed rules for steelhead and for chinook salmon (NMFS, 1996 and 1998b).

Efforts Being Made to Protect West Coast Chinook Salmon

Under section 4(b)(1)(A) of the ESA, the Secretary is required to make listing determinations solely on the basis of the best scientific and commercial data available and after taking into account efforts being made to protect a species. During the status review for west coast chinook salmon and for other salmonids, NMFS reviewed protective efforts ranging in scope from regional strategies to local watershed initiatives; some of the major efforts are summarized in the March 9, 1998, proposed rule (63 FR 11482). Since then, NMFS has received some new information regarding these and other efforts being made to protect chinook salmon. Notable efforts within the range of the chinook ESUs to be listed continue to be the NFP, PACFISH, Oregon Plan for Salmon and Watersheds (OPSW), CVPIA, CALFED Bay-Delta Program implementation and development, development and implementation of VAMP, Klamath and Trinity Basin restoration programs and flow re-evaluations, CDFG's Salmonid Restoration Program for coastal watersheds, NMFS and state funded multi-county conservation planning efforts in California, and the ongoing ESA section 7 and habitat conservation planning efforts within the range of currently listed species.

In California's Central Valley and coastal watersheds within the range of the chinook ESUs to be listed, several important conservation efforts have recently been implemented or initiated. In the Central Valley, the CALFED Bay-Delta Program and Ecosystem Restoration Plan are continuing to be implemented while a long-term implementation plan continues to be developed. The CALFED program and its implementation through 1997 is described in detail in previous **Federal Register** notices (63 FR 11482, March 9, 1998; 63 FR 13347, March 19, 1998). In 1998, CALFED funded 71 restoration projects totaling $27.5 million throughout the Central Valley dealing with fish passage assessment, fish passage and/or screening projects, floodplain management/habitat restoration, watershed planning, and other activities. In 1999, CALFED funded 13 projects totaling $52.5 million in the Central Valley. Nearly $40 million of these funds were directed at major salmon and steelhead habitat restoration activities on Battle Creek in the upper Sacramento River and fish passage improvements at the Anderson-Cottonwood Irrigation District in the upper Sacramento River. Substantial new funding is anticipated in 2000.

Several important projects have been initiated or implemented in the Central Valley since 1998 as a result of CALFED and/or CVPIA funding. In the Sacramento River Basin, significant efforts are underway to restore habitat in the Battle Creek drainage in the upper Sacramento River. NMFS, FWS, and CDFG have reached agreement with the Pacific Gas and Electric Company to restore access to nearly 42 miles of high quality spawning and rearing habitat. Water acquisitions are ongoing, and most restoration actions should be completed by 2002. This effort in Battle Creek will primarily benefit spring-run chinook salmon. Significant habitat restoration efforts are also underway in Butte, Deer, Mill and Clear Creeks which are tributaries to the upper Sacramento River to remove barriers, improve stream flows, and improve riparian habitat conditions which are expected to benefit both spring and fall chinook salmon. Major new fish screen projects have also recently been initiated or completed. Construction on the Glenn-Colusa Irrigation District fish screen was implemented and is scheduled for completion in late 1999. This is the single largest diversion on the upper Sacramento River (3,000 cfs) and will include a $1.0 million evaluation and monitoring program. New screens have been installed on four additional major diversions in the Sacramento River which total a combined diversion of nearly 2,000 cfs. In the San Joaquin River Basin, important habitat restoration projects have been implemented in the Tuolumne and Stanislaus Rivers to improve instream and riparian habitat and flow conditions. These efforts will benefit San Joaquin fall-run chinook salmon. Additional habitat restoration efforts were funded in the Delta region which should benefit all anadromous salmonids in the Central Valley.

In the San Joaquin Basin, collaboration between water interests and state and Federal resource agencies has also led to the development of a scientifically based adaptive fisheries management effort known as VAMP. The VAMP is intended to (1) improve protection of fall-run chinook salmon smolt passage from the San Joquin River Basin, (2) gather scientific information on the effects of various flows and Delta facilities operations on the survival of salmon smolts through the Delta, and (3) provide environmental benefits in the San Joaquin River tributaries, the lower San Joaquin River, and the Delta. The 12-year plan will be implemented in 1999 through a combination of increasing experimental flow releases from tributary streams in the San Joaquin Basin and through such operational changes as the reduction of exports at the Delta export pumping plants during the peak smolt outmigration period (approximately April 15 to May 15). Additional attraction flows are targeted for adult fall-run chinook upstream passage in October. In coordination with VAMP, the California Department of Water Resources (CDWR) will install and operate a barrier at the head of Old River to improve the survival of juvenile fall chinook emigrating from the lower San Joaquin River. By selecting a combination of flows and export rates, VAMP represents a long-term commitment to evaluate the effects of San Joaquin River flows and Delta export rates on San Joaquin Basin fall-run chinook salmon and to provide improved interim protections.

In June 1998, the State of California listed Sacramento River (Central Valley) spring-run chinook salmon as a threatened species under the CESA based on a status review conducted by CDFG. Since the state listing of Central Valley spring-run chinook, CDFG and NMFS have engaged in a joint ESA/CESA consultation/conference with the CDWR and the U.S. Bureau of Reclamation (BOR) to assess the effects the State Water Project's and the Central Valley Project's operations are having on Sacramento River spring-run chinook salmon. This consultation/conference focuses on a 1-year operation period through the spring of 2000, at which time it is anticipated that a plan for implementation of Stage 1 for the CALFED Bay-Delta Program and a Federal Record of Decision (ROD) will be completed. Pursuant to CDFG's 1994 Fish Screening Policy, all diversions that are located within the essential habitat of a CESA-listed species require screening. Accordingly, many unscreened diversions in the principal spring-run chinook salmon tributaries, particularly Butte Creek, have been identified and assigned a high priority for implementing corrective actions and receiving restoration funding.

NMFS identified state and Federal hatchery practices within the Central Valley as a serious risk factor to fall- and spring-run chinook populations at the time of the listing proposal. In an effort to address these concerns, both the State of California and FWS have recently initiated several actions to address hatchery practice concerns. First, CDFG has obtained funding from CALFED to develop a statistically designed marking/tagging and recovery program for Central Valley hatchery-produced chinook salmon to address questions about the relative contribution of hatchery and natural production in naturally-spawning adult populations, fisheries, and at Central Valley salmon hatcheries, and to develop a methodology for evaluating the desirability of selective fisheries. Second, CDFG, in conjunction with NMFS, has initiated a comprehensive review of anadromous salmonid hatchery practices in California. As part of this effort, CDFG has completed an internal review of its hatchery operating criteria at Iron Gate, Trinity River, Feather River, Nimbus, Mokelumne, and Merced hatcheries and, in some instances, modified operations. A major objective of this joint evaluation is to review these hatchery operating criteria and identify further modifications that are appropriate for natural stock integrity, while maintaining the mitigation and/or supplementation objectives of individual facilities. Finally, FWS, in conjunction with NMFS, has undertaken a reassessment of the mitigation goals and operational criteria for the CNFH, which is the only Federal hatchery in California. This assessment was initiated in early 1999 and may be integrated with the CDFG/NMFS review of state hatchery practices. In conjunction with its ongoing re-evaluation of CNFH hatchery programs, FWS has substantially reduced its future target for the production and release of fall-run chinook salmon fry in order to reduce the potential impacts on naturally spawning fall-run populations.

In the 1998 fiscal year, CDFG's Salmonid Restoration Program established a Watershed Initiative element aimed at supporting local, community-based watershed planning and landowner-based timber harvest planning for coastal regions of California. That same fiscal year, CDFG funded $2.65 million in projects for the restoration of coastal salmon and anadromous trout habitat through its Salmon and Steelhead Trout Restoration Account. CDFG entered into 102 contracts, through the Fishery Restoration Grants Program, with public agencies, nonprofit groups, recognized Native American Tribes, and individuals to restore habitats lost or degraded as a result of past land use practices. During the 1999 and 2000 fiscal years, CDFG's Fishery Restoration Grants Program has increased funding for this program for coastal restoration project grants to approximately $7 million annually. In addition to funding these restoration programs, CDFG has substantially increased its program staff (36.2 additional personnel-years) to improve anadromous salmonid management efforts in coastal watersheds.

Pursuant to a March 1998 Memorandum of Agreement between NMFS and the State of California, NMFS and the State committed to an expedited review of California's forest practice rules, their implementation, and enforcement. This effort has been ongoing over the past year and has resulted in proposals to improve forestry practices in California. These proposals are currently undergoing further review prior to being submitted to the Board of Forestry for action. The current schedule calls for implementing measures adopted by the Board in January 2000. NMFS believes this effort is critically important for improving habitat conditions in coastal watersheds for anadromous salmonids, including chinook salmon.

An additional Federal effort affecting the Snake River fall-run chinook salmon ESU, the Interior Columbia Basin Ecosystem Management Project (ICBEMP), was not addressed in the proposed rule. ICBEMP addresses Federal lands in this region that are managed under USFS and Bureau of Land Management (BLM) Land and Resource Management Plans or Land Use Plans amended by PACFISH. PACFISH provides objectives, standards, and guidelines that are applied to all Federal land management activities, such as timber harvest, road construction, mining, grazing, and recreation. USFS and BLM implemented PACFISH in 1995 intending to provide interim protection to anadromous fish habitat while a longer term, basin scale aquatic conservation strategy was developed by ICBEMP. It is intended that ICBEMP will have a Final Environmental Impact Statement and ROD by early 2000.

For other ESUs already listed in the Interior Columbia Basin (e.g., Snake River chinook salmon, Snake River steelhead, Upper Columbia River steelhead, and Upper Columbia River spring-run chinook salmon), NMFS' ESA section 7 consultations have required several components that are in addition to the PACFISH strategy (NMFS, 1995; NMFS, 1998c). NMFS, USFS, and BLM intend these additional components to bridge the gap between interim PACFISH direction and the long-term strategy envisioned for ICBEMP. NMFS anticipates that these components will also be carried forward in the ICBEMP direction. These components include, but are not limited to, implementation monitoring and accountability, a system of watersheds that are prioritized for protection and restoration, improved and monitored grazing systems, road system evaluation and planning requirements, mapping and analysis of unroaded areas, multi-year restoration strategies, and batching and analyzing projects at the watershed scale.

In the range of these chinook salmon ESUs, several notable efforts have recently been initiated. Harvest, hatchery, and habitat protections under state control are evolving under OPSW. The OPSW is a long-term effort to protect all at-risk wild salmonids through cooperation between state, local, and Federal agencies, tribal governments, industry, private organizations, and individuals. Parts of the OPSW are already providing benefits including an aggressive program by the Oregon Department of Transportation to inventory, repair, and replace road culverts that block fish from reaching important spawning and rearing areas. The OPSW also encourages efforts to improve conditions for salmon through non-regulatory means, including significant efforts by local watershed councils. An Independent Multi disciplinary Science Team provides scientific oversight to OPSW components and outcomes. A recent Executive Order from Governor Kitzhaber reinforced his expectation that all state agencies will make environmental health improvement and salmon recovery part of their mission.

NMFS and FWS are also engaged in an ongoing effort to assist in the development of multiple species HCPs for state and privately owned lands in Oregon, Washington, and California. While section 7 of the ESA addresses species protection associated with Federal actions and lands, Habitat Conservation Planning under section 10 of the ESA addresses species protection on private (non-Federal) lands. HCPs are particularly important since more than 85 percent of the habitat in the range of the Central Valley spring-run and California Coastal ESUs is in non-Federal ownership. The intent of the HCP process is to ensure that any incidental taking of listed species will not appreciably reduce the likelihood of survival of the species, will reduce conflicts between listed species and economic development activities, and will provide a framework that would encourage "creative partnerships" between the public and private sectors and state, municipal, and Federal agencies in the interests of endangered and threatened species and habitat conservation. Implementation of the recently approved Pacific Lumber HCP, which covers 210,000 acres in

California's coastal watersheds, has begun in earnest with review of timber harvest plans and formalization of watershed analysis and monitoring programs. The foundation of this HCP rests on watershed analysis which is used to tailor site-specific prescriptions for salmon conservation on a watershed-specific basis. The initial watershed analysis is proceeding and is expected to establish a framework for similar analyses in the Pacific Lumber HCP and other HCP efforts which are under development in California.

NMFS will continue to evaluate state, tribal, and non-Federal efforts to develop and implement measures to protect and begin the recovery of chinook salmon populations within these ESUs. Because a substantial portion of land in these ESUs is in state or private ownership, conservation measures on these lands will be key to protecting and recovering chinook salmon populations in these ESUs. NMFS recognizes that strong conservation benefits will accrue from specific components of many non-Federal conservation efforts.

While NMFS acknowledges that many of the ongoing protective efforts are likely to promote the conservation of chinook salmon and other salmonids, some are very recent and few address salmon conservation at a scale that is adequate to protect and conserve entire ESUs. NMFS concludes that existing protective efforts are inadequate to preclude a listing for the Central Valley spring-run and California Coastal chinook salmon ESUs. However, NMFS will continue to encourage these and future protective efforts and will work with Federal, state, and tribal fisheries managers to evaluate, promote, and improve efforts to conserve chinook salmon populations.

Determinations

Section 3 of the ESA defines the term ''endangered species'' as any species that is in danger of extinction throughout all or a significant portion of its range. The term ''threatened species'' is defined as any species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

After reviewing the best available information, including public and peer review comments, biological data on the species' status, and an assessment of protective efforts directed at the four chinook ESUs proposed for listing, NMFS has concluded that only two ESUs—the Central Valley spring-run ESU and California Coastal ESU—warrant protection under the ESA. NMFS has determined that both ESUs are at risk of becoming endangered in the foreseeable future throughout all or a significant portion of their range. While NMFS has determined that the Central Valley fall and late fall-run ESU does not warrant listing at this time, the agency remains concerned about the status of this ESU and will consider it a candidate species. The agency will reevaluate the status of the Central Valley fall and late fall-run ESU as new information becomes available to determine whether listing may be warranted.

In the listed ESUs, only ''naturally spawned'' populations of chinook salmon are listed. NMFS' intent in listing only these populations is to protect chinook salmon stocks that are indigenous to (i.e., part of) the ESUs. In this listing determination, NMFS has identified various non-indigenous populations that co-occur with fish in the California Coastal ESU. NMFS recognizes the difficulty of differentiating between indigenous and non-indigenous fish, especially when the latter are not readily distinguishable with a mark (e.g., fin clip). Also, matings in the wild of either type would generally result in progeny that would be treated as listed fish (i.e., they would have been naturally spawned in the geographic range of the listed ESUs and have no distinguishing mark). Therefore, to reduce confusion regarding which chinook salmon are considered listed within the ESUs, NMFS will treat all naturally spawned fish as listed for purposes of the ESA. Efforts to determine the conservation status of an ESU would focus on the contribution of indigenous fish to the listed ESU. It should be noted that NMFS will take actions necessary to minimize or prevent non-indigenous chinook salmon from spawning in the wild unless the fish are specifically part of a recovery effort.

NMFS has evaluated the relationship between hatchery and natural populations of chinook salmon in the listed ESUs (NMFS, 1999a). In the Central Valley spring-run ESU, spring-run chinook salmon (and their progeny) from the Feather River Hatchery stock are considered part of the ESU. However, they are not considered to be essential for its recovery and are not listed at this time. In the California Coastal ESU, chinook salmon (and their progeny) from the following hatchery stocks are considered part of the ESU: Redwood Creek, Hollow Tree Creek, Freshwater Creek, Mad River Hatchery, Van Arsdale Station, Yager Creek, and Mattole River fall-run stock. However, they too, are not considered to be essential for the ESU's recovery and are not listed at this time. In addition, NMFS concludes that fall-run chinook salmon from the following stocks are not part of the California Coastal ESU (thus, not listed): Warm Springs Hatchery stock and fall-run fish of Feather River or Nimbus Hatchery origin that are released in this ESU.

The determination that a hatchery stock is not ''essential'' for recovery does not preclude it from playing a role in recovery. Any hatchery population that is part of the ESU is available for use in recovery if conditions warrant. In this context, an ''essential'' hatchery population is one that is vital to incorporate into recovery efforts (for example, if the associated natural populations were extinct or at high risk of extinction). Under such circumstances, NMFS would consider taking the administrative action of listing existing hatchery fish.

NMFS' ''Interim Policy on Artificial Propagation of Pacific Salmon Under the Endangered Species Act'' (58 FR 17573, April 5, 1993) provides guidance on the treatment of hatchery stocks in the event of a listing. Under this policy, ''progeny of fish from the listed species that are propagated artificially are considered part of the listed species and are protected under the ESA.'' In the case of hatchery chinook populations considered to be part of the Central Valley spring-run ESU or California Coastal ESU, NMFS' protective regulations may not apply the take prohibitions to naturally spawned listed fish used as broodstock as part of an overall conservation program. According to the interim policy, the progeny of these hatchery-wild or wild-wild crosses would also be listed. Given the requirement for an acceptable conservation plan as a prerequisite for collecting broodstock, NMFS determines that it is not necessary to consider the progeny of intentional hatchery-wild or wild-wild crosses as listed (except in cases where NMFS has listed the hatchery population as well).

In addition, NMFS believes it may be desirable to incorporate naturally spawned fish into these unlisted hatchery populations to ensure that their genetic and life history characteristics do not diverge significantly from the natural populations. NMFS, therefore, concludes that it is not inconsistent with NMFS' interim policy, nor with the policy and purposes of the ESA, to consider these progeny as part of the ESU but not listed.

NMFS is not now issuing protective regulations under section 4(d) of the ESA for these ESUs. NMFS will propose such protective measures it considers necessary for the conservation of chinook salmon ESUs listed as threatened in a forthcoming **Federal Register** document. Even though NMFS is not now issuing protective regulations for these ESUs, Federal agencies possess a duty under section 7 of the ESA to consult with NMFS if any activity they authorize, fund, or carry out may affect listed chinook salmon ESUs. The effective date for this requirement is November 15, 1999.

Prohibitions and Protective Measures

Section 9 of the ESA prohibits certain activities that directly or indirectly affect endangered species. These prohibitions apply to all individuals, organizations, and agencies subject to U.S. jurisdiction. Section 4(d) of the ESA directs the Secretary to implement regulations ''to provide for the conservation of [threatened] species,'' that may include extending any or all of the prohibitions of section 9 to threatened species. Section 9(a)(1)(g) also prohibits violations of protective regulations for threatened species implemented under section 4(d). NMFS intends to issue protective regulations pursuant to section 4(d) for the Central Valley spring-run and California Coastal ESUs, as well as for other threatened chinook salmon ESUs.

In the case of threatened species, NMFS also has flexibility under section 4(d) of the ESA to tailor the protective regulations based on the adequacy of available conservation measures. Even though existing conservation efforts and plans are not sufficient to preclude the need for listings at this time, they are, nevertheless, valuable for improving watershed health and restoring salmon populations. In those cases where well-developed and reliable conservation measures or plans exist, NMFS may choose to incorporate them into the recovery planning process starting with protective regulations. NMFS has already adopted ESA section 4(d) protective regulations that ''except'' a limited range of activities from section 9 take prohibitions. For example, the interim rule for Southern Oregon/ Northern California Coast coho salmon (62 FR 38479, July 18, 1997) does not apply the take prohibitions to habitat restoration activities conducted in accordance with approved plans and fisheries conducted in accordance with an approved state management plan. In the future, such rules may contain limits on take prohibitions applicable to such activities as forestry, agriculture, and road construction when such activities are conducted in accordance with approved conservation plans.

These are all examples where NMFS may apply the modified ESA section 9 prohibitions in light of the protections provided in a conservation plan that is adequately protective. There may be other circumstances as well in which NMFS would use the flexibility of section 4(d) of the ESA. For example, if a healthy population exists within an overall ESU that is listed, it may not be necessary to apply the full range of prohibitions available in section 9. NMFS intends to use the flexibility of the ESA to respond appropriately to the biological condition of each ESU and to the strength of the efforts to protect them.

Section 7(a)(4) of the ESA requires that Federal agencies consult with NMFS on any actions likely to jeopardize the continued existence of a species proposed for listing and on actions likely to result in the destruction or adverse modification of proposed critical habitat. For listed species, section 7(a)(2) requires Federal agencies to ensure that activities they authorize, fund, or conduct are not likely to jeopardize the continued existence of a listed species or to destroy or adversely modify its critical habitat. If a Federal action may affect a listed species or its critical habitat, the responsible Federal agency must enter into consultation with NMFS.

Examples of Federal actions likely to affect chinook salmon in the listed ESUs include authorized land management activities of the USFS, BLM, and National Park Service, as well as operation of hydroelectric and storage projects of the BOR and U.S. Army Corps of Engineers (COE). Such activities include timber sales and harvest, hydroelectric power generation, and flood control. Federal actions, including the COE section 404 permitting activities under the Clean Water Act, COE permitting activities under the River and Harbors Act, National Pollution Discharge Elimination System permits issued by the Environmental Protection Agency, highway projects authorized by the Federal Highway Administration, Federal Energy Regulatory Commission (FERC) licenses for non-Federal development and operation of hydropower, and Federal salmon hatcheries, may also require consultation. These actions will likely be subject to ESA section 7 consultation requirements that may result in conditions designed to achieve the intended purpose of the project while avoiding or reducing impacts to chinook salmon and their habitat within the range of the listed ESU.

There are likely to be Federal actions ongoing in the range of the listed ESUs at the time the listing becomes effective. Therefore, NMFS will review all ongoing actions that may affect the listed species with Federal agencies and will complete formal or informal consultations, when necessary, for such actions pursuant to ESA section 7(a)(2).

Sections 10(a)(1)(A) and 10(a)(1)(B) of the ESA provide NMFS with authority to grant exceptions to the ESA's ''taking'' prohibitions. Section 10(a)(1)(A) scientific research and enhancement permits may be issued to entities (Federal and non-Federal) conducting research that involves a directed take of listed species.

NMFS has issued section 10(a)(1)(A) research or enhancement permits for other listed species (e.g., Snake River chinook salmon and Sacramento River winter-run chinook salmon) for a number of activities, including trapping and tagging to determine population distribution and abundance, and for collection of adult fish for artificial propagation programs. NMFS is aware of sampling efforts for chinook salmon within the listed chinook salmon ESUs, including efforts by Federal and state fisheries agencies and by private landowners. These and other research efforts could provide critical information regarding chinook salmon distribution and population abundance.

ESA section 10(a)(1)(B) incidental take permits may be issued to non-Federal entities performing activities that may incidentally take listed species. The types of activities potentially requiring a section 10(a)(1)(B) incidental take permit include the release of artificially propagated fish by state or privately operated and funded hatcheries, state or university research on other species not receiving Federal authorization or funding, the implementation of state fishing regulations, and timber harvest activities on non-Federal lands.

Take Guidance

On July 1, 1994, (59 FR 34272) NMFS and FWS published a policy committing the Services to identify, to the maximum extent practicable at the time a species is listed, those activities that would or would not constitute a violation of section 9 of the ESA. The intent of this policy is to increase public awareness of the effect of a listing on proposed and ongoing activities within the species' range. NMFS believes that, based on the best available information, the following actions will not result in a violation of section 9: (1) Possession of chinook salmon from the listed ESUs acquired lawfully by permit issued by

NMFS pursuant to section 10 of the ESA, or by the terms of an incidental take statement pursuant to section 7 of the ESA; and (2) federally funded or approved projects that involve such activities as silviculture, grazing, mining, road construction, dam construction and operation, discharge of fill material, stream channelization or diversion for which a section 7 consultation has been completed, and when such an activity is conducted in accordance with any terms and conditions provided by NMFS in an incidental take statement accompanied by a biological opinion pursuant to section 7 of the ESA. As described previously in this notice, NMFS may adopt ESA section 4(d) protective regulations that ''except'' other activities from section 9 take prohibitions for threatened species.

Activities that NMFS believes could potentially harm, injure, or kill chinook salmon in the listed ESUs and result in a violation of section 9 of the ESA include, but are not limited, to the following: (1) Land-use activities in riparian areas and areas susceptible to mass wasting and surface erosion, which may disturb soil and increase sediment delivered to streams, such as logging, grazing, farming, and road construction; (2) destruction or alteration of chinook salmon habitat in these listed ESUs, such as removal of large woody debris and ''sinker logs'' or riparian shade canopy, dredging, discharge of fill material, draining, ditching, diverting, blocking, or altering stream channels or surface or ground water flow; (3) construction or operation of dams or water diversion structures with inadequate fish screens or fish passage facilities in a listed species' habitat; (4) construction or maintenance of inadequate bridges, roads, or trails on stream banks or unstable hill slopes adjacent to or above a listed species' habitat; (5) discharges or dumping of toxic chemicals or other pollutants (e.g., sewage, oil, gasoline) into waters or riparian areas supporting listed chinook salmon; (6) violation of discharge permits; (7) pesticide and herbicide applications; (8) interstate and foreign commerce of chinook salmon from the listed ESUs without an ESA permit, unless the fish were harvested pursuant to legal exception; (9) collecting or handling of chinook salmon from listed ESUs (permits to conduct these activities are available for purposes of scientific research or to enhance the propagation or survival of the species); and (10) release of non-indigenous or artificially propagated species into a listed species' habitat or where they may access the habitat of listed species. This list is not exhaustive. It is intended to provide some examples of the types of activities that might or might not be considered by NMFS as constituting a take of listed chinook salmon under the ESA and its regulations. Questions regarding whether specific activities will constitute a violation of this rule and general inquiries regarding prohibitions and permits should be directed to NMFS (see **ADDRESSES**).

Effective Date of Final Listing

Given the cultural, scientific, and recreational importance of chinook salmon and the broad geographic range of these chinook salmon ESUs, NMFS recognizes that numerous parties may be affected by the listings. Therefore, to permit an orderly implementation of the consultation requirements and take prohibitions associated with this action, the final listings will take effect on November 15, 1999.

Conservation Measures

Conservation benefits are provided to species listed as endangered or threatened under the ESA through increased recognition, recovery actions, Federal agency consultation requirements, and prohibitions on taking. Increased recognition through listing promotes public awareness and conservation actions by Federal, state, and local agencies, private organizations, and individuals.

Several conservation efforts are underway that may reverse the decline of west coast chinook salmon and other salmonids. NMFS is encouraged by these significant efforts, which could provide all stakeholders with a less regulatory approach to achieving the purposes of the ESA—protecting and restoring native fish populations and the ecosystems upon which they depend. NMFS will continue to encourage and support these initiatives as important components of recovery planning for chinook salmon and other salmonids.

To succeed, protective regulations and recovery programs for chinook salmon will need to focus on conserving aquatic ecosystem health. NMFS intends that Federal lands and Federal activities play a primary role in preserving listed populations and the ecosystems upon which they depend. However, throughout the range of the listed ESUs, chinook salmon habitat occurs and can be affected by activities on state, tribal, or private land.

Conservation measures that could be implemented to help conserve the species are listed here (the list is generalized and does not constitute NMFS' interpretation of a recovery plan under section 4(f) of the ESA). Progress on some of these is being made to different degrees in specific areas.

1. Measures could be taken to promote practices that are more protective of (or restore) chinook salmon habitat across a variety of land and water management activities. Activities affecting this habitat include timber harvest; agriculture; livestock grazing and operations; pesticide and herbicide applications; construction and urban development; road building and maintenance; sand and gravel mining; stream channelization; dredging and dredged spoil disposal; dock and marina construction; diking and bank stabilization; dam construction/operation; irrigation withdrawal, returns, storage, and management; mineral mining; wastewater/pollutant discharge; wetland and floodplain alteration; habitat restoration projects; and woody debris/structure removal from rivers and estuaries. Each of these activities could be modified to ensure that watersheds and specific river reaches are adequately protected in the short- and long-terms.

2. Fish passage could be restored at barriers to migration through the installation or modification of fish ladders, upgrade of culverts, or removal of barriers.

3. Harvest regulations could be modified to protect listed chinook salmon populations affected by both directed harvest and incidental take in other fisheries.

4. Artificial propagation programs could be modified to minimize negative impacts (e.g., genetic introgression, competition, disease, etc.) upon native populations of chinook salmon.

5. Predator control/relocation programs could be implemented in areas where predators pose a significant threat to chinook salmon.

6. Measures could be taken to improve monitoring of chinook salmon populations and their habitat.

7. Federal agencies such as the USFS, BLM, NPS, FERC, COE, U.S. Department of Transportation, and BOR could review their management programs and use their discretionary authorities to formulate conservation plans pursuant to section 7(a)(1) of the ESA.

NMFS encourages non-Federal landowners to assess the impacts of their actions on threatened or endangered salmonids. In particular, NMFS encourages state and local governments to use their existing authorities and programs and encourages the formation of watershed partnerships to promote conservation in accordance with ecosystem principles. These partnerships will be successful only if state, tribal, and local governments, landowner representatives, and Federal and non-Federal biologists all participate and share the goal of restoring salmon to the watersheds.

Critical Habitat

Section 4(a)(3)(A) of the ESA requires that, to the extent prudent and determinable, critical habitat be designated concurrently with the listing of a species. Section 4(b)(6)(C)(ii) provides that, where critical habitat is not determinable at the time of final listing, NMFS may extend the period for designating critical habitat by no more than one additional year.

In the proposed rule (63 FR 11482, March 9, 1998), NMFS described the areas that may constitute critical habitat for these chinook salmon ESUs. Since then, NMFS has received numerous comments from the public concerning the process and definition of critical habitat for these and other listed salmonids. The agency needs additional time to complete the needed biological assessments and evaluate special management considerations affecting critical habitat. Therefore, critical habitat is not yet determinable for these ESUs, and NMFS extends the deadline for designating critical habitat for no more than 1 year until the required assessments can be made.

Classification

The 1982 amendments to the ESA, in section 4(b)(1)(A), restrict the information that may be considered when assessing species for listing. Based on this limitation of criteria for a listing decision and the opinion in *Pacific Legal Foundation* v. *Andrus*, 675 F.2d 825 (6th Cir., 1981), NMFS has categorically excluded all ESA listing actions from the environmental assessment requirements of the National Environmental Policy Act (NEPA) under NOAA Administrative Order 216–6.

As noted in the Conference Report on the 1982 amendments to the ESA, economic impacts cannot be considered when assessing the status of a species. Therefore, the economic analysis requirements of the Regulatory Flexibility Act (RFA) are not applicable to the listing process. In addition, this final rule is exempt from review under E.O. 12866.

This rule has been determined to be major under the Congressional Review Act (5 U.S.C. 801 *et seq.*)

At this time NMFS is not promulgating protective regulations pursuant to ESA section 4(d). In the future, prior to finalizing its 4(d) regulations for the threatened chinook salmon ESUs, NMFS will comply with all relevant NEPA and RFA requirements.

References

A complete list of all references cited herein is available upon request (see **ADDRESSES**) and can also be obtained from the internet at www.nwr.noaa.gov.

Change in Enumeration of Threatened and Endangered Species

In the proposed rule issued on March 9, 1998 (63 FR 11482), the Central Valley spring-run chinook salmon was added as an endangered species to paragraph (a) in § 222.23, while several threatened chinook salmon ESUs (including populations in the California Coastal chinook salmon ESU) were enumerated under § 227.4. Since that time NMFS has issued a final rule consolidating and reorganizing existing regulations regarding implementation of the ESA (64 FR 14052, March 23, 1999). In this reorganization, § 222.23 has been redesignated as § 224.101, and § 227.4 has been redesignated as § 223.102. Given these reorganized regulations, as well as the Central Valley spring-run ESU's revised status as threatened, both the Central Valley spring-run and the California Coastal chinook salmon ESUs are now designated in this final rule as paragraphs (a)(20) and (a)(21) and added under § 223.102, respectively.

List of Subjects in 50 CFR Part 223

Endangered and threatened species, Exports, Imports, Marine mammals, Transportation.

Dated: September 9, 1999.

Andrew A. Rosenberg,

Deputy Assistant Administrator for Fisheries, National Marine Fisheries Service.

For the reasons set out in the preamble, 50 CFR part 223 is amended as follows:

PART 223—THREATENED MARINE AND ANADROMOUS SPECIES

1. The authority citation for part 223 is revised to read as follows:

Authority: 16 U.S.C. 1531 *et seq.*; 16 U.S.C. 742a *et seq.*; 31 U.S.C. 9701.

2. In § 223.102, paragraphs (a)(20) and (a)(21) are added to read as follows:

§ 223.102 Enumeration of threatened marine and anadromous species.

* * * * *

(a) * * *

(20) Central Valley spring-run chinook salmon (*Oncorhynchus tshawytscha*). Includes all naturally spawned populations of spring-run chinook salmon in the Sacramento River Basin, and its tributaries, California.

(21) California coastal chinook salmon (*Oncorhynchus tshawytscha*). Includes all naturally spawned populations of chinook salmon from Redwood Creek (Humboldt County, California) through the Russian River (Sonoma County, California).

* * * * *

[FR Doc. 99–24051 Filed 9–15–99; 8:45 am]
BILLING CODE 3510–22–F

EXHIBIT 5

Federal Register

Friday,
December 10, 2004

Part II

Department of Commerce

National Oceanic and Atmospheric Administration

50 CFR Part 226

Endangered and Threatened Species; Designation of Critical Habitat for Seven Evolutionarily Significant Units of Pacific Salmon (*Oncorhynchus tshawytscha*) and Steelhead (*O. mykiss*) in California; Proposed Rule

DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

50 CFR Part 226

[Docket No. 041123329–4329–01; I.D. No. 110904F]

RIN 0648–AO04

Endangered and Threatened Species; Designation of Critical Habitat for Seven Evolutionarily Significant Units of Pacific Salmon (*Oncorhynchus tshawytscha*) and Steelhead (*O. mykiss*) in California

AGENCY: National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration, Commerce.

ACTION: Proposed rule; request for comments.

SUMMARY: The National Marine Fisheries Service (NMFS) proposes to designate critical habitat for two Evolutionarily Significant Units (ESUs) of chinook salmon (*Oncorhynchus tshawytscha*) and five ESUs of *O. mykiss* (inclusive of anadromous steelhead and resident rainbow trout) listed under the Endangered Species Act of 1973, as amended (ESA). The specific areas proposed for designation in the rule text set out below include approximately 11,668 miles (18,669 km) of riverine habitat and 947 mi^2 (2,444 km^2) of bay/estuarine habitat (primarily in San Francisco-San Pablo-Suisun Bays) in California. Some of the proposed areas, however, are occupied by two or more ESUs. However, as explained below, we are also considering excluding many of these areas from the final designation based on existing land management plans and policies, voluntary conservation efforts and other factors that could substantially reduce the scope of the final designations. The net economic impacts of ESA section 7 associated with designating the areas described in the proposed rule are estimated to be approximately $83,511,186, but we believe the additional exclusions under review could reduce this impact by up to 57 percent or more. We solicit information and comments from the public on all aspects of the proposal, including information on the economic, national security, and other relevant impacts of the proposed designation. We may revise this proposal and solicit additional comments prior to final designation to address new information received during the comment period.

DATES: Comments on this proposed rule must be received by 5 p.m. P.s.t. on February 8, 2005. Requests for public hearings must be made in writing by January 24, 2005.

ADDRESSES: You may submit comments, identified by docket number [041123329–4329–01] and RIN number [0648–AO04], by any of the following methods:

- E-mail: *critical.habitat.swr@noaa.gov*. Include docket number [041123329–4329–01] and RIN number [0648–AO04] in the subject line of the message.
- Federal e-Rulemaking Portal: *http://www.regulations.gov*. Follow the instructions for submitting comments.
- Agency Web site: *http://ocio.nmfs.noaa.gov/ibrm-ssi/index.shtml*. Follow the instructions for submitting comments at *http://ocio.nmfs.noaa.gov/ibrm-ssi/process.shtml*.
- Mail: Submit written comments and information to: Assistant Regional Administrator, Protected Resources Division, NMFS, 501 W. Ocean Blvd., Suite 4200, Long Beach, CA 90802–4213. You may hand-deliver written comments to our office during normal business hours at the address given above.
- Fax: 562–980–4027

FOR FURTHER INFORMATION CONTACT: Craig Wingert at the above address, at 562–980–4021, or by facsimile at 562–980–4027; or Marta Nammack at 301–713–1401. The proposed rule, maps, and other materials relating to this proposal can be found on our Web site at *http://swr.nmfs.noaa.gov*.

SUPPLEMENTARY INFORMATION:

Background

NMFS is responsible for determining whether species, subspecies, or distinct population segments of Pacific salmon and *O. mykiss* (inclusive of anadromous steelhead and some populations of resident rainbow trout) are threatened or endangered, and for designating constitute critical habitat for them under the ESA (16 U.S.C. 1531 *et seq*). To be considered for ESA listing, a group of organisms must constitute a ‘‘species.’’ Section 3 of the ESA defines a species as ‘‘any subspecies of fish or wildlife or plants, and any distinct population segment of any species of vertebrate fish or wildlife which interbreeds when mature.’’ Since 1991, NMFS has identified distinct population segments of Pacific salmon and *O. mykiss* by dividing the U.S. populations of each species into evolutionarily significant units (ESUs) which it determines are substantially reproductively isolated and represent an important component in the evolutionary legacy of the biological species (56 FR 58612; November 20, 1991). Using this approach, every Pacific salmon and *O. mykiss* population in the U.S. is part of a distinct population segment that is eligible for listing as a threatened or endangered species under the ESU. In ESA listing determinations for Pacific salmon and *O. mykiss* since 1991 we have identified 52 ESUs in Washington, Oregon, Idaho and California. Presently, 25 ESUs are listed as threatened or endangered. One additional ESU (Oregon Coast coho salmon) was listed as threatened from 1998 to 2004 when it was removed from the list of threatened or endangered species as a result of a Court Order.

In a **Federal Register** document published on June 14, 2004 (69 FR 33101), we proposed to list 27 ESUs as threatened or endangered. The ESUs proposed for listing include 25 that are currently listed, but in most cases the ESUs are being redefined in either of two significant ways: By including hatchery fish that are no more than moderately divergent genetically from naturally spawning fish within the ESU, and in the case of *O. mykiss* species, by including some resident trout populations in the ESUs. We have also proposed to list the previously-listed Oregon Coast coho salmon population which is redefined to include some fish reared in hatcheries, and are proposing to list one new ESU (Lower Columbia River *O. mykiss*, was previously thought to be extinct in the wild). In this document, *O. mykiss* ESUs refer to ESUs that include populations of both anadromous steelhead and resident rainbow trout. Also, references to ‘‘salmon’’ in this notice generally include all members of the genus *Oncorhynchus*, including *O. mykiss*.

This **Federal Register** document describes proposed critical habitat designations for the following seven ESUs of Pacific salmon and *O. mykiss* in California: (1) California Coastal chinook salmon; (2) Northern California *O. mykiss*; (3) Central California Coast *O. mykiss*; (4) South-Central California Coast *O. mykiss*; (5) Southern California *O. mykiss*; (6) Central Valley spring run chinook salmon; and (7) Central Valley *O. mykiss*.

Section 3 of the ESA defines critical habitat as ‘‘the specific areas within the geographical area occupied by the species, at the time it is listed, on which are found those physical or biological features (I) essential to the conservation of the species and (II) which may require special management considerations or protection; and specific areas outside the geographical area occupied by the species at the time it is listed that are determined by the Secretary to be essential for the conservation of the species.'' Section 3 of the ESA (16 U.S.C. 1532(3)) also defines the terms ''conserve,'' ''conserving,'' and ''conservation'' to mean ''to use, and the use of, all methods and procedures which are necessary to bring any endangered species or threatened species to the point at which the measures provided pursuant to this chapter are no longer necessary.'' Section 4 of the ESA requires that before designating critical habitat, we must consider economic impacts, impacts on national security and other relevant impacts of specifying any particular area as critical habitat, and the Secretary may exclude any area from critical habitat if the benefits of exclusion outweigh the benefits of inclusion, unless excluding an area from critical habitat will result in the extinction of the species concerned. Once critical habitat for a salmon or *O. mykiss* ESU is designated, section 7(a)(2) of the ESA requires that each Federal agency shall, in consultation with and with the assistance of NMFS, ensure that any action authorized, funded or carried out by such agency is not likely to result in the destruction or adverse modification of critical habitat.

Previous Federal Action and Related Litigation

Many Pacific salmon and *O. mykiss* ESUs in California and the Pacific Northwest have suffered broad declines over the past hundred years. We have conducted several ESA status reviews and status review updates for Pacific salmon and *O. mykiss* in California, Oregon, Washington, and Idaho. The most recent ESA status review and proposed listing determinations were published on June 14, 2004 (69 FR 33101). Six of the currently listed ESUs have final critical habitat designations. Table 1 summarizes the NMFS scientific reviews of West Coast salmon and *O. mykiss* and the ESA listing determinations and critical habitat designations made to date.

TABLE 1.—SUMMARY OF PREVIOUS ESA LISTING ACTIONS AND CRITICAL HABITAT DESIGNATIONS FOR WEST COAST SALMON AND *O. Mykiss*

Evolutionarily significant unit (ESU)	Current endangered species Act (ESA) status	Year listed	Previous ESA listing determinations and critical habitat designations—**Federal Register** citations	Previous scientific viability reviews and updates
Snake River sockeye ESU	Endangered	1991	*Listing Determinations* 69 FR 33102; 06/14/04 (Proposed rule) 56 FR 58619; 11/20/1991 (Final rule) 56 FR 14055; 04/05/1991 (Proposed rule) *Critical Habitat Designations* 58 FR 68543; 12/28/1993 (Final rule) 57 FR 57051; 12/02/1992 (Proposed rule)	NMES 1991a.
Ozette Lake sockeye ESU	Threatened	1999	*Listing Determinations* 69 FR 33102; 06/14/04 (Proposed rule) 64 FR 14528; 03/25/1999 (Final rule) 63 FR 11750; 03/10/1998 (Proposed rule) *Critical Habitat Designations* 68 FR 55900; 09/29/2003 (removal) 65 FR 7764; 02/16/2000 (Final rule) 63 FR 11750; 03/10/1998 (Proposed rule)	NMFS 1998d. NMFS 1997f.
Sacramento River winter-run chinook ESU	Endangered	1994	*Listing Determinations* 69 FR 33102; 06/14/04 (Proposed rule) 59 FR 440; 01/01/1994 (Final rule) 57 FR 27416; 06/19/1992 (Proposed rule) 55 FR 49623; 11/30/1990 (Final rule) 55 FR 12831, 04/06/1990 (Emergency rule) 55 FR 102260; 03/20/1990 (Proposed rule) 54 FR 10260; 08/04/1989 (Emergency rule) 52 FR 6041; 02/27/1987 (Final rule) *Critical Habitat Designations*. 68 FR 55900; 09/29/2003 (removal) 65 FR 7764; 02/16/2000 (Final rule) 63 FR 11482; 03/09/1998 (Proposed rule)	
Central Valley spring-run chinook ESU	Threatened	1999	*Listing Determinations* 69 FR 33102; 06/14/04 (Proposed rule) 64 FR 50394; 09/16/1999 (Final rule) 63 FR 11482; 03/09/1998 (Proposed rule) *Critical Habitat Designations* 68 FR 55900; 09/29/2003 (removal) 65 FR 7764; 02/16/2000 (Final rule) 63 FR 11482; 03/09/1998 (Proposed rule)	NMFS 1998b. NMFS 1999d.
			Listing Determinations 69 FR 33102; 06/14/04 (Proposed rule) 64 FR 50394; 09/16/1999 (Final rule) 63 FR 11482; 03/09/1998 (Proposed rule) *Critical Habitat Designations* 68 FR 55900; 09/29/2003 (removal)	

TABLE 1.—SUMMARY OF PREVIOUS ESA LISTING ACTIONS AND CRITICAL HABITAT DESIGNATIONS FOR WEST COAST SALMON AND *O. Mykiss*—Continued

Evolutionarily significant unit (ESU)	Current endangered species Act (ESA) status	Year listed	Previous ESA listing determinations and critical habitat designations—**Federal Register** citations	Previous scientific viability reviews and updates
			65 FR 7764; 02/16/2000 (Final rule)	NMFS 1998b.
California Coastal chinook ESU	Threatened	1999	63 FR 11482; 03/09/1998 (Proposed rule)	NMFS 1999d.
			Listing Determinations	
			69 FR 33102; 06/14/04 (Proposed rule)	
			64 FR 14308; 03/24/99 (Final rule)	
			63 FR 11482; 03/09/1998 (Proposed rule)	
			Critical Habitat Designations	
			68 FR 55900; 09/29/2003 (removal)	NMFS 1998b.
			65 FR 7764; 02/16/2000 (Final rule)	NMFS 1998e.
Upper Willamette River chinook ESU	Threatened	1999	63 FR 11482; 03/09/1998 (Proposed rule)	NMFS 1999c.
			Listing Determinations	NMFS 1998e.
Lower Columbia River chinook ESU	Threatened	1999	69 FR 33102; 06/14/04 (Proposed rule)	NMFS 1999c.
			64 FR 14308; 03/24/99 (Final rule)	
			63 FR 11482; 03/09/1998 (Proposed rule)	
			Critical Habitat Designations	
			68 FR 55900; 09/29/2003 (removal)	
			65 FR 7764; 02/16/2000 (Final rule)	
			63 FR 11482; 03/09/1998 (Proposed rule)	
			Listing Determinations	
			69 FR 33102; 06/14/04 (Proposed rule)	
			64 FR 14308; 03/24/99 (Final rule)	
			63 FR 11482; 03/09/1998 (Proposed rule)	
			Critical Habitat Designations	
			68 FR 55900; 09/29/2003 (removal)	NMFS 1998b.
			65 FR 7764; 02/16/2000 (Final rule)	NMFS 1998e.
Upper Columbia River spring-run chinook ESU.	Endangered.	1999	63 FR 11482; 03/09/1998 (Proposed rule)	NMFS 1998c.
			Listing Determinations	
			69 FR 33102; 06/14/04 (Proposed NMFS 1999c rule)	
			64 FR 14308; 03/24/99 (Final rule)	
			63 FR 11482; 03/09/1998 (Proposed rule)	
			Critical Habitat Designations	
			68 FR 55900; 09/29/2003 (removal)	NMFS 1998b.
			65 FR 7764; 02/16/2000 (Final rule)	NMFS 1998e.
Puget Sound chinook ESU	Threatened.	1999	63 FR 11482; 03/09/1998 (Proposed rule)	NMFS 1999c.
			Listing Determinations	
			69 FR 33102; 06/14/04 (Proposed rule)	
			63 FR 1807; 0/12/1998 (Proposal withdrawn)	
			59 FR 66784; 12/28/1994 (Proposed rule)	
			59 FR 42529; 08/18/1994 (Emergency rule)	
			57 FR 23458; 06/03/1992 (Correction)	
			57 FR 14653; 04/22/1992 (Final rule)	
			56 FR 29547; 06/27/1991 (Proposed rule)	NMFS 1991c.
Snake River fall-run chinook ESU	Threatened	1992	*Critical Habitat Designations*	NMFS 1999d.
			58 FR 68543; 12/28/1993 (Final rule)	
			57 FR 57051; 12/02/1992 (Proposed rule)	
			Listing Determinations	
			69 FR 33102; 06/14/04 (Proposed rule)	
			63 FR 1807; 0/12/1998 (Proposal withdrawn)	
			59 FR 66784; 12/28/1994 (Proposed rule)	
			59 FR 42529; 08/18/1994 (Emergency rule)	
			57 FR 23458; 06/03/1992 (Correction)	
			57 FR 34639; 04/22/92 (Final rule)	
			56 FR 29542; 06/27/1991 (Proposed rule)	
			Critical Habitat Designations	
			58 FR 68543; 12/28/1993 (Final rule)	NMFS 1991b.
Snake River spring/summer-run chinook ESU.	Threatened	1992	57 FR 57051; 12/02/1992 (Proposed rule)	NMFS 1998b.
			Listing Determinations	
			69 FR 33102; 06/14/04 (Proposed rule)	
			61 FR 56138;–10/31/1996 (Final rule)	
			60 FR 38011; 07/25/1995 (Proposed rule)	
			Critical Habitat Designations	
			64 FR 24049; 05/05/1999 (Final rule)	Bryant 1994.
Central California Coast coho ESU	Threatened	1996	62 FR 62791; 11/25/1997 (Proposed rule)	NMFS 1995a.

TABLE 1.—SUMMARY OF PREVIOUS ESA LISTING ACTIONS AND CRITICAL HABITAT DESIGNATIONS FOR WEST COAST SALMON AND *O. Mykiss*—Continued

Evolutionarily significant unit (ESU)	Current endangered species Act (ESA) status	Year listed	Previous ESA listing determinations and critical habitat designations—**Federal Register** citations	Previous scientific viability reviews and updates
Southern Oregon/Northern California Coast	Threatened	1997	*Listing Determinations* 69 FR 33102; 06/14/04 (Proposed rule) 62 FR 24588; 05/06/1997 (Final rule) 60 FR 38011; 07/25/1995 (Proposed rule) *Critical Habitat Designations* 64 FR 24049; 05/05/1999 (Final rule) 62 FR 62791; 11/25/1997 (Proposed rule)	NMFS 1997a. NMFS1996c. NMFS 1996e. NMFS 1995a.
Oregon Coast coho ESU	Proposed Threatened*	1998	*Listing Determinations* 69 FR 33102; 06/14/04 (Proposed rule) 69 FR 19975; 04/15/2004 (Candidate list) 63 FR 42587; 08/10/1998 (Final rule) 62 FR 24588; 05/06/1997 (Proposal withdrawn) 61 FR 56138;10/31/1996 (6 mo. extension) 60 FR 38011; 07/25/1995 (Proposed rule) *Critical Habitat Designations* 68 FR 55900; 09/29/2003 (removal) 65 FR 7764; 02/16/2000 (Final rule) 64 FR 24998; 0510/1999 (Proposed rule)	NMFS 1997a. NMFS 1996b. NMFS 1996d. NMFS 1995a.
Lower Columbia River coho ESU	Proposed Threatened	1995	*Listing Determinations* 69 FR 33102; 06/14/04 (Proposed rule) 69 FR 19975; 04/15/2004 (Candidate list) 60 FR 38011; 07/25/1995 (Not warranted) *Critical Habitat Designations* n/a	NMFS 1996e. NMFS 1995a. BNFS 1991a.
Columbia River chum ESU	Threatened	1999	*Listing Determinations* 69 FR 33102; 06/14/04 (Proposed rule) 64 FR 14508; 03/25/1999 (Final rule) 63 FR 11774; 03/10/1998 (Proposed rule) *Critical Habitat Designations* 68 FR 55900; 09/29/2003 (removal) 65 FR 7764; 02/16/2000 (Final rule) 63 FR 11774; 03/10/1998 (Proposed rule)	NMFS 1997e. NMFS 1999b. NMFS 1999c.
Hood Canal summer-run chum ESU	Threatened	1999	*Listing Determinations* 69 FR 33102; 06/14/04 (Proposed rule) 64 FR 14508; 03/25/1999 (Final rule) 63 FR 11774; 03/10/1998 (Proposed rule) *Critical Habitat Designations* 68 FR 55900; 09/29/2003 (removal) 65 FR 7764; 02/16/2000 (Final rule) 63 FR 11774; 03/10/1998 (Proposed rule)	NMFS 1996d. NMFS 1997e. NMFS 1999b. NMFS 1999c.
Southern California *O. mykiss*+ ESU	Endangered	1997	*Listing Determinations* 69 FR 33102; 06/14/04 (Proposed rule) 67 FR 21568; 05/01/2002 (Redefinition of ESU) 62 FR 43937; 08/18/1997 (Final rule) 61 FR 41541; 08/09/1996 (Proposed rule) *Critical Habitat Designations* 68 FR 55900; 09/29/2003 (removal) 65 FR 7764; 02/16/2000 (Final rule) 64 FR 5740; 03/10/1999 (Proposed rule)	NMFS 1996b NMFS 1997b.
South-Central California Coast *O. mykiss* ESU	Threatened	1997	*Listing Determinations* 69 FR 33102; 06/14/04 (Proposed rule) 62 FR 43937; 08/18/1997 (Final rule) 61 FR 41541; 08/09/1996 (Proposed rule) *Critical Habitat Designations* 68 FR 55900; 09/29/2003 (removal) 65 FR 7764; 02/16/2000 (Final rule) 64 FR 5740; 03/10/1999 (Proposed rule)	NMFS 1996b. NMFS 1997b.
			Listing Determinations 69 FR 33102; 06/14/04 (Proposed rule) 62 FR 43937; 08/18/1997 (Final rule) 61 FR 41541; 08/09/1996 (Proposed rule) *Critical Habitat Designations* 68FR 55900; 09/29/2003 (removal)	

TABLE 1.—SUMMARY OF PREVIOUS ESA LISTING ACTIONS AND CRITICAL HABITAT DESIGNATIONS FOR WEST COAST SALMON AND *O. Mykiss*—Continued

Evolutionarily significant unit (ESU)	Current endangered species Act (ESA) status	Year listed	Previous ESA listing determinations and critical habitat designations—**Federal Register** citations	Previous scientific viability reviews and updates
			65 FR 7764; 02/16/2000 (Final rule)	NMFS 1996b.
Central California Coast *O. mykiss* ESU	Threatened	1997	64 FR 5740; 03/10/1999 (Proposed rule)	NMFS 1997b.
			Listing Determinations	
			69 FR 33102; 6/14/04 (Proposed rule)	NMFS 1996b.
			63 FR 13347; 03/19/1998 (Final rule)	NMFS 1997b.
			62 FR 43974; 08/18/1997 (6 mo. extension).	NMFS 1997c.
			61 FR 41541; 08/09/1996 (Proposed rule)	NMFS 1997d.
California Central Valley *O. mykiss* ESU	Threatened	1998	*Critical Habitat Designations*	NMFS 1998a.
			68 FR 55900; 09/29/2003 (removal)	
			65 FR 7764; 02/16/2000 (Final rule)	
			64 FR 5740; 03/10/1999 (Proposed rule)	
			Listing Determinations	
			69 FR 33102; 06/14/04 (Proposed rule)	
			65 FR 36074; 06/07/2000 (Final rule)	
			65 FR 6960; 02/11/2000 (Proposed rule)	
			63 FR 13347; 03/19/1998 (Not Warranted)	
			62 FR 43974; 08/18/1997 (6 mo. extension)	NMFS 1996b.
			61 FR 41541; 08/09/1996 (Proposed rule)	NMFS 1997c.
			Critical Habitat Designations	NMFS 1998a.
Northern California *O. mykiss* ESU	Threatened	2000	n/a	NMFS 2000
			Listing Determinations	
			69 FR 33102; 06/14/04 (Proposed rule)	
			64 FR 14517; 03/25/1999 (Final rule)	
			63 FR 11798; 03/10/1998 (Proposed rule)	
			62 FR 43974; 08/18/1997 (6 mo. extension)	
			61 FR 41541; 08/09/1996 (Proposed rule)	
			Critical Habitat Designation	NMFS 1996b.
			68 FR 55900; 09/29/2003 (removal)	NMFS 1997d.
			65 FR 7764; 02/16/2000 (Final rule)	NMFS 1999a.
Upper Willamette River *O. mykiss* ESU	Threatened	1999	64 FR 5740; 03/10/1999 (Proposed rule)	NMFS 1999c.
			Listing Determinations	
			69 FR 33102; 06/14/04 (Proposed rule)	
			63 FR 13347; 03/19/1998 (Final rule)	
			62 FR 43974; 08/18/1997 (6 mo. extension)	
			61 FR 41541; 08/09/1996 (Proposed rule)	
			Critical Habitat Designations	NMFS 1996b.
			68 FR 55900; 09/29/2003 (removal)	NMFS 1997c.
			65 FR 7764; 02/16/2000 (Final rule)	NMFS 1997d.
Lower Columbia River *O. mykiss* ESU	Threatened	1998	64 FR 5740; 03/10/1999 (Proposed rule)	NMFS 1998a.
			Listing Determinations	
			69 FR 33102; 06/14/04 (Proposed rule)	
			64 FR 14517; 03/25/1999 (Final rule)	
			63 FR 11798; 03/10/1998 (Proposed rule)	
			62 FR 43974; 08/18/1997 (6 mo. extension)	
			61 FR 41541; 08/09/1996 (Proposed rule)	
			Critical Habitat Designations	NMFS 1996b.
			68 FR 55900; 09/29/2003 (removal	NMFS 1997d.
			65 FR 7764; 02/16/2000 (Final rule)	NMFS 1999a.
Middle Columbia River *O. mykiss* ESU	Threatened	1999	64 FR 5740; 03/10/1999 (proposed rule)	NMFS 1999c.
			Listing Determinations	
			69 FR 33102; 06/14/04 (Proposed rule)	
			62 FR 43974; 08/18/1997 (Final rule)	
			61 FR 41541; 08/09/1996 (Proposed rule)	
			Critical Habitat Designations	
			68 FR 55900; 09/29/2003 (removal)	
			65 FR 7764; 02/16/2000 (Final rule)	NMFS 1996b.
Upper Columbia River *O. mykiss* ESU	Endangered	1997	64 FR 5740; 03/10/1999 (Proposed rule)	NMFS 1997b.
			Listing Determinations	
			69 FR 33102; 06/14/04 (Proposed rule)	
			62 FR 43937; 08/18/1997 (Final rule)	
			61 FR 41541; 08/09/1996 (Proposed rule)	
			Critical Habitat Designations	
			68 FR 55900; 09/29/2003 (removal)	

TABLE 1.—SUMMARY OF PREVIOUS ESA LISTING ACTIONS AND CRITICAL HABITAT DESIGNATIONS FOR WEST COAST SALMON AND *O. Mykiss*—Continued

Evolutionarily significant unit (ESU)	Current endangered species Act (ESA) status	Year listed	Previous ESA listing determinations and critical habitat designations—**Federal Register** citations	Previous scientific viability reviews and updates
Snake River Basin *O. mykiss* ESU	Threatened	1997	65 FR 7764; 02/16/2000 (Final rule) 64 FR 5740; 03/10/1999 (Proposed rule)	NMFS 1996b. NMFS 1997b.

* Previously listed as a ''threatened'' species (63 FR 42587, August 10, 1998). Threatened listing set aside in *Alsea Valley Alliance* v. *Evans (Alsea Valley Alliance v. Evans,* 161 F.Supp.2d 1154 (D.Or.2001), *appeals dismissed* 358 F.3d 1181 (9th Cir. 2004).
+ *O. mykiss* ESUs include both anadromous ''steelhead'' and resident ''rainbow trout'' in certain areas (see 69 FR 33101; July 14, 2004).

On February 16, 2000, NMFS published final critical habitat designations for 19 ESUs, thereby completing designations for all 25 ESUs listed at the time (65 FR 7764). The 19 designations included more than 150 river subbasins in Washington, Oregon, Idaho, and California. Within each occupied subbasin, we designated as critical habitat those lakes and river reaches accessible to listed fish along with the associated riparian zone, except for reaches on Indian land. Areas considered inaccessible included areas above long-standing natural impassable barriers and areas above impassable dams, but not areas above ephemeral barriers such as failed culverts.

In considering the economic impact of the February 16, 2000, action, NMFS determined that the critical habitat designations would impose very little or no additional requirements on Federal agencies beyond those already associated with the listing of the ESUs themselves. NMFS reasoned that since it was designating only occupied habitat, there would be few or no actions that destroy or adversely modify critical habitat that did not also jeopardize the continued existence of the species. Therefore, the agency reasoned that there would be no economic impact as a result of the designations (65 FR 7764, 7765; February 16, 2000).

The National Association of Homebuilders (NAHB) challenged the designations in District Court in Washington, DC on the grounds that he agency did not adequately consider economic impacts of the critical habitat designations (*National Association of Homebuilders* v. *Evans*, 2002 WL 1205743 No. 00–CV–2799 (D.D.C.)). NAHB also challenged NMFS' designation of Essential Fish Habitat (EFH) (Pacific Coast Salmon Fishery Management Plan, 2000). While the NAHB litigation was pending, the Court of Appeals for the 10th Circuit issued its decision in *New Mexico Cattlegrowers' Association* v. *U.S. Fish and Wildlife Service*, 248 F.3d 1277 (10th Cir. 2001) (*NMCA*). In that case, the Court rejected the U.S. Fish and Wildlife Service (FWS) approach to economic analysis, which was similar to the approach taken by NMFS in the final rule designating critical habitat for 19 ESUs of West Coast salmon and *O. mykiss.* The Court ruled that ''Congress intended that the FWS conduct a full analysis of all of the economic impacts of a critical habitat designation, regardless of whether those impacts are attributable co-extensively to other causes.'' Subsequent to the 10th Circuit decision, we entered into and sought judicial approval of a consent decree resolving the NAHB litigation. That decree provided for the withdrawal of critical habitat designations for the 19 Pacific salmon and *O. mykiss* ESUs and dismissed NAHB's challenge to the EFH designations. The District Court approved the consent decree and vacated the critical habitat designations by Court order on April 30, 2002 (*National Ass'n of Homebuilders* v. *Evans*, 2002 WL 1205743 (D.D.C. 2002)).

Subsequently, in response to a complaint filed in the District of Columbia by the Pacific Coast Federation of Fishermen's Associations, Institute for Fisheries Resources, the Center for Biological Diversity, the Oregon Natural Resources Council, the Pacific Rivers Council, and the Environmental Protection Information Center (PCFFA *et al.*) alleging that NMFS had failed to timely designate critical habitat for the 19 ESUs for which critical habitat had been vacated (as well as the Northern California *O. mykiss* ESU), PCFFA and NMFS filed—and the court approved—an agreement resolving that litigation and establishing a schedule for designation of critical habitat. On July 13, 2004, the D.C. District Court approved an amendment to the Consent Decree and Stipulated Order of Dismissal providing for a revised schedule for the submission of proposed and final rules designating critical habitat for the 20 ESUs to the **Federal Register**. For those ESUs that are included on the list of threatened and endangered species as of September 30, 2004, and which fall under the responsibility of the Northwest Regional office of NMFS, proposed rules must be submitted to the **Federal Register** no later than September 30, 2004. For those ESUs that are included on the list of threatened and endangered species as of November 30, 2004, and which fall under the responsibility of NMFS's Southwest Regional office, proposed rules must be submitted to the **Federal Register** for publication no later than November 30, 2004. For those of the 20 ESUs addressed in the proposed rules and included on the lists of threatened and endangered species as of June 15, 2005, final rules must be submitted to the **Federal Register** for publication no later than June 15, 2005. On September 17, 2004, NMFS filed a motion with the Court seeking an additional 60-day extension of the deadline for submitting to the **Federal Register** a proposed rule for the 13 ESUs subject to the September 30, 2004, deadline. On October 7, 2004, the court granted the motion.

Past critical habitat designations have generated considerable public interest. Therefore, in an effort to engage the public early in this rulemaking process, we published an advance notice of proposed rulemaking (ANPR) on September 29, 2003 (68 FR 55926). The ANPR identified issues for consideration and evaluation, and solicited comments regarding these issues and information regarding the areas and species under consideration. We received numerous comments in response to the ANPR and considered them during development of this proposed rulemaking. Where applicable we have referenced these comments in this **Federal Register** document as well as in other documents supporting this proposed rule. We encourage those who submitted comments on the ANPR to review and comment on this proposed rule as well. We will address all comments in the final rule.

Methods and Criteria Used to Identify Proposed Critical Habitat

Salmon Life History

Pacific salmon are anadromous fish, meaning adults migrate from the ocean to spawn in freshwater lakes and streams where their offspring hatch and rear prior to migrating back to the ocean to forage until maturity. The migration and spawning times vary considerably across and within species and populations (Groot and Margolis, 1991). At spawning, adults pair to lay and fertilize thousands of eggs in freshwater gravel nests or ''redds'' excavated by females. Depending on lake/stream temperatures, eggs incubate for several weeks to months before hatching as ''alevins'' (a larval life stage dependent on food stored in a yolk sac). Following yolk sac absorption, alevins emerge from the gravel as young juveniles called ''fry'' and begin actively feeding. Depending on the species and location, juveniles may spend from a few hours to several years in freshwater areas before migrating to the ocean. The physiological and behavioral changes required for the transition to salt water result in a distinct ''smolt'' stage in most species. On their journey juveniles must migrate downstream through every riverine and estuarine corridor between their natal lake or stream and the ocean. For example, smolts from Idaho will travel as far as 900 miles from the inland spawning grounds. En route to the ocean the juveniles may spend from a few days to several weeks in the estuary, depending on the species. The highly productive estuarine environment is an important feeding and acclimation area for juveniles preparing to enter marine waters.

Juveniles and subadults typically spend from 1 to 5 years foraging over thousands of miles in the North Pacific Ocean before returning to spawn. Some species, such as coho and chinook salmon, have precocious life history types (primarily male fish known as ''jacks'') that mature and spawn after only several months in the ocean. Spawning migrations known as ''runs'' occur throughout the year, varying by species and location. Most adult fish return or ''home'' with great fidelity to spawn in their natal stream, although some do stray to non-natal streams. Salmon species die after spawning, while anadromous *O. mykiss* may return to the ocean and make repeat spawning migrations. This complex life cycle gives rise to complex habitat needs, particularly during the freshwater phase (see review by Spence *et al.*, 1996). Spawning gravels must be of a certain size and free of sediment to allow successful incubation of the eggs. Eggs also require cool, clean, and well-oxygenated waters for proper development. Juveniles need abundant food sources, including insects, crustaceans, and other small fish. They need places to hide from predators (mostly birds and bigger fish), such as under logs, root wads and boulders in the stream, and beneath overhanging vegetation. They also need places to seek refuge from periodic high flows (side channels and off channel areas) and from warm summer water temperatures (coldwater springs and deep pools). Returning adults generally do not feed in fresh water but instead rely on limited energy stores to migrate, mature, and spawn. Like juveniles, they also require cool water and places to rest and hide from predators. During all life stages salmon require cool water that is free of contaminants. They also require rearing and migration corridors with adequate passage conditions (water quality and quantity available at specific times) to allow access to the various habitats required to complete their life cycle.

The homing fidelity of salmon has created a meta-population structure with distinct populations distributed among watersheds (McElhany *et al.*, 2000). Low levels of straying result in regular genetic exchange among populations, creating genetic similarities among populations in adjacent watersheds. Maintenance of the meta-population structure requires a distribution of populations among watersheds where environmental risks (*e.g.*, from landslides or floods) are likely to vary. It also requires migratory connections among the watersheds to allow for periodic genetic exchange and alternate spawning sites in the case that natal streams are inaccessible due to natural events such as a drought or landslide.

Identifying the Geographical Area Occupied by the Species and Specific Areas within the Geographical Area

In past critical habitat designations, NMFS had concluded that the limited availability of species distribution data prevented mapping salmonid critical habitat at a scale finer than occupied river basins (65 FR 7764; February 16, 2000). Therefore, the 2000 designations defined the ''geographical area occupied by the species at the time of listing'' as all accessible river reaches within the current range of the listed species. Comments received on the ANPR expressed a range of opinions about the appropriate scale for defining occupied areas; many expressed concern that the 2000 designations were overly broad and inclusive and encouraged us to use a finer scale in designating critical habitat for salmon.

In the 2000 designations, NMFS relied on the U.S. Geological Survey's (USGS) identification of subbasins, which was the finest scale mapped by USGS at that time, to define the ''specific areas'' within the geographical area occupied by the species. The subbasin boundaries are based on an area's topography and hydrography, and USGS has developed a uniform framework for mapping and cataloging drainage basins using a unique hydrologic unit code (HUC) identifier (Seaber *et al.* 1986). The code contains separate two-digit identifier fields wherein the first two digits refer to a region comprising a relatively large drainage area (*e.g.*, Region 17 for the entire Pacific Northwest), while subsequent fields identify smaller nested drainages. Under this convention, fourth field hydrologic units contain eight digits and are commonly referred to as ''HUC4s'' or ''subbasins.'' In the 2000 designations, therefore, we identified as critical habitat all areas accessible to listed salmon within an occupied HUC4 subbasin. Since the critical habitat designations in 2000, additional scientific information in the Pacific Northwest has significantly improved our ability to identify freshwater and estuarine areas occupied by salmonids and to group the occupied stream reaches into finer scale ''specific areas'' in the states of Washington, Oregon, and Idaho.

In the Pacific Northwest, we can now be somewhat more precise about the ''geographical area occupied by the species'' because Federal, state, and tribal fishery biologists in the northwest have made progress mapping actual species distribution at the level of stream reaches. The current mapping identifies occupied stream reaches where the species has been observed. It also identifies stream reaches where the species is presumed to occur based on the professional judgement of biologists familiar with the watershed. However, such presumptions may not be sufficiently rigorous or consistent to support a critical habitat designation. Much of these data can now be accessed and analyzed using geographic information systems (GIS) to produce consistent and fine-scale maps. As a result, nearly all salmonid freshwater and estuarine habitats in Washington, Oregon, and Idaho are now mapped and available in GIS at a scale of 1:24,000. Previous distribution data were often compiled at a scale of 1:100,000 or greater.

In California, similar fine-scale species distribution mapping efforts have not been conducted by Federal, State or tribal co-managers on the scale that was needed for the critical habitat designation effort, and therefore, maps of species distribution were not available for the seven ESUs addressed in this rulemaking. Given the need to identify and map occupied habitat more precisely and the lack of fine-scale species distribution mapping in California, the Southwest Regional office embarked on a major effort to compile available information on species distribution, habitat use, and other parameters, and develop species distribution and habitat use maps for all seven ESUs. In order to make this effort manageable, data were compiled for stream hydrography at a scale of 1:100,000 rather than the 1:24,000 scale of data that were available in the Pacific Northwest. Fishery biologists in the Southwest Region were organized into a series of teams tasked with compiling and organizing information available in the literature, from Federal and state agencies, and personal knowledge, regarding the spatial distribution, habitat use (*i.e.* spawning, rearing, and/ or migration) and habitat quality on a stream reach basis for each of the seven ESUs in California. This information was organized into a series of databases and then converted to GIS data layers for the analysis of data and generation of distribution maps. The current mapping identifies occupied stream reaches where the various ESUs have been observed, and also identifies stream reaches where the ESUs are presumed to occur based on the professional judgement of biologists familiar with the watersheds. As in the Northwest, such presumptions, however, may not be sufficiently rigorous or consistent to support a critical habitat designation, and we therefore solicit information as to which stream reaches are actually occupied by the various ESUs addressed in this rule. We made use of these finer scale data for the critical habitat designations for the seven California ESUs, and now believe they enable us to make a more accurate delineation of the ''geographical area occupied by the species'' referred to in the ESA definition of critical habitat. The final critical habitat designations will be based on the final listing decisions for these ESUs due by June 2005 and thus will reflect occupancy ''at the time of listing'' as the ESA requires.

NMFS is now able to also identify ''specific areas'' (section 3(5)(a)) and ''particular areas'(section 4(b)(2)) for ESUs in the Pacific Northwest (Oregon, Washington and Idaho) at a finer scale than in 2000. Since 2000, various Federal agencies in the Pacific Northwest have identified fifth field hydrologic units (referred to as ''HUC5s'' or hereafter ''watersheds'') throughout the Pacific Northwest using the USGS mapping conventions referred to above. This information is now generally available from these agencies and via the internet (California Spatial Information Library, 2004; Interior Columbia Basin Ecosystem Management Project, 2003; Regional Ecosystem Office, 2004). For ESUs in the Pacific Northwest, the agency used this information to organize critical habitat information systematically and at a scale that is relevant to the spatial distribution of salmon. Organizing information at this scale is especially relevant to salmonids, since their innate homing ability allows them to return to the watersheds where they were born. Such site fidelity results in spatial aggregations of salmonid populations that generally correspond to the area encompassed by subbasins or HUC5 watersheds (Washington Department of Fisheries *et al.*, 1992; Kostow, 1995; McElhany *et al.*, 2000).

In California, it was not possible to use the USGS's HUC5 watershed framework to organize the biological and other types of information since HUC5s have not been delineated for the entire geographical area occupied by the seven ESUs addressed in this rulemaking. The Southwest Region, therefore, used the State of California's CALWATER watershed classification system (version 2.2), which is similar to the USGS watershed classification system, to organize biological and other types of information. Under the CALWATER watershed classification system, geographic units range from hydrologic regions (the largest) to planning watersheds (the smallest). For the purposes of this critical habitat designation analysis, biological and other types of information were organized primarily by hydrologic subareas (HSAs) that generally correspond to major tributary watersheds and are roughly equivalent in size to USGS HUC5s. These smaller HSA watersheds were then aggregated into larger geographic units called hydrologic units that correspond to major watersheds or sub-regions for purposes of describing critical habitat for each of the seven ESUs in California. However, it must be recognized that even the CALWATER HSA watershed units used for the designations in California are very broad units, often containing several different populations of salmonids which may in fact be largely independent of each other.We therefore solicit information on ways to further improve the geographic precision of our habitat analyis.

Both the USGS and CALWATER systems map watershed units as polygons that bound a drainage area and encompass streams, riparian areas and uplands. Within the boundaries of any such watershed unit (HUC5 or HSA), there are stream reaches not occupied by the species. Land areas within the HUC5 or HSA boundaries are also generally not ''occupied'' by the species (though certain areas such as flood plains or side channels may be occupied at some times of some years). In California, we used the HSA watershed boundaries as a basis for aggregating occupied stream reaches and to delineate ''specific'' areas occupied by the species. This document generally refers to the occupied stream reaches within the watershed boundary as the ''habitat area'' to distinguish it from the entire area encompassed by the watershed boundary.

At the same time, the ESA requires that an area cannot be designated as critical habitat unless at the time of listing it contains physical or biological features essential to the conservation of the species. The ESA does not permit an area lacking such features to be designated as critical habitat in the hope that it may over time acquire such features and therefore aid in the conservation of the species.

The HSA watershed-scale aggregation of stream reaches also allowed us to analyze the impacts of designating a ''particular area,'' as required by ESA section 4(b)(2). As a result of watershed processes, many activities occurring in riparian or upland areas and in non-fish-bearing streams may affect the physical or biological features essential to conservation in the occupied stream reaches. The watershed boundary thus describes an area in which Federal activities have the potential to affect critical habitat (Spence *et al.* 1996). Using HSA watershed boundaries for the economic analysis ensured that all potential economic impacts were considered. Section 3(5) defines critical habitat in terms of ''specific areas,'' and section 4(b)(2) requires the agency to consider certain factors before designating ''particular areas.'' In the case of Pacific salmonids, the biology of the species, the characteristics of its habitat, the nature of the impacts and the limited information currently available at finer geographic scales made it appropriate to consider ''specific areas'' and ''particular areas'' as the same unit.

In addition, HSA watersheds are consistent with the scale of recovery efforts for West Coast salmon. In its review of the long-term sustainability of Pacific Northwest salmonids, the National Research Council's Committee on Protection and Management of Pacific Northwest Anadromous Salmonids concluded that ''habitat protection must be coordinated at landscape scales appropriate to salmon life histories' and that social structures and institutions ''must be able to operate at the scale of watersheds'' (National Research Council, 1996). Watershed-level analyses are now common throughout the West Coast (Forest Ecosystem Management Assessment Team, 1993; Montgomery *et al.*, 1995; Spence *et al.*, 1996). The recent recovery strategy developed for coho salmon in California by the California Department of Fish and Game (CDFG, 2004) organized its watershed assessment and recovery recommendations on the basis of CALWATER HSA watersheds. There are presently more than 400 watershed councils or groups in Washington, Oregon, and California alone (For the Sake of the Salmon, 2004). Many of these groups operate at a geographic scale of one to several watersheds and are integral parts of larger-scale salmon recovery strategies (Northwest Power Planning Council, 1999; Oregon Plan for Salmon and Watersheds, 2001; Puget Sound Shared Strategy, 2002; CALFED Bay-Delta Program, 2003). Aggregating stream reaches into watersheds allowed us to consider ''specific areas,'' within or outside the geographical area occupied by the species, at a scale that often corresponds well to salmonid population structure and ecological processes.

Occupied estuarine and marine areas were also considered with regard to the seven ESUs in California. In previous designations of salmonid critical habitat the agency did not designate marine areas outside of estuaries and Puget Sound. In the Pacific Ocean, we concluded that there may be essential habitat features, but that they did not require special management considerations or protection (see *Physical or Biological Features Essential to the Conservation of the Species* and *Special Management Considerations or Protection* sections below). Several commenters on that previous rule questioned the finding, and we stated that we would revisit the issue (65 FR 7764; February 16, 2000). Since that time we have considered the best available scientific information, and related agency actions, such as the designation of Essential Fish Habitat under the Magnuson-Stevens Fishery Conservation and Management Act.

We now conclude that it is possible to delineate some estuarine areas in California (*e.g.*, the San Francisco-San Pablo-Suisun Bay complex, Humboldt Bay, and Morro Bay) that are occupied and contain essential habitat features that may require special management considerations or protection. Such estuarine areas are crucial for juvenile salmonids, given their multiple functions as areas for rearing/feeding, freshwater-saltwater acclimation, and migration (Simenstad *et al.*, 1982; Marriott *et al.* 2002). In many areas, especially the San Francisco Bay estuary, these habitats are occupied by multiple ESUs. Accordingly, we are proposing to designate specific occupied estuarine areas as defined by a line connecting the furthest land points at the estuary mouth.

Nearshore coastal marine areas may provide important habitat for rearing/feeding and migrating salmonids in California; however, we were not able to identify essential habitat features or conclude that such areas require special management considerations or protection.

For salmonids in marine areas farther offshore, it becomes more difficult to identify specific areas where essential habitat can be found. Links between human activity, habitat conditions and impacts to listed salmonids are less direct in offshore marine areas. Perhaps the closest linkage exists for salmon prey species that are harvested commercially (*e.g.*, Pacific herring) and, therefore, may require special management considerations or protection. However, because salmonids are opportunistic feeders we could not identify ''specific areas'' beyond the nearshore marine zone where these or other essential features are found within this vast geographic area occupied by Pacific salmon. Moreover, prey species move or drift great distances throughout the ocean and would be difficult to link to any ''specific'' areas.

Unoccupied Areas

ESA section 3(5)(A)(ii) defines critical habitat to include ''specific areas outside the geographical area occupied'' if the areas are determined by the Secretary to be ''essential for the conservation of the species.'' NMFS regulations at 50 CFR 424.12(e) emphasize that we ''shall designate as critical habitat areas outside the geographical area presently occupied by a species only when a designation limited to its present range would be inadequate to ensure the conservation of the species.'' NMFS regulations at 50 CFR 424.12(e) emphasize that we ''shall designate as critical habitat areas outside the geographical area presently occupied by a species only when a designation limited to its present range would be inadequate to ensure the conservation of the species.'' We are not proposing to designate any areas not occupied at the time of listing; however, within the range of some ESUs, we have identified unoccupied areas which may be essential to their conservation, and we seek public comment on this issue.

Primary Constituent Elements and Physical or Biological Features Essential to the Conservation of the Species

In determining what areas are critical habitat, agency regulations at 50 CFR 424.12(b) require that we must ''consider those physical or biological features that are essential to the conservation of a given species including space for individual and population growth and for normal behavior; food, water, air, light, minerals, or other nutritional or physiological requirements; cover or shelter; sites for breeding, reproduction, and rearing of offspring; and habitats that are protected from disturbance or are representative of the historical geographical and ecological distribution of a species.'' The regulations further direct us to ''focus on the principal biological or physical constituent elements * * * that are essential to the conservation of the species,'' and specify that the ''known primary constituent elements shall be listed with the critical habitat description.'' The regulations identify primary constituent elements (PCE) as including, but not limited to: ''roost sites, nesting grounds, spawning sites, feeding sites, seasonal wetland or dryland, water quality or quantity, host species or plant pollinator, geological formation, vegetation type, tide, and specific soil types.'' An area must contain one or more PCEs at the time the species is listed to be eligible for designation as critical habitat; an area lacking a PCE may not be designated in the hope it will acquire one or more PCEs in the future.

NMFS biologists developed a list of PCEs specific to salmon for the ANPR (68 FR 55926; September 29, 2003), based on a decision matrix (NMFS, 1996) that describes general parameters and characteristics of most of the essential features under consideration in this critical habitat designation. As a result of biological assessments supporting this proposed rule (see Critical Habitat Analytical Review

Teams section), we are now proposing slightly revised PCEs.

The ESUs addressed in this proposed rulemaking share many of the same rivers and estuaries and have similar life history characteristics and, therefore, many of the same PCEs. These PCEs include sites essential to support one or more life stages of the ESU (sites for spawning, rearing, migration and foraging). These sites in turn contain physical or biological features essential to the conservation of the ESU (for example, spawning gravels, water quality and quantity, side channels, forage species). Specific types of sites and the features associated with them include:

1. Freshwater spawning sites with water quantity and quality conditions and substrate supporting spawning, incubation and larval development;

2. Freshwater rearing sites with water quantity and floodplain connectivity to form and maintain physical habitat conditions and support juvenile growth and mobility; water quality and forage supporting juvenile development; and natural cover such as shade, submerged and overhanging large wood, log jams and beaver dams, aquatic vegetation, large rocks and boulders, side channels, and undercut banks;

3. Freshwater migration corridors free of obstruction with water quantity and quality conditions and natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, side channels, and undercut banks supporting juvenile and adult mobility and survival;

4. Estuarine areas free of obstruction with water quality, water quantity, and salinity conditions supporting juvenile and adult physiological transitions between fresh- and saltwater; natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, and side channels; and juvenile and adult forage, including aquatic invertebrates and fishes, supporting growth and maturation.

5. Nearshore marine areas free of obstruction with water quality and quantity conditions and forage, including aquatic invertebrates and fishes, supporting growth and maturation; and natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, and side channels.

6. Offshore marine areas with water quality conditions and forage, including aquatic invertebrates and fishes, supporting growth and maturation.

The habitat areas designated in this proposal currently contain PCEs within the acceptable range of values required to support the biological processes for which the ESUs use the habitat. It is important to note that the contribution of the PCEs to the habitat varies by site and biological function, illustrating the interdependence of the habitat elements such that the quality of the elements may vary within a range of acceptable conditions. An area in which a PCE no longer exists because it has been degraded to the point where it no longer functions as a PCE cannot be designated in the hope that its function may be restored in the future.

Special Management Considerations or Protection

An occupied area cannot be designated as critical habitat unless it contains physical and biological features that ''may require special management considerations or protection.'' Agency regulations at 424.02(j) define ''special management considerations or protection'' to mean ''any methods or procedures useful in protecting physical and biological features of the environment for the conservation of listed species.'' Many forms of human activity have the potential to affect the habitat of listed salmon ESUs including: (1) Forestry; (2) grazing and other associated rangeland activities; (3) agriculture and associated water withdrawals for agriculture; (4) road building/maintenance; (5) channel modifications/diking/stream bank stabilization; (6) urbanization; (7) sand and gravel mining; (8) mineral mining; (9) dams; (10) irrigation impoundments and water withdrawals; (11) wetland loss/removal; (12) exotic/invasive species introductions; and (13) impediments to fish passage. In addition to these, the harvest of salmonid prey species (*e.g.*, herring, anchovy, and sardines) may present another potential habitat-related management activity (Pacific Fishery Management Council, 1999). In recent years the Federal government and many non-Federal landowners have adopted many changes in land and water management practices that are contributing significantly to protecting and restoring the habitat of listed species. Thus, many of the available special management considerations or protections for these areas are already in place and the need for designating such areas as critical habitat is diminished accordingly. We request comment on the extent to which particular areas may require special management considerations or protection in light of existing management constraints. The contributions of these management measures are also relevant to the exclusion analysis under section 4(b)(2) of the ESA, and will be considered further in a later section of this notice.

Military Lands

The Sikes Act of 1997 (Sikes Act) (16 U.S.C. 670a) required each military installation that includes land and water suitable for the conservation and management of natural resources to complete, by November 17, 2001, an Integrated Natural Resource Management Plan (INRMP). An INRMP integrates implementation of the military mission of the installation with stewardship of the natural resources found on the installation. Each INRMP includes: an assessment of the ecological needs on the installation, including the need to provide for the conservation of listed species; a statement of goals and priorities; a detailed description of management actions to be implemented to provide for these ecological needs; and a monitoring and adaptive management plan. Among other things, each INRMP must, to the extent appropriate and applicable, provide for fish and wildlife management, fish and wildlife habitat enhancement or modification, wetland protection, enhancement, and restoration where necessary to support fish and wildlife and enforcement of applicable natural resource laws.

The recent National Defense Authorization Act for Fiscal Year 2004 (Public Law 108–136) amended the ESA to limit areas eligible for designation as critical habitat. Specifically, section 4(a)(3)(B)(I) of the ESA (16 U.S.C. 1533(a)(3)(B)(I)) now provides: ''The Secretary shall not designate as critical habitat any lands or other geographical areas owned or controlled by the Department of Defense, or designated for its use, that are subject to an integrated natural resources management plan prepared under section 101 of the Sikes Act (16 U.S.C. 670a), if the Secretary determines in writing that such plan provides a benefit to the species for which critical habitat is proposed for designation.''

To address this new provision we contacted the Department of Defense (DOD) and requested information on all INRMPs that might benefit Pacific salmon. In response to the ANPR (68 FR 55926, September 29, 2003) we had already received a letter from the U.S. Marine Corps regarding this and other issues associated with a possible critical habitat designation on its facilities in the range of the Southern California *O. mykiss* ESU. In response to our request, the military services identified 25 installations in California with INRMPs in place or under development. Based on information provided by the military, as well as GIS analysis of fish distributional information compiled by NMFS'' Southwest Region (NMFS, 2004a) and land use data, we determined that the following facilities with INRMPs overlap with habitat areas under consideration for critical habitat designation in California: (1) Camp Pendleton Marine Corps Base; (2) Vandenberg Air Force Base; (3) Camp San Luis Obispo; (4) Camp Roberts; and (5) Mare Island Army Reserve Center. Two additional facilities are adjacent to, but do not appear to overlap with, habitat areas under consideration for critical habitat in California: (1) Naval Weapons Station, Seal Beach/Concord Detachment; and (2) Point Mugu Naval Air Station. None of the remaining facilities with INRMPs in place overlapped with or were adjacent to habitat under consideration for critical habitat based on the information available to us. All of these INRMPs are final except for the Vandenberg Air Force Base INRMP, which is expected to be finalized in the near term.

We identified habitat of value to listed salmonids in each INRMP and reviewed these plans, as well as other information available regarding the management of these military lands. Our preliminary review indicates that each of these INRMPs addresses habitat for salmonids, and all contain measures that provide benefits to ESA-listed salmon and steelhead. Examples of the types of benefits include actions that control erosion, protect riparian zones, minimize stormwater and construction impacts, reduce contaminants, and monitor listed species and their habitats. Also, we have received some information from the DOD identifying national security impacts at certain sites including the Camp Pendleton Marine Corps Base and Vandenberg Air Force Base. On the basis of this information, therefore, we are not proposing to designate critical habitat in areas subject to the final INRMPs or the draft INRMP for Vandenberg Air Force Base at this time.

Critical Habitat Analytical Review Teams

To assist in the designation of critical habitat, we convened several Critical Habitat Analytical Review Teams (Teams) organized by major geographic areas that roughly correspond to salmon recovery planning domains in California. The Teams consisted of NMFS fishery biologists from the Southwest Region with demonstrated expertise regarding salmonid habitat within the domain. The Teams were tasked with compiling and assessing biological information pertaining to areas under consideration for designation as critical habitat. Each Team worked closely with GIS specialists to develop maps depicting the spatial distribution of habitat occupied by each ESU and the use of occupied habitat on stream hydrography at a scale of 1:100,000.

The Teams examined each habitat area within the watershed to determine whether the stream reaches occupied by the species contain the physical or biological features essential to conservation. The Teams also relied on their experience conducting section 7 consultations to determine whether there are management activities in the area that threaten the currently existing primary constituent elements identified for the species. Where such activities occur, the Teams concluded that there were ''any methods or procedures useful in protecting physical and biological features'' for the area (50 CFR 424.02(j)), and therefore, that the features ''may require special management considerations or protection.''

However, the Teams were not asked to evaluate the effects of existing management protections on the species, or analyze the usefulness of protective methods or procedures in addressing risks to PCEs. Thus, the Teams' evaluations do not reflect the extent to which an area will contribute to conservation of the species in the absence of a critical habitat designation.

In addition to occupied areas, the definition of critical habitat also includes unoccupied areas if we determine that area is essential for conservation of a species. Accordingly the Teams were next asked whether there were any unoccupied areas within the historical range of the ESUs that may be essential for conservation. For the seven ESUs addressed in this rulemaking, the Teams did not have information available that would allow them to conclude that specific unoccupied areas were essential for conservation; however, in many cases they were able to identify areas they believed may be determined essential through future recovery planning efforts. These are identified under the Species Descriptions and Area Assessments section, and we are specifically requesting information regarding such areas under Public Comments Solicited.

The Teams were next asked to determine the relative conservation value of each occupied area or watershed for each ESU. The Teams scored each habitat area based on several factors related to the quantity and quality of the physical and biological features. They next considered each area in relation to other areas and with respect to the population occupying that area. Based on a consideration of the raw scores for each area, and a consideration of that area's contribution to conservation in relation to other areas and in relation to the overall population structure of the ESU, the Teams rated each habitat area as having a ''high,'' ''medium'' or ''low'' conservation value.

The rating of habitat areas as having a high, medium, or low conservation value provided information useful for the discretionary balancing consideration in ESA section 4(b)(2). The higher the conservation value for an area, the greater may be the likely benefit of the ESA section 7 protections. The correlation is not perfect because the Teams did not take the additional step of separately considering two factors: how likely are section 7 consultations in an area (that is, how strong is the ''Federal nexus''), and how much protection would exist in the absence of a section 7 consultation (that is, how protective are existing management measures and would they likely continue in the absence of section 7 requirements). We considered the Team's ratings one useful measure of the ''benefit of designating a particular area as critical habitat'' as contemplated in section 4(b)(2). We are soliciting public comments on approaches that would better refine this assessment.

As discussed earlier, the scale chosen in California for the ''specific area'' referred to in the definition of critical habitat was an HSA watershed as delineated by the CALWATER classification system. This delineation required us to adapt the approach for some areas. In particular, a large stream or river might serve as a rearing and migration corridor to and from many watersheds, yet be embedded itself in a watershed. In any given watershed through which it passes, the stream may have a few or several tributaries. For rearing/migration corridors embedded in a watershed, the Teams were asked to rate the conservation value of the watershed based on the tributary habitat. We assigned the rearing/migration corridor the rating of the highest-rated watershed for which it served as a rearing/migration corridor. The reason for this treatment of migration corridors is the role they play in the salmon's life cycle. Salmon are anadromous—born in fresh water, migrating to salt water to feed and grow, and returning to fresh water to spawn. Without a rearing/migration corridor to and from the sea, salmon cannot complete their life cycle. It would be illogical to consider a spawning and rearing area as having a particular conservation value and not consider the associated rearing/migration corridor as having a similar conservation value.

Preliminary ESU mapping results and some of the preliminary HSA watershed conservation assessments developed by the Teams were shared with the CDFG for review and comment. In some instances, their reviews and comments resulted in changes to the ESU distribution maps, and in some cases changes in the conservation assessments. Because of time constraints, however, this comanager review process was limited in duration and focused on identifying major discrepancies in the mapping products developed by the Teams. These revised preliminary assessments, along with this proposed rulemaking, will once again be made available to these comanagers, as well as the general public and peer reviewers, during the public comment period leading up to the final rule. The Teams will be reconvened to review the comments and any new information that might bear on their assessments before the agency publishes final critical habitat designations.

Lateral Extent of Critical Habitat

In past designations NMFS described the lateral extent of critical habitat in various ways ranging from fixed distances to ''functional'' zones defined by important riparian functions (65 FR 7764, February 16, 2000). Both approaches presented difficulties, and this was highlighted in several comments (most of which requested that we focus on aquatic areas only) received in response to the ANPR (68 FR 55926; September 29, 2003). Designating a set riparian zone width will (in some places) accurately reflect the distance from the stream on which PCEs might be found, but in other cases may over- or understate the distance. Designating a functional buffer avoids that problem, but makes it difficult for Federal agencies to know in advance what areas are critical habitat. To address these issues we are proposing to define the lateral extent of designated critical habitat as the width of the stream channel defined by the ordinary high-water line as defined by the U.S. Army Corps of Engineers (Corps) in 33 CFR 329.11. In areas for which the ordinary high-water line has not been defined pursuant 33 CFR 329.11, the width of the stream channel shall be defined by its bankfull elevation. Bankfull elevation is the level at which water begins to leave the channel and move into the floodplain (Rosgen, 1996) and is reached at a discharge which generally has a recurrence interval of 1 to 2 years on the annual flood series (Leopold *et al.*, 1992). Such an interval is commensurate with nearly all of the juvenile freshwater life phases of most salmon and *O. mykiss* ESUs. Therefore, it is reasonable to assert that for an occupied stream reach this lateral extent is regularly ''occupied.'' Moreover, the bankfull elevation can be readily discerned for a variety of stream reaches and stream types using recognizable water lines (*e.g.*, marks on rocks) or vegetation boundaries (Rosgen, 1996).

As underscored in previous critical habitat designations, the quality of aquatic habitat within stream channels is intrinsically related to the adjacent riparian zones and floodplain, to surrounding wetlands and uplands, and to non-fish-bearing streams above occupied stream reaches. Human activities that occur outside the stream can modify or destroy physical and biological features of the stream. In addition, human activities that occur within and adjacent to reaches upstream (*e.g.*, road failures) or downstream (*e.g.*, dams) of designated stream reaches can also have demonstrable effects on physical and biological features of designated reaches.

In estuarine areas we believe that mean extreme high water is the best descriptor of lateral extent. We are proposing the area inundated by extreme high tide because it encompasses habitat areas typically inundated and regularly occupied during the spring and summer when juvenile salmonids are migrating in nearshore estuarine areas. However, it may be more appropriate to use the ordinary high water level in estuarine nearshore areas and we request comment on this issue. As noted above for stream habitat areas, human activities that occur outside the area inundated by extreme or ordinary high water can modify or destroy physical and biological features of the nearshore habitat areas and Federal agencies must be aware of these important habitat linkages as well.

Species Descriptions and Area Assessments

This section provides descriptions of the seven Pacific salmon and *O. mykiss* ESUs addressed in this rulemaking and summarizes the Teams' assessment of habitat areas for each ESU. The Teams' assessments addressed PCEs in the habitat areas within occupied CALWATER HSA watersheds (as well as rearing/migration corridors for some ESUs). For ease of reporting and reference these HSA watersheds have been organized into ''units'' based on their associated subbasin or CALWATER Hydrologic Unit (HU).

California Coastal (CC) Chinook Salmon ESU

The CC chinook salmon ESU was listed as a threatened species in 1999 (64 FR 50394). The ESU includes all naturally spawned populations of chinook salmon from rivers and streams south of the Klamath River to and including the Russian River. Following completion of an updated status review (NMFS, 2003a) and review of hatchery populations located within the range of the ESU (NMFS, 2003b), NMFS recently proposed that the ESU remain listed as a threatened species and that seven hatchery populations be included as part of the ESU (69 FR 33102; June 14, 2004). Major watersheds occupied by naturally spawning fish in this ESU include Redwood Creek, Mad River, Eel River, several smaller coastal watersheds, and the Russian River. A Technical Recovery Team has been formed and is in the process of identifying the historical and extant population structure of this ESU; however, this is still in progress.

The Team's assessment for this ESU addressed habitat areas within 45 occupied watersheds or CALWATER HSAs that occur in 8 associated subbasins or CALWATER HUs (NMFS, 2004b). In addition to the 45 HSA watershed units, conservation assessments were also made for Humboldt Bay and the Eel River Estuary. As part of its assessment, the Team considered the conservation value of each habitat area in the context of the productivity, spatial distribution, and diversity of habitats across the range of the ESU. The Team evaluated the conservation value of habitat areas on the basis of the physical and biological habitat requirements of CC chinook salmon, consistent with the PCEs identified for Pacific salmon and *O. mykiss* described under Methods and Criteria Used to Identify Proposed Critical Habitat

Unit 1. Redwood Creek Subbasin (HU #1107)

The Redwood Creek HU is located in the northern portion of the ESU and includes the Redwood Creek drainage. The HU encompasses approximately 294 mi^2 (758 km^2) and includes three occupied HSA watersheds. Fish distribution and habitat use data compiled by NMFS biologists identify approximately 107 miles (171 km) of occupied riverine and estuarine habitat in the occupied HSA watersheds (NMFS, 2004a). The Team concluded that all occupied areas contain one or more PCEs (*i.e.*, spawning, rearing, or migratory habitat) for this ESU and identified several management activities that may affect the PCEs, including forestry, sand and gravel mining, agricultural water withdrawals and impoundments, grazing, and channelization. Of the three occupied HSA watersheds, two were rated as having high conservation value and one as having medium conservation value to the ESU (NMFS, 2004b). The Team did not identify any unoccupied areas in this subbasin that may be essential for the conservation of the ESU.

Unit 2. Trinidad Subbasin (HU #1108)

The Trinidad HU is located in the northern portion of the ESU and includes Big Lagoon and Little River. The HU encompasses approximately 131 mi^2 (338 km^2) and contains two HSA watersheds both of which are occupied. Fish distribution and habitat use data compiled by NMFS biologists identify approximately 26 miles (42 km) of occupied riverine and estuarine habitat in the occupied HSAs (NMFS, 2004a). The Team concluded that these occupied areas contained one or more PCEs (*i.e.* spawning, rearing, or migratory habitat) for this ESU and identified management activities that may affect the PCEs, including forestry, agriculture, non-agricultural and agricultural water withdrawals, and grazing. Of the two occupied HSA watersheds, one was rated as having low conservation value and one as having high conservation value to the ESU (NMFS, 2004b). The Team did not identify any unoccupied areas in this subbasin that may be essential for conservation of the ESU.

Unit 3. Mad River Subbasin (HU #1109)

The Mad River HU is located in the northern portion of the ESU and includes the Mad River drainage. The HU encompasses approximately 499 mi^2 (1287 km^2) and includes four HSA watersheds, three of which are occupied. Fish distribution and habitat use data compiled by NMFS biologists identify approximately 53 miles (85 km) of occupied riverine and estuarine habitat in the occupied HSA watersheds (NMFS, 2004a). The Team concluded that these occupied areas contained one or more PCEs (*i.e.* spawning, rearing, or migratory habitat) for this ESU and identified several management activities that may affect the PCEs, including forestry, agriculture, and grazing. All of the occupied HSA watersheds were rated as having high conservation value to the ESU (NMFS, 2004b). The Team did not identify any unoccupied areas in this subbasin that may be essential for the conservation of the ESU.

Unit 4. Eureka Plain Subbasin (HU #1110)

The Eureka Plain HU is located in the vicinity of Eureka and surrounds Humboldt Bay. The HU encompasses approximately 224 mi^2 (578 km^2) and contains a single HSA which is occupied. Fish distribution and habitat use data compiled by NMFS biologists identify approximately 74 miles (118 km) of occupied riverine and estuarine habitat in this HSA watershed (NMFS, 2004a). The Team concluded that these occupied areas contained one or more PCEs (*i.e.*, spawning, rearing, or migratory habitat) for this ESU and identified several management activities that may affect the PCEs, including urbanization, flood control channelization, and road building and maintenance. This single occupied HSA watershed was rated as having high conservation value to the ESU (NMFS, 2004b). The Team also evaluated Humboldt Bay into which most of these freshwater streams in this subbasin drain as a separate habitat unit. Humboldt Bay contains approximately 25 mi^2 (65 km^2) of estuarine habitat which the Team found contained PCEs for rearing and migration and was of high conservation value since it provides migratory connectivity for juveniles and adults between high value freshwater spawning and rearing habitat and the ocean. The Team did not identify any unoccupied areas in this subbasin that may be essential for the conservation of the ESU.

Unit 5. Eel River Subbasin (HU #1111)

The Eel River HU is located in the northern and central portion of the ESU and includes the Eel River and Van Duzen River drainages. This HU, which is the largest in the ESU, encompasses approximately 3,682 mi^2 (9,500 km^2) and contains 19 occupied HSA watersheds. Fish distribution and habitat use data compiled by NMFS biologists identify approximately 841 miles (1,345 km) of occupied riverine and estuarine habitat in the occupied HSA watersheds (NMFS, 2004a). The Team concluded that these occupied habitat areas contained one or more PCEs (*i.e.*, spawning, rearing, or migratory habitat) for this ESU and identified several management activities that may affect the PCEs including agriculture, forestry, sand and gravel mining, grazing, exotic/invasive species, agricultural and non-agricultural water withdrawals, and urbanization. Of these occupied HSA watersheds, three were rated as having low conservation value, four were rated as having medium conservation value, and twelve were rated as having high conservation value to the ESU (NMFS, 2004b). The Team also evaluated the Eel River estuary as a separate habitat unit and concluded it contained PCEs for rearing and migration and is of high conservation value since it provides migratory connectivity for juveniles and adults between high value freshwater spawning and rearing habitat and the ocean. The Team did not identify any unoccupied areas in this subbasin that may be essential for the conservation of the ESU.

Unit 6. Cape Mendocino Subbasin (HU #1112)

The Cape Mendocino HU is located in the central portion of the ESU and includes the Bear River and Mattole River drainages. This HU encompasses approximately 499 mi^2 (1,287 km^2) and contains three HSA watersheds, two of which are occupied. Fish distribution and habitat use data compiled by NMFS biologists identify approximately 173 miles (277 km) of occupied riverine and estuarine habitat in the occupied HSAs (NMFS, 2004a). The Team concluded that these occupied areas contained one or more PCEs (*i.e.*, spawning, rearing, or migratory habitat) for this ESU and identified several management activities that may affect the PCEs, including agriculture, grazing, forestry, and agricultural water withdrawals. Both occupied HSA watersheds were rated as having high conservation value to the ESU (NMFS, 2004b). The Team did not identify any unoccupied areas in this subbasin that may be essential for the conservation of the ESU.

Unit 7. Mendocino Coast Subbasin (HU #1113)

The Mendocino Coast HU is located in the southern portion of the ESU and includes several smaller coastal streams including the Ten Mile, Noyo, Albion, Navarro, and Garcia Rivers. This HU encompasses approximately 1,598 mi^2 (4,123 km^2) and contains eighteen HSA watersheds, seven of which are occupied. Fish distribution and habitat use data compiled by NMFS biologists identify approximately 204 miles (326 km) of occupied riverine and estuarine habitat in the occupied HSAs (NMFS, 2004a). The Team concluded that these occupied areas contained one or more PCEs (*i.e.* spawning, rearing, or migratory habitat) for this ESU and identified management activities that may affect the PCEs, including forestry, grazing, urbanization, agriculture, and agricultural and non-agricultural water withdrawals. Of the occupied HSA watersheds, the Team rated two as low in conservation value, three as medium in conservation value, and two as high in conservation value to the ESU (NMFS, 2004b). The Team did not identify any unoccupied areas in this subbasin that may be essential for the conservation of the ESU.

Unit 8. Russian River Subbasin (HU #1114)

The Russian River HU is located in the southernmost portion of the ESU and includes the Russian River drainage and its tributaries. The HU encompasses approximately 1,482 mi^2 (3,824 km^2) and contains ten HSA watersheds within the range of the ESU, nine of which are occupied. Fish distribution and habitat use data compiled by NMFS biologists identify approximately 133 miles (212 km) of occupied riverine and estuarine habitat in the occupied HSAs (NMFS, 2004a). The Team concluded these occupied HSA areas contained one or more PCEs (*i.e.*, spawning, rearing, or migratory habitat) for this ESU and identified several management activities that may affect the PCEs, including urbanization, agriculture, forestry, sand and gravel mining, grazing, flood control channelization, and agricultural water withdrawals. Of the occupied HSA watersheds, the Team rated three as low in conservation value, two as medium in conservation value, and four as having high conservation value to the ESU (NMFS, 2004b). The Team did not identify any unoccupied areas in this subbasin that may be essential for the conservation of the ESU.

Northern California (NC) *O. mykiss* ESU

The NC *O. mykiss* ESU was listed as a threatened species in 2000 (65 FR 36074; June 7, 2000). The ESU includes all naturally spawned populations of *O. mykiss* in coastal river basins from Redwood Creek south to and including the Gualala River. Major watersheds occupied by naturally spawning fish in this ESU include Redwood Creek, Mad River, Eel River, several smaller coastal watersheds on the coast south to the Gualala River. *O. mykiss* within this ESU include both winter and summer run types, including what is presently considered to be the southernmost population of summer run *O. mykiss* in the Middle Fork Eel River (NMFS, 1996). The half-pounder life history type also occurs in the ESU, specifically in the Mad and Eel Rivers. Based on an updated status review (NMFS, 2003a) and an assessment of hatchery populations located within the range of the ESU (NMFS, 2003b), NMFS recently proposed that the ESU remain listed as a threatened species and that resident *O. mykiss* co-occurring with anadromous populations below impassible barriers (both natural and man-made) as well as two artificial propagation programs (Yager Creek Hatchery and North Fork Gualala River Hatchery) also be included in the ESU (69 FR 33102; June 14, 2004). A Technical Recovery Team has been formed and is in the process of identifying the historical and extant independent population structure of this ESU and associated population viability parameters for each population.

The Team's assessment for this ESU addressed habitat areas within 50 occupied watersheds or CALWATER HSAs that occur in 7 associated subbasins or CALWATER HUs. In addition to the 50 HSA watershed units, conservation assessments were also made for Humboldt Bay and the Eel River Estuary. As part of its assessment, the Team considered the conservation value of each habitat area in the context of the productivity, spatial distribution, and diversity of habitats across the range of the ESU. The Team evaluated the conservation value of habitat areas on the basis of the physical and biological habitat requirements of NC *O. mykiss*, consistent with the PCEs identified for Pacific salmon and *O. mykiss* described under Methods and Criteria Used to Identify Proposed Critical Habitat.

Unit 1. Redwood Creek Subbasin (HU #1107)

The Redwood Creek HU is located in the northern portion of the ESU and includes the Redwood Creek drainage. The HU encompasses approximately 294 mi^2 (758km^2) and includes three HSA watersheds, all of which are occupied. Fish distribution and habitat use data compiled by NMFS biologists identify approximately 138 (220 km) of occupied riverine and estuarine habitat in the three occupied HSAs (NMFS, 2004a). The Team concluded that these occupied HSA watersheds contained one or more PCEs (*i.e.*, spawning, rearing, or migratory habitat) and identified several management activities that may affect the PCEs, including forestry, sand and gravel mining, agricultural water withdrawals and impoundments, grazing and channelization. Of the three occupied HSA watersheds, one was rated as medium and two were rated as having high conservation value to the ESU (NMFS, 2004b). The Team did not identify any unoccupied areas in this subbasin that may be essential for the conservation of the ESU.

Unit 2. Trinidad Subbasin (HU #1108)

The Trinidad HU is located in the northern portion of the ESU and includes Big Lagoon and Little River. The HU encompasses approximately 131 mi^2 (338 km^2) and contains two HSA watersheds, both of which are occupied. Fish distribution and habitat use data compiled by NMFS biologists identify approximately 66 miles (106 km) of occupied riverine and estuarine habitat in the occupied HSAs (NMFS, 2004a). The Team concluded that these occupied areas contained one or more PCEs (*i.e.*, spawning, rearing, or migratory habitat) and identified several management activities that may affect the PCEs, including forestry, agriculture, non-agricultural and agricultural water withdrawals and grazing. Of the two HSA watersheds, one was rated by the Team as having medium conservation value and one was rated as having high conservation value to the ESU (NMFS, 2004b). The Team did not identify any unoccupied areas in this subbasin that may be essential for conservation of the ESU.

Unit 3. Mad River Subbasin (HU #1109)

The Mad River HU is located in the northern portion of the ESU and includes the Mad River drainage. The HU encompasses approximately 499 mi^2 (1,287 km^2) and contains four HSA watersheds, all of which are occupied. Fish distribution and habitat use data compiled by NMFS biologists identify approximately 169 miles (270 km) of occupied riverine and estuarine habitat in these occupied habitat areas (NMFS, 2004a). The Team concluded that these occupied areas contained one or more PCEs (*i.e.*, spawning, rearing, or migratory habitat) and identified several management activities that may affect the PCEs, including forestry, agriculture, and grazing. Of these occupied HSA watersheds, one was rated as having low conservation value and three were rated by the Team as having high conservation value to the ESU (NMFS, 2004b). The Team did not identify any unoccupied areas in this subbasin that may be essential for the conservation of the ESU.

Unit 4. Eureka Plain Subbasin (HU #1110)

The Eureka Plain HU is located in the vicinity of Eureka and includes Humboldt Bay. The HU encompasses approximately 224 mi^2 (578 km^2) and contains a single HSA which is occupied. Fish distribution and habitat use data compiled by NMFS biologists identify approximately 122 miles (195 km) of occupied riverine and estuarine habitat in the occupied HSA watersheds (NMFS, 2004a). The Team concluded that these occupied areas contained one or more PCEs (*i.e.* spawning, rearing, or migratory habitat) for this ESU and identified several management activities that may affect the PCEs, including urbanization, flood control channelization, and road building and maintenance. The single HSA watershed in the subbasin was rated by the Team as having high conservation value to the ESU. The Team also evaluated Humboldt Bay into which most of these freshwater streams in this subbasin drain as a separate habitat unit. Humboldt Bay contains approximately 25 mi^2 (65 km^2) of estuarine habitat which the Team found contained PCEs for rearing and migration and was of high conservation value since it provides migratory connectivity for juveniles and adults between high value freshwater spawning and rearing habitat and the ocean. The Team did not identify any unoccupied areas in this subbasin that may be essential for the conservation of the ESU.

Unit 5. Eel River Subbasin (HU #1111)

The Eel River HU is located in the north central portion of the ESU and includes the Eel River and Van Duzen River drainages. The HU encompasses approximately 3,682 mi^2 (9,500 km^2) and contains nineteen HSA watersheds, all of which are occupied. Fish distribution and habitat use data compiled by NMFS biologists identify approximately 1,269 miles (2,030 km) of occupied riverine and estuarine habitat in the occupied HSA watersheds (NMFS, 2004a). The Team concluded that these occupied watershed areas contained one or more PCEs (*i.e.*, spawning, rearing, or migratory habitat) for this ESU and identified several management activities that may affect the PCEs, including agriculture, forestry, sand and gravel mining, grazing, exotic/invasive species, agricultural and non-agricultural water withdrawals, and urbanization. Of these nineteen occupied watersheds, nine were rated by the Team as medium in conservation value and ten were rated as high in conservation value to the ESU (NMFS, 2004b). The Team also evaluated the Eel River estuary as a separate habitat unit and concluded it contained PCEs for rearing and migration and is of high conservation value since it provides migratory connectivity for juveniles and adults between high conservation value freshwater spawning and rearing habitat and the ocean. The Team did not identify any unoccupied areas in this subbasin that may be essential for the conservation of the ESU.

Unit 6. Cape Mendocino Subbasin (HU #1112)

The Cape Mendocino HU is located in the central portion of the ESU and includes the Bear River and Mattole River drainages. This HU encompasses approximately 499 mi^2 (1,287 km^2) and contains three HSA watersheds which are all occupied. Fish distribution and habitat use data compiled by NMFS biologists identify approximately 342 miles (547 km) of occupied riverine and estuarine habitat in the occupied HSA watersheds (NMFS, 2004a). The Team concluded that these occupied areas contained one or more PCEs (*i.e.*, spawning, rearing, or migratory habitat) for this ESU and identified several management activities that may affect the PCEs, including agriculture, grazing, forestry, and agricultural water withdrawals. Of these watersheds, the Team rated two as having low conservation value and one as having high conservation value to the ESU (NMFS, 2004b). The Team did not identify any unoccupied areas in this subbasin that may be essential for the conservation of the ESU.

Unit 7. Mendocino Coast Subbasin (HU #1112)

The Mendocino Coast HU is located in the southern portion of the ESU and includes several smaller coastal streams such as Ten Mile, Noyo, Albion, Navarro, and Garcia Rivers. This HU encompasses approximately 1,598 mi^2 (4,123 km^2) and contains eighteen HSA watersheds that are all occupied. Fish distribution and habitat use data compiled by NMFS biologists identify approximately 1,022 miles (1,635 km) of occupied riverine and estuarine habitat in these watersheds (NMFS, 2004a). The Team concluded that these occupied areas contained one or more PCEs (*i.e.*, spawning, rearing, or migratory habitat) for this ESU and identified several management activities that may affect the PCEs, including forestry, grazing, urbanization, agriculture, and agricultural and non-agricultural water withdrawals. Of these occupied HSA watersheds, the Team rated five as low in conservation value, four as medium in conservation value, and nine as high in conservation value to the ESU (NMFS, 2004b). The Team did not identify any unoccupied areas in this subbasin that may be essential for the conservation of the ESU.

Central California Coast (CCC) O. mykiss ESU

The CCC *O. mykiss* ESU was listed as a threatened species in 1997 (62 FR 433937; August 18, 1997). The ESU includes all naturally spawned populations of *O. mykiss* in coastal river basins from the Russian River southward to and including Aptos Creek, as well as naturally spawned populations of *O. mykiss* in drainages of San Francisco and San Pablo Bay eastward to but excluding the Sacramento-San Joaquin Delta. Major coastal watersheds occupied by naturally spawning fish in this ESU include the Russian River, Lagunitas Creek, and San Lorenzo River. Important watersheds occupied by naturally spawning fish within the San Francisco Bay/San Pablo Bay area include Alameda Creek, Coyote Creek, Guadelupe Creek, Petaluma River, and the Napa River. Based on an updated status review (NMFS, 2003a) and an assessment of hatchery populations located within the range of the ESU (NMFS, 2003b), NMFS recently proposed that the ESU remain listed as a threatened species (69 FR 33102; June 14, 2004). In addition, NMFS proposed that: (1) Resident *O. mykiss* occurring with anadromous populations below impassable barriers (both natural and man made); (2) two artificially propagated populations (Don Clausen Fish Hatchery in the Russian River basin and the Kingfisher Flat Hatchery/Scott Creek hatchery in Scott Creek south of San Francisco); and (3) three resident *O. mykiss* sub-populations above Dam 1 on Alameda Creek also be included in the CCC *O. mykiss* ESU. For the purposes of this re-designation proposal, therefore, the watershed units occupied by resident *O. mykiss* in upper Alameda Creek were considered occupied. A Technical Recovery Team has been formed and is in the process of identifying the historical and extant independent population structure of this ESU as well as the associated viability criteria for these populations.

The Team's assessment for this ESU addressed habitat areas within 47 occupied watersheds or CALWATER HSAs that occur in 10 associated subbasins (or CALWATER HUs). Five of these HSAs encompass the San Francisco—San Pablo—Suisun Bay complex which constitutes migratory and rearing habitat for several Bay area tributary stream populations in this ESU. As part of this assessment, the Team considered the conservation value of each habitat area in the context of the productivity, spatial distribution, and diversity of habitats across the range of the ESU. The Team evaluated the conservation value of habitat areas on the basis of the physical and biological habitat requirements of the CCC *O. mykiss* ESU, consistent with the PCEs identified for Pacific salmon and *O. mykiss* described under Methods and Criteria Used to Identify Proposed Critical Habitat.

Unit 1. Russian River Subbasin (HU #1114)

The Russian River HU is located in the northern portion of the ESU and includes the Russian River drainage and its tributaries. The HU encompasses approximately 1,482 mi^2 (3,824 km^2) and contains eleven HSA watersheds, ten of which are occupied. The unoccupied HSA does not contain fish because it is located above Coyote Dam, which is an impassable fish barrier used to facilitate water diversions from the Eel River and delivery downstream for agricultural and municipal purposes. Fish distribution and habitat use data compiled by NMFS biologists identify approximately 713 miles (1,141 km) of occupied riverine and estuarine habitat in the 10 occupied HSA watersheds (NMFS, 2004a). The Team concluded that these occupied HSAs watersheds contained one or more PCEs (*i.e.*, spawning, rearing, or migratory habitat) and identified several management activities that may affect the PCEs, including urbanization, agriculture, grazing, flood control channelization, road building and maintenance, agricultural and non-agricultural water withdrawals, and non-hydro dams. Of the occupied HSA watersheds, the Team rated one as low in conservation value, two as medium in conservation value, and seven as high in conservation value to the ESU (NMFS, 2004b). The Team did not identify and unoccupied areas in this subbasin that may be essential for the conservation of the ESU.

Unit 2. Bodega Bay Subbasin (HU #1115)

The Bodega Bay HU is located in the north central portion of the ESU and includes several small streams as well as Bodega Harbor. The HU encompasses approximately 147 mi^2 (411 km^2) and contains four HSA watersheds, two of which are occupied. Fish distribution and habitat use data compiled by NMFS biologists identify approximately 18 miles (29 km^2) of occupied riverine or estuarine habitat in the occupied HSAs (NMFS, 2004a). The Team concluded that these occupied areas contained one or more PCEs (*i.e.*, spawning, rearing, or migratory habitat) and identified management activities that may affect the PCEs, including grazing, urbanization, agriculture, and agricultural water withdrawals. The Team rated one occupied HSA watershed as low in conservation value and one as medium in conservation value to the ESU (NMFS, 2004b). The Team did not identify any unoccupied areas in this subbasin that may be essential for the conservation of the ESU.

Unit 3. Marin Coastal Subbasin (HU #2201)

The Marin Coastal HU is located in the central portion of the ESU along the coast and includes several small watersheds including Lagunitas Creek. The HU encompasses approximately 327 mi^2 (844 km^2) and contains five HSA watersheds, four of which are occupied. The unoccupied HSA lacks satisfactory habitat and is of high gradient. Fish distribution and habitat use data compiled by NMFS biologists identify approximately 74 miles (118 km) of occupied riverine or estuarine habitat in the occupied HSAs (NMFS, 2004a). The Team concluded that these occupied habitat areas contained one or more PCEs (*i.e.*, spawning, rearing, or migratory habitat) and identified management activities that may affect the PCEs, including grazing, urbanization, forestry, agricultural and non-agricultural water withdrawals, and non-hydro dams. Of the occupied HSA watersheds, the Team rated two as low in conservation value, one as medium in conservation value, and one as high in conservation value to the ESU. The Team did not identify any unoccupied areas in this subbasin that may be essential to the conservation of the ESU.

Unit 4. San Mateo Subbasin (HU #2202)

The San Mateo HU is located on the coast immediately south of the Golden Gate Bridge and includes several small creeks including San Gregorio and Pescadero Creeks. The HU encompasses approximately 257 mi^2 (663 km^2) and contains six HSA watersheds, five of which are occupied. Fish distribution and habitat use data compiled by NMFS biologists identify approximately 146 miles (234 km) of occupied riverine or estuarine habitat in the occupied watersheds (NMFS, 2004a). The Team concluded that these occupied areas contained one or more PCEs (*i.e.*, spawning, rearing, or migratory habitat) for this ESU and identified management activities that may affect the PCEs, including agriculture, agricultural and non-agricultural water withdrawals, urbanization, non-hydro dams, and road building and maintenance. Of these occupied HSA watersheds, one is low in conservation value, two are medium in value, and two are high in conservation value to the ESU (NMFS, 2004b). The Team did not identify and unoccupied areas in this subbasin that may be essential for the conservation of the ESU.

Unit 5. Bay Bridges Subbasin (HU #2203)

The Bay Bridges HU is located in the central portion of the ESU and includes portions of northern San Francisco Bay, San Pablo Bay, and some associated watersheds. The HU encompasses approximately 191 mi^2 (493 km^2) and contains four HSA watersheds, three of which are occupied. The San Francisco Bayside HSA is unoccupied by this ESU due to intense urbanization and lack of stream habitat. Fish distribution and habitat use data compiled by NMFS biologists identify approximately 46 miles (74 km) of occupied riverine and estuarine habitat in the occupied HSA watersheds (NMFS, 2004a). One of the occupied HSAs (HSA #220312; Bay Waters) includes that portion of San Francisco Bay bounded by the Bay Bridge, the Golden Gate Bridge, and the Richmond Bridge, and encompasses an area of approximately 83 mi^2 (214 km^2). This occupied estuarine habitat area constitutes important migratory and rearing habitat and access to the ocean for some populations within this ESU. The Team concluded that these occupied habitat areas contained one or more PCEs (*i.e.*, spawning, rearing, or migratory habitat) for this ESU and identified management activities that may affect the PCEs, including urbanization, channel modification, flood control channelization, road building and maintenance, and wetland loss. Of the occupied watersheds, one each is rated low, medium and high, respectively, in conservation value to the ESU. The Team did not identify any unoccupied areas in this subbasin that may be essential for the conservation of the ESU.

Unit 6. South Bay Subbasin (HU #2204)

The South Bay HU is located in the southern portion of the ESU and includes South San Francisco Bay and associated tributaries such as Alamada Creek. This HU encompasses approximately 1,220 mi^2 (3.148 km^2) and contains four occupied HSA watersheds. One of these four watersheds (Upper Alameda Creek; HSA #220430) is not accessible to anadromous fish at this time, but is nonetheless considered occupied for the purposes of this critical habitat designation because genetic evidence indicates the resident O. mykiss that reside there are closely related to local anadromous steelhead (Nielsen 2003) and we have proposed to include these fish in the listed ESU (69 FR 33102; June 14, 2004). Fish distribution and habitat use data compiled by NMFS biologists identify approximately 172 miles (275 km) of occupied riverine and estuarine habitat in the occupied watersheds (NMFS, 2004a), including the Upper Alameda Creek HSA (#220430). One of the occupied HSAs (Bay Channel; HSA #220410) includes that portion of San Francisco Bay south of the Bay Bridge to the Dumbarton Bridge, and encompasses an area of approximately 173 mi^2 (446 km^2). This occupied estuarine habitat area constitutes important migratory and rearing habitat and access to the ocean for some populations within this ESU. The Team concluded that these occupied habitat areas contained one or more PCEs (*i.e.*, spawning, rearing, or migratory habitat) for this ESU and identified management activities that may affect the PCEs, including urbanization, flood control channelization, non-hydro dams, channel modification, and non-agricultural water withdrawals. Of these occupied HSAs, the Team rated one as low in conservation value, one as medium in conservation value, and two as high in conservation value to the ESU. The Team did not identify any unoccupied areas in this subbasin that may be essential for the conservation of the ESU.

Unit 7. Santa Clara Subbasin (HU #2205)

The Santa Clara HU is located in the southern portion of the ESU and includes part of South San Francisco Bay and associated tributaries including Coyote Creek and the Guadalupe River. This HU encompasses approximately 840 mi^2 (2,167 km^2) and contains five HSA watersheds, four of which are occupied. The remaining HSA is unoccupied due to lack of stream habitat and intense urbanization. Fish distribution and habitat use data compiled by NMFS biologists identify approximately 135 miles (216 km) of occupied riverine or estuarine habitat in the occupied watersheds (NMFS, 2004a). One of the occupied HSAs (Dumbarton South; HSA #220510) includes that portion of San Francisco Bay south of the Dumbarton Bridge, and encompasses an area of approximately 15 mi^2 (39 km^2). This occupied estuarine habitat area constitutes important migratory and rearing habitat and access to the ocean for some populations within this ESU. The Team concluded that these occupied areas contained one or more PCEs (*i.e.*, spawning, rearing, or migratory habitat) for this ESU and identified management activities that may affect the PCEs, including road building and maintenance, urbanization, wetland loss, flood control channelization, non-hydro dams, and non-agricultural water withdrawals. Of the occupied watersheds, the Team rated one as low in conservation value, two as medium in conservation value, and one as high in conservation value to the ESU (NMFS, 2004b). The Team did not identify any unoccupied areas in this subbasin that may be essential for the conservation of the ESU.

Unit 8. San Pablo Subbasin (HU #2206)

The San Pablo HU is located in the central portion of the ESU and includes part of San Pablo Bay as well as several associated tributaries including the Petaluma River, Sonoma Creek, and the Napa River. This HU encompasses approximately 1,018 mi^2 (2,626 km^2) and contains six occupied HSA watersheds. Fish distribution and habitat use data compiled by NMFS biologists identify approximately 392 miles (627 km) of occupied riverine and estuarine habitat in the occupied watersheds (NMFS, 2004a). One of the occupied HSAs (San Pablo Bay; HSA #220610) includes San Pablo Bay from the Richmond Bridge to the Carquinez Bridge, and encompasses an area of approximately 115 mi^2 (297 km^2). This occupied estuarine habitat area constitutes important migratory and rearing habitat and access to the ocean for some populations within this ESU. The Team concluded that these occupied areas contained one or more PCEs (*i.e.*, spawning, rearing, or migratory habitat) for this ESU and identified management activities that may affect the PCEs, including urbanization, road building and maintenance, channel modification, flood control channelization, agriculture, wetland loss, and non-hydro dams. Of these occupied watersheds, the Team rated two as low, one as medium, and three as high in conservation value to the ESU (NMFS, 2004b). The Team did not identify any unoccupied areas in this subbasin that may be essential for the conservation of the ESU.

Unit 9. Suisun Bay Subbasin (HU #2207)

The Suisun Bay HU is located in the easternmost portion of the ESU and includes Suisun Bay and associated tributaries including Mount Diablo Creek and Suisun Creek. This HU encompasses approximately 653 mi^2 (1,684 km^2) and contains eight HSA watersheds, five of which are occupied. The remaining three HSA watersheds are unoccupied due to unsuitable habitat and/or barriers and urbanization. Fish distribution and habitat use data compiled by NMFS biologists identify approximately 86 miles (138 km) of occupied riverine and estuarine habitat in these watersheds (NMFS, 2004a). One of the occupied HSAs (Suisun Bay; HSA #220710) includes Suisun Bay which encompasses an area of approximately 56 mi^2 (143 km^2). This occupied estuarine habitat area constitutes important migratory and rearing habitat and access to the ocean for some populations within this ESU. The Team concluded that these occupied areas contained one or more PCEs (*i.e.*, spawning, rearing, or migratory habitat) for this ESU and identified management activities that may affect the PCEs, including urbanization, road building and maintenance, wetland loss, non-hydro dams, flood control channelization, and agricultural and non-agricultural water withdrawals. Of the occupied watersheds, the Team rated four as low and one as medium in conservation value for the ESU (NMFS, 2004b). The Team did not identify any unoccupied areas in this subbasin that may be essential for the conservation of the ESU.

Unit 10. Big Basin Subbasin (HU #3304)

The Big Basin HU is located in the southernmost coastal portion of the ESU south of the Golden Gate Bridge and includes several small coastal streams such as Gazos Creek, Waddell Creek, Scott Creek, the San Lorenzo River, Soquel Creek and Aptos Creek. This HU encompasses approximately 367 mi^2 (947 km^2) and contains four occupied HSA watersheds. Fish distribution and habitat use data compiled by NMFS biologists identify approximately 220 miles (352 km) of occupied riverine and estuarine habitat in these watersheds (NMFS, 2004a). The Team concluded that these occupied areas contained one or more PCEs (*i.e.*, spawning, rearing, or migratory habitat) for this ESU and identified management activities that may affect the PCEs, including road building and maintenance, forestry, agricultural and non-agricultural water withdrawals, and non-hydro dams. Of these occupied watersheds, the Team rated one as medium and three as high in conservation value to the ESU (NMFS, 2004b). The Team did not identify any unoccupied areas in this subbasin that may be essential for the conservation of the ESU.

South-Central California Coast (SCCC) O. mykiss ESU

The SCCC *O. mykiss* ESU was listed as a threatened species in 1997 (62 FR 43937). The ESU includes all naturally spawned populations of *O. mykiss* in coastal river basins from the Pajaro River southward to, but not including, the Santa Maria River. The major watersheds occupied by naturally spawning fish in this ESU include the Pajaro River, Salinas River, Carmel River, and numerous smaller rivers and streams along the Big Sur coast and southward. Most of the rivers in this ESU drain the Santa Lucia Range, the southernmost unit of the California Coast Range, and only winter steelhead are found in this ESU. The climate is drier and warmer than in the north, as reflected in vegetational changes from coniferous forest to chapparral and coastal scrub. The mouths of many rivers and streams in this ESU are seasonally closed by sand berms that form during periods of low flow in the summer. Based on an updated status review (NMFS, 2003a), NMFS recently proposed that the ESU remain listed as a threatened species and that resident *O. mykiss* co-occurring with anadromous populations below impassible barriers (both natural and man-made) be included in the ESU (69 FR 33102; June 14, 2004). A Technical Recovery Team has been formed and is in the process of identifying the historical and extant independent population structure of this ESU and associated population viability criteria. The time frame for completion of this work is uncertain.

The Team's assessment for this ESU addressed habitat areas within 30 occupied watersheds or CALWATER HSAs that occur in 8 associated subbasins (or CALWATER HUs). In addition to 29 HSA watershed units, a conservation assessment was also made for Morro Bay (a separate HSA unit) which provides rearing and migration PCEs for this ESU. As part of its conservation assessment, the Team considered the conservation value of each habitat area in the context of the productivity, spatial distribution, and diversity of habitat across the range of the ESU. The Team evaluated the conservation value of habitat areas on the basis of the physical and biological habitat requirements of the SCCC *O. mykiss* ESU, consistent with the PCEs identified for Pacific salmon and *O. mykiss* described under Methods and Criteria Used to Identify Proposed Critical Habitat.

Unit 1. Pajaro River Subbasin (HU #3305)

The Pajaro River HU is located in the northern part of the ESU and includes the Pajaro River and its tributaries. The HU encompasses approximately 1,311 mi^2 (3,382 km^2) and contains five occupied HSA watersheds, although a portion of one HSA is located outside the boundary of the ESU. Fish distribution and habitat use data compiled by NMFS biologists identify approximately 296 miles (474 km) of occupied riverine and/or estuarine habitat in the occupied HSA watersheds (NMFS, 2004a). The Team concluded that these occupied HSAs contained one or more PCEs (*i.e.*, spawning, rearing, or migratory habitat) and identified several management activities that may affect the PCEs, including flood control channelization, agricultural and non-agricultural water withdrawals, road building and maintenance, and non-hydro dams. Of the five occupied watersheds, the Team rated three as medium in conservation value and two as high in conservation value to the ESU (NMFS, 2004b).

The Team also concluded that inaccessible habitat above Uvas Dam in Uvas Creek (a tributary to the Pajaro River) may be essential to the conservation of the ESU. The Team concluded that this unoccupied habitat area may be essential for conservation because: (1) It supports *O. mykiss* native to the Pajaro River watershed and contains habitat suitable for spawning and rearing; and (2) efforts are underway to implement a long-standing agreement between the South Santa Clara Valley Water Conservation District and the State of California to provide fish passage past this dam. We seek comment on whether this unoccupied area should be proposed as critical habitat.

Unit 2. Bolsa Neuva Subbasin (HU #3306)

The Bolsa Neuva HU is a small watershed unit located in the northern part of the ESU which includes Elkhorn Slough. The HU encompasses approximately 51 mi^2 (132 km^2) and contains one HSA watershed and approximately 63 miles of streams (at 1:100,000 hydrography). Fish distribution and habitat use data compiled by NMFS biologists indicate that this watershed is not occupied (NMFS, 2004a). The Team did not identify this unoccupied HSA as a habitat area that was essential for the conservation of the ESU. Because this HU did not contain occupied habitat or unoccupied habitat that the Team believed may be essential for the conservation of the ESU, it was not considered further in the designation process.

Unit 3. Carmel River Subbasin (HU #3307)

The Carmel River HU is located in the northwestern portion of the ESU and includes the Carmel River watershed. The HU encompasses approximately 256 mi^2 (660 km^2) and contains only one HSA which is occupied. Fish distribution and habitat use data compiled by NMFS biologists identify approximately 136 miles (218 km) of occupied riverine and estuarine habitat in this watershed (NMFS, 2004a). The Team concluded that this occupied watershed contained habitat areas with one or more PCEs (*i.e.*, spawning, rearing, or migratory habitat) and identified management activities that may affect the PCEs, including flood control channelization, non-hydro dams, and non-agricultural water withdrawals. The Team rated this watershed as having high conservation value to the ESU (NMFS, 2004b). The Team did not identify any unoccupied areas in this subbasin that may be essential for conservation of the ESU.

Unit 4. Santa Lucia Subbasin (HU #3308)

The Santa Lucia HU is located along the Big Sur coastal area and includes the Big Sur River and Little Sur River watersheds. The HU encompasses approximately 302 mi^2 (779 km^2) and contains only a single HSA which is occupied. Fish distribution and habitat use data compiled by NMFS biologists identify approximately 102 miles (163 km) of occupied riverine and estuarine habitat in this watershed (NMFS, 2004a). The Team concluded that this occupied watershed contained one or more PCEs (*i.e.* spawning, rearing, or migratory habitat) and identified at least one management activity that may affect the PCEs, including road building and maintenance. The Team rated this watershed as having high conservation value to the ESU (NMFS, 2004b). The Team did not identify any unoccupied areas in this subbasin that may be essential for the conservation of the ESU.

Unit 5. Salinas River Subbasin (HU #3309)

The Salinas River HU is located in the north-central portion of the ESU and includes the Salinas River watershed which is the largest in the ESU. The Salinas River HU encompasses approximately 3,527 mi^2 (9,099km^2) and contains twelve HSA watersheds, seven of which are occupied. Fish distribution and habitat use data compiled by NMFS biologists identify approximately 375 miles (600 km) of occupied riverine and estuarine habitat in the occupied HSA watersheds (NMFS, 2004a). The Team concluded that these occupied areas contained one or more PCEs (*i.e.*, spawning, rearing, or migratory habitat) and identified management activities that may affect the PCEs, including agriculture, flood control channelization, wetland loss, road building and maintenance, non-hydro dams, and agricultural water withdrawals. Of the occupied watersheds, the Team rated four as having low conservation value, one as having medium conservation value, and two as having high conservation value to the ESU (NMFS, 2004b). The Team did not identify any unoccupied areas in this subbasin that may be essential for the conservation of the ESU.

Unit 6. Estero Bay (HU #3310)

The Estero Bay HU is located along the southern coast of the ESU and includes several relatively small coastal streams including Arroyo De La Cruz, San Simeon Creek, Santa Rosa Creek, Morro Creek, Chorro Creek, San Luis Obispo Creek, and Arroyo Grande Creek. The HU encompasses approximately 751 mi^2 (436 km^2) and contains seventeen HSA watersheds, sixteen of which are occupied. One of these occupied watersheds is Morro Bay into which the Morro Creek and Chorro Creek watersheds drain. Morro Bay proper encompasses an area of approximately 3 mi^2 (8 km^2) and is an important rearing and migratory habitat for populations that occupy the watersheds that drain into the Bay. Fish distribution and habitat use data compiled by NMFS biologists identify approximately 352 miles (563 km) of occupied riverine habitat in the occupied watersheds (NMFS, 2004a). The Team concluded that these occupied habitat areas contained one or more PCEs (*i.e.*, spawning, rearing, or migratory habitat) and identified management activities that may affect the PCEs, including grazing, agriculture, urbanization, non-hydro dams, road building and maintenance, and agricultural water withdrawals. Of the occupied HSA watersheds, the Team rated two as low, seven as medium, and seven as high in conservation value to the ESU (NMFS, 2004b). The Team did not identify any unoccupied areas in this subbasin that may be essential for the conservation of the ESU.

Units 7 (Santa Maria HU #3312) and 8 (Estrella HU #3317)

Portions of the Santa Maria and Estrella HUs are within the geographic range of this ESU, but do not contain occupied riverine or estuarine habitat. The Santa Maria HU includes a single HSA (Guadalupe; 331210) which is divided by the ESU boundary. All occupied habitat within this HSA occurs within the range of the Southern California steelhead ESU. The Estrella HU contains a single HSA (Estrella River; 331700) which is unoccupied. The Team did not identify any unoccupied areas in this subbasin that may be essential for the conservation of the ESU. Because these areas did not contain occupied habitat or unoccupied habitat that may be essential for the conservation of the ESU, they were not considered further in the designation process.

Southern California (SC) O. mykiss ESU

The SC *O. mykiss* ESU was listed as an endangered species in 1997 (62 FR 3937; August 18, 1997). In 2002, the status of the ESU was updated and its range extended based on new information indicating that anadromous *O. mykiss* had re-colonized watersheds from which it was thought to have been extirpated (67 FR 21586; May 1, 2002). The SC *O. mykiss* ESU includes all naturally spawned populations of *O. mykiss* in coastal river basins from the Santa Maria River in San Luis Obispo County southward to the U.S.—Mexican Border (67 FR 21586). Major coastal watersheds occupied by naturally spawning fish in this ESU include the Santa Maria, Santa Ynez, Ventura, and Santa Clara Rivers. Several smaller streams in Santa Barbara, Ventura and northern Los Angeles County also support naturally spawning steelhead, as do two watersheds (San Juan Creek and San Mateo Creek) in southern Orange County and northern San Diego County. These southernmost populations are disjunct in distribution and are separated from the northernmost populations by approximately 80 miles (128 km). Based on an updated status review (NMFS, 2003a), NMFS recently proposed that the ESU remain listed as an endangered species (69 FR 33102; June 14, 2004). In addition, NMFS proposed that resident *O. mykiss* occurring with anadromous populations below impassable barriers (both natural and man made) also be included in the ESU. A Technical Recovery Team has been formed for the South-Central coast of California and is in the process of identifying the historical and extant independent population structure of this ESU and the SCCC *O. mykiss* ESU, as well as the associated viability criteria for these populations.

The Team's assessment for this ESU addressed habitat areas within 37 occupied watersheds or CALWATER HSAs that occur in 8 associated subbasins or CALWATER HUs. As part of its assessment, the Team considered the conservation value of each habitat area (or HSA) in the context of the productivity, spatial distribution, and diversity of habitats across the range of the ESU. The Team evaluated the conservation value of habitat areas on the basis of the physical and biological habitat requirements of the SC *O. mykiss*, consistent with the PCEs identified for Pacific salmon and *O. mykiss* described under Methods and Criteria Used to Identify Proposed Critical Habitat.

Unit 1. Santa Maria River Subbasin (HU #3312)

The Santa Maria River HU is located in the northwestern portion of the ESU and includes the Santa Maria River and its upstream tributaries, the Sisquoc and Cuyama Rivers. The HU encompasses an area of approximately 704 mi^2 (1816 km^2) and contains three occupied HSA watersheds. Fish distribution and habitat use data compiled by NMFS biologists identify approximately 219 miles (350 km) of occupied riverine and estuarine habitat in these watersheds (NMFS, 2004a). The Team concluded that these occupied HSA watersheds contained one or more PCEs (*i.e.*, spawning, rearing, or migratory habitat) and identified several management activities that may affect the PCEs, including non-hydro dams, water withdrawals, sand and gravel mining, and grazing. Of the occupied watersheds, the Team rated two as low and one as high in conservation value to the ESU (NMFS, 2004b). The Team did not identify any unoccupied areas in this subbasin that may be essential for the conservation of the ESU.

Unit 2. Santa Ynez River Subbasin (HU #3314)

The Santa Ynez River HU is located in the northwestern portion of the ESU and includes the Santa Ynez River watershed. The HU encompasses an area of approximately 485 mi^2 (1,251 km^2) and contains six HSA watersheds, five of which are occupied. Fish distribution and habitat use data compiled by NMFS biologists identify approximately 138 miles (221 km) of occupied riverine and estuarine habitat in the occupied watersheds (NMFS, 2004a). The Team concluded that these occupied watersheds contained one or more PCEs (*i.e.*, spawning, rearing, or migratory habitat) and identified several management activities that may affect the PCEs, including grazing, water withdrawals, non-hydro dams, urbanization, barriers to migration, and road building and maintenance. Of these occupied watersheds, the Team rated one as low, two as medium, and two as high in conservation value to the ESU (NMFS, 2004b).

The Team also concluded that inaccessible reaches of the Santa Ynez River and its tributaries above Bradbury Dam may be essential to the conservation of this ESU. The Team reached this conclusion because historical records indicate that the upper portion of the Santa Ynez watershed above Bradbury Dam provided the principal spawning and rearing habitat for a historically large anadromous *O. mykiss* population within this river system prior to construction of the dam. In addition, most of these unoccupied river reaches are located on lands under public ownership and management, primarily the Los Padres National Forest. Because of the large size of the Santa Ynez river system, it is likely to have historically supported one or more independent populations which contributed to the resiliency of the ESU and served as a buffer against extinction. The currently occupied habitat areas within the range of the SC *O. mykiss* ESU are relatively small in number and size, and in many cases are isolated from other occupied habitats, thus the re-establishment of larger populations such as the one that historically occurred in the Santa Ynez River may be necessary to reduce the extinction probability of this ESU. We seek comment on whether unoccupied areas above Bradbury Dam should be proposed as critical habitat.

Unit 3. South Coast Subbasin (HU #3315)

The South Coast HU is located in the northwestern portion of the ESU and includes several small coastal streams such as Jalama Creek, Arroyo Hondo, Mission Creek, and Carpinteria Creek. The HU encompasses an area of approximately 375 mi^2 (968 km^2) and contains five occupied HSAs. Fish distribution and habitat use data compiled by NMFS biologists identify approximately 152 miles (243 km) of occupied riverine and estuarine habitat in the occupied watersheds (NMFS, 2004a). The Team concluded that these occupied HSA watersheds contained one or more PCEs (*i.e.*, spawning, rearing, or migratory habitat) and identified several management activities that may affect the PCEs, including agriculture, migration barriers or impediments, water withdrawals, urbanization, road building and maintenance, and wetland loss. Of the occupied watersheds, the Team rated all five as high in conservation value to the ESU (NMFS, 2004b). The Team did not identify any unoccupied areas in this subbasin that may be essential for the conservation of the ESU.

Unit 4. Ventura River Subbasin (HU #4402)

The Ventura River HU is located in the northwestern portion of the ESU and includes the Ventura River and its associated tributaries. The HU encompasses an area of approximately 162 mi^2 (259 km^2) and contains four occupied HSA watersheds. Fish distribution and habitat use data compiled by NMFS biologists identify approximately 68 miles (109 km) of occupied riverine and estuarine habitat in the occupied watersheds (NMFS, 2004a). The Team concluded that these occupied HSAs contained one or more PCEs (*i.e.*, spawning, rearing, or migratory habitat) and identified several management activities that may affect the PCEs, including urbanization, agriculture, water withdrawals, non-hydro dams, barriers or impediments, and exotic or invasive species. Of these occupied watersheds, the Team rated two as medium and two as high in conservation value (NMFS, 2004b).

The Team also concluded that inaccessible reaches of Matilija Creek and its tributaries above Matilija Dam and inaccessible reaches of Coyote and Santa Ana Creeks above Casitas Dam may be essential to the conservation of this ESU. The Team reached this conclusion because historical records indicate that the inaccessible habitat reaches above Matilija and Casitas Dams provided the principal spawning and rearing habitat for a historically large anadromous *O. mykiss* population within the Ventura River watershed prior to construction of the dams. In addition, most of these unoccupied river reaches are located on lands under public ownership and management, primarily the Los Padres National Forest. Because of the relatively large size of the Ventura River watershed, it is likely to have historically supported one or more independent populations prior to dam construction which contributed to the resiliency of the ESU and served as a buffer against extinction. The currently occupied habitat areas within the range of the SC *O. mykiss* ESU are relatively small in number and size, and in many cases are isolated from other occupied habitats. Thus the re-establishment of larger populations such as the ones that historically occurred in the Ventura River watershed may be necessary to reduce the extinction probability of this ESU. We seek comment on whether unoccupied areas above Matilija and Casitas Dams should be proposed as critical habitat.

Unit 5. Santa Clara—Calleguas Subbasin (HU #4403)

The Santa Clara—Calleguas HU is located in the northwestern portion of the range of the ESU and includes the Santa Clara River and its tributaries including Sespe Creek. That portion of the HU within the range of the ESU encompasses a large area of approximately 1,236 mi^2 (3,189 km^2) and contains 14 HSA watersheds, only 6 of which are occupied. Fish distribution and habitat use data compiled by NMFS biologists identify approximately 182 miles (291 km) of occupied riverine and estuarine habitat in the occupied watersheds (NMFS, 2004a). The Team concluded that these occupied HSAs contained one or more PCEs (*i.e.*, spawning, rearing, or migratory habitat) and identified several management activities that may affect the PCEs, including agriculture, irrigation water withdrawals, barriers and impediments, dams, urbanization, and exotic/invasive species. Of these occupied watersheds, the Team rated one as medium and five as high in conservation value (NMFS, 2004b).

The Team also concluded that inaccessible reaches of Piru Creek and its tributaries above Santa Felicia Dam may be essential to the conservation of this ESU. The Team reached this conclusion because historical records indicate that the inaccessible habitat reaches above Santa Felicia Dam provided the principal spawning and rearing habitat for a historically large anadromous *O. mykiss* population within the Santa Clara River watershed prior to construction of the dam. In addition, most of these unoccupied river reaches are located on lands under public ownership and management, primarily the Los Padres National Forest. Because of the large size of the Santa Clara River watershed, it is likely to have historically supported one or more independent populations prior to dam construction which contributed to the resiliency of the ESU and served as a buffer against its extinction. The currently occupied habitat areas within the range of the SC *O. mykiss* ESU are relatively small in number and size, and in many cases are isolated from other occupied habitats, thus the re-establishment of larger populations such as the one that historically occurred in the Santa Clara River watershed may be necessary to reduce the extinction probability of this ESU. We seek comment on whether unoccupied areas above Santa Felicia Dam should be proposed as critical habitat.

Unit 6. Santa Monica Bay Subbasin (HU #4404)

The Santa Monica Bay HU is located in the northwestern portion of the ESU and includes Topanga Creek, Malibu Creek, and Arroyo Sequit. That portion of the HU within the ESU encompasses approximately 328 mi^2 (846 km^2) and includes 29 HSA watersheds, only 3 of which are occupied. Fish distribution and habitat use data compiled by NMFS biologists identify only approximately 11 miles (18 km) of occupied riverine and estuarine habitat in the 3 occupied watersheds (NMFS, 2004a). The Team concluded that these occupied watersheds contained one or more PCEs (*i.e.*, spawning, rearing, or migratory habitat) and identified several management activities that may affect the PCEs, including road building and maintenance, urbanization, barriers and impediments, and flood control and other channel modifications. Of these occupied watersheds, the Team rated all three as high in conservation value to the ESU (NMFS, 2004b).

The Team also concluded that inaccessible reaches of Malibu Creek above Rindge Dam may be essential to the conservtion of this ESU. The Team reached this conclusion because historical records indicate that the inaccessible habitat reaches above Rindge Dam provided the principal spawning and rearing habitat for an important anadromous *O. mykiss* population within the Malibu River watershed prior to construction of the dam. Because of the size of this watershed, it is likely to have historically supported an independent population prior to dam construction which contributed to the resiliency of the ESU and served as a buffer against its extinction. The currently occupied habitat areas within the range of the SC *O. mykiss* ESU are relatively small in number and size, and in many cases are isolated from other occupied habitats, thus the re-establishment of larger populations such as the one that historically occurred in Malibu Creek may be necessary to reduce the extinction probability of this ESU. We seek comment on whether unoccupied areas above Rindge Dam should be proposed as critical habitat.

Unit 7. Calleguas Subbasin (HU #4408)

The Calleguas HU is located in the northwestern portion of the ESU and includes Calleguas Creek and estuary. That portion of the HU within the range of the ESU encompasses a large area of approximately 344 mi^2 (888 km^2) and 12 HSA watersheds, only 2 of which are occupied. Fish distribution and habitat use data compiled by NMFS biologists identify only approximately 1 mile (1.6 km) of occupied freshwater and estuarine habitat in the occupied HSA watersheds (NMFS, 2004b). The Team concluded that the occupied watersheds contained one or more PCEs (*i.e.*, rearing and migratory habitat) and identified management activities that may affect the PCEs, including agriculture, channel modifications, and barriers or impediments. The Team also concluded that both watersheds have a low conservation value to the ESU (NMFS, 2004b). The Team did not identify any unoccupied areas that may be essential to the conservation of the ESU.

Unit 8. San Juan Subbasin (HU #4901)

The San Juan HU is located in the southern portion of the ESU and includes the San Juan Creek and San Mateo Creek watersheds which have recently been re-colonized by anadromous *O. mykiss*. That portion of the HU within the range of the ESU encompasses an area of approximately 496 mi^2 (1,280 km^2) and contains 18 HSA watersheds, 9 of which are occupied. Fish distribution and habitat use data compiled by NMFS biologists identify approximately 66 miles (106 km) of occupied riverine and estuarine habitat in the occupied watersheds (NMFS, 2004a). The Team concluded that the occupied watersheds contained one or more PCEs (*i.e.*, spawning, rearing, or migratory habitat) and identified several management activities that may affect the PCEs, including urbanization, road building and maintenance, barriers and impediments, channel modifications or flood control structures, agriculture, agricultural and non-agricultural water withdrawals, and exotic/invasive species. Of these occupied watersheds, the Team rated one as low, one as medium, and seven as high in conservation value to the ESU (NMFS, 2004b). The Team did not identify any unoccupied areas that may be essential for the conservation of the ESU.

Within the range of the SC *O. mykiss* ESU, which extends from the Santa Maria River southward to the U.S.—Mexico border, there are a large number of HSA watersheds and their associated subbasins (or HUs) that are not occupied. These unoccupied subbasins include the San Gabriel River, Los Angeles River, Santa Ana River, Santa Margarita River, San Luis Rey River, San Dieguito River, San Diego River, Sweetwater River, Otay River and Tijuana River. Because these areas are unoccupied and were not considered essential for conservation of the ESU by the Team, they were not considered further in the designation process.

Central Valley (CV) Spring-Run Chinook ESU

The CV spring-run chinook ESU was listed as a threatened species in 1999 (64 FR 50394). The ESU includes all naturally spawned populations of spring-run chinook salmon in the Sacramento River and its tributaries. The agency recently conducted a review to update the ESU's status, taking into account new information and considering the net contribution of artificial propagation efforts in the ESU. A single artificially propagated spring-run chinook stock resides within the historical geographic range of the ESU (Feather River Hatchery spring-run chinook program), but it is not considered part of the ESU because of introgression with fall-run chinook salmon. NMFS has recently proposed that the CV spring-run chinook ESU remain listed as a threatened species (69 FR 33102; June 14, 2004). No artificial propagation programs were proposed for listing.

A Technical Recovery Team has been established for the Central Valley recovery planning domain, and it has identified historic and extant demographically independent populations of spring chinook (NMFS, 2004; NOAA Technical Memorandum NOAA–TM–NMFS–SWFSC–370). The TRT divided the range of the spring-run chinook ESU into four geographic groups. Geographic areas in each group inhabit similar environments based on a principle components analysis of environmental variables. The four geographic groups are the southern Cascades, northern Sierra, southern Sierra, and Coast Range. The TRT identified at least 18 historically demographically independent populations of spring-run chinook distributed among these four geographic areas, plus an additional seven likely dependent populations that may have been strongly influenced by adjacent independent population. Three of the 18 independent populations are extant (Mill, Deer and Butte Creek populations) and all occur in the Southern Cascade geographic area. Several extant dependent populations have intermittent runs of spring chinook including Big Chico, Antelope, and Beegum Creeks. Recovery planning will likely emphasize the need for having viable populations distributed across the range of the identified geographic areas (Ruckelshaus *et al.*, 2002; McElhany *et al.*, 2003). Recovery planning efforts are currently focused on working with the CalFed and Central

Valley Project Improvement Act programs to implement habitat restoration projects and other recovery related efforts in the Central Valley. The Team considered the TRT products in rating each watershed and also solicited input from the TRT on the distributional and habitat use information that was compiled as well as the conservation assessment of occupied HSAs.

The Team's assessment for this ESU addressed habitat areas within 37 occupied watersheds or CALWATER HSAs that occur in 15 associated subbasins or CALWATER HUs. This assessment also included four HSAs that encompass the San Francisco-San Pablo-Suisun Bay complex, which constitutes rearing and migration habitat for this ESU. This complex is treated as a separate unit in the following ESU description even though it is not a CALWATER HU. As part of its assessment, the Team considered the conservation value of each habitat area (or HSA) in the context of the productivity, spatial distribution, and diversity of habitats across the range of the ESU. The Team evaluated the conservation value of habitat areas on the basis of the physical and biological habitat requirements of the CV spring-run chinook, consistent with the PCEs identified for Pacific salmon and *O. mykiss* described under Methods and Criteria Used to Identify Proposed Critical Habitat.

Unit 1. Tehama Subbasin (HU #5504)

The Tehama HU is located in the north central portion of the ESU and includes portions of the mainstem Sacramento River, the lower portions of two westside tributaries (Thomes and Stony Creeks) and the lower portions of three eastside tributaries (Mill Creek, Deer Creek, and Pine Creek). The HU encompasses an area of approximately 1,119 square miles (2,887 km^2) and contains two HSA watersheds, both of which are occupied. Fish distribution and habitat use data compiled by NMFS biologists identify approximately 250 miles (400 km) of occupied riverine habitat in the occupied watersheds (NMFS, 2004a). The Team concluded that these occupied watersheds contained one or more PCEs (*i.e.*, spawning, rearing, or migratory habitat) and identified several management activities that may affect the PCEs, including agricultural water withdrawals, fish passage impediments, stream bank stabilization for flood control, dam operations, urbanization, rangeland management, diking, and point and non-point source water pollution. Of these occupied watersheds, the Team rated one as medium and one as having high conservation value to the ESU (NMFS, 2004b). The Team did not identify any unoccupied areas in this subbasin that may be essential for the conservation of the ESU.

Unit 2. Whitmore Subbasin (HU #5507)

The Whitmore HU is located in the north eastern portion of the ESU and includes portions of upper Battle Creek (North and South Forks), upper Bear Creek, and the Cow Creek watershed. The HU encompasses an area approximately 913 mi^2 (2,355 km^2) and contains seven HSA watersheds, four of which are occupied. Fish distribution and habitat use data compiled by NMFS biologists identify approximately 58 miles (93 km) of occupied riverine habitat in the occupied HSAs (NMFS, 2004a). The Team concluded that these occupied areas contained one or more PCEs (*i.e.,* spawning, rearing, or migratory habitat) and identified management activities that may affect the PCEs, including agricultural and no-agricultural water withdrawals, forestry, rangeland management, hydropower diversions, urbanization, and fish passage impediments. Of these watersheds, the Team rated three as having low conservation value and one as having high conservation value to the ESU (NMFS, 2004b). The Team did not identify any unoccupied areas in this subbasin that may be essential for the conservation of the ESU.

Unit 3. Redding Subbasin (HU #5508)

The Redding HU is located in the northernmost portion of the ESU and includes portions of the upper Sacramento River mainstem, westside tributaries including Cottonwood Creek (portions of both the Middle and South Forks) and Clear Creek, and the lower portions of several eastside tributaries (Cow Creek, Bear Creek, and lower Battle Creek). The HU encompasses an area of approximately 705 mi^2 (1,818 km^2) and contains two occupied HSA watersheds. Fish distribution and habitat use data compiled by NMFS biologists identify approximately 159 miles (254 km) of occupied riverine habitat in these watersheds (NMFS, 2004a). The Team concluded that these occupied areas contained one or more PCEs (*i.e.,* spawning, rearing, or migratory habitat) and identified management activities that may affect the PCEs, including rangeland management, gravel mining, fish passage impediments, dam operations and flood control water storage, and agricultural water withdrawals. The Team rated both occupied watersheds as having high conservation value to the ESU (NMFS, 2004b). The Team did not identify any unoccupied areas in this subbasin that may be essential for the conservation of the ESU.

Unit 4. Eastern Tehama Subbasin (HU #5509)

The Eastern Tehama HU is located in the northeastern portion of the ESU and includes portions of several important populations including Mill Creek, Deer Creek, Antelope Creek, and the upper portion of Big Chico Creek. The HU encompasses an area of approximately 896 mi^2 (2,311 km^2) and contains ten HSA watersheds, four of which are occupied. Fish distribution and habitat use data compiled by NMFS biologists identify approximately 117 miles (187 km) of occupied riverine habitat in the occupied watersheds (NMFS, 2004a). The Team concluded that these occupied areas contained one or more PCEs (*i.e.,* spawning, rearing, or migratory habitat) for this ESU and identified management activities that may affect the PCEs, including forestry, rangeland management, fish passage impediments, road building and maintenance, and agricultural water withdrawals. Of the occupied watersheds, the Team rated them all high in conservation value to the ESU (NMFS, 2004b). The Team did not identify any unoccupied areas in this subbasin may be essential for the conservation of the ESU.

Unit 5. Sacramento Delta Subbasin (HU #5510)

The Sacramento Delta HU is located in the southern portion of the ESU and includes portions of the mainstem Sacramento River and the Deep Water Ship Channel. The HU encompasses an area of approximately 446 mi^2 (1,150 km^2) and contains a single HSA which is occupied. Fish distribution and habitat use data compiled by NMFS biologists identify approximately 180 miles (288 km) of occupied riverine habitat in this watershed (NMFS, 2004a). The Team concluded that these occupied areas contained one or more PCEs (*i.e.,* spawning, rearing, or migratory habitat) for this ESU and identified management activities that may affect the PCEs, including agricultural water withdrawals, point and non-point water pollution, invasive/non-native species, diking, and streambank stabilization for flood control. The Team rated this watershed as high in conservation value to the ESU (NMFS, 2004b). The Team did not identify any unoccupied habitat areas in the subbasin that may be essential for conservation of the ESU.

Unit 6. Valley Putah-Cache Subbasin (HU #5511)

The Valley Putah-Cache HU is located in the southern portion of the ESU and includes portions of Putah and Cache Creeks. This HU encompasses an area of approximately 961 mi^2 (2,479 km^2) and contains two HSA watersheds within the range of the ESU, one of which is occupied. Fish distribution and habitat use data compiled by NMFS biologists identify approximately 16 miles (26 km) of occupied riverine habitat in this watershed (NMFS, 2004a). The Team concluded that these occupied areas contained one or more PCEs (*i.e.,* spawning, rearing, or migratory habitat) for this ESU and identified management activities that may affect the PCEs, including urban development, agricultural water withdrawals, and impediments to fish passage. The Team rated the occupied watershed as high in conservation value to the ESU (NMFS, 2004b). The Team did not identify any unoccupied habitat areas in this subbasin that may be essential for the conservation of the ESU.

Unit 7. Marysville Subbasin (HU #5515)

The Marysville HU is located in the central portion of the ESU and includes portions of the lower Feather and Yuba Rivers. This HU encompasses an area of approximately 417 mi^2 (1,076 km^2) and contains three HSA watersheds, two of which are occupied. Fish distribution and habitat use data compiled by NMFS biologists identify only 58 miles (93 km) of occupied riverine habitat in these occupied watersheds (NMFS, 2004a). The Team concluded that these occupied areas contained one or more PCEs (*i.e.,* spawning, rearing, or migratory habitat) for this ESU and identified management activities that may affect the PCEs, including agricultural water withdrawals, hydroelectric and municipal water diversions, water storage for flood control, dam operations, streambank stabilization for flood control, diking, and fish passage impediments. The Team rated both occupied watersheds as high in conservation value to the ESU (NMFS, 2004b).

The Team did not identify any unoccupied habitat areas in this subbasin that may be essential for the conservation of the ESU; however, the Team did conclude that inaccessible stream reaches in the Upper Feather River above Oroville Dam in the adjacent subbasin (HU #5518) may be essential to the conservation of this ESU. Specifically, the Team identified the following stream reaches above Oroville Dam that may be essential for conservation of this ESU: from Oroville Dam upstream along the West Branch of the Feather River to the vicinity of Kimshew Falls; along the North Fork of the Feather River upstream of the location of Lake Almanor; along the East Branch of the NF Feather River including Indian Creek and Spanish Creek; the South Middle Fork of the Feather River, and the South Fork of the Feather River upstream to the first natural impassible barrier. Both spring-run chinook and steelhead historically occurred in the Upper Feather River prior to Pacific Gas and Electric's hydroelectric development in the North Fork watershed and the construction of Oroville Dam. Construction of Oroville Dam extirpated both the spring-run chinook and steelhead populations in this upper watershed. The Team concluded that spawning, rearing, and migratory habitat occurs above Oroville Dam in these inaccessible reaches, but it is in better condition for steelhead than spring-run chinook salmon. The feasibility of providing fish passage past Oroville Dam is currently being evaluated through the ongoing FERC relicensing process for this facility. The Team concluded this inaccessible habitat may be essential for the conservation of this ESU because the genetic integrity of spring-run chinook in the Lower Feather River has been compromised by Feather River Hatchery practices (*i.e.,* introgression of spring and fall runs in the hatchery), and providing access to the unoccupied habitat above the dam would allow for expansion of the population in this watershed. We seek comment on whether this unoccupied habitat should be proposed as critical habitat.

Unit 8. Yuba River Subbasin (HU #5517)

The Yuba River HU is located in the central and eastern portion of the ESU and includes part of the upper Yuba River watershed. This HU encompasses an area of approximately 1,436 mi^2 (3,704 km^2) and contains sixteen HSA watersheds, only four of which are occupied. Virtually all of these watersheds, however, are outside the previously identified boundary of the ESU. Fish distribution and habitat use data compiled by NMFS biologists identify only approximately 22 miles (35 km) of occupied riverine habitat in the occupied watersheds (NMFS, 2004a). The Team concluded that these occupied areas contained one or more PCEs (*i.e.,* spawning, rearing, or migratory habitat) for this ESU and identified management activities that may affect the PCEs, including agricultural and non-agricultural water withdrawals, fish passage impediments, and dam operations. Of these occupied watersheds, the Team rated one as low, one as medium, and two as high in conservation value to the ESU (NMFS, 2004b).

The Team concluded that inaccessible stream reaches on the Upper Yuba River above Englebright Dam may be essential to the conservation of this ESU, including those upstream reaches on the North Yuba to New Bullards Bar Dam, on the Middle Yuba to Milton Dam, and on the South Yuba to Lake Spaulding. All three forks of the Upper Yuba River historically supported populations of spring chinook and steelhead (Yoshiyama *et al.,* 1995). The Team considered this area to be essential for conservation because it provides one of the largest areas of suitable habitat in the Central Valley that can be accessed by providing passage at one relatively small dam. The Lower Yuba is also considered to have a good ''seed'' population of both spring chinook and steelhead and both populations are considered relatively free of hatchery influence. A large, multi-million dollar study program is underway through the CALFED Ecological Restoration Program to evaluate the feasibility of restoring anadromous salmonid populations to the Upper Yuba River. We seek comment on whether this unoccupied habitat should be proposed as critical habitat.

Unit 9. Valley-American Subbasin (HU #5519)

The Valley-American HU is located in the south-central and eastern portion of the ESU and includes portions of the Lower American River, the mainstem Sacramento River, and the lower Feather River. This HU encompasses an area of approximately 958 mi^2 (2,471 km^2) and contains four HSA watersheds, only two of which are occupied. Fish distribution and habitat use data compiled by NMFS biologists identify only approximately 61 miles (98 km) of occupied riverine habitat in these watersheds (NMFS, 2004a). The Team concluded that these occupied areas contained one or more PCEs (*i.e.,* spawning, rearing, or migratory habitat) for this ESU and identified management activities that may affect the PCEs, including agricultural and municipal water withdrawals, point source and non-point source water pollution, streambank stabilization for flood control, fish passage impediments, water storage for flood control, dam operations, and urbanization. The Team rated one watershed as medium in conservation value and one as high in conservation value to the ESU (NMFS, 2004b). The Team did not identify any unoccupied habitat areas in this subbasin that may be essential for the conservation of the ESU.

Unit 10. Colusa Basin Subbasin (HU #5520)

The Colusa Basin HU is located in the central portion of the ESU and includes portions of the mainstem Sacramento River, lower Butte Creek, and the Butte Creek-Sutter Bypass. This HU encompasses an area of approximately 2,767 mi^2 (7,139 km^2) and contains five HSA watersheds, four of which are occupied. Fish distribution and habitat use data compiled by NMFS biologists identify approximately 230 miles of occupied riverine habitat, including the Butte Creek-Sutter Bypass, in these watersheds (NMFS, 2004a). The Team concluded that these occupied areas contained one or more PCEs (*i.e.,* spawning, rearing, or migratory habitat) for this ESU and identified management activities that may affect the PCEs, including agricultural and municipal water withdrawals, fish passage impediments, point and non-point source pollution, diking, wildlife habitat management, flood control operations, and non-native/invasive species. The Team rated all four occupied watersheds as having high conservation value to the ESU (NMFS, 2004b). The Team did not identify any unoccupied habitat areas in this subbasin that may be essential for the conservation of the ESU.

Unit 11. Butte Creek Subbasin (HU #5521)

The Butte Creek HU is located in the northeastern portion of the ESU and includes portions of upper Butte Creek. This HU encompasses an area of approximately 207 mi^2 (534 km^2) and contains three HSA watersheds, only one of which is occupied. Fish distribution and habitat use data compiled by NMFS biologists identify approximately 15 miles (24 km) of occupied riverine habitat in the watershed (NMFS, 2004a). The Team concluded that these occupied areas contained one or more PCEs (*i.e.,* spawning, rearing, or migratory habitat) for this ESU and identified water diversions for hydroelectric power as the principal management activity that may affect the PCEs. The Team rated this occupied watershed as high in conservation value to the ESU (NMFS, 2004b).

The Team also concluded that inaccessible reaches of Upper Butte Creek above Centerville Dam upstream to Butte Meadow may be essential to the conservation of this ESU. It is uncertain whether this area was historically used by the ESU, but spawning, rearing, and migration is present in the inaccessible areas and is thought to be in good condition. The Team believed this area may be essential for conservation because current spring run chinook and steelhead spawning in this watershed is all below an elevation of 1,000 ft and other spring-run chinook populations within the ESU typically spawn above 2,000 ft. High water temperatures in the lower portion of Butte Creek have led to significant spring-run chinook pre-spawning mortalities in recent years, and the Team concluded that improved fish passage over the Centerville Diversion Dam would increase the range of this ESU and reduce the risk of adult losses in the lower stream reaches. The Team expects that feasibility of passage at the Centerville Diversion Dam will be evaluated through the upcoming FERC relicensing process for the facility. We seek comment on whether these unoccupied habitat areas should be proposed as critical habitat.

Unit 12. Ball Mountain Subbasin (HU #5523)

The Ball Mountain HU is located in the northwestern portion of the ESU and includes a portion of upper Thomes Creek. This HU encompasses an area of approximately 334 mi^2 (862 km^2) and contains three HSAs, only one of which is occupied primarily in the Thomes Creek watershed. Fish distribution and habitat use data compiled by NMFS biologists identify approximately 15 miles (24 km) of occupied riverine habitat in the single occupied HSA watershed (NMFS, 2004a). The Team concluded that the occupied areas in this watershed contained one or more PCEs (*i.e.,* spawning, rearing, or migratory habitat) for this ESU and identified rangeland management as the principal activity that may affect the PCEs. The Team rated this single occupied watershed as low in conservation value to the ESU (NMFS, 2004b). The Team did not identify any occupied habitat areas in this subbasin that may be essential for the conservation of the ESU.

Unit 13. Shasta Bally Subbasin (HU #5524)

The Shasta Bally HU is located in the northwestern portion of the ESU and includes portions of South Fork Cottonwood Creek and Beegum Creek. This HU encompasses an area of approximately 905 mi^2 (2,335 km^2) and contains nine HSA watersheds, four of which are occupied. Fish distribution and habitat use data compiled by NMFS biologists identify approximately 50 miles (80 km) of occupied riverine habitat in these watersheds (NMFS, 2004a). The Team concluded that these occupied areas contained one or more PCEs (*i.e.*, spawning, rearing, or migratory habitat) for this ESU and identified management activities that may affect the PCEs, including forestry, rangeland management, road building and maintenance, water diversion for hydroelectric power generation, water storage for flood control, dam operations, gravel mining, and fish passage impediments. The Team rated one watershed as low in conservation value and three as high in conservation value to the ESU (NMFS, 2004b). The Team did not identify any unoccupied habitat in this subbasin that is essential for the conservation of the ESU.

Unit 14. North Diablo Range Subbasin (HU #5543)

The North Diablo Range HU is located in the southernmost portion of the ESU near the Delta and includes only a small portion of the south-central Delta. This HU encompasses an area of approximately 315 mi^2 (812 km^2) and only a single HSA which is partially occupied. Fish distribution and habitat use data compiled by NMFS biologists identify only approximately 4 miles (6 km) of occupied riverine or estuarine habitat in this HSA (NMFS, 2004a). The Team concluded that these occupied areas contained one or more PCEs (*i.e.*, rearing and migratory habitat) for this ESU and identified management activities that may affect the PCEs, including agricultural and municipal water withdrawals, fish passage impediments, and invasive/non-native species. The Team rated this single watershed as medium in conservation value (NMFS, 2004b). The Team did not identify any unoccupied habitat areas in this subbasin that may be essential for the conservation of the ESU.

Unit 15. San Joaquin Delta Subbasin (HU #5544)

The San Joaquin Delta HU is located in the southernmost portion of the ESU and includes portions of the central and south Delta. This HU encompasses an area of approximately 628 mi^2 (1,620 km^2) and contains a single HSA watershed which is occupied. Fish distribution and habitat use data compiled by NMFS biologists identify approximately 142 miles (227 km) of occupied estuarine habitat in this HSA (NMFS, 2004a). The Team concluded that these occupied areas contained one or more PCEs (*i.e.*, spawning, rearing, or migratory habitat) for this ESU and identified management activities that may affect the PCEs, including agricultural and municipal water withdrawals, fish passage impediments, invasive/non-native species, and entrainment and flow alterations. The Team rated this single watershed as low in conservation value (NMFS, 2004b). The Team did not identify any unoccupied habitat areas in this subbasin that may be essential for the conservation of the ESU.

Unit 16. Suisun Bay (HU #2207), San Pablo Bay (HU #2206) and San Francisco Bay (HU #s 2203 and 2204)

Portions of four HUs (2207, 2206, 2203, 2204) comprise the Suisun Bay-San Pablo-San Francisco Bay complex that is utilized by this ESU. These four HUs contain both estuarine habitat in the Bay complex as well as freshwater tributaries to the Bay complex, but only the 4 HSAs (HSAs: 220710, 220610, 220410, and 220312) that comprise the estuarine Bay complex are occupied by this ESU. These four HSAs encompass approximately 427 mi^2 (1,102 km^2) of estuarine habitat that serves as a rearing and migratory corridor providing connectivity between freshwater spawning, rearing, and migratory habitats for this ESU in the Sacramento-San Joaquin basin and the ocean. The Team concluded that these four HSAs were occupied and contained PCEs for migratory habitat that support this ESU, and identified management activities that may affect the PCEs, including agricultural and municipal water withdrawals, point and non-point source water pollution, diking, streambank stabilization activities, industrial development, invasive/non-native species, wetland/estuary management, and habitat restoration. Of these occupied HSAs, the Team rated one as having low conservation value (#220410) and three as having high conservation value to the ESU (NMFS, 2004b). The Team did not identify any unoccupied areas in the San Francisco-San Pablo-Suisun Bay complex that may be essential for the conservation of this ESU.

Unoccupied Habitat Outside the ESU Range That May Be Essential to Conservation

The Team identified several unoccupied habitat areas in the Central Valley that are outside the current range of the CV spring-run chinook ESU, but that may be essential for its conservation. We seek comment on whether these unoccupied areas should be proposed as critical habitat. These areas are identified below:

(1) *Lower and Upper Mokelumne River.* The Team concluded that currently unoccupied portions of the Lower Mokelumne River from its confluence with the San Joaquin River upstream to Comanche Dam may be essential for the conservation of this ESU. In addition, the Team concluded that inaccessible reaches of the Upper Mokelumne River above Comanche Dam up to Bald Rock Falls (which is 7 miles above Electra Dam) may be essential to the conservation of this ESU. The Mokelumne River historically supported large runs of spring run chinook salmon (Yoshiyama *et al.*, 1995) which have been extirpated. The lower portion of the Mokelumne River would be essential as a migratory corridor for spring chinook access to the upper watershed above Comanche Dam. Suitable habitat exists above Comanche Dam, but it has been altered by Comanche and Pardee reservoirs. The Central Valley Technical Recovery Team identifies this as a historically independent population and indicates that multiple independent populations of this ESU distributed throughout the Central Valley may be required to recover this ESU.

(2) *Lower and Middle Stanislaus River.* The Team concluded that currently unoccupied reaches of the Lower Stanislaus River from its confluence with the San Joaquin River up to Goodwin Dam may be essential for the conservation of this ESU. The Team also concluded that inaccessible habitat reaches in the Middle Stanislaus River from Goodwin Dam to New Melones Dam may be essential to the conservation of this ESU. The Stanislaus River historically supported a large population of spring-run chinook salmon (McEwan 1996; Yoshiyama 1996) which was extirpated with the construction of Goodwin Dam. The lower portion of the Stanislaus River would be essential as a migratory corridor for spring chinook access to the upper watershed above Goodwin Dam. Depending upon dam operations and resulting instream water temperatures, rearing and spawning habitat might be available in this lower reach. Suitable habitat exists above Goodwin Dam and fish passage at the Dam is thought to be feasible. The Central Valley Technical Recovery Team identifies this as a historically independent population and indicates that multiple independent populations of this ESU distributed throughout the Central Valley may be required to recover this ESU.

(3) *Lower and Middle Tuolumne River.* The Team concluded that currently unoccupied reaches of the Lower Tuolumne River from its confluence with the San Joaquin River up to LaGrange Dam may be essential for the conservation of this ESU. The Team also concluded that inaccessible habitat reaches in the Middle Tuolumne River between LaGrange and New Don Pedro Dams may be essential to the conservation of this ESU. The Tuolumne River historically supported a large population of spring-run chinook salmon (McEwan 1996; Yoshiyama 1996) which was extirpated with the construction of LaGrange Dam. The lower portion of the Stanislaus River would be essential as a migratory corridor for spring chinook access to the upper watershed above LaGrange Dam. Depending upon dam operations and resulting instream water temperatures, rearing and spawning habitat might be available in this lower reach. Suitable habitat is thought to exist above LaGrange Dam for this ESU although feasibility of providing passage above the dam is uncertain. The Central Valley Technical Recovery Team identifies this as a historically independent population that is now extirpated and indicates that multiple independent populations of this ESU distributed throughout the Central Valley may be required to recover this ESU.

(4) *Lower and Middle Merced River.* The Team concluded that currently unoccupied reaches of the Lower Merced River from its confluence with the San Joaquin River up to Crocker-Huffman Dam may be essential for the conservation of this ESU. The Team also concluded that inaccessible habitat reaches in the Middle Merced River between Crocker-Huffman and Exchequer Dams may be essential to the conservation of this ESU. The Merced River historically supported a large population of spring-run chinook salmon (Yoshiyama 1996) which was extirpated with the construction of Crocker-Huffman Dam. The lower portion of the Merced River would be essential as a migratory corridor for spring-chinook access to the upper watershed above Crocker-Huffman Dam. Depending upon dam operations and resulting instream water temperatures, rearing and spawning habitat might be available in this lower reach. Suitable habitat is thought to exist above Crocker-Huffman Dam for this ESU although passage at the Dam is thought to be feasible because of its low height. The Central Valley Technical Recovery Team identifies this as a historically independent population that is now extirpated and indicates that multiple independent populations of this ESU distributed throughout the Central Valley may be required to recover this ESU.

Central Valley (CV) O. mykiss ESU

The CV *O. mykiss* ESU was listed as a threatened species in 1998 (63 FR

13347; March 19, 1998). The ESU includes all naturally spawned populations of *O. mykiss* in the Sacramento and San Joaquin Rivers and their tributaries, but excludes *O. mykiss* from San Francisco and San Pablo Bays and their tributaries. Based on an updated status review (NMFS 2003a) and an assessment of hatchery populations located within the range of the ESU (NMFS 2003b), NMFS recently proposed that the ESU remain listed as a threatened species (69 FR 33102; June 14, 2004). In addition, NMFS proposed that resident *O. mykiss* occurring with anadromous populations below impassable barriers (both natural and man made) and two artificially propagated populations (Coleman National Fish Hatchery on Battle Creek and Feather River Hatchery on the Feather River) also be included in the CV *O. mykiss* ESU. Two artificially propagated *O. mykiss* stocks reside within the historical geographic range of the ESU (Nimbus Fish Hatchery on the American River and Mokelumne River Hatchery on the Mokelumne River), but are not considered part of the ESU because they are derived from out-of-ESU broodstock (69 FR 33102; June 14, 2004). A Technical Recovery Team has been established for the Central Valley recovery planning domain and is in the process of identifying the historical and extant independent population structure of this ESU as well as the associated viability criteria for these populations.

The Team's assessment for the CV *O. mykiss* ESU addressed habitat areas within 67 occupied watersheds or CALWATER HSAs that occur in over 25 associated subbasins or CALWATER HUs. This assessment also included four HSAs that encompass the San Francisco-San Pablo-Suisun Bay complex which constitutes rearing and migration habitat for this ESU. This complex is treated as a separate unit in the following ESU description even though it is not a CALWATER HU. As part of its assessment, the Team considered the conservation value of each habitat area (or HSA) in the context of the productivity, spatial distribution, and diversity of habitat across the range of the ESU. The Team evaluated the conservation value of habitat areas on the basis of the physical and biological habitat requirements of the CV *O. mykiss* ESU, consistent with the PCEs identified for Pacific salmon and *O. mykiss* described under Methods and Criteria Used to Identify Proposed Critical Habitat.

Unit 1. Tehama Subbasin (HU #5504)

The Tehama HU is located in the north central portion of the ESU and includes portions of the mainstem Sacramento River, the lower portions of two westside tributaries (Thomes and Stony Creeks), and the lower portions of three eastside tributaries (Mill Creek, Deer Creek, and Pine Creek). The HU encompasses an area approximately 1,119 mi² (2,887 km²) and contains two HSAs, both of which are occupied. Fish distribution and habitat use data compiled by NMFS biologists identify approximately 228 miles (365 km) of occupied riverine habitat in the occupied watersheds (NMFS, 2004a). The Team concluded that these occupied HSA watersheds contained one or more PCEs (*i.e.*, spawning, rearing, and/or migratory habitat) and identified several management activities that may affect the PCEs, including agricultural and municipal water withdrawals, dam operations, diking activities, streambank stabilization for flood control, rangeland management, fish passage impediments, and urban development. Of the occupied HSA watersheds, the Team rated one as medium and one as high in conservation value (NMFS, 2004b). The Team did not identify any unoccupied areas in this subbasin that may be essential for the conservation of the ESU.

Unit 2. Whitmore Subbasin (HU #5507)

The Whitmore HU is located in the north eastern portion of the ESU and includes portions of upper Battle Creek (North and South Forks), upper Bear Creek, and the Cow Creek watershed. The HU encompasses an area approximately 913 mi² (2,355km²) and contains seven HSA watersheds, all of which are occupied. Fish distribution and habitat use data compiled by NMFS biologists identify approximately 177 miles (283 km) of occupied riverine habitat in the occupied HSAs (NMFS, 2004a). The Team concluded that these occupied areas contained one or more PCEs (*i.e.*, spawning, rearing, or migratory habitat) and identified management activities that may affect the PCEs, including agricultural and municipal water withdrawals, forest management, rangeland management, fish passage impediments, urban development, and hydropower diversions. Of these seven occupied watersheds, the Team rated two as having low conservation value, two as medium in conservation value, and three as high in conservation value to the ESU (NMFS, 2004b). The Team did not identify any unoccupied areas in this subbasin that may be essential for the conservation of this ESU.

Unit 3. Redding Subbasin (HU #5508)

The Redding HU is located in the northern most portion of the ESU and includes portions of the upper Sacramento River mainstem, westside tributaries including Cottonwood Creek (portions of both the Middle and South Forks) and Clear Creek, and the lower portions of several eastside tributaries (Cow Creek, Bear Creek, and lower Battle Creek). The HU encompasses an area of approximately 705 mi² (1,818 km²) and contains two HSA watersheds, both of which are occupied. Fish distribution and habitat use data compiled by NMFS biologists identify approximately 233 miles (373 km) of occupied riverine habitat in these watersheds (NMFS, 2004a). The Team concluded that these occupied areas contained one or more PCEs (*i.e.*, spawning, rearing, or migratory habitat) and identified management activities that may affect the PCEs, including dam operations and water storage for flood control, fish passage impediments, point and non-point source water pollution, gravel mining, agricultural water withdrawals, and rangeland management. The Team rated both occupied watersheds as having high conservation value to the ESU (NMFS, 2004b). The Team did not identify any unoccupied areas in this subbasin that may be essential for the conservation of this ESU.

Unit 4. Eastern Tehama Subbasin (HU #5509)

The Eastern Tehama HU is located in the northeastern portion of the ESU and includes portions of several important watersheds including Mill Creek, Deer Creek, Antelope Creek, and the upper portion of Big Chico Creek. The HU encompasses an area of approximately 896 mi² (2,311 km²) and contains ten HSA watersheds, six of which are occupied. Fish distribution and habitat use data compiled by NMFS biologists identify approximately 151 miles (242 km) of occupied riverine habitat in the occupied HSAs (NMFS, 2004a). The Team concluded that these occupied areas contained one or more PCEs (*i.e.*, spawning, rearing, or migratory habitat) for this ESU and identified management activities that may affect the PCEs, including forest management, rangeland management, fish passage impediments, road building and maintenance, and agricultural water withdrawals. Of the six occupied watersheds, the Team rated one as low, one as medium, and four as high in conservation value to the ESU (NMFS, 2004b).

The Team also concluded that inaccessible stream reaches in Upper

Deer Creek above Upper Deer Creek Falls may be essential for the conservation of this ESU. Historically, *O. mykiss* (steelhead) had access to this area when conditions allowed fish to pass the falls. A ladder was constructed in the late 1940s but it provides poor attraction and passage conditions and has been closed since 2001. Deer Creek currently supports a population of steelhead and improved passage conditions into this reach would increase the amount of spawning, rearing and migration habitat available to the ESU. We seek comment on whether this unoccupied habitat area should be proposed as critical habitat.

Unit 5. Sacramento Delta (HU #5510)

The Sacramento Delta HU is located in the central portion of the ESU and includes portion of the mainstem Sacramento River and the Deep Water Ship Channel. The HU encompasses an area of approximately 446 mi^2 (1,150km^2) and contains a single HSA which is occupied. Fish distribution and habitat use data compiled by NMFS biologists identify approximately 194 miles (310 km) of occupied riverine habitat in this HSA (NMFS, 2004a). The Team concluded that these occupied areas contained one or more PCEs (*i.e.*, spawning, rearing, or migratory habitat) for this ESU and identified management activities that may affect the PCEs, including agricultural water withdrawals, point and non-point source water pollution, invasive/non-native species, diking activities, and streambank stabilization for flood control. The Team rated this watershed as high in conservation value to the ESU (NMFS, 2004b). The Team did not identify any unoccupied habitat areas in this subbasin that may be essential to the conservation of the ESU.

Unit 6. Valley Putah-Cache Subbasin (HU #5511)

The Valley Putah-Cache HU is located in the southern portion of the Sacramento river basin includes a portion of the Yolo Bypass and portions of west side tributaries Putah, Ulatis, and Alamo Creeks. This HU encompasses an area of approximately 961 mi^2 (2,479 km^2) and contains three HSA watersheds, two of which are occupied. Portions of the occupied HSAs are outside the boundary of ESU and the unoccupied HSA is completely outside the ESU boundary. Fish distribution and habitat use data compiled by NMFS biologists identify approximately 83 miles (133 km) of occupied riverine habitat in the occupied HSAs (NMFS, 2004a). The Team concluded that the occupied areas contained one or more PCEs (*i.e.*, spawning, rearing, or migratory habitat) for this ESU and identified management activities that may affect the PCEs, including urban development, impediments to fish passage, and agricultural water withdrawals. The Team rated both occupied watersheds as having medium conservation value to the ESU (NMFS, 2004b).

Within this subbasin, the Team also concluded that unoccupied stream reaches in Middle Putah Creek from Solano Irrigation Dam to Monticello Dam may be essential to the conservation of this ESU. Steelhead are thought to have historically utilized the upper watershed above Monticello Dam. There is currently a very small opportunistic population of steelhead in Lower Putah Creek, but habitat conditions in this area are not suitable for spawning or rearing. The provision of fish passage past the Solano Irrigation Dam would provide access to suitable habitat for this ESU and efforts are currently underway to investigate the feasibility of providing passage beyond this dam. The Team concluded that this unoccupied area may be essential to conservation of the ESU because populations of steelhead in the Central Valley are constrained by the lack of accessible habitat and access to this area would provide cold water rearing and spawning habitat for this population. We seek comments on whether these unoccupied areas should be proposed as critical habitat.

Unit 7. American River Subbasin (HU #5514)

The American River HU is located in the eastern portion of the ESU and includes portions of upper Coon Creek, Doty Creek, and Auburn Ravine. This HU encompasses an area of approximately 1,642 mi^2 (4,236 km^2) and contains fifteen HSA watersheds, all of which are outside the range of the ESU, and only one of which is partially occupied. Fish distribution and habitat use data compiled by NMFS biologists identify approximately 20 miles of occupied riverine habitat in the occupied HSA (NMFS, 2004a). The Team concluded that the occupied watershed contained one or more PCEs (*i.e.*, spawning, rearing, or migratory habitat) for this ESU and identified urban development as the primary management activity that may affect the PCEs. The Team rated this occupied watershed as having medium conservation value (NMFS, 2004b) and did not identify any unoccupied habitat in this subbasin that may be essential for the conservation of the ESU.

Unit 8. Marysville Subbasin (HU #5515)

The Marysville HU is located in the central portion of the ESU and includes portions of the Feather and Yuba Rivers. This HU encompasses an area of approximately 417 mi^2 (1,076 km^2) and contains three HSA watersheds, all of which are occupied. Fish distribution and habitat use data compiled by NMFS biologists identify approximately 75 miles (120 km) of occupied riverine habitat in these watersheds (NMFS, 2004a). The Team concluded that these occupied areas contained one or more PCEs (*i.e.*, spawning, rearing, or migratory habitat) for this ESU and identified management activities that may affect the PCEs, including agricultural and municipal water withdrawals, point and non-point water pollution, diking, streambank stabilization activities, dam operations and water storage for flood control, and fish passage impediments. The Team rated one occupied watershed as low in conservation value and two as having high conservation value to the ESU (NMFS, 2004b).

The Team did not identify any unoccupied habitat areas in this subbasin that may be essential for the conservation of the ESU. However, the Team did conclude that inaccessible stream reaches in the adjacent subbasin (in HU #5518) which contains the Upper Feather River above Oroville Dam may be essential to the conservation of this ESU. Specifically, the Team identified the following stream reaches above Oroville Dam that may be essential for conservation of this ESU: from Oroville Dam upstream along the West Branch of the Feather River to the vicinity of Kimshew Falls; along the North Fork of the Feather River upstream of the location of Lake Almanor; along the East Branch of the NF Feather River including Indian Creek and Spanish Creek; the South Middle Fork of the Feather River, and the South Fork of the Feather River upstream to the first natural impassible barrier. Both steelhead and spring-run chinook salmon historically occurred in the Upper Feather River prior to Pacific Gas and Electric's hydroelectric development in the North Fork watershed and the construction of Oroville Dam. Construction of Oroville Dam extirpated both the steelhead and spring-run chinook populations in this upper watershed. The Team concluded that spawning, rearing, an migratory habitat is available above Oroville Dam in these inaccessible stream reaches, but it is in better condition for steelhead than spring-run chinook salmon. The feasibility of providing fish passage past

Oroville Dam is currently being evaluated through the ongoing FERC relicensing process for this facility. The Team concluded this inaccessible habitat may be essential for the conservation of this ESU because the natural production of steelhead in the lower Feather River is limited by the substantial lack of suitable spawning and rearing habitat below Oroville Dam, and access to the unoccupied habitat above the dam would allow for expansion of the population in this watershed.

Unit 9. Yuba River Subbasin (HU #5517)

The Yuba River HU is located in the central and eastern portion of the ESU and includes part of the upper Yuba River watershed (Dry and Deer Creeks). This HU encompasses an area of approximately 1,436 mi^2 (3,704 km^2) and contains sixteen HSA watersheds, most of which are outside the recognized ESU boundary; however, four of these watersheds are partially occupied. Fish distribution and habitat use data compiled by NMFS biologists identify only approximately 22 miles (35 km) of occupied riverine habitat in these occupied watersheds (NMFS, 2004a). The Team concluded that these occupied areas contained one or more PCEs (*i.e.*, spawning, rearing, or migratory habitat) for this ESU and identified management activities that may affect the PCEs, including agricultural and municipal water withdrawals, fish passage impediments, and dam operations. The Team rated two of these watersheds as having low conservation value, and two as having high conservation value to the ESU (NMFS, 2004b).

The Team concluded that inaccessible stream reaches of the Upper Yuba River above Englebright Dam may be essential to the conservation of this ESU, including those upstream reaches on the North Yuba to New Bullards Bar Dam, on the Middle Yuba to Milton Dam, and on the South Yuba to Lake Spaulding. All three forks of the Upper Yuba River historically supported populations of spring chinook and steelhead (Yoshiyama *et al.*, 1995). The Team considered this area to be essential for conservation because it provides one of the largest areas of suitable habitat in the Central Valley that can be accessed by providing passage at one relatively small dam. The Lower Yuba is also considered to have a good ''seed'' population of both spring chinook and steelhead and both populations are considered relatively free of hatchery influence. A large, multi-million dollar study program is underway through the CALFED Ecological Restoration Program to evaluate the feasibility of restoring anadromous salmonid populations to the Upper Yuba River. We seek comment on whether this unoccupied habitat should be proposed as critical habitat.

Unit 10. Valley-American Subbasin (HU #5519)

The Valley-American HU is located in the central-eastern portion of the ESU and includes portions of the American River and lower Auburn Ravine. This HU encompasses an area of approximately 958 mi^2 (2,471 km^2) and contains four HSA watersheds, only two of which are occupied. Fish distribution and habitat use data compiled by NMFS biologists identify approximately 190 miles (304 km) of occupied riverine habitat in these watersheds (NMFS, 2004a). The Team concluded that these occupied areas contained one or more PCEs (*i.e.*, spawning, rearing, or migratory habitat) for this ESU and identified management activities that may affect the PCEs, agricultural and municipal water withdrawals, point and non-point source water pollution, streambank stabilization activities, fish passage impediments, diking, urban development, and dam operations and water storage for flood control. The Team rated both occupied watersheds as having high conservation value to the ESU (NMFS, 2004b). The Team did not identify any unoccupied areas in this subbasin that may be essential to the conservation of the ESU.

Unit 11. Colusa Basin Subbasin (HU #5520)

The Colusa Basin HU is located in the central portion of the ESU and includes portions of the mainstem Sacramento River, lower Butte Creek, the Butte Creek-Sutter Bypass and Little Chico Creek. This HU encompasses an area of approximately 2,767 mi^2 (7,138 km^2) and contains five HSA watersheds, three of which are occupied. Fish distribution and habitat use data compiled by NMFS biologists identify approximately 285 miles (456 km) of occupied riverine habitat, including the Sutter Bypass, in the occupied watersheds (NMFS, 2004a). The Team concluded that these occupied areas contained one or more PCEs (*i.e.*, spawning, rearing, or migratory habitat) for this ESU and identified management activities that may affect the PCEs, including agricultural water withdrawals, point and non-point water pollution, diking, fish passage impediments, streambank stabilization activities, wildlife habitat management, and invasive/non-native species management. The Team rated all three occupied watersheds as having high conservation value to the ESU (NMFS, 2004b) and did not identify any unoccupied habitat areas in this subbasin that may be essential to the conservation of the ESU.

Unit 12. Butte Creek Subbasin (HU #5521)

The Butte Creek HU is located in the northeastern portion of the ESU and contains portions of Butte Creek and Little Chico Creek. This HU encompasses an area of approximately 207 mi^2 (534 km^2) and contains three HSA watersheds all of which are occupied. Fish distribution and habitat use data compiled by NMFS biologists identify approximately 38 miles (61 km) of occupied riverine habitat in the occupied watersheds (NMFS, 2004a). The Team concluded that these occupied areas contained one or more PCEs (*i.e.*, spawning, rearing, or migratory habitat) for this ESU and identified management activities that may affect the PCEs, including urban development, rangeland management, agricultural water withdrawals, and hydroelectric water diversions. The Team rated two of these watersheds as having low conservation value and one as having high conservation value to the ESU (NMFS, 2004b).

The Team also concluded that inaccessible reaches of Upper Butte Creek above Centerville Dam upstream to Butte Meadow may be essential to the conservation of this ESU. It is uncertain whether this area was historically used by the steelhead, but resident rainbow trout were historically present and still occur above Centerville Diversion Dam. Spawning, rearing, and migration is present and thought to be in good condition. The Team believed this area may be essential for conservation because current spring-run chinook and steelhead spawning in this watershed is all below an elevation of 1,000 ft. High water temperatures in the lower portion of Butte Creek has led to significant spring-run chinook pre-spawning mortalities in recent years, and the Team concluded that improved fish passage over the Centerville Diversion Dam would increase the range for both the spring run chinook and steelhead ESUs, as well as reduce the risk of adult losses in the lower stream reaches. The Team expects that feasibility of passage at the Centerville Diversion Dam will be evaluated through the upcoming FERC relicensing process for the facility. We seek comment on whether this unoccupied habitat area should be proposed as critical habitat.

Unit 13. Ball Mountain Subbasin (HU #5523)

The Ball Mountain HU is located in the northwestern portion of the ESU and includes a portion of upper Thomes Creek and associated tributaries. This HU encompasses an area of approximately 334 mi² (862 km²) and contains three HSA watersheds, only one of which is occupied. Fish distribution and habitat use data compiled by NMFS biologists identify approximately 41 miles (66 km) of occupied riverine habitat in the single occupied watersheds (NMFS, 2004a). The Team concluded that these occupied areas contained one or more PCEs (*i.e.*, spawning, rearing, or migratory habitat) for this ESU and identified management activities that may affect the PCEs, including rangeland management, forestry management, agricultural water withdrawals, and municipal water withdrawals. The Team rated this single occupied watershed as having high conservation value to the ESU (NMFS, 2004b). The Team did not identify any unoccupied areas in the subbasin that may be essential for conservation of the ESU.

Unit 14. Shasta Bally Subbasin (HU #5524)

The Shasta Bally HU is located in the northwestern corner of the ESU and includes portions of SF Cottonwood Creek and Beegum Creek among others. This HU encompasses an area of approximately 905 mi² (2,335 km²) and contains nine HSA watersheds, five of which are occupied. Fish distribution and habitat use data compiled by NMFS biologists identify approximately 122 miles (195 km) of occupied riverine habitat in the occupied watersheds (NMFS, 2004a). The Team concluded that these occupied areas contained one or more PCEs (*i.e.*, spawning, rearing, or migratory habitat) for this ESU and identified management activities that may affect the PCEs, including forestry management, rangeland management, road building and maintenance, hydroelectric power water diversions, water storage for flood control, dam operations, gravel mining, and fish passage impediments. Of the occupied watersheds, the Team rated three as having medium conservation value and two as having high conservation value for the ESU (NMFS, 2004b). The Team did not identify any unoccupied habitat areas in this subbasin that may be essential for the conservation of the ESU.

Unit 15. North Valley Floor Subbasin (HU #5531)

The North Valley Floor HU is located in the southeastern portion of the ESU and includes portions of the Calaveras, Mokelumne, and Cosumnes Rivers. This HU encompasses an area of approximately 1,378 mi² (3,555 km²) and contains five HSA watersheds, three of which are occupied by the ESU. Fish distribution and habitat use data compiled by NMFS biologists identify about 190 miles (304 km) of occupied riverine habitat in these watersheds (NMFS, 2004a). The Team concluded that these occupied areas contained one or more PCEs (*i.e.*, spawning, rearing, or migratory habitat) for this ESU and identified management activities that may affect the PCEs, including agricultural and municipal water withdrawals, fish passage impediments, rangeland management, diking, channelization, streambank stabilization activities, and dam operations. Of these occupied watersheds, the Team rated one as low in conservation value, one as having medium conservation value, and one as having high conservation value to the ESU (NMFS, 2004b).

The Team also concluded that inaccessible stream reaches of the Upper Mokelumne River above Comanche Dam up to Bald Rock Falls (which is 7 miles above Electra Dam) may be essential to the conservation of this ESU, as well as spring-run chinook salmon. Portions of this inaccessible habitat area extend into the Middle Sierra Subbasin (HU #5532). The Upper Mokelumne historically supported large runs of spring-run chinook salmon (Yoshiyama *et al.*, 1995), and since steelhead and spring-run chinook use similar habitats it is assumed this area also supported large runs of steelhead. Suitable habitat exists above Comanche Dam, but it has been altered by Comanche and Pardee reservoirs. The Team concluded that this area may be essential for conservation of the ESU because steelhead have been extirpated from the area above the dam and recovery of this ESU may require the re-establishment of multiple independent populations of steelhead throughout the Central Valley. We seek comment on whether these unoccupied habitat areas should be proposed as critical habitat.

Unit 16. Middle Sierra Subbasin (HU #5532)

The Middle Sierra HU is located in the eastern portion of the ESU and contains portions of the upper Cosumnes River watershed. This HU encompasses an area of approximately 1,424 mi² (3,674 km²) and contains six HSA watersheds, four of which are occupied. Fish distribution and habitat use data compiled by NMFS biologists identify only about 70 miles (112 km) of occupied riverine habitat in the occupied watersheds (NMFS, 2004a). The Team concluded that these occupied areas contained one or more PCEs (*i.e.*, spawning, rearing, or migratory habitat) for this ESU and identified management activities that may affect the PCEs, including forestry management, agricultural water withdrawals, rangeland management, and urban development. Of these occupied watersheds, the Team rated all four as having low conservation value to the ESU (NMFS, 2004b). As discussed for Unit 15 (North Valley Floor Subbasin—HU #5531), inaccessible portions of the upper Mokelumne River which may be essential to the conservation of this ESU extend into this subbasin. The Team did not identify any other unoccupied areas in this subbasin that may be essential to the conservation of the ESU.

Unit 17. Upper Calavera Subbasin (HU #5533)

The Upper Calaveras HU is located in the eastern portion of the ESU and contains portions of the Calaveras River. This HU encompasses an area of approximately 362 mi² (934 km²) and contains three HSA watersheds, only one of which is occupied by the ESU. Fish distribution and habitat use data compiled by NMFS biologists identify only about 6 miles of occupied riverine habitat in the HSA (NMFS, 2004a). The Team concluded that occupied areas in this HSA watershed contained one or more PCEs (*i.e.*, spawning, rearing, or migratory habitat) for this ESU and identified management activities that may affect the PCEs, including agricultural and municipal water withdrawals, gravel mining, and water storage for flood control. The Team rated this single occupied watershed as having high conservation value to the ESU (NMFS, 2004b) and did not identify any unoccupied areas in this subbasin that may be essential for conservation.

Unit 18. Stanislaus River Subbasin (HU #5534)

The Stanislaus River HU is located in the southeastern portion of the ESU and contains portions of the Stanislaus River. This HU encompasses an area of approximately 998 mi² (2,575 km² and contains eight HSA watersheds; however, only one is in the ESU and occupied. Fish distribution and habitat use data compiled by NMFS biologists identify only about 3 miles of occupied riverine habitat in this HSA (NMFS, 2004a). The Team concluded that the occupied areas in this watershed contained one or more PCEs (*i.e.*, spawning, rearing, or migratory habitat) for this ESU and identified management activities that may affect the PCEs, including agricultural water withdrawals, fish passage impediments, dam operations, and water storage for flood control. The Team rated this single occupied watershed as having high conservation value to the ESU (NMFS, 2004b).

Within this subbasin, the Team also concluded that inaccessible stream reaches in the Middle Stanislaus River from Goodwin Dam to New Melones Dam may be essential to the conservation of this ESU. The Stanislaus River historically supported a large population of spring-run chinook salmon and because steelhead utilize similar habitats it is likely that this River system also supported a large population of steelhead. Construction of Goodwin Dam blocked access of steelhead to those portions of the Stanislaus River above the Dam and largely extirpated this population. Recently, however, dam operations have provided conditions that allowed a few steelhead to spawn below Goodwin Dam. Suitable habitat is thought to exist above Goodwin Dam for steelhead and fish passage is considered feasible because of its low height. Based on preliminary technical recovery planning for ESUs in the central valley, recovery of this ESU will likely require the establishment of multiple independent steelhead populations particularly in the San Joaquin portion of the central valley. We seek comment on whether these unoccupied areas should be proposed as critical habitat for this ESU.

Unit 19. San Joaquin Valley Floor Subbasin (HU #5535)

The San Joaquin Valley Floor HU is located in the southeastern portion of the ESU and contains portions of the Merced, Tuolumne, and Stanislaus Rivers. This HU encompasses an area of approximately 1,932 mi^2 (4,985 km^2) and contains nine HSA watersheds, several of which occur outside of or partially outside of the geographic boundary of the ESU. Of these watersheds, seven are occupied and fish distribution and habitat use data compiled by NMFS biologists identify about 159 miles (254 km) of occupied riverine habitat (NMFS, 2004a). The Team concluded that these occupied watersheds contained one or more PCEs (*i.e.*, spawning, rearing, or migratory habitat) for this ESU and identified management activities that may affect the PCEs, including agricultural and municipal water withdrawals, diking, fish passage impediments, streambank stabilization activities, and urban development. Of these occupied watersheds, the Team rated three as having medium conservation value and four as having high conservation value to the ESU (NMFS, 2004b).

Within this subbasin, the Team also concluded that inaccessible stream reaches in the Middle Tuolumne River (between LaGrange and New Don Pedro Dams) and the Middle Merced River (between Crocker-Huffman and Exchequer Dams) may be essential to the conservation of this ESU. Both rivers historically supported large populations of spring-run chinook salmon and because steelhead utilize similar habitat it is likely that these rivers also supported large populations of steelhead. Although current central valley steelhead populations are considered winter-run, habitat conditions in most San Joaquin basins, including the Tuolumne and Merced, may have historically supported summer steelhead (McEwan, 1996; Yoshiyama, 1996). With construction of LaGrange and Crocker-Huffman Dams, spring-chinook in both basins were extirpated, and most likely steelhead as well. Although steelhead cannot access the upper watersheds in the Tuolumne and Merced Rivers, dam operations in both watersheds have provided conditions allowing steelhead to spawn downstream of LaGrange and Crocker-Huffman Dams. The Team believes that suitable habitat conditions exist above LaGrange and Crocker-Huffman Dams and that there may be opportunities to provide fish passage at each facility. Based on preliminary technical recovery planning for ESUs in the central valley, it is likely that recovery of this ESU will require the establishment of multiple independent steelhead populations particularly in the San Joaquin portion of the central valley. We seek comment on whether these unoccupied areas should be proposed as critical habitat for this ESU.

Units 20 (Tuolumne River; HU #5536) and 21 (Merced River; HU #5537)

The Tuolumne River and Merced River HUs contain portions of the upper Tuolumne and Merced Rivers that are mostly or entirely outside the range of the ESU. These HUs contain eighteen HSA watersheds and over 2,800 miles (4,480 km) of streams (at 1:100,000 hydrography), but all are unoccupied by the ESU. The Team did not identify any areas in these subbasins that may be essential for the conservation of the ESU, and therefore, they were not considered further in the critical habitat designation process.

Unit 22. Delta-Mendota Canal Subbasin (HU #5541)

The Delta-Mendota Canal HU is located in the southernmost portion of the ESU and contains portions of the Delta-Mendota Canal. This HU encompasses an area of approximately 1,220 mi^2 (3,148 km^2) and contains two HSAs, both of which are occupied. Fish distribution and habitat use data compiled by NMFS biologists identify only about 50 miles of occupied riverine habitat in these HSA watersheds (NMFS, 2004a). The Team concluded that these occupied areas contained one or more PCEs (*i.e.*, spawning, rearing, or migratory habitat) for this ESU and identified management activities that may affect the PCEs, including agricultural and municipal water withdrawals, invasive/non-native species management, urban development, dredging, and point and non-point source water pollution. The Team rated these occupied watersheds as having medium and high conservation value, respectively, to the ESU (NMFS, 2004b). The Team did not identify any unoccupied areas in this subbasin that may be essential for the conservation of the ESU.

Unit 23. Middle West Side Subbasin (HU #5542)

The Middle West Side Subbasin is located in the southwestern portion of the ESU in the San Joaquin basin. The HU contains four HSAs and approximately 509 miles (814 km) of streams (at 1:100,000 hydrography), but all are unoccupied by the ESU. The Team did not identify any habitat areas in this subbasin that may be essential for the conservation of the ESU, and therefore, they were not considered further in the critical habitat designation process.

Unit 24. North Diablo Range (HU #5543)

The North Diablo Range HU is located in the southwestern portion of the ESU in the south Delta. This HU encompasses an area of approximately 315 mi^2 (812 km^2) and contains only a single HSA which is partially occupied. Fish distribution and habitat use data compiled by NMFS biologists identify only approximately 4 miles of occupied riverine/estuarine habitat in this HSA (NMFS, 2004a). The Team concluded the occupied areas in this HSA contained one or more PCEs (*i.e.* spawning, rearing, or migratory habitat) for this ESU and identified management activities that may affect the PCEs, including agricultural and water withdrawals, point and non-point source water pollution, and invasive/non-native species management. The Team rated this watershed as having medium conservation value to the ESU (NMFS, 2004b), and did not identify any unoccupied areas that may be essential to the conservation of the ESU.

Unit 25. San Joaquin Delta Subbasin (HU #5544)

The San Joaquin Delta HU is located in the southwestern portion of the ESU and includes portions of the south and central Delta channel complex. This HU encompasses an area of approximately 628 mi^2 (1,620 km^2) and contains a single HSA which is occupied. Fish distribution and habitat use data compiled by NMFS biologists identify approximately 276 miles (442 km) of occupied riverine and/or estuarine habitat in this HSA (NMFS, 2004a). The Team concluded that the occupied areas in this HSA contained one or more PCEs (*i.e.*, spawning, rearing, or migratory habitat) for this ESU and identified management activities that may affect the PCEs, including agricultural water and municipal water withdrawals, entrainment associated with water diversions, invasive/non-native species management, and point and non-point source water pollution. The Team rated this HSA as having high conservation value to the ESU (NMFS, 2004b). The Team did not identify any unoccupied habitat areas in this subbasin that may be essential for the conservation of this ESU.

Unit 26. Suisun Bay (HU #2207), San Pablo Bay (HU #2206) and San Francisco Bay (HU #s 2203 and 2204)

Portions of four HUs (2207, 2206, 2203, 2204) comprise the Suisun Bay-San Pablo-San Francisco Bay complex that is utilized by this ESU. These four HUs contain both estuarine habitat in the Bay complex as well as freshwater tributaries to the Bay complex, but only the 4 HSAs (HSAs: 220710, 220610, 220410, and 220312) that comprise the Bay complex are occupied by this ESU. These four HSAs encompass approximately 427 mi^2 (1,102 km^2) of estuarine habitat that serves as a rearing and migratory corridor providing connectivity between freshwater spawning, rearing, and migratory habitats for this ESU in the Sacramento-San Joaquin basin and the ocean. Collectively, these HSAs encompass an area of approximately 427 mi^2 (1,102 km^2). The Team concluded that these four HSAs were occupied and contained PCEs for migratory habitat that support this ESU, and identified management activities that may affect the PCEs, including agricultural and municipal water withdrawals, point and non-point source water pollution, diking, streambank stabilization activities, industrial development, invasive/non-native species, wetland/estuary management, and habitat restoration. Of these occupied HSAs, the Team rated one as having low conservation value (#220410) and three as having high conservation value to the ESU (NMFS, 2004b). The Team did not identify any unoccupied areas that may be essential for the conservation as critical habitat for this ESU.

Application of ESA Section 4(b)(2)

The foregoing discussion describes those areas that are eligible for designation as critical habitat—the specific areas that fall within the ESA section 3(5)(A) definition of critical habitat, minus those lands owned or controlled by the DOD, or designated for its use, that are covered by an INRMP that we have determined in writing provides a benefit to the species. The application of section 4(b)(2) was a major concern of those commenting on the ANPR (68 FR 55926; September 29, 2003). Many commenters requested that we describe the process used—in particular the economic analysis—as part of our proposed rulemaking.

Specific areas eligible for designation are not automatically designated as critical habitat. Section 4(b)(2) of the ESA requires that the Secretary first considers the economic impact, impact on national security, and any other relevant impact. The Secretary has the discretion to exclude an area from designation if he determines the benefits of exclusion (that is, avoiding the impact that would result from designation), outweigh the benefits of designation. The Secretary may not exclude an area from designation if exclusion will result in the extinction of the species. Because the authority to exclude is discretionary, exclusion is not required for any areas.

In this proposed rule, the Secretary has applied his statutory discretion to exclude areas from critical habitat for several different reasons. To be consistent, we used CALWATER HSAs or watersheds for ESUs in California as the unit for exclusion in each case. However, the agency is asking for public comment on whether considering exclusions on a stream-by-stream approach would be more appropriate.

Impacts to Tribes

We believe there is very little benefit to designating critical habitat on Indian lands. Although there is a broad array of activities on Indian lands that may trigger section 7 consultation, Indian lands comprise only a minor portion (substantially less than 1 percent) of the total habitat under consideration for these seven California ESUs. Specifically, occupied stream reaches on Indian lands only occur within the range of the California Coastal chinook, Northern California *O. mykiss,* and Central California Coast *O. mykiss* ESUs, and these areas represent less than 0.1 percent of the total occupied habitat under consideration for these three ESUs. Based on our analysis, the remaining four ESUs did not contain any Indian lands that overlapped with occupied stream habitat. These percentages are likely overestimates as they include all habitat area within reservation boundaries.

There are several benefits to excluding Indian lands. The longstanding and distinctive relationship between the Federal and tribal governments is defined by treaties, statutes, executive orders, judicial decisions, and agreements, which differentiate tribal governments from the other entities that deal with, or are affected by, the Federal government. This relationship has given rise to a special Federal trust responsibility involving the legal responsibilities and obligations of the United States toward Indian Tribes and the application of fiduciary standards of due care with respect to Indian lands, tribal trust resources, and the exercise of tribal rights. Pursuant to these authorities lands have been retained by Indian Tribes or have been set aside for tribal use. These lands are managed by Indian Tribes in accordance with tribal goals and objectives within the framework of applicable treaties and laws.

In addition to the distinctive trust relationship for Pacific salmon in California and in the Northwest, there is a unique partnership between the Federal government and Indian tribes regarding salmon management. Indian tribes in California and the Northwest are regarded as ''co-managers'' of the salmon resource, along with Federal and state managers. This co-management relationship evolved as a result of numerous court decisions clarifying the tribes' treaty right to take fish in their usual and accustomed places.

The benefits of excluding Indian lands from designation include: (1) The furtherance of established national policies, our Federal trust obligations and our deference to the tribes in management of natural resources on their lands; (2) the maintenance of effective long-term working relationships to promote the conservation of salmonids on an ecosystem-wide basis; (3) the allowance for continued meaningful collaboration and cooperation in scientific work to learn more about the conservation needs of the species on an ecosystem-wide basis; and (4) continued respect for tribal sovereignty over management of natural resources on Indian lands through established tribal natural resource programs.

We believe that the current co-manager process addressing activities on an ecosystem-wide basis across three states is currently beneficial for the conservation of the salmonids. Because the co-manager process provides for coordinated ongoing focused action through a variety of forums, we find the benefits of this process to be greater than the benefits of applying ESA section 7 to Federal activities on Indian lands, which comprise much less than one percent of the total area under consideration for these ESUs. Additionally, we have determined that the exclusion of tribal lands will not result in the extinction of the species concerned. We also believe that maintenance of our current co-manager relationship consistent with existing policies is an important benefit to continuance of our tribal trust responsibilities and relationship. Based upon our consultation with the Round Valley Indian Tribes and the Bureau of Indian Affairs (BIA), we believe that designation of Indian lands as critical habitat would adversely impact our working relationship and the benefits resulting from this relationship.

Based upon these considerations, we have determined to exercise agency discretion under ESA section 4(b)(2) and propose to exclude Indian lands from the eligible critical habitat designation for these ESUs of salmonids. The Indian lands specifically excluded from critical habitat are those defined in the Secretarial Order, including: (1) Lands held in trust by the United States for the benefit of any Indian tribe; (2) land held in trust by the United States for any Indian Tribe or individual subject to restrictions by the United States against alienation; (3) fee lands, either within or outside the reservation boundaries, owned by the tribal government; and (4) fee lands within the reservation boundaries owned by individual Indians. The Indian tribes for which these exclusions apply in California include: Big Lagoon Reservation, Blue Lake Rancheria, Round Valley Indian Tribes, Laytonville Rancheria, Redwood Valley Rancheria, Coyote Valley Reservation, and Manchester—Point Arena Rancheria.

Impacts to National Security

As noted previously (see Military Lands section) the U.S. Marine Corps provided comments in response to the ANPR (68 FR 55926; September 29, 2003) regarding their INRMP for Camp Pendleton Marine Corps Base and potential impacts to national security for this facility, which is within the range of the southern California *O. mykiss* ESU. By letter, NMFS subsequently provided the DOD with information about the areas we were considering to designate as critical habitat for the seven ESUs in California (as well as the 13 ESUs in the Pacific Northwest) and, in addition to a request for information about DOD's INRMPs, requested information about potential impacts to national security as a result of any critical habitat designation. In response to the request concerning national security impacts, Camp Pendleton Marine Corps Base and the Vandenberg Air Force Base provided detailed information on such impacts. Both military agencies concluded that critical habitat designation at either of these sites would likely impact national security by diminishing military readiness. The possible impacts include: (1) Preventing, restricting, or delaying training or testing exercises or access to such sites; (2) restricting or delaying activities associated with space launches; (3) delaying response times for troop deployments and overall operations; and (4) creating uncertainties regarding ESA consultation (*e.g.*, reinitiation requirements) or imposing compliance conditions that would divert military resources. Also, both military agencies cited their ongoing and positive consultation history with NMFS and underscored cases where they are implementing best management practices to reduce impacts on listed salmonids.

The Teams assessing conservation values for the overlap areas of habitat and Camp Pendleton and Vandenberg AFB concluded that all of them were of high conservation value to the respective ESUs. The overlap areas, however, are a small percentage of the total area for the affected ESUs. Designating habitat on these two installations will likely reduce the readiness capability of the Marine Corps and the Air Force, both of which are actively engaged in training, maintaining, and deploying forces in the current war on terrorism. Therefore, we conclude that the benefits of exclusion outweigh the benefits of designation, and we are not proposing to designate these DoD sites as critical habitat.

We anticipate working with DOD to obtain and review any additional information regarding national security impacts to other military installations before issuing a final critical habitat designation for the seven ESUs that are the subject of this proposed rulemaking. We will analyze any information we receive and prepare findings that will be made available for public review and comment through a notice of availability in the **Federal Register**.

Other Potential Exclusions

As discussed above, in 2001 the Tenth Circuit issued a ruling in *NMCA*, which criticized the historic approach that FWS and NMFS had taken towards the economic analysis required in the critical habitat designation process. As a result of this ruling, both agencies engaged in a long-term process of reevaluating existing critical habitat designations consistent with the Tenth Circuit's ruling. NMFS's critical habitat designations for steelhead and salmon ESUs and FWS's designations for bull trout are the first to fully evaluate the economic impacts of the designations for aquatic species on a broad landscape scale. As a result, many of the critical issues faced by the two agencies are issues of first impression.

On October 6, 2004, the FWS issued a final rule designating critical habitat for the bull trout, a species in many respects co-extensive in distribution with listed salmon and steelhead ESUs in the Pacific Northwest. Necessarily, the FWS had to make determinations on many of these novel issues. The Secretary of the Interior found that a number of conservation measures designed to protect salmon and steelhead on Federal, state, tribal and private lands would also have significant beneficial impacts to bulltrout. Therefore, the Secretary of the Interior determined that the benefits of excluding those areas exceeded the benefits of including those areas as critical habitat.

The Secretary of Commerce has reviewed the bull trout rule and has recognized the merits of the approach taken by the Secretary of the Interior with these emerging issues. As a result, the Secretary of Commerce is considering the following exclusions because the benefits of exclusion may outweigh the benefits of inclusion and expects the final rule will include some or all of these exclusions. However, given the time constraints associated with this rule making and the broader geographic range of the potential salmon and steelhead designations in California and the Pacific Northwest, the Secretary of Commerce has not had an opportunity to fully evaluate all of the potential exclusions, the geographical extent of such exclusions, or compare the benefits of these exclusions to the benefits of inclusion. As a result, the proposed designations included in this rule generally represent an upper bound to the area that the Secretary is considering designating as critical habitat and do not include the following additional exclusions that the Secretary is considering:

A set of exclusions based on existing land management plans adopted and currently implemented by Federal agencies within the relevant geographic area: These plans are the Northwest Forest Plan, PACFISH and INFISH which are implemented by the U.S. Forest Service (USFS) and the Bureau of Land Management (BLM) in parts of California and the Pacific Northwest. The Secretary is considering excluding from critical habitat all Federal lands subject to these plans. We may make these exclusions on a fifth field watershed basis or a stream-by-stream basis and we invite comment on the appropriate method. Each of these plans is designed to provide very substantial conservation benefits to salmonid species including areas occupied by each of the seven California ESUs, while permitting provision of other multiple uses on those Federal lands to the extent compatible with the provisions of the plan. Imposing an overlay of critical habitat in these areas could threaten the provision of the other multiple used contemplated by these plans and potentially impede vital land restoration activities while potentially offering a negligible conservation benefit in light of the other existing conservation measures provided by the plans. The threat to forest restoration activities (forest thinning and brush clearing to reduce catastrophic fire risks), economic activities (*e.g.* grazing and timber production) and recreational uses on public lands may outweigh the benefit of a critical habitat designation in these areas.

Federal land managed by the Forest Service and BLM constitutes a relatively lesser proportion of the land ownership within the range of the seven California ESUs (4–25 percent) compared with private land (71–88 percent). However, the estimated annualized economic impacts attributable to section 7 consultations on Federal land management activities comprise a disproportionately large portion of the total annual costs for several of the California ESUs. This relationship is most pronounced for the California Coastal chinook and Northern California *O. mykiss* ESUs. For example, Federal lands comprise only 16 percent of the land ownership within the California Coastal chinook ESU, but approximately 77 percent of the annualized section 7 economic impacts are attributable to Federal land management. Similarly, Federal lands comprise only 18 percent of the land ownership within the Northern California *O. mykiss* ESU, but approximately 87 percent of the annualized section 7 economic impacts are attributable to Federal land management. Section 7 related economic impacts associated with Federal land management also constitute a significant portion of the total annual economic impact for the South-Central California Coast *O. mykiss* (44 percent) and Southern California *O. mykiss* (69 percent) ESUs.

An exclusion of areas covered by conservation commitments by state and private landowners: Another set of exclusions is based on conservation commitments by state and private landowners reflected in habitat conservation plans (HCPs) and cooperative agreements approved by NMFS. In California, we have not identified any state conservation commitments that would apply, but seek public comment on this issue. With regard to private lands, however, the HCP adopted by the Pacific Lumber Company would constitute such a commitment. Lands managed under the existing Pacific Lumber Company HCP are relatively limited in comparison to the broad geographic area addressed in this rulemaking, but do occur within the geographic range of the California Coastal chinook and Northern California *O. mykiss* ESUs. Several other HCPs are under development in California, but they have not yet been adopted and therefore their conservation benefits are uncertain.

An exclusion for intermingled lands: If a large part of a watershed is determined to warrant exclusion, the Secretary is considering excluding the entire watershed. For example, if a large proportion of a watershed consists of Federal land to be excluded based on an existing management plan, the entire watershed could be excluded. There may be little policy justification for designating non-Federal lands as critical habitat in a watershed dominated by excluded Federal lands. As noted above, Federal lands do not constitute a large portion of the land ownership in any of the seven California ESUs under consideration. However, there are areas within the range of each of the ESUs where Federal lands are more concentrated and intermingled non-Federal lands occur to a limited extent. Such conditions occur mainly in specific watersheds within the range of the California Coastal chinook, Northern California *O. mykiss*, South-Central California Coast *O. mykiss*, and Southern California *O. mykiss* ESUs.

Accordingly, NMFS specifically asks for public comment on the categories of exclusions discussed above. Specifically, NMFS requests comment on the benefits of excluding:

(1) Other Federal lands subject to protective management provisions for salmonids (*e.g.*, the Aquatic Conservation Strategy of the Northwest Forest Plan, PACFISH, or INFISH);

(2) Other state, tribal, or private lands subject to (or planned to receive) other forms of protective management for salmonids (*e.g.*, private land HCPs, State of California Forest Practices Act lands); and

(3) Other state, tribal, or private lands within watersheds containing a large proportion of Federal, state, tribal or private lands already subject to protective management measures.

Exclusions Primarily Based on Economic Impacts

In this exercise of discretion, the first issue we must address is the scope of impacts relevant to the 4(b)(2) evaluation. As discussed in the Previous Federal Action section, we are re-designating critical habitat for these seven ESUs in California because the previous designations were vacated. (*National Association of Homebuilders* v. *Evans*, 2002 WL 1205743 No. 00–CV–2799 (D.D.C.) (*NAHB*)). The *NAHB* Court had agreed with the reasoning of the Court of Appeals for the Tenth Circuit in *New Mexico Cattle Growers Association* v. *U.S. Fish and Wildlife Service*, 248 F.3d 1277 (10th Cir. 2001). In that decision, the Tenth Circuit stated ''[t]he statutory language is plain in requiring some kind of consideration of economic impact in the critical habitat designation phase.'' The Tenth Circuit concluded that, given the FWS' failure to distinguish between ''adverse modification'' and ''jeopardy'' in its 4(b)(2) analysis, the FWS must analyze the full impacts of critical habitat designation, regardless of whether those impacts are co-extensive with other impacts (such as the impact of the jeopardy requirement).

In re-designating critical habitat for these seven salmon and *O. mykiss* ESUs, we have followed the Tenth Circuit Court's directive regarding the statutory requirement to consider the economic impact of designation. Areas designated as critical habitat are subject to ESA section 7 requirements, which provide that Federal agencies ensure that their actions are not likely to destroy or adversely modify critical habitat. To evaluate the economic impact of critical habitat we first examined our voluminous section 7 consultation record for these as well as other ESUs of salmon. That record includes consultations on habitat-modifying Federal actions both where critical habitat has been designated and where it has not. We could not discern a distinction between the impacts of applying the jeopardy provision versus the adverse modification provision in occupied critical habitat. Given our inability to detect a measurable difference between the impacts of applying these two provisions, the only reasonable alternative was to follow the recommendation of the Tenth Circuit, approved by the *NAHB* court—to measure the co-extensive impacts; that is, measure the entire impact of applying the adverse modification provision of section 7, regardless of whether the jeopardy provision alone would result in the identical impact.

The Tenth Circuit's opinion only addressed ESA section 4(b)(2)'s requirement that economic impacts be considered. The Court did not address how ''other relevant impacts'' were to be considered, nor did it address the benefits of designation. Because section 4(b)(2) requires a consideration of other relevant impacts of designation, and the benefits of designation, and because our record did not support a distinction between impacts resulting from application of the adverse modification provision versus the jeopardy provision, we are uniformly considering coextensive impacts and coextensive benefits, without attempting to distinguish the benefit of a critical habitat consultation from the benefit that would otherwise result from a jeopardy consultation that would occur even if critical habitat were not designated. To do otherwise would distort the balancing test contemplated by section 4(b)(2).

The principal benefit of designating critical habitat is that Federal activities that may affect such habitat are subject to consultation pursuant to section 7 of the ESA. Such consultation requires every Federal agency to ensure that any action it authorizes, funds or carries out is not likely to result in the destruction or adverse modification of critical habitat. This complements the section 7 provision that Federal agencies ensure that their actions are not likely to jeopardize the continued existence of a listed species. Another benefit is that the designation of critical habitat can serve to educate the public regarding the potential conservation value of an area, and thereby, focus and contribute to conservation efforts by clearly delineating areas of high conservation value for certain species. It is unknown to what extent this process actually occurs and what the actual benefit is, as there are also concerns, noted above, that a critical habitat designation may discourage such conservation efforts.

The balancing test in section 4(b)(2) contemplates weighing benefits that are not directly comparable—the benefit to species conservation balanced against the economic benefit, benefit to national security, or other relevant benefit that results if an area is excluded from designation. Section 4(b)(2) does not specify a method for the weighing process. Agencies are frequently required to balance benefits of regulations against impacts; Executive Order 12866 established this requirement for Federal agency regulation. Ideally such a balancing would involve first translating the benefits and impacts into a common metric. Executive branch guidance from the Office of Management and Budget (OMB) suggests that benefits should first be monetized (*i.e.*, converted into dollars). Benefits that cannot be monetized should be quantified (for example, numbers of fish saved). Where benefits can neither be monetized nor quantified, agencies are to describe the expected benefits (OMB, Circular A–4, September 17, 2003 (OMB, 2003)).

It may be possible to monetize benefits of critical habitat designation for a threatened or endangered species in terms of willingness-to-pay (OMB, 2003). However, we are not aware of any available data that would support such an analysis for salmon. The short statutory time-frames, geographic scale of the designations under consideration, and the statute's requirement to use best ''available'' information suggests such a costly and time-consuming approach is not currently available. In addition, ESA section 4(b)(2) requires analysis of impacts other than economic impacts that are equally difficult to monetize, such as benefits to national security of excluding areas from critical habitat. In the case of salmon designations, impacts to Indian tribes are an ''other relevant impact'' that also may be difficult to monetize.

An alternative approach, approved by OMB, is to conduct a cost-effectiveness analysis. A cost-effectiveness analysis ideally first involves quantifying benefits, for example, percent reduction in extinction risk, percent increase in productivity, or increase in numbers of fish. Given the state of the science, it would be difficult to reliably quantify the benefits of including particular areas in the critical habitat designation. Although it is difficult to monetize or quantify benefits of critical habitat designation, it is possible to differentiate among habitat areas based on their relative contribution to conservation. For example, habitat areas can be rated as having a high, medium or low conservation value. The qualitative ordinal evaluations can then be combined with estimates of the economic costs of critical habitat designation in a framework that essentially adopts that of cost-effectiveness. Individual habitat areas can then be assessed using both their biological evaluation and economic cost, so that areas with high conservation value and lower economic cost might be considered to have a higher priority for designation while areas with a low conservation value and higher economic cost might have a higher priority for exclusion. While this approach can provide useful information to the decision-maker, there is not rigid formula through which this information translates into exclusion decisions. Every geographical area containing habitat eligible for designation is different, with a unique set of ''relevant impacts'' that may be considered in the exclusion process. Regardless of the analytical approach, section 4(b)(2) makes clear that what weight the agency gives various impacts and benefits, and whether the agency excludes areas from the designation, is discretionary.

Assessment of Economic Impacts

Assessment of economic impact generated considerable interest from commenters on the ANPR (68 FR 55926; September 29, 2003). A number of commenters requested that we make the economic analysis available as part of the proposed rulemaking, and some identified key considerations (*e.g.*, sector-specific impacts, direct and indirect costs, ecological services/benefits) that they believed must be taken into account. In a draft report, we have documented our conclusions regarding the economic impacts of designating each of the particular areas found to meet the definition of critical habitat for the seven ESUs addressed in this rulemaking (NMFS, 2004c). This report is available from NMFS (see **ADDRESSES**).

The first step was to identify existing legal and regulatory constraints on economic activity that are independent of critical habitat designation, such as Clean Water Act requirements. Coextensive impacts of the ESA section 7 requirement to avoid jeopardy were not considered part of the baseline. Given the uncertainty that existing critical habitat designations in California (*i.e.*, Sacramento River winter run chinook salmon, Central California Coast coho salmon, and Southern Oregon/Northern California coho salmon ESUs) will remain in place in their current configuration, we decided not to consider them.

Next, from the consultation record, we identified Federal activities that might affect habitat and that might result in a section 7 consultation. (We did not consider Federal actions, such as the approval of a fishery, that might affect the species directly but not affect its habitat.) We identified nine types of activities including: hydropower dams; non-hydropower dams and other water supply structures; Federal lands management, including grazing (considered separately); transportation projects; utility line projects; in-stream activities, including dredging (considered separately); activities permitted under Environmental Protection Agency's (EPA) National Pollution Discharge Elimination System; sand & gravel mining; and residential and commercial development. Based on our consultation record and other available information, we determined the modifications each type of activity was likely to undergo as a result of section 7 consultation (regardless of whether the modification might be required by the jeopardy or the adverse modification provision). We developed an expected direct cost for each type of action and projected the likely occurrence of each type of project in each watershed, using existing spatial databases (*e.g.*, the Corps 404(d) permit database). Finally, we aggregated the costs from the various types of actions and estimated an annual impact, taking into account the probability of consultation occurring and the likely rate of occurrence of that project type.

This analysis allowed us to estimate the coextensive economic impact of designating each ''particular area'' that was occupied by each ESU (*i.e.* each occupied CALWATER HSA watershed). Expected economic impacts from this analysis ranged from zero to several million dollars per occupied habitat area within the range of the seven ESUs addressed in this rulemaking. Where a watershed included both tributaries and a migration corridor that served other watersheds, we attempted to estimate the separate impacts of designating the tributaries and the migration corridor. We did this by identifying those categories of activities most likely to affect tributaries and those most likely to affect larger migration corridors.

Because of the methods we selected and the data limitations, portions of our analysis both under- and over-estimate the co-extensive economic impact of section 7 requirements. For example, we lacked data on the likely impact on flows at non-Federal hydropower projects, which would increase economic impacts. We also did not have sufficient information currently available allowing us to estimate the likely economic impact of a judicially-imposed ban on pesticide use near salmon-bearing streams. The EPA was recently enjoined from authorizing the application of a set of pesticides within a certain distance of ''salmon supporting waters.'' We have completed a preliminary analysis of these impacts at the ESU level (NMFS, 2004c). Because of existing data limitations of the preliminary nature of the analysis, we determined not to use these estimates in the proposed designations. However, we believe the information presented in this preliminary consideration will aid public comment and assist in the development of a more complete examination of these impacts for the final rule. Finally, we did not have information about potential changes in irrigation flows associated with section 7 consultations. These impacts would increase the estimate of co-extensive costs. On the other hand, we estimated an impact on all activities occurring within the geographic boundaries of a watershed, even though in some cases activities would be far removed from occupied stream reaches and so might not require modification or even consultation. We intend to pursue information prior to issuing a final rule that will allow us to refine our estimates of economic impacts and better inform our analysis under section 4(b)(2).

In addition, we had no information on the costs of critical habitat designation that occur outside the section 7 consultation process, including costs resulting from state or local regulatory burdens imposed on developers and landowners as a result of a Federal critical habitat designation. We solicit information on these subjects during the public comment period.

Exclusion Process

In determining whether the economic benefit of excluding a habitat area (that is, an HSA watershed) might outweigh the benefit of designation to the species, we took into consideration a cost-effectiveness approach giving priority to excluding habitat areas with a relatively lower benefit of designation and a relatively higher economic impact. We believe it is reasonable at this stage of the analysis to assume that all areas containing physical or biological features essential to the conservation of the species are essential to the conservation of the species.

The circumstances of most listed ESUs can make a cost-effectiveness approach useful. Pacific salmon are wide-ranging species and occupy numerous habitat areas with thousands of stream miles. Not all occupied areas, however, are of equal importance to conserving an ESU. Within the currently occupied range there are areas that support highly productive populations, areas that support less productive populations, and areas that support production in only some years. Some populations within an ESU may be more important to long-term conservation of the ESU than other populations. Therefore, in many cases it may be possible to construct different scenarios for achieving conservation. Scenarios might have more or less certainty of achieving conservation, and more or less economic impact. Future applications of this methodology will strive to better distinguish the relative conservation value of habitat areas (*i.e.* HSA watersheds) eligible for designation, which should improve the utility of this approach.

We attempted to consider the effect of excluding areas, either alone or in combination with other areas, on the opportunities for conservation of the ESUs. We preferred exclusions in areas with a lower conservation value to those with a high conservation value. We also recognize that in practice a large proportion of all watersheds received a ''high'' conservation rating, making it difficult to establish priorities within that subgroup. In the second step of the process, we asked the Teams whether excluding any of the habitat areas identified in the first step would significantly impede conservation, recognizing that the breadth of available conservation measures makes such judgements necessarily subjective. The Teams considered this question in the context of all of the areas eligible for exclusion as well as the information they had developed in providing the initial conservation ratings. The following section describes the results of applying this process to each ESU. The results are discussed in greater detail in a separate report that is available for public review and comment (NMFS, 2004d). While the possible effect on conservation was useful information, it was not determinative in deciding whether to propose the exclusion of an area. The only determinative limitation is the statutory bar on excluding any area that ''will result in the extinction of the species concerned.''

Critical Habitat Designation

Not including any of the additional categories of potential exclusions identified above, we are proposing to designate approximately 11,668 mi (18,669 km) of riverine habitat and 947 mi² (2,444 km²) of estuarine habitat within the geographical areas presently occupied by the seven ESUs (Table 2). This proposal excludes approximately 1,109 mi (1,774 km) of occupied riverine habitat as a result of economic considerations, 36 mi (22 km) of occupied riverine habitat on Tribal lands, and 41 mi (66 km) of occupied riverine habitat on DOD lands. In addition, the proposal excludes approximately 229 mi² (591 km²) of estuarine habitat in San Francisco Bay. Some of these areas proposed for designation or exclusion overlap substantially with two or more ESUs. For example, the CC chinook and NC *O. mykiss* ESUs have similar geographic distributions in coastal watersheds north of San Francisco Bay, the CV spring-run chinook and CV *O. mykiss* ESUs have overlapping distributions in the Sacramento River watershed and Delta within the central valley, and the CV spring-run chinook, CV *O. mykiss*, and CCC *O. mykiss* ESUs have overlapping distributions in portions of the San Francisco-San Pablo-Suisun Bay estuarine complex. As described previously, NMFS is not proposing to designate Tribal lands with occupied habitat or DOD controlled lands with occupied habitat that are subject to INRMPs that benefit the listed ESUs. The net economic impacts (coextensive with ESA section 7) associated with the areas proposed for designation for all ESUs combined are estimated to be approximately $83,511,186. This estimate does not account for reductions that occur as a result of excluding Indian lands or military lands. Moreover, as discussed previously, we are soliciting comment on additional exclusions which, if adopted, would further reduce the estimate of coextensive costs.

The proposed designated habitat areas, summarized below by ESU, contain physical and biological features essential to the conservation of the species and that may require special management considerations or protection. Some of the areas proposed for designation are likely to be excluded in the final rule after consideration of the additional three categories of potential exclusions identified above.

TABLE 2.—APPROXIMATE QUANTITY OF PROPOSED CRITICAL HABITAT* AND OWNERSHIP WITHIN WATERSHEDS CONTAINING HABITAT AREAS PROPOSED FOR DESIGNATION

ESU	Streams (mi) (km)	Estuary habitat (sq mi) (sq km)	Federal	Tribal	State/local	Private
California Coastal Chinook	1,513	25	16.4	0.4	3.4	79.8
	2,421	65				
Northern California *O. mykiss*	2,989	25	18.8	0.5	3.7	77.1
	4,782	65				
Central California Coast *O. mykiss*	1,675	386	4.5	0.0	7.2	88.3
	2,680	996				
South-Central California *O. mykiss*	1,240	3	16.3	0.0	2.2	81.6
	1,984	8				
Southern California *O. mykiss*	784		25.0	1.0	2.4	71.6
	1,254					
Central Valley spring-run Chinook	1,150	254	12.1	0.0	3.3	84.5
	1,840	655				
Central Valley *O. mykiss*	2,317	254	8.6	0.0	3.1	88.3
	3,707	655				

*These estimates are the total amount proposed for each ESU. They do not account for overlapping areas proposed for multiple ESUs.

California Coastal Chinook Salmon ESU

There are 45 occupied HSA watersheds within the freshwater and estuarine range of this ESU. For ease of reference these watersheds have been aggregated into 8 larger subbasin units (or CALWATER HUs). Eight HSA watersheds received a low rating, 10 received a medium rating, and 27 received a high rating of conservation value to the ESU (NMFS, 2004b). Two estuarine habitat areas used for rearing and migration (Humboldt Bay and the Eel River Estuary) that are not CALWATER HSAs were also evaluated and received a high conservation value rating.

HSA watershed habitat areas in this ESU include approximately 1,638 mi (2,635 km) of occupied stream habitat and 25 mi² (65 km²) of occupied estuarine habitat (Humboldt Bay). Approximately 12 mi (19 km) of occupied stream habitat is within the boundaries of Indian reservations and proposed for exclusion. We have not calculated the potential reduction in estimated economic impact as a result of these Indian land exclusions, but expect it would be small given the small percentage of stream miles these exclusions represent (less than 0.1 percent of all occupied stream miles).

As a result of the balancing process for economic impacts described above, the Secretary is currently proposing to exclude from the designation, at a minimum, the habitat areas (or HSAs) shown in Table 3. Of the areas eligible for designation, no fewer than approximately 113 stream miles (180 km) are proposed for exclusion because the economic benefits of exclusion outweigh the benefits of designation. The total potential estimated economic impact, with no exclusions, would be $11,651,723. The exclusions set forth in Table 3 would reduce the total estimated economic impact to $7,586,559. However, as indicated above, the Secretary is considering a number of additional exclusions which may further reduce this economic impact by a substantial amount. For this ESU, a preliminary analysis of the economic impact of designating critical habitat after considering some of these additional exclusions (primarily the exclusion of watersheds with a large percentage of Federal lands) indicates cost impacts could be reduced to about $3,200,000.

TABLE 3.—HSA WATERSHEDS OCCUPIED BY THE CALIFORNIA COASTAL CHINOOK SALMON ESU AND PROPOSED FOR EXCLUSION FROM CRITICAL HABITAT

Subbasin/hydrologic unit	Watershed (HSA) code	Watershed (HSA) name	Area proposed for exclusion
Unit 1. Eel River HU	111122	Bridgeville	Entire watershed.
	111171	Eden Valley	Entire watershed.
	111173	Black Butte River	Entire watershed.
	111174	Wilderness	Entire watershed
Unit 8. Russian River HU	111422	Santa Rosa	Entire watershed.

Northern California O. mykiss ESU

There are 50 occupied HSA watersheds within the freshwater and estuarine range of this ESU. For ease of reference these watersheds have been aggregated into seven larger subbasin units (or CALWATER HUs) within which the HSA watersheds are nested. Nine watersheds received a low rating, 14 received a medium rating, and 27 received a high rating of conservation value to the ESU (NMFS, 2004b). Two estuarine habitat areas used for rearing and migration (Humboldt Bay and the Eel River Estuary) that are not CALWATER HSAs were also evaluated and received a high conservation value rating.

HSA watershed habitat areas in this ESU include approximately 3,128 mi (5,005 km) of occupied stream habitat and 25 mi^2 (65 km^2) of occupied estuarine habitat (Humboldt Bay). Approximately 23 mi (37 km) of stream habitat are within the boundaries of Indian reservations and are proposed for exclusion. We have not calculated the potential reduction in estimated economic impact as a result of these Indian land exclusions, but expect it would be small given the small percentage of stream miles these exclusions represent.

As a result of the balancing process for economic impacts described above, the Secretary is currently proposing to exclude from the designation, at a minimum, the habitat areas (or HSAs) shown in Table 4. Of the areas eligible for designation, no fewer than approximately 116 mi (185 km) are proposed for exclusion because the economic benefits of exclusion outweigh the benefits of designation. Total potential estimated economic impact, with no exclusions, is $10,842,357. The exclusions set forth in Table 4 would reduce the total estimated economic impact to $6,688,254. However, as indicated above, the Secretary is considering a number of additional exclusions which may further reduce this economic impact by a substantial amount. For this ESU, a preliminary analysis of the economic impact of designating critical habitat after considering some of these additional exclusions (primarily the exclusion of watersheds with a large percentage of Federal lands) indicates the cost impact could be reduced to about $1,900,000.

TABLE 4.—HSA WATERSHEDS OCCUPIED BY THE NORTHERN CALIFORNIA O. MYKISS ESU AND PROPOSED FOR EXCLUSION FROM CRITICAL HABITAT

Subbasin/unit	Watershed code	Watershed name	Area proposed for exclusion
Unit 3. Mad River HU	110940	Ruth	Entire watershed.
Unit 5. Eel River HU	111150	North Fork Eel	Entire watershed.
	111163	Lake Pillsbury	Entire watershed.

Central California Coast O. mykiss ESU

There are 47 occupied HSA occupied watersheds within the freshwater and estuarine range of this ESU, including the Upper Alameda Creek watershed which supports a resident *O. mykiss* population that is proposed for listing. For ease of reference these watersheds have been aggregated into10 larger subbasin units (or CALWATER Hus) within which the HSA watersheds are nested. Fourteen HSA watersheds received a low rating, 13 received a medium rating, and 20 received a high rating of conservation value to the ESU (NMFS, 2004b). Five of these HSA watershed units comprise portions of the San Francisco-San Pablo-Suisun Bay complex which constitutes rearing and migratory habitat for this ESU.

HSA watershed habitat areas in this ESU include approximately 2,002 miles (3,203 km) of occupied stream habitat and 442 mi^2 (1,140 km^2) of occupied estuarine habitat in the San Francisco Bay complex. Approximately 1.0 mi (2.0 km) of occupied stream habitat is within the boundaries of Indian reservations and proposed for exclusion. We have not calculated the potential reduction in estimated economic impact as a result of these Indian land exclusions, but expect it would be small given the small percentage of stream miles these exclusions represent.

As a result of the balancing process for economic impacts described above, the Secretary is currently proposing to exclude from the designation, at a minimum, the HSA habitat areas shown in Table 5. Of the areas eligible for designation, no fewer than approximately 326 mi (522 km) of stream habitat and 56 mi^2 (144 km^2) of estuarine habitat in Suisun Bay (HSA 220710) are proposed for exclusion because the economic benefits of exclusion outweigh the benefits of designation. The total potential estimated economic impact, with no exclusions, is $9,327,996. The exclusions set forth in Table 5 would reduce the total estimated economic impact to $5,452,712. However, as indicated above, the Secretary is considering a number of additional exclusions which may further reduce this economic impact. For this ESU, a preliminary analysis of the economic impact of designating critical habitat after considering some of these additional exclusions (primarily the exclusion of watersheds with a large percentage of Federal lands), indicates the cost impact could be reduced to approximately $5,000,000.

TABLE 5.—HSA WATERSHEDS OCCUPIED BY THE CENTRAL CALIFORNIA COAST O. MYKISS ESU AND PROPOSED FOR FULL OR PARTIAL EXCLUSION FROM CRITICAL HABITAT

Subbasin/hydrologic unit	Watershed (HSA) code	Watershed name	Area proposed for exclusion
Unit 1. Russian River HU	111422	Santa Rosa	Entire watershed.
	111431	Ukiah	Tributaries.
Unit 5. Bay Bridges HU	220330	San Rafael	Entire watershed.
Unit 6. South Bay HU	220440	San Mateo Bayside	Entire watershed.
	220420	Eastbay Cities	Tributaries.
Unit 7. Santa Clara HU	220540	Guadelupe River	Entire watershed.
Unit 8. San Pablo HU	220620	Novato	Entire watershed.
	220660	Pinole	Entire watershed.
Unit 9. Suisun HU	220710	Suisun Bay	Entire unit.
	220721	Benecia	Entire watershed.
	220731	Pittsburg	Entire watershed.
	220733	Martinez	Entire watershed.

Watersheds for which tributaries only are excluded contain rearing/migration corridors necessary for conservation.

South-Central California Coast O. mykiss ESU

There are 30 occupied HSA watersheds within the freshwater and estuarine range of this ESU. For ease of reference these watersheds have been organized into eight larger subbasin units (or CALWATER HUs) within which the HSA watersheds are nested. Six watersheds received a low conservation rating, 11 received a medium rating, and 13 received a high rating of conservation value to the ESU (NMFS, 2004b). One of these occupied watershed units is Morro Bay which is rearing and migratory habitat for those populations which spawn and rear in tributaries to the Bay. Of the 1,261 mi (2,018 km) of occupied riverine habitat and 3 mi^2 (8 km^2) of occupied estuarine habitat (Morro Bay) in the ESU, approximately 21 mi (34 km) are not proposed for designation because they are within lands controlled by the military (Camp San Luis Obispo and Camp Roberts) that have qualifying INRMPs.

As a result of the balancing process for economic impacts described above, the Secretary is not proposing to exclude any areas from the habitat that is eligible for designation. The total potential estimated economic impact of the designation, without exclusions, would be $10,084,293. However, as indicated above, the Secretary is considering a number of additional exclusions which may reduce this economic impact by a substantial amount. For this ESU, a preliminary analysis of the economic impact of designating critical habitat after considering some of these additional exclusions (primarily the exclusion of watersheds with a large percentage of Federal lands) indicates the cost impacts could be reduced to about $4,300,000.

Southern California O. mykiss ESU

There are 37 occupied HSA watersheds within the freshwater and estuarine range of this ESU. For ease of reference these watersheds have been aggregated into eight subbasin units (or CALWATER HUs) within which the HSA watersheds are nested. Six HSA watersheds received a low rating, 6 received a medium rating, and 25 received a high rating of conservation value to the ESU (NMFS, 2004b).

There are 837 mi (1,339 km) of occupied stream habitat in the 37 HSA watersheds comprising this ESU. Of these, approximately 20 mi (32 km) occupied stream miles (30.0 km) occur on Vandenberg AFB and Camp Pendleton Marine Corps Base which are not proposed for designation because they are within lands controlled by the military that have qualifying INRMPs.

As a result of the balancing process for economic impacts described above, the Secretary is currently proposing to exclude from the designation, at a minimum, the habitat areas shown in Table 6. Of the areas eligible for designation, no fewer than 33 mi (53km) are proposed for exclusion because the economic benefits of exclusion outweigh the benefits of designation. The total potential estimated economic impact, with no exclusions, would be $21,008,746. The exclusions set forth in Table 6 would reduce the total estimated economic impact to $12,716,386. However, as indicated above, the Secretary is considering a number of additional exclusions which may further reduce this economic impact by a substantial amount for this ESU. For this ESU, a preliminary analysis of the economic impact of designating critical habitat after considering some of these additional exclusions (primarily the exclusion of watersheds with a large percentage of Federal lands) indicates that impacts could be reduced to about $3,600,000.

TABLE 6.—HSA WATERSHEDS OCCUPIED BY THE SOUTHERN CALIFORNIA O. MYKISS ESU AND PROPOSED FOR EXCLUSION FROM CRITICAL HABITAT

Subbasin/hydrologic unit	Watershed code	HSA watershed name	Area proposed for exclusion
Unit 1. Santa Maria River HU	331210	Guadelupe	Tributaries only.
	331230	Cuyama Valley	Entire watershed.
Unit 2. Santa Ynez HU	331430	Buelton	Tributaries only.
	331451	Santa Cruz Creek	Entire watershed
Unit 7. Calleguas HU	440811	East of Oxnard	Entire watershed.

Central Valley Spring-Run Chinook Salmon ESU

There are 37 occupied HSA watersheds within the freshwater and estuarine range of this ESU. For ease of reference these watersheds have been aggregated into 15 subbasin units (or CALWATER HUs) within which the HSA watersheds are nested. Four of these HSA watershed units comprise the San Francisco-San Pablo-Suisun Bay complex through which this ESU migrates to and from the ocean, and these HSAs were aggregated into a separate unit for descriptive purposes. Eight HSA watersheds received a low rating, 4 received a medium rating, and 25 received a high rating of conservation value to the ESU (NMFS, 2004b). Occupied habitat areas or HSA watersheds for this ESU include approximately 1,381 mi (2,212 km) of riverine habitat, in addition to approximately 427 mi^2 (1,102 km^2) of estuarine habitat in the San Francisco-San Pablo-Suisun Bay complex.

As a result of the balancing process for economic impacts described above, the Secretary is currently proposing to exclude from the designation, at a minimum, the habitat areas (or HSAs) shown in Table 7. Of the areas eligible for designation, no fewer than approximately 231 mi (369 km) of stream habitat and 173 mi^2 (446 km^2) of estuarine habitat in San Francisco Bay are proposed for exclusion because the economic benefits of exclusion outweigh the benefits of designation. The total potential estimated economic impact, with no exclusions, is $23,577,391. The exclusions set forth in Table 7 would reduce the total estimated economic impact to 16,787,737. However, the Secretary is considering a number of additional exclusions which may further reduce this economic impact by a substantial amount. For this ESU, a preliminary analysis of the economic impact of designating critical habitat after considering some of these additional exclusions (primarily the exclusion of watersheds with a large percentage of Federal lands) indicates the cost impact could be reduced to about $12,900,000.

TABLE 7.—HSA WATERSHEDS OCCUPIED BY THE CENTRAL VALLEY SPRING-RUN CHINOOK SALMON ESU AND PROPOSED FOR EXCLUSION FROM CRITICAL HABITAT

Subbasin/hydrologic unit	Watershed code	HSA watershed name	Area proposed for exclusion
Unit 2. Whitmore HU	550731	South Cow Creek	Entire watershed.
Unit 5. Sacramento Delta HU	551000	Sacramento Delta	Partial.
Unit 8. Yuba River HU	551713	Mildred Lake	Entire watershed.
Unit 9. Valley American HU	551921	Lower American	Entire watershed.
Unit 12. Ball Mountain HU	552310	Thomes Creek	Entire watershed.
Unit 13. Shasta Bally HU	552433	South Fork	Entire watershed.
Unit 14. No. Diable Range HU	554300	No. Diablo Range	Entire watershed.
Unit 15. San Joaquin Delta HU	554400	San Joaquin Delta	Entire watershed.
Unit 16 South SF Bay HU	220410	South SF Bay	Entire unit.

Central Valley O. mykiss ESU

There are 67 occupied HSA watersheds within the freshwater and estuarine range of this ESU. For ease of reference these watersheds have been aggregated into 25 subbasin units (or CALWATER HUs) within which the HSA watersheds are nested. Four of these HSA watershed units comprise the San Francisco-San Pablo-Suisun Bay complex through which this ESU migrates to and from the ocean, and these HSAs were aggregated into a separate unit for descriptive purposes. Fourteen HSA watersheds received a low rating, 16 received a medium rating, and 37 received a high rating of conservation value to the ESU (NMFS, 2004b). Occupied habitat areas or HSA watersheds for this ESU include approximately 2,607 mi (4,171 km) of stream habitat, in addition to approximately 427 mi^2 (1,102 km^2) of estuarine habitat in the San Francisco-San Pablo-Suisun Bay complex.

As a result of the balancing process for economic impacts described above, the Secretary is proposing to exclude from the designation, at a minimum, the habitat areas (or HSAs) shown in Table 8. Of the areas eligible for designation, no fewer than approximately 290 mi (464 km) of stream and 173 mi^2 (446 km^2) of estuarine habitat in San Francisco Bay are proposed for exclusion because the economic benefits of exclusion outweigh the benefits of designation. The total potential estimated economic impact, with no exclusions, is $29,187,888. The exclusions set forth in Table 8 would reduce the total estimated economic impact to $24,195,245. However, as indicated above, the Secretary is considering a number of additional exclusions which may further reduce this economic impact by a substantial amount. For this ESU, a preliminary analysis of the economic impact of designating critical habitat after considering some of these additional exclusions (primarily the exclusion of watersheds with a large percentage of Federal lands) indicates that economic impacts could be reduced to about $18,500,000.

TABLE 8.—HSA WATERSHEDS OCCUPIED BY THE CENTRAL VALLEY O. MYKISS ESU AND PROPOSED FOR EXCLUSION FROM CRITICAL HABITAT

Subbasin/hydrologic unit	Watershed (HSA) code	Watershed name	Area proposed for exclusion
Unit 5. Sacramento Delta HU	551000	Sacramento Delta	Partial watershed.
Unit 6. Valley-Putah Cache HU	551110	Elmira	Entire watershed.
Unit 8. Marysville HU	551510	Lower Bear River	Entire watershed.
Unit 9. Yuba River HU	551713	Mildred Lake	Entire watershed.
	551720	Nevada City	Entire watershed.
Unit 12. Butte Creek HU	552110	Upper Dry Creek	Entire watershed.

TABLE 8.—HSA WATERSHEDS OCCUPIED BY THE CENTRAL VALLEY O. MYKISS ESU AND PROPOSED FOR EXCLUSION FROM CRITICAL HABITAT—Continued

Subbasin/hydrologic unit	Watershed (HSA) code	Watershed name	Area proposed for exclusion
Unit 15. North Valley Floor HU	553111	Herald	Entire watershed.
	553120	Lower Mokelumne	Partial watershed.
Unit 16. Middle Sierra	553221	Big Canyon Creek	Entire watershed.
	553223	NF Cosumnes	Entire watershed.
	553224	Omo Ranch	Entire watershed.
	553240	Sutter Creek	Entire watershed.
Unit 21. No. Diablo Range	554300	No. Diablo Range	Entire watershed.
Unit 23. So. SF Bay	220410	So. SF Bay	Entire unit.

Effects of Critical Habitat Designation

Section 7 Consultation

Section 7 of the ESA requires Federal agencies, including NMFS, to ensure that actions they fund, authorize, permit, or carry out do not destroy or adversely modify critical habitat. In agency regulations at 50 CFR 402.02, we define destruction or adverse modification as ''a direct or indirect alteration that appreciably diminishes the value of critical habitat for both the survival and recovery of a listed species. Such alterations include, but are not limited to: Alterations adversely modifying any of those physical or biological features that were the basis for determining the habitat to be critical.'' However, in a March 15, 2001, decision of the United States Court of Appeals for the Fifth Circuit (*Sierra Club* v. *U.S. Fish and Wildlife Service*, 243 F.3d 434 (5th Cir. 2001), and an August 9, 2004 decision of the United States Court of Appeals for the Ninth Circuit (*Gifford Pinchot Task Force* v. *U.S. Fish and Wildlife*, No. 03–35279, the courts have found the agencies' definition of destruction or adverse modification to be invalid. In response to this decision, we are reviewing this regulatory definition.

Section 7(a) of the ESA requires Federal agencies, including NMFS, to evaluate their actions with respect to any species that is proposed or listed as endangered or threatened and with respect to its critical habitat, if any is proposed or designated. Regulations implementing this provision of the ESA are codified at 50 CFR part 402. Section 7(a)(4) of the ESA requires Federal agencies to confer with us on any action that is likely to jeopardize the continued existence of a proposed species or result in the destruction or adverse modification of proposed critical habitat. Conference reports provide conservation recommendations to assist the agency in eliminating conflicts that may be caused by the proposed action. The conservation recommendations in a conference report are advisory.

We may issue a formal conference report if requested by a Federal agency. Formal conference reports include an opinion that is prepared according to 50 CFR 402.14, as if the species were listed or critical habitat designated. We may adopt the formal conference report as the biological opinion when the species is listed or critical habitat designated, if no substantial new information or changes in the action alter the content of the opinion (see 50 CFR 402.10(d)).

If a species is listed or critical habitat is designated, ESA section 7(a)(2) requires Federal agencies to ensure that activities they authorize, fund, or carry out are not likely to jeopardize the continued existence of such a species or to destroy or adversely modify its critical habitat. If a Federal action may affect a listed species or its critical habitat, the responsible Federal agency (action agency) must enter into consultation with us. Through this consultation, we would review actions to determine if they would destroy or adversely modify critical habitat.

If we issue a biological opinion concluding that a project is likely to result in the destruction or adverse modification of critical habitat, we will also provide reasonable and prudent alternatives to the project, if any are identifiable. Reasonable and prudent alternatives are defined at 50 CFR 402.02 as alternative actions identified during consultation that can be implemented in a manner consistent with the intended purpose of the action, that are consistent with the scope of the Federal agency's legal authority and jurisdiction, that are economically and technologically feasible, and that we believe would avoid destruction or adverse modification of critical habitat. Reasonable and prudent alternatives can vary from slight project modifications to extensive redesign or relocation of the project. Costs associated with implementing a reasonable and prudent alternative are similarly variable.

Regulations at 50 CFR 402.16 require Federal agencies to reinitiate consultation on previously reviewed actions in instances where critical habitat is subsequently designated and the Federal agency has retained discretionary involvement or control over the action or such discretionary involvement or control is authorized by law. Consequently, some Federal agencies may request reinitiation of consultation or conference with us on actions for which formal consultation has been completed, if those actions may affect designated critical habitat or adversely modify or destroy proposed critical habitat.

Activities on Federal lands that may affect these ESUs or their critical habitat will require ESA section 7 consultation. Activities on private or state lands requiring a permit from a Federal agency, such as a permit from the Corps under section 404 of the Clean Water Act, a section 10(a)(1)(B) permit from NMFS, or some other Federal action, including funding (*e.g.*, Federal Highway Administration (FHA) or Federal Emergency Management Agency (FEMA) funding), will also be subject to the section 7 consultation process. Federal actions not affecting listed species or critical habitat and actions on non-Federal and private lands that are not federally funded, authorized, or permitted do not require section 7 consultation.

Activities Affected by Critical Habitat Designation

Section 4(b)(8) of the ESA requires that we evaluate briefly and describe, in any proposed or final regulation that designates critical habitat, those activities involving a Federal action that may adversely modify such habitat or that may be affected by such designation. As noted in the *Special Management Considerations or Protection* section above, we received several comments on the ANPR (68 FR 55926; September 29, 2003) regarding activities potentially affected by a critical habitat designation.

A wide variety of activities may affect critical habitat and, when carried out, funded, or authorized by a Federal agency, require that an ESA section 7 consultation be conducted. Such activities include, but are not limited to, those described in the Species Descriptions and Area Assessments section. Generally these include water and land management actions of Federal agencies (*e.g.*, USFS, BLM, Corps, U.S. Bureau of Reclamation (BOR), the FHA, Natural Resource Conservation Service (NRCS), National Park Service (NPS), BIA, and the Federal Energy Regulatory Commission (FERC)) and related or similar actions of other federally regulated projects and lands, including livestock grazing allotments by the USFS and BLM; hydropower sites licensed by the FERC; dams built or operated by the Corps or BOR; timber sales and other vegetation management activities conducted by the USFS, BLM, and BIA; irrigation diversions authorized by the USFS and BLM; road building and maintenance activities authorized by the FHA, USFS, BLM, NPS, and BIA; and mining and road building/maintenance activities authorized by the State of California. Other actions of concern include dredge and fill, mining, diking, and bank stabilization activities authorized or conducted by the Corps, habitat modifications authorized by the FEMA, and approval of water quality standards and pesticide labeling and use restrictions administered by the EPA.

The Federal agencies that will most likely be affected by this critical habitat designation include the USFS, BLM, BOR, Corps, FHA, NRCS, NPS, BIA, FEMA, EPA, and the FERC. This designation will provide these agencies, private entities, and the public with clear notification of critical habitat designated for listed salmonids and the boundaries of the habitat. This designation will also assist these agencies and others in evaluating the potential effects of their activities on listed salmon and their critical habitat and in determining if section 7 consultation with NMFS is needed.

As noted above, numerous private entities also may be affected by this critical habitat designation because of the direct and indirect linkages to an array of Federal actions, including Federal projects, permits, and funding. For example, private entities may harvest timber or graze livestock on Federal land or have special use permits to convey water or build access roads across Federal land; they may require Federal permits to armor stream banks, construct irrigation withdrawal facilities, or build or repair docks; they may obtain water from federally funded and operated irrigation projects; or they may apply pesticides that are only available with Federal agency approval. These activities will need to be analyzed with respect to their potential to destroy or adversely modify critical habitat. In some cases, proposed activities may require modifications that may result in decreases in activities such as timber harvest and livestock and crop production. The transportation and utilities sectors may need to modify the placement of culverts, bridges and utility conveyances (*e.g.*, water, sewer and power lines) to avoid barriers to fish migration. Developments occurring in or near salmon streams (*e.g.*, marinas, residential, or industrial facilities) that require Federal authorization or funding may need to be altered or built in a manner that ensures that critical habitat is not destroyed or adversely modified as a result of the construction, or subsequent operation, of the facility. These are just a few examples of potential impacts, but it is clear that the effects will encompass numerous sectors of private and public activities. If you have questions regarding whether specific activities will constitute destruction or adverse modification of critical habitat, contact NMFS (see **ADDRESSES** and **FOR FURTHER INFORMATION CONTACT**).

Public Comments Solicited

We intend that any final action resulting from this proposal will be as accurate and as effective as possible. Therefore, comments or suggestions from the public, other concerned governments and agencies, the scientific community, industry, or any other interested party concerning this proposed rule are hereby solicited. Comments particularly are sought concerning:

(1) Maps and specific information describing the amount, distribution, and use type (*e.g.*, spawning, rearing, or migration) of salmon habitat in each ESU, as well as any additional information on occupied and unoccupied habitat areas;

(2) The reasons why any habitat should or should not be determined to be critical habitat as provided by sections 3(5)(A) and 4(b)(2) of the ESA;

(3) Information regarding the benefits of excluding lands covered by HCPs (ESA section 10(a)(1)(B) permits), including the regulatory burden designation may impose on landowners and the likelihood that exclusion of areas covered by existing plans will serve as an incentive for other landowners to develop plans covering their lands;

(4) Information regarding the benefits of excluding Federal and other lands covered by habitat conservation strategies and plans (*e.g.*, Northwest Forest Plan, PACFISH, etc.), including the regulatory burden designation may impose on land managers and the likelihood that exclusion of areas covered by existing plans will serve as an incentive for land user to implement the conservation measures covering the lands subject to those plans;

(5) Information regarding the benefits of designating particular areas as critical habitat;

(6) Current or planned activities in the areas proposed for designation and their possible impacts on proposed critical habitat;

(7) Any foreseeable economic or other potential impacts resulting from the proposed designations, in particular, any impacts on small entities;

(8) Whether our approach to critical habitat designation could be improved or modified in any way to provide for greater public participation and understanding, or to assist us in accommodating public concern and comments; and

(9) Whether specific unoccupied areas (*e.g.*, dewatered stream reaches, areas behind dikes or dams, above dams, etc) not presently proposed for designation may be essential to provide additional spawning and rearing areas for an ESU. In particular we are seeking information regarding unoccupied areas that may be essential for the conservation of the SC and CV *O. mykiss* ESUs, and the CV spring-run chinook ESU (see ESU Descriptions for specific unoccupied areas that may be essential for conservation and for which comments are being solicited).

If you wish to comment on this proposal, you may submit your comments and materials concerning this proposal by any one of several methods (see **ADDRESSES** section). The proposed rule, maps, fact sheets, and other materials relating to this proposal can be found on our Web site at *http://swr.nmfs.noaa.gov.* We will consider all comments and information received during the comment period on this proposed rule as we prepare our final rulemaking. Accordingly, the final decision may differ from this proposal.

Public Hearings

Joint Commerce-Interior ESA implementing regulations state that the Secretary shall promptly hold at least one public hearing if any person requests one within 45 days of publication of a proposed regulation to list a species or to designate critical habitat (see 50 CFR 424.16(c)(3)). Requests for public hearing must be made in writing (see **ADDRESSES**) by January 24, 2005. Details regarding the specific hearing locations and times will be posted on our Web site at *http://swr.nmfs.noaa.gov.* These hearings will provide the opportunity for interested individuals and parties to give comments, exchange information and opinions, and engage in a constructive dialogue concerning this proposed rule. We encourage the public's involvement in such ESA matters.

Peer Review

In accordance with an ESA policy published on July 1, 1994 (59 FR 34270), we will solicit the expert opinions of at least three appropriate independent specialists regarding this proposed rule. Given the varied considerations involved in making the proposed designations, we intend to solicit reviews from specialist(s) with biological expertise as well as specialist(s) with economic expertise in the geographic range of these ESUs. The purpose of such review is to ensure that the critical habitat designation is based on scientifically sound data, assumptions, and analyses. We will send these reviewers copies of this proposed rule immediately following publication in the **Federal Register**. We will invite them to comment, during the public comment period, on the specific assumptions and conclusions regarding the proposed designation of critical habitat.

In response to the ANPR (68 FR 55926; September 29, 2003) we received the names of two potential independent reviewers and will identify other candidates prior to or soon after publishing this proposed rule. We will announce the availability of comments received from these reviewers and the public and make them available via the internet as soon as practicable during or after the comment period but in advance of a final rule.

Required Determinations

Clarity of the Rule

Executive Order 12866 requires each agency to write regulations and notices that are easy to understand. We invite your comments on how to make this proposed rule easier to understand, including answers to questions such as the following: (1) Are the requirements in the proposed rule clearly stated? (2) Does the proposed rule contain technical jargon that interferes with its clarity? (3) Does the format of the proposed rule (grouping and order of the sections, use of headings, paragraphing, *etc.*) aid or reduce its clarity? (4) What else could we do to make this proposed rule easier to understand? You may send comments on how we could make this proposed rule easier to understand to one of the addresses identified in the **ADDRESSES** section or via e-mail to: *critical.habitat.swr@noaa.gov.*

Regulatory Planning and Review

In accordance with Executive Order 12866, this document is a significant rule and has been reviewed by the OMB. As noted above, we have prepared several reports to support the exclusion process under section 4(b)(2) of the ESA. The economic costs of the proposed critical habitat designations are described in our draft economic report (NMFS, 2004c). The benefits of the proposed designations are described in the Critical Habitat Analytical Review Team preliminary findings report (NMFS, 2004b). This document uses a biologically-based ranking system for gauging the benefits of applying section 7 of the ESA to particular watersheds. Because data are not available to express these benefits in monetary terms, we have adopted a cost-effectiveness framework, as outlined in our draft 4(b)(2) report (NMFS, 2004d). This approach is in accord with OMB's guidance on regulatory analysis (OMB Circular A–4, Regulatory Analysis, September 17, 2003). By taking this approach, we seek to designate sufficient critical habitat to meet the biological goal of the ESA while imposing the least burden on society, as called for by E.O. 12866.

In assessing the overall cost of critical habitat designation for the seven Pacific salmon and *O. mykiss* ESUs, the annual total impact figures given in the draft economic analysis (NMFS, 2004c) cannot be added together to obtain an aggregate annual impact. Because some watersheds are included in more than one ESU, a simple summation would entail duplication, resulting in an overestimate. Accounting for this duplication, the aggregate annual economic impact of the seven proposed critical habitat designations is $83,511,186 (in contrast to a $115,680,394 aggregate annual economic impact from designating *all* areas considered in the 4(b)(2) process for these ESUs). These amounts include impacts that are co-extensive with the implementation of the jeopardy standard of section 7 (NMFS, 2004c).

Regulatory Flexibility Act (5 U.S.C. 601 et seq.)

Under the Regulatory Flexibility Act (5 U.S.C. 601 *et seq.*, as amended by the Small Business Regulatory Enforcement Fairness Act (SBREFA) of 1996), whenever an agency is required to publish a notice of rulemaking for any proposed or final rule, it must prepare and make available for public comment a regulatory flexibility analysis that describes the effects of the rule on small entities (*i.e.*, small businesses, small organizations, and small government jurisdictions). We have prepared a draft regulatory flexibility analysis and this document (NMFS, 2004e) is available upon request (*see* **ADDRESSES**). This analysis estimates that the number of regulated small entities potentially affected by this proposed rulemaking ranges from 379 to 3,151, depending on the ESU. If the proposed areas are designated as critical habitat, the estimated co-extensive costs of section 7 consultation incurred by small entities are estimated to range from $1.6 million to $18.2 million depending on the ESU. As described in the analysis, we considered various alternatives for designating critical habitat for these seven ESUs. We considered and rejected the alternative of not designating critical habitat for any of the ESUs because such an approach did not meet the legal requirements of the ESA. We also examined and rejected an alternative in which all the potential critical habitat of the seven Pacific salmon and *O. mykiss* ESUs is proposed for designation (*i.e.*, no areas are excluded) because many of the areas considered to have a low conservation value also had relatively high economic impacts that might be mitigated by excluding those areas from designation. A third alternative we examined and rejected would exclude all habitat areas with a low or medium conservation value. While this alternative furthers the goal of reducing economic impacts, it is not sensitive to the fact that for most ESUs, eliminating all habitat areas with low and medium conservation value is likely to significantly impede conservation. Moreover, for some habitat areas the incremental economic benefit from excluding that area is relatively small. Therefore, after considering these alternatives in the context of the section 4(b)(2) process of weighing benefits of exclusion against benefits of designation, we determined that the current proposal for designating critical habitat (*i.e.*, designating some but not all areas with low or medium conservation value) provides an appropriate balance of conservation and economic mitigation and that excluding the areas identified in this proposed rulemaking would not result in extinction of the ESUs. It is estimated that small entities could save from $650,000 to $4.3 million in compliance costs, depending on the ESU, if the areas proposed for exclusion in this proposed rule are excluded from the designation.

Executive Order 13211

On May 18, 2001, the President issued an Executive Order on regulations that significantly affect energy supply, distribution, and use. Executive Order 13211 requires agencies to prepare Statements of Energy Effects when undertaking certain actions. This proposed rule may be a significant regulatory action under Executive Order 12866. We have prepared a draft analysis of the energy effects of critical habitat designation and this document (NMFS, 2004e; see Appendix G) is available upon request (see **ADDRESSES**).

Approximately 90 hydropower projects exist within the area covered by the seven ESUs addressed in this rulemaking. The projects range from very small ones with installed capacities considerably less than 5 MW to much larger projects ranging up to 196 MW installed capacity. Within California, the majority of hydropower project are private or State-owned and licensed by FERC. A smaller percentage of all projects are owned and operated by the Corps or BOR. Consultations on hydropower projects represent a relatively small percentage of the total section 7 consultations concerning listed salmon, but cost of project modification may be higher that for other activities. According to the economic analysis performed for the proposed designation (NMFS, 2004e), costs to hydropower projects associated with salmon section 7 actions are anticipated to be approximately 23 percent of the annual costs of overall section 7 statewide. The primary modifications resulting from section 7 include construction or improvements to fish passage facilities and programs, research and monitoring of water quality and fish passage efficiency, and other offsite mitigation efforts.

Two threshold tests were considered to determine whether critical habitat designation would have a ''significant adverse effect on the supply, distribution, or use of energy'': Reductions in electricity production in excess of 1 billion kilowatt-hours per year or in excess of 500 megawattts of installed capacity; and increases in the cost of energy production in excess of one percent. For both thresholds of the energy impacts analysis, the assessment concludes that the total impacts of salmon conservation/mitigation measures for hydropower projects may exceed the thresholds for determining that an adverse energy effect is significant. However, the assessment also concludes based on the agency's section 7 consultation history, that the total impacts of such conservation or mitigation overestimate the incremental impacts of critical habitat designation alone because there is strong evidence that consultation based on the jeopardy standard alone is capable of imposing significant impacts on such projects. Based on the energy impacts analysis, NMFS believes that the designation of critical habitat will not have impacts that exceed the thresholds identified above.

Unfunded Mandates Reform Act (2 U.S.C. 1501 et seq.)

In accordance with the Unfunded Mandates Reform Act, we make the following findings:

(a) This proposed rule will not produce a Federal mandate. In general, a Federal mandate is a provision in legislation, statute or regulation that would impose an enforceable duty upon State, local, tribal governments, or the private sector and includes both ''Federal intergovernmental mandates'' and ''Federal private sector mandates.'' These terms are defined in 2 U.S.C. 658(5)–(7). ''Federal intergovernmental mandate'' includes a regulation that ''would impose an enforceable duty upon State, local, or tribal governments'' with two exceptions. It excludes ''a condition of Federal assistance.'' It also excludes ''a duty arising from participation in a voluntary Federal program,'' unless the regulation ''relates to a then-existing Federal program under which $500,000,000 or more is provided annually to State, local, and tribal governments under entitlement authority,'' if the provision would ''increase the stringency of conditions of assistance'' or ''place caps upon, or otherwise decrease, the Federal Government's responsibility to provide funding'' and the State, local, or tribal governments ''lack authority'' to adjust accordingly. (At the time of enactment, these entitlement programs were: Medicaid; AFDC work programs; Child Nutrition; Food Stamps; Social Services Block Grants; Vocational Rehabilitation State Grants; Foster Care, Adoption Assistance, and Independent Living; Family Support Welfare Services; and Child Support Enforcement.) ''Federal private sector mandate'' includes a regulation that ''would impose an enforceable duty upon the private sector, except (I) a condition of Federal assistance; or (ii) a duty arising from participation in a voluntary Federal program.'' The designation of critical habitat does not impose a legally binding duty on non-Federal government entities or private parties. Under the ESA, the only regulatory effect is that Federal agencies must ensure that their actions do not destroy or adversely modify critical habitat under section 7. While non-Federal entities who receive Federal funding, assistance, permits or otherwise require approval or authorization from a Federal agency for an action may be indirectly impacted by the designation of critical habitat, the legally binding duty to avoid destruction or adverse modification of critical habitat rests squarely on the Federal agency. Furthermore, to the extent that non-Federal entities are indirectly impacted because they receive Federal assistance or participate in a voluntary Federal aid program, the Unfunded Mandates Reform Act would not apply; nor would critical habitat shift the costs of the large entitlement programs listed above to State governments.

(b) Due to current public knowledge of salmon protection and the prohibition against take of these species both within and outside of the designated areas, we do not anticipate that this proposed rule will significantly or uniquely affect small governments. As such, a Small Government Agency Plan is not required.

Takings

In accordance with Executive Order 12630, the proposed rule does not have significant takings implications. A takings implication assessment is not required. The designation of critical habitat affects only Federal agency actions. The proposed rule will not increase or decrease the current restrictions on private property concerning take of salmon. As noted above, due to widespread public knowledge of salmon protection and the prohibition against take of the species both within and outside of the designated areas, we do not anticipate that property values will be affected by the proposed critical habitat designations. While real estate market values may temporarily decline following designation, due to the perception that critical habitat designation may impose additional regulatory burdens on land use, we expect any such impacts to be short term (NMFS, 2004c). Additionally, critical habitat designation does not preclude development of HCPs and issuance of incidental take permits. Owners of areas that are included in the designated critical habitat will continue to have the opportunity to use their property in ways consistent with the survival of listed salmon.

Federalism

In accordance with Executive Order 13132, this proposed rule does not have significant federalism effects. A federalism assessment is not required. In keeping with Department of Commerce policies, we requested information from, and coordinated development of, this proposed critical habitat designation with appropriate state resource agencies in California. The proposed designation may have some benefit to the states and local resource agencies in that the areas essential to the conservation of the species are more clearly defined, and the primary constituent elements of the habitat necessary to the survival of the species are specifically identified. While making this definition and identification does not alter where and what federally sponsored activities may occur, it may assist local governments in long-range planning (rather than waiting for case-by-case section 7 consultations to occur).

Civil Justice Reform

In accordance with Executive Order 12988, the Department of the Commerce has determined that this proposed rule does not unduly burden the judicial system and meets the requirements of sections 3(a) and 3(b)(2) of the Order. We are proposing to designate critical habitat in accordance with the provisions of the ESA. This proposed rule uses standard property descriptions and identifies the primary constituent elements within the designated areas to assist the public in understanding the habitat needs of the seven salmon ESUs.

Paperwork Reduction Act of 1995 (44 U.S.C. 3501 et seq.)

This proposed rule does not contain new or revised information collection for which OMB approval is required under the Paperwork Reduction Act. This rule will not impose recordkeeping or reporting requirements on State or local governments, individuals, businesses, or organizations. An agency may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid OMB control number.

National Environmental Policy Act

We have determined that we need not prepare environmental analyses as provided for under the National Environmental Policy Act of 1969 for critical habitat designations made pursuant to the ESA. See *Douglas County* v. *Babbitt,* 48 F.3d 1495 (9th Cir. 1995), cert. denied, 116 S.Ct. 698 (1996).

Government-to-Government Relationship With Tribes

The longstanding and distinctive relationship between the Federal and tribal Governments is defined by treaties, statutes, executive orders, judicial decisions, and agreements, which differentiate tribal governments from the other entities that deal with, or are affected by, the Federal Government. This relationship has given rise to a special Federal trust responsibility involving the legal responsibilities and obligations of the United States toward Indian Tribes and the application of fiduciary standards of due care with respect to Indian lands, tribal trust resources, and the exercise of tribal rights. Pursuant to these authorities lands have been retained by Indian Tribes or have been set aside for tribal use. These lands are managed by Indian Tribes in accordance with tribal goals and objectives within the framework of applicable treaties and laws.

Administration policy contained in the Secretarial Order: ''American Indian Tribal Rights, Federal-Tribal Trust Responsibilities, and the Endangered Species Act'' (June 5, 1997) (''Secretarial Order''); the President's Memorandum of April 29, 1994, ''Government-to-Government Relations with Native American Tribal Governments'' (50 FR 2291); Executive Order 13175; and Department of Commerce-American Indian and Alaska Native Policy (March 30, 1995) reflects and defines this unique relationship.

These policies also recognize the unique status of Indian lands. The Presidential Memorandum of April 29, 1994, provides that, to the maximum extent possible, tribes should be the governmental entities to manage their lands and tribal trust resources. The Secretarial Order provides that, ''Indian lands are not Federal public lands or part of the public domain, and are not subject to Federal public lands laws.''

In implementing these policies the Secretarial Order specifically seeks to harmonize this unique working relationship with the Federal Government's duties pursuant to the ESA. The order clarifies our responsibilities when carrying out authorities under the ESA and requires that we consult with and seek participation of, the affected Indian Tribes to the maximum extent practicable in the designation of critical habitat. Accordingly, we recognize that we must carry out our responsibilities under the ESA in a manner that harmonizes these duties with the Federal trust responsibility to the tribes and tribal sovereignty while striving to ensure that Indian Tribes do not bear a disproportionate burden for the conservation of species. Any decision to designate Indian land as critical habitat must be informed by the Federal laws and policies establishing our responsibility concerning Indian lands, treaties and trust resources, and by Department of Commerce policy establishing our responsibility for dealing with tribes when we implement the ESA.

Pursuant to the Secretarial Order we consulted with the affected Indian Tribes when considering the designation of critical habitat in an area that may impact tribal trust resources, tribally owned fee lands or the exercise of tribal rights. Additionally, one California Indian tribe and the BIA provided written comments that are a part of the administrative record for this proposed rulemaking.

We understand from the tribes and the BIA that there is general agreement that Indian lands should not be designated critical habitat. The Secretarial Order defines Indian lands as ''any lands title to which is either: (1) Held in trust by the United States for the benefit of any Indian tribe or (2) held by an Indian Tribe or individual subject to restrictions by the United States against alienation.'' In clarifying this definition with the tribes, we agree that (1) fee lands within the reservation boundaries and owned by the Tribe or individual Indian, and (2) fee lands outside the reservation boundaries and owned by the Tribe would be considered Indian lands for the purposes of this proposed rule. (Fee lands outside the reservation owned by individual Indians are not included within the definition of Indian lands for the purposes of this rule.)

In evaluating Indian lands for designation as critical habitat we look to section 4(b)(2) of the ESA. Section 4(b)(2) requires us to base critical habitat designations on the best scientific and commercial data available, after taking into consideration the economic impact, the impact on national security and any other relevant impact of specifying any particular area as critical habitat. The Secretary may exclude areas from a critical habitat designation when the benefits of exclusion outweigh the benefits of designation, provided the exclusion will not result in the extinction of the species. We find that a relevant impact for consideration is the degree to which the Federal designation of Indian lands would impact the longstanding unique relationship between the tribes and the Federal Government and the corresponding effect on Pacific salmon protection and management (See Other Relevant Impacts and Critical Habitat Designation sections). This is consistent with recent case law addressing the designation of critical habitat on tribal lands. ''It is certainly reasonable to consider a positive working relationship relevant, particularly when the relationship results in the implementation of beneficial natural resource programs, including species preservation.'' *Center for Biological Diversity et al.* v. *Norton,* 240 F. Supp. 2d 1090, 1105); *Douglas County* v. *Babbitt,* 48 F3d 1495, 1507 (1995) (defining ''relevant'' as impacts consistent with the purposes of the ESA).

NMFS and many tribal governments in California currently have cooperative working relationships that have enabled us to implement natural resource programs of mutual interest for the benefit of threatened and endangered salmonids. Some tribes have existing natural resource programs that assist us on a regular basis in providing information relevant to salmonid protection throughout the region. Our consultation with the tribes and the BIA indicates that they view the designation of Indian lands as an unwanted intrusion into tribal self-governance, compromising the government-to-government relationship that is essential to achieving our mutual goal of conserving threatened and endangered salmonids.

At this time, for the general reasons described above, we anticipate that the ESA 4(b)(2) analysis will lead us to exclude all Indian lands with occupied habitat in our final designation for these seven ESUs of salmon and *O. mykiss.* Consistent with other proposed exclusions, any exclusion in the final rule will be made only after consideration of all comments received.

References Cited

A complete list of all references cited in this rulemaking can be found on our Web site at *http://swr.nmfs.noaa.gov* and is available upon request from the NMFS office in Long Beach, California (see **ADDRESSES** section).

List of Subjects in 50 CFR Part 226

Endangered and threatened species.

Dated: November 29, 2004.

William T. Hogarth,

Assistant Administrator for Fisheries, National Marine Fisheries Service.

For the reasons set out in the preamble, we propose to amend part 226, title 50 of the Code of Regulations as set forth below:

PART 226—[AMENDED]

1. The authority citation of part 226 continues to read as follows:

Authority: 16 U.S.C. 1533.

2. Add § 226.211 to read as follows:

§ 226.211 Critical habitat for seven Evolutionarily Significant Units (ESUs) of salmon (Oncorhynchus spp.) in California.

Critical habitat is designated in the following counties for the following ESUs as described in paragraph (a) of this section, and as further described in paragraphs (b) through (e) of this section. The textual descriptions of critical habitat for each ESU are included in paragraphs (f) through (l) of this section, and these descriptions are the definitive source for determining the critical habitat boundaries. General location maps are provided at the end of each ESU description (paragraphs (f) through (l) of this section) and are provided for general guidance purposes only, and not as a definitive source for determining critical habitat boundaries.

(a) Critical habitat is designated for the following ESUs in the following counties:

ESU	State—Counties
(1) California Coastal Chinook	*CA*—Humboldt, Trinity, Mendocino, Sonoma, Lake, Napa, Glenn, Colusa, and Tehama.
(2) Northern California *O. mykiss*	*CA*—Humboldt, Trinity, Mendocino, Sonoma, Lake, Glenn, Colusa, and Tehama.
(3) Central California Coast *O. mykiss*	*CA*—Lake, Mendocino, Sonoma, Napa, Marin, San Francisco, San Mateo, Santa Clara, Santa Cruz, Alameda, Contra Costa, and San Joaquin.
(4) South-Central Coast *O. mykiss*	*CA*—Monterey, San Benito, Santa Clara, Santa Cruz, San Luis Obispo.
(5) Southern California *O. mykiss*	*CA*—San Luis Obispo, Santa Barbara, Ventura, Los Angeles, Orange and San Diego.
(6) Central Valley spring-run Chinook	*CA*—Tehama, Butte, Glenn, Shasta, Yolo, Sacramento, Solano, Colusa, Yuba, Sutter, Trinity, Alameda, San Joaquin, and Contra Costa.
(7) Central Valley *O. mykiss*	*CA*—Tehama, Butte, Glenn, Shasta, Yolo, Sacramento, Solona, Yuba, Sutter, Placer, Calaveras, San Joaquin, Stanislaus, Tuolumne, Merced, Alameda, Contra Costa.

(b) *Critical habitat boundaries.* Critical habitat includes the stream channels within the proposed stream reaches, and includes a lateral extent as defined by the ordinary high-water line (33 CFR 329.11). In areas for which the ordinary high-water line has not been defined pursuant to 33 CFR 329.11, the lateral extent will be defined by the bankfull elevation. Bankfull elevation is the level at which water begins to leave the channel and move into the floodplain and is reached at a discharge which generally has a recurrence interval of 1 to 2 years on the annual flood series. Critical habitat in estuaries (e.g. San Francisco-San Pablo-Suisun Bay, Humboldt Bay, and Morro Bay) is defined by the perimeter of the water body as displayed on standard 1:24,000 scale topographic maps or the elevation of extreme high water, whichever is greater.

(c) *Primary constituent elements.* Within these areas, the primary constituent elements essential for the conservation of these ESUs are those sites and habitat components that support one or more life stages, including:

(1) Freshwater spawning sites with water quantity and quality conditions and substrate supporting spawning, incubation and larval development;

(2) Freshwater rearing sites with:

(i) Water quantity and floodplain connectivity to form and maintain physical habitat conditions and support juvenile growth and mobility;

(ii) Water quality and forage supporting juvenile development; and

(iii) Natural cover such as shade, submerged and overhanging large wood, log jams and beaver dams, aquatic vegetation, large rocks and boulders, side channels, and undercut banks.

(3) Freshwater migration corridors free of obstruction and excessive predation with water quantity and quality conditions and natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, side channels, and undercut banks supporting juvenile and adult mobility and survival.

(4) Estuarine areas free of obstruction and excessive predation with:

(i) Water quality, water quantity, and salinity conditions supporting juvenile and adult physiological transitions between fresh- and saltwater;

(ii) Natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, side channels; and

(iii) Juvenile and adult forage, including aquatic invertebrates and fishes, supporting growth and maturation.

(d) *Exclusion of Indian lands.* Critical habitat does not include occupied habitat areas on Indian lands. The Indian lands specifically excluded from critical habitat are those defined in the Secretarial Order, including:

(1) Lands held in trust by the United States for the benefit of any Indian tribe;

(2) Land held in trust by the United States for any Indian Tribe or individual subject to restrictions by the United States against alienation;

(3) Fee lands, either within or outside the reservation boundaries, owned by the tribal government; and

(4) Fee lands within the reservation boundaries owned by individual Indians.

(e) *Land owned or controlled by the Department of Defense.* Additionally, critical habitat does not include the following areas owned or controlled by the Department of Defense, or designated for its use, that are subject to an integrated natural resources management plan prepared under section 101 of the Sikes Act (16 U.S.C. 670a):

(1) Camp Pendleton Marine Corps Base;

(2) Vandenberg Air Force Base;

(3) Camp San Luis Obispo;

(4) Camp Roberts; and

(5) Mare Island Army Reserve Center.

(f) California Coastal Chinook Salmon (Oncorhynchus tshawytscha). Critical habitat is proposed to include the areas defined in the following units:

(1) Redwood Creek Hydrologic Unit 1107—*(i) Orick Hydrologic Sub-area 110710.* Outlet(s) = Redwood Creek (Lat −41.2997, Long −124.0917) upstream to endpoint(s) in: Boyes Creek (41.3639, −123.9845); Bridge Creek (41.137, −124.0012); Brown Creek (41.3986, −124.0012); Emerald (Harry Weir) (41.2142, −123.9812); Godwood Creek (41.3889, −124.0312); Larry Dam Creek (41.3359, −124.003); Little Lost Man Creek (41.2944, −124.0014); Lost Man Creek (41.3133, −123.9854); May Creek (41.3547, −123.999); McArthur Creek (41.2705, −124.041); North Fork Lost Man Creek (41.3374, −123.9935); Prairie Creek (41.4239, −124.0367); Redwood Creek (41.1367, −123.9309); Redwood Creek (41.2997, −124.0499); Tom McDonald (41.1628, −124.0419).

(ii) Beaver Hydrologic Sub-area 110720. Outlet(s) = Redwood Creek (Lat 41.1367, Long −123.9309) upstream to endpoint(s): Lacks Creek (41.0334, −123.8124); Minor Creek (40.9706, −123.7899).

(iii) Lake Prairie Hydrologic Sub-area 110730. Outlet(s) = Redwood Creek (Lat 40.9070, Long −123.8170) upstream to endpoint(s) in: Redwood Creek (40.7432, −123.7206).

(2) Trinidad Hydrologic Unit 1108—*(i) Big Lagoon Hydrologic Sub-area 110810.* Outlet(s) = Maple Creek (Lat 41.1555, Long −124.1380) upstream to endpoint(s) in: North Fork Maple Creek (41.1294, −124.0771); Maple Creek (41.1223, −124.0995).

(ii) Little River Hydrologic Sub-area 110820. Outlet(s) = Little River (41.0277, −124.1112) upstream to endpoint(s) in: South Fork Little River (40.9961, −124.0435); Little River (41.0463, −123.9818); Railroad Creek (41.0474, −124.0453); Lower South Fork Little River (41.003, −124.0081); Upper South Fork Little River (41.0163, −123.9939).

(3) Mad River Hydrologic Unit 1109—*(i) Blue Lake Hydrologic Sub-area 110910.* Outlet(s) = Mad River (Lat 40.9139, Long −124.0642) upstream to endpoint(s) in: Lindsay Creek (40.983, −124.0326); Mill Creek (40.9008, −124.0086); North Fork Mad River (40.8687, −123.9649); Squaw Creek (40.9426, −124.0202); Warren Creek (40.8901, −124.0402).

(ii) North Fork Mad River 110920. Outlet(s) = North Fork Mad River (Lat 40.8687, Long −123.9649) upstream to endpoint(s) in: Sullivan Gulch (40.8557, −123.9487); North Fork Mad River (40.8837, −123.9436).

(iii) Butler Valley 110930. Outlet(s) = Mad River (Lat 40.8449, Long −123.9807) upstream to endpoint(s) in: Black Creek (40.7547, −123.9016); Black Dog Creek (40.8334, −123.9805); Canon Creek (40.8362, −123.9028); Mad River (40.7007, −123.8642); Maple Creek (40.7928, −123.8742).

(4) Eureka Plain Hydrologic Unit 1110—*(i) Eureka Plain Hydrologic Sub-area 111000.* Outlet(s) = Mad River (Lat 40.9560, Long −124.1278); Jacoby Creek (40.8435, −124.0815); Freshwater Creek (40.8088, −124.1442); Elk River (40.7568, −124.1948); Salmon Creek (40.6868, −124.2194) upstream to endpoint(s) in: Bridge Creek (40.6958, −124.0795); Dunlap Gulch (40.7101, −124.1155); Elk River (40.7025, −124.1522); Freshwater Creek (40.7389, −123.9944); Gannon Slough (40.8628, −124.0818); Jacoby Creek (40.7944, −124.0093); Little Freshwater Creek (40.7485, −124.0652); North Branch of the North Fork Elk River (40.6878, −124.0131); North Fork Elk River (40.6756, −124.0153); Ryan Creek (40.7835, −124.1198); Salmon Creek (40.6438, −124.1319); South Branch of the North Fork Elk River (40.6691, −124.0244); South Fork Elk River (40.6626, −124.061); South Fork Freshwater Creek (40.7097, −124.0277).

(5) Eel River Hydrologic Unit 1111—*(i) Ferndale Hydrologic Sub-area 111111.* Outlet(s) = Eel River (Lat 40.6282, Long −124.2838) upstream to endpoint(s) in: Atwell Creek (40.472, −124.1449); Howe Creek (40.4748, −124.1827); Price Creek (40.5028, −124.2035); Strongs Creek (40.5986, −124.1222); Van Duzen River (40.5337, −124.1262).

(ii) Scotia Hydrologic Sub-area 111112. Outlet(s) = Eel River (Lat 40.4918, Long −124.0998) upstream to endpoint(s) in: Bear Creek (40.391, −124.0156); Chadd Creek (40.3921, −123.9542); Jordan Creek (40.4324, −124.0428); Monument Creek (40.4676, −124.1133).

(iii) Larabee Creek Hydrologic Sub-area 111113. Outlet(s) = Larabee Creek (40.4090, Long −123.9334) upstream to endpoint(s) in: Carson Creek (40.4189, −123.8881); Larabee Creek (40.3950, −123.8138).

(iv) Hydesville Hydrologic Sub-area 111121. Outlet(s) = Van Duzen River (Lat 40.5337, Long −124.1262) upstream to endpoint(s) in: Cummings Creek (40.5258, −123.9896); Hely Creek (40.5042, −123.9703); Yager Creek (40.5383, −124.1121); Unnamed (40.5383, −124.1121).

(v) Yager Creek Hydrologic Sub-area 111123. Outlet(s) = Yager Creek (Lat 40.5583, Long −124.0577) upstream to endpoint(s) in: Corner Creek (40.6189, −123.9994); Fish Creek (40.6392, −124.0032); Lawrence Creek (40.6394, −123.9935); Middle Fork Yager Creek (40.5799, −123.9015); North Fork Yager Creek (40.6044, −123.9084); Owl Creek (40.5557, −123.9362); Shaw Creek (40.6245, −123.9518); Yager Creek (40.5673, −123.9403).

(vi) Weott Hydrologic Sub-area 111131. Outlet(s) = South Fork Eel River (Lat 40.3500, Long −213.9305)

upstream to endpoint(s) in: Bridge Creek (40.2929, −123.8569); Bull Creek (40.3148, −124.0343); Canoe Creek (40.2909, −123.922); Cow Creek (40.3583, −123.9626); Cuneo Creek (40.3377, −124.0385); Elk Creek (40.2837, −123.8365); Fish Creek (40.2316, −123.7915); Harper Creek (40.354, −123.9895); Mill Creek (40.3509, −124.0236); Salmon Creek (40.2214, −123.9059); South Fork Salmon River (40.1769, −123.8929); Squaw Creek (40.3401, −123.9997); Tostin Creek (40.1722, −123.8796).

(vii) Benbow Hydrologic Sub-area 111132. Outlet(s) = South Fork Eel River (Lat 40.1932, Long −123.7692) upstream to endpoint(s) in: Anderson Creek (39.9337, −123.8933); Bear Pen Creek (39.9125, −123.8108); Bear Wallow Creek (39.7296, −123.7172); Bond Creek (39.7856, −123.6937); Butler Creek (39.7439, −123.692); China Creek (40.1035, −123.9493); Connick Creek (40.0911, −123.8187); Cox Creek (40.0288, −123.8542); Cummings Creek (39.8431, −123.5752); Dean Creek (40.1383, −123.7625); Dinner Creek (40.0915, −123.937); East Branch South Fork Eel River (39.9433, −123.6278); Elk Creek (39.7986, −123.5981); Fish Creek (40.0565, −123.7768); Foster Creek (39.8455, −123.6185); Grapewine Creek (39.7991, −123.5186); Hartsook Creek (40.012, −123.7888); Hollow Tree Creek (39.7316, −123.6918); Huckleberry Creek (39.7315, −123.7253); Indian Creek (39.9464, −123.8993); Jones Creek (39.9977, −123.8378); Leggett Creek (40.1374, −123.8312); Little Sproul Creel (40.0897, −123.8585); Low Gap Creek (39993, −123.767); McCoy Creek (399598, −123.7542); Michael's Creek (397642, −123.7175); Miller Creek (40.1215, −123.916); Moody Creek (399531, −123.8819); Mud Creek (398232, −123.6107); Piercy Creek (399706, −123.8189); Pollock Creek (40.0822, −123.9184); Rattlesnake Creek (397974, −123.5426); Redwood Creek (397721, −123.7651); Redwood Creek (40.0974, −123.9104); Seely Creek (40.1494, −123.8825); Somerville Creek (40.0896, −123.8913); South Fork Redwood Creek (397663, −123.7579); Spoul Creek (40.0125, −123.8585); Standley Creek (399479, −123.8083); Tom Long Creek (40.0315, −123.6891); Twin Rocks Creek (398269, −123.5543); Warden Creek (40.0625, −123.8546); West Fork Sproul Creek (40.0386, −123.9015); Wildcat Creek (399049, −123.7739); Wilson Creek (39841, −123.6452); Unnamed Tributary (40.1136, −123.9359); Unnamed Tributary (40.0538, −123.8293).

(viii) Laytonville Hydrologic Sub-area 111133. Outlet(s) = South Fork Eel River (Lat 39.7665, Long −123.6484)) upstream to endpoint(s) in: Bear Creek (39.6413, −123.5797); Cahto Creek (39.6624, −123.5453); Dutch Charlie Creek (39.6892, −123.6818); Grub Creek (39.7777, −123.5809); Jack of Hearts Creek (39.7244, −123.6802); Kenny Creek (39.6733, −123.6082); Mud Creek (39.6561, −123.592); Redwood Creek (39.6738, −123.6631); Rock Creek (39.6931, −123.6204); South Fork Eel River (39.6271, −123.5389); Streeter Creek (39.7328, −123.5542); Ten Mile Creek (39.6651, −123.451).

(ix) Sequoia Hydrologic Sub-area 111141. Outlet(s) = South Fork Eel River (Lat 40.3558, Long −123.9194) upstream to endpoint(s) in: Brock Creek (40.2411, −123.7248); Dobbyn Creek (40.2216, −123.6029); Hoover Creek (40.2312, −123.5792); Line Gulch (40.1655, −123.4831); North Fork Dobbyn Creek (40.2669, −123.5467); South Fork Dobbyn Creek (40.1723, −123.5112); South Fork Eel River (40.35, −123.9305); Unnamed Tributary (40.3137, −123.8333); Unnamed Tributary (40.2715, −123.549).

(x) Spy Rock Hydrologic Sub-area 111142. Outlet(s) = Eel River (Lat 40.1736, Long −123.6043) upstream to endpoint(s) in: Bell Springs Creek (39.9399, −123.5144); Burger Creek (39.6943, −123.413); Chamise Creek (40.0563, −123.5479); Jewett Creek (40.1195, −123.6027); Kekawaka Creek (40.0686, −123.4087); North Fork Eel River (39.9567, −123.4375); Woodman Creek (39.7639, −123.4338).

(xi) North Fork Eel River Hydrologic Sub-area 111150. Outlet(s) = North Fork Eel River (Lat 39.9567, Long −123.4375) upstream to endpoint(s) in: North Fork Eel River (39.9370, −123.3758).

(xii) Outlet Creek Hydrologic Sub-area 111161. Outlet(s) = Outlet Creek (Lat 39.6263, Long −123.3453) upstream to endpoint(s) in: Baechtel Creek (39.3688, −123.4028); Berry Creek (39.4272, −123.2951); Bloody Run (39.5864, −123.3545); Broaddus Creek (39.3907, −123.4163); Davis Creek (39.3701, −123.3007); Dutch Henry Creek (39.5788, −123.4543); Haehl Creek (39.3795, −123.3393); Long Valley Creek (39.6091, −123.4577); Outlet Creek (39.4526, −123.3338); Ryan Creek (39.4803, −123.3642); Upp Creek (39.4276, −123.3578); Upp Creek (39.4276, −123.3578); Willits Creek (39.4315, −123.3794).

(xiii) Tomki Creek Hydrologic Sub-area 111162. Outlet(s) = Eel River (Lat 39.7138, Long −123.3531) upstream to endpoint(s) in: Cave Creek (39.3925, −123.2318); Long Branch Creek (39.4074, −123.1897); Middle Fork Eel River (39.7136, −123.353); Outlet Creek (39.6263, −123.3453); Rocktree Creek (39.4533, −123.3079); Salmon Creek (39.4461, −123.2104); Scott Creek (39.456, −123.2297); String Creek (39.4855, −123.2891); Tomki Creek (39.549, −123.3613); Wheelbarrow Creek (39.5029, −123.3287).

(xiv) Lake Pillsbury Hydrologic Sub-area 111163. Outlet(s) = Eel River (Lat 39.3860, Long −123.1163) upstream to endpoint(s) in: Eel River (39.4078, −122.958).

(xv) Round Valley Hydrologic Sub-area 111172. Outlet(s) = Mill Creek (Lat 39.7398, Long −123.1431); Williams (39.8147, −123.1335) upstream to endpoint(s) in: Mill Creek (39.8456, −123.2822); Murphy Creek (39.8804, −123.1636); Poor Mans Creek (39.8179, −123.1833); Short Creek (39.8645, −123.2242); Turner Creek (39.7238, −123.2191); Williams Creek (39.8596, −123.1341).

(6) Cape Mendocino Hydrologic Unit 1112—*(i) Capetown Hydrologic Sub-area 111220.* Outlet(s) = Bear River (Lat 40.4744, Long −124.3881) upstream to endpoint(s) in: Bear River (40.3591, −124.0536); South Fork Bear River (40.4271, −124.2873).

(ii) Mattole River Hydrologic Sub-area 111230. Outlet(s) = Mattole River (Lat 40.2942, Long −124.3536) upstream to endpoint(s) in: Bear Creek (40.1262, −124.0631); Blue Slide Creek (40.1286, −123.9579); Bridge Creek (40.0503, −123.9885); Conklin Creek (40.3169, −124.229); Dry Creek (40.2389, −124.0621); East Fork Honeydew Creek (40.1633, −124.0916); East Fork of the North Fork Mattole River (40.3489, −124.2244); Eubanks Creek (40.0893, −123.9743); Gilham Creek (40.2162, −124.0309); Grindstone Creek (40.1875, −124.0041); Honeydew Creek (40.1942, −124.1363); Mattole Canyon (40.1833, −123.9666); Mattole River (39.9735, −123.9548); McGinnis Creek (40.3013, −124.2146); McKee Creek (40.0674, −123.9608); Mill Creek (40.0169, −123.9656); North Fork Mattole River (40.3729, −124.2461); North Fork Bear Creek (40.1422, −124.0945); Oil Creek (40.3008, −124.1253); Rattlesnake Creek (40.2919, −124.1051); South Fork Bear Creek (40.0334, −124.0232); Squaw Creek (40.219, −124.1921); Thompson Creek (39.9969, −123.9638); Unnamed (40.1522, −124.0989); Upper North Fork Mattole River (40.2907, −124.1115); Westlund Creek (40.2333, −124.0336); Woods creek (40.2235, −124.1574); Yew Creek (40.0019, −123.9743).

(7) Mendocino Coast Hydrologic Unit 1113—*(i) Wages Creek Hydrologic Sub-area 111312.* Outlet(s) = Wages Creek (Lat 39.6513, Long −123.7851)

upstream to endpoint(s) in: Wages Creek (39.6393, −123.7146).

(ii) Ten Mile River Hydrologic Sub-area 111313. Outlet(s) = Ten Mile River (Lat 39.5529, Long −123.7658) upstream to endpoint(s) in: Middle Fork Ten Mile River (39.5397, −123.5523); Little North Fork Ten Mile River (39.6188, −123.7258); Ten Mile River (39.5721, −123.7098); South Fork Ten Mile River (39.4927, −123.6067); North Fork Ten Mile River (39.5804, −123.5735).

(iii) Noyo River Hydrologic Sub-area 111320. Outlet(s) = Noyo River (Lat 39.4274, Long −123.8096) upstream to endpoint(s) in: North Fork Noyo River (39.4541, −123.5331); Noyo River (39.431, −123.494); South Fork Noyo River (39.3549, −123.6136).

(iv) Big River Hydrologic Sub-area 111330. Outlet(s) = Big River (Lat 39.3030, Long −123.7957) upstream to endpoint(s) in: Big River (39.3095, −123.4454).

(v) Albion River Hydrologic Sub-area 111340. Outlet(s) = Albion River (Lat 39.2253, Long −123.7679) upstream to endpoint(s) in: Albion River (39.2644, −123.6072); North Fork Albion River (39.2827, −123.607).

(vi) Navarro River Hydrologic Sub-area 111350. Outlet(s) = Navarro River (Lat 39.1921, Long −123.7611) upstream to endpoint(s) in: Navarro River (39.0534); Rancheria Creek (38.9689, −123.4169).

(vii) Garcia River Hydrologic Sub-area 111370. Outlet(s) = Garcia River (Lat 38.9455, Long −123.7257) upstream to endpoint(s) in: Garcia River (38.9160, −123.4900).

(8) Russian River Hydrologic Unit 1114—*(i) Guerneville Hydrologic Sub-area 111411.* Outlet(s) = Russian River (Lat 38.4507, Long −123.1289) upstream to endpoint(s) in: Austin Creek (38.5099, −123.0681); Mark West Creek (38.4961, −122.8489).

(ii) Austin Creek Hydrologic Sub-area 111412. Outlet(s) = Austin Creek (Lat 38.5099, Long −123.0681) upstream to endpoint(s) in: Austin Creek (38.5326, −123.0844).

(iii) Mark West Hydrologic Sub-area 111423. Outlet(s) = Mark West Creek (Lat 38.4961, Long −122.8489) upstream to endpoint(s) in: Mark West Creek (38.4526, −122.8347).

(iv) Warm Springs Hydrologic Sub-area 111424. Outlet(s) = Dry Creek (Lat 38.5861, Long −122.8573) upstream to endpoint(s) in: Dry Creek (38.7179, −123.0075).

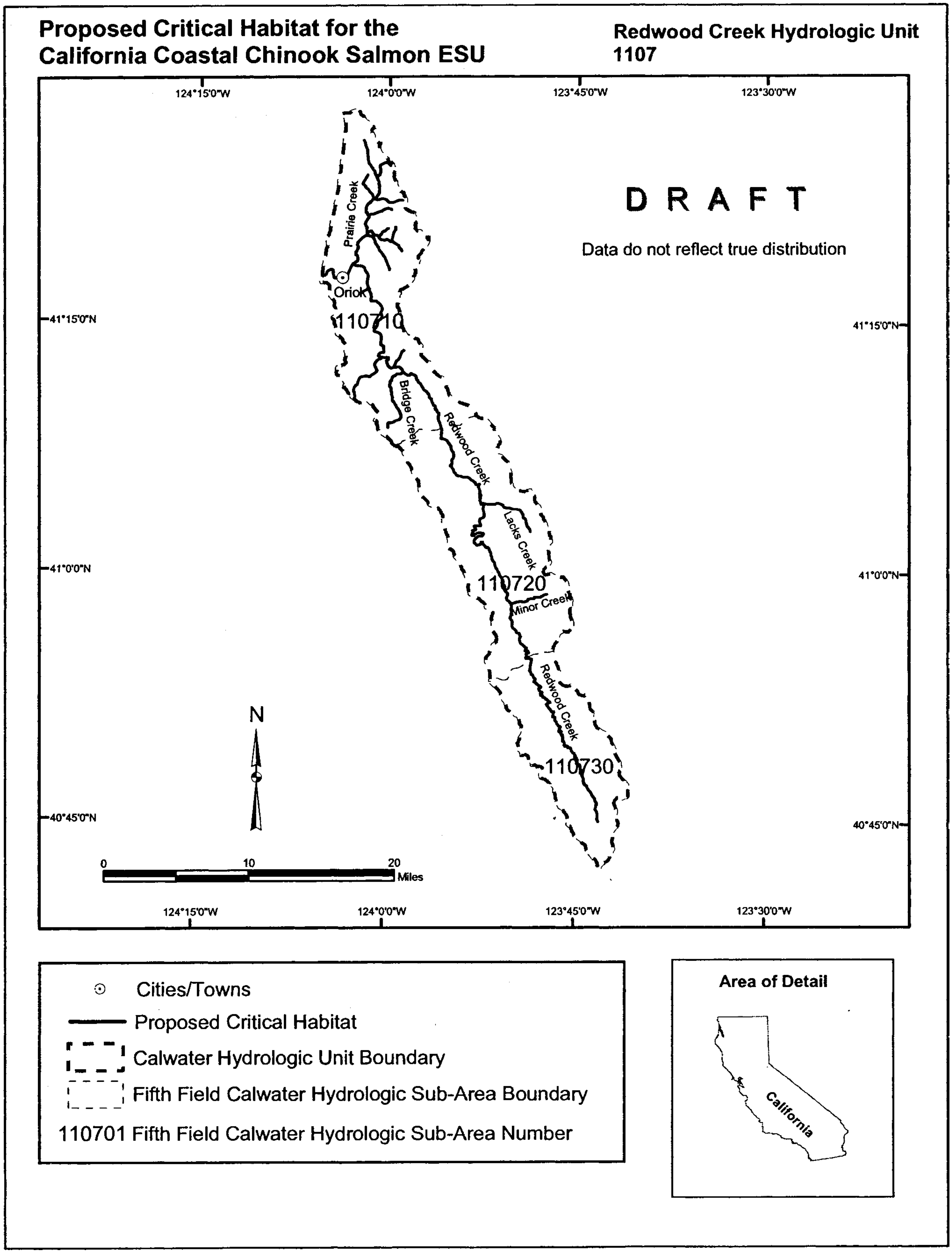
(v) Geyserville Hydrologic Sub-area 111425. Outlet(s) = Russian River (Lat 38.6132, Long −122.8321) upstream.

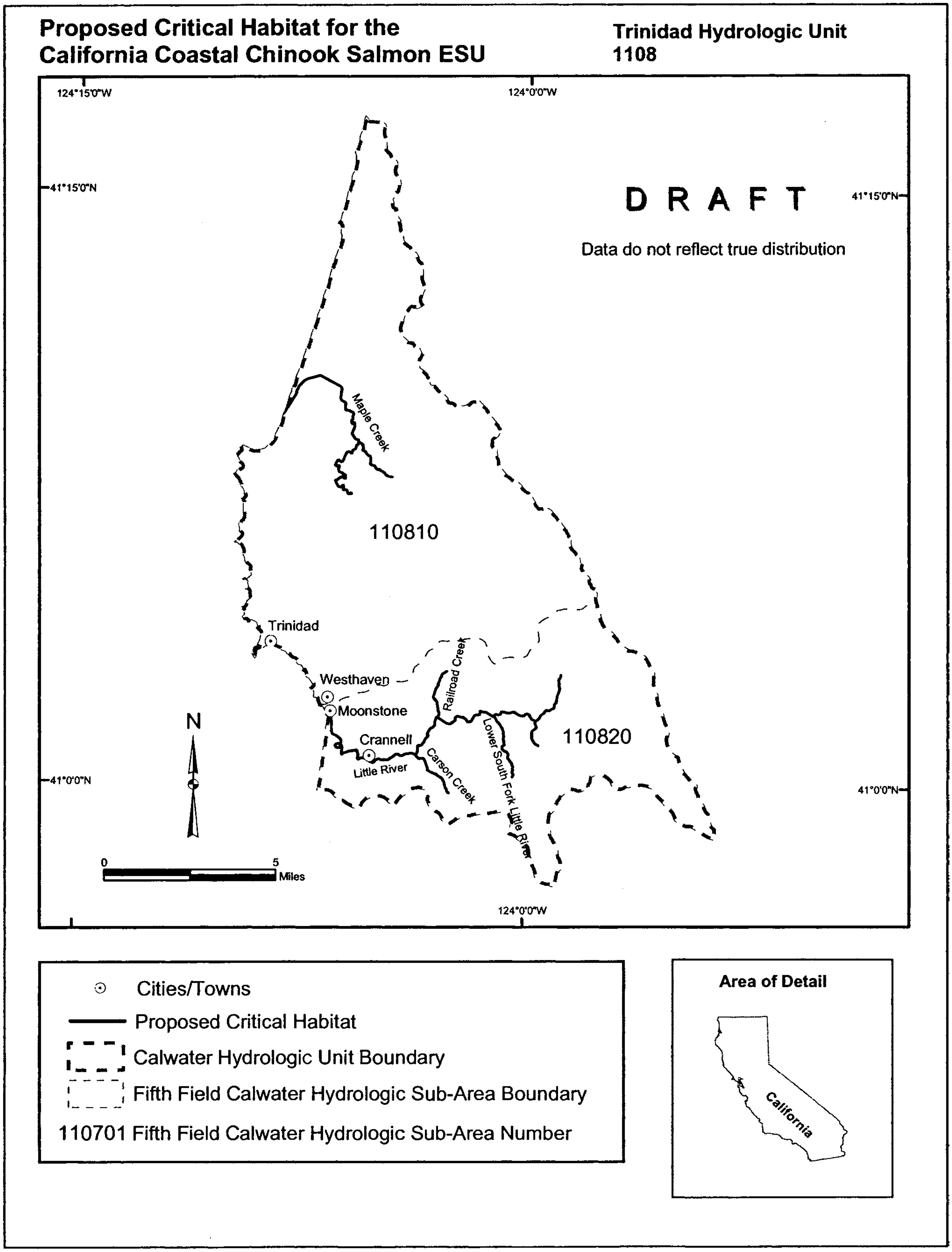
(vi) Ukiah Hydrologic Sub-area 111431. Outlet(s) = Russian River (Lat 38.8828, Long −123.0557) upstream to endpoint(s) in: Feliz Creek (38.9941, −123.1779).

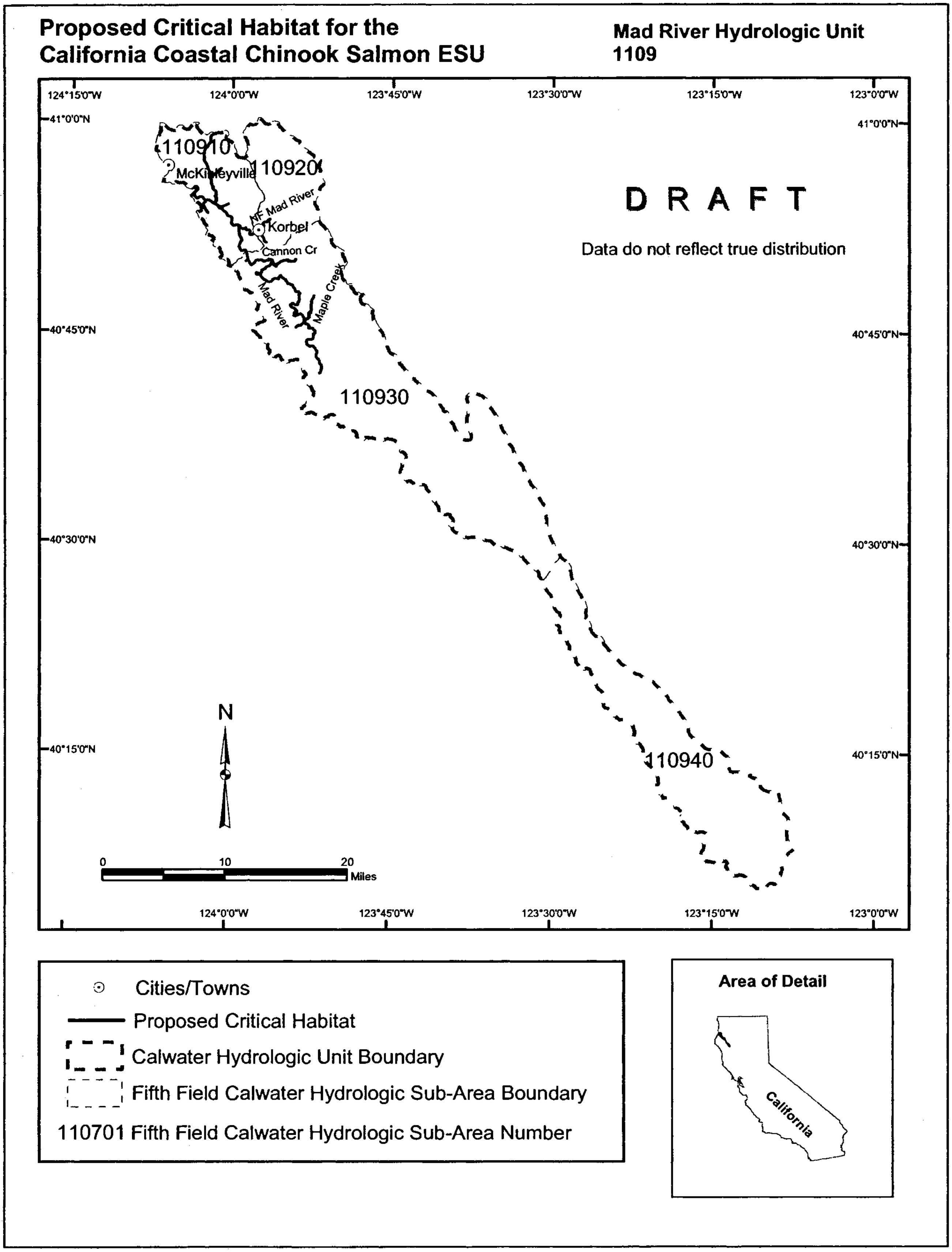
(vii) Forsythe Creek Hydrologic Sub-area 111433. Outlet(s) = Russian River (Lat 39.2257, Long −123.2012) upstream to endpoint(s) in: Forsythe Creek (39.2780, −123.2608); Russian River (39.3599, −123.2326).

(9) Maps of proposed critical habitat for the California Coast chinook salmon ESU follow:

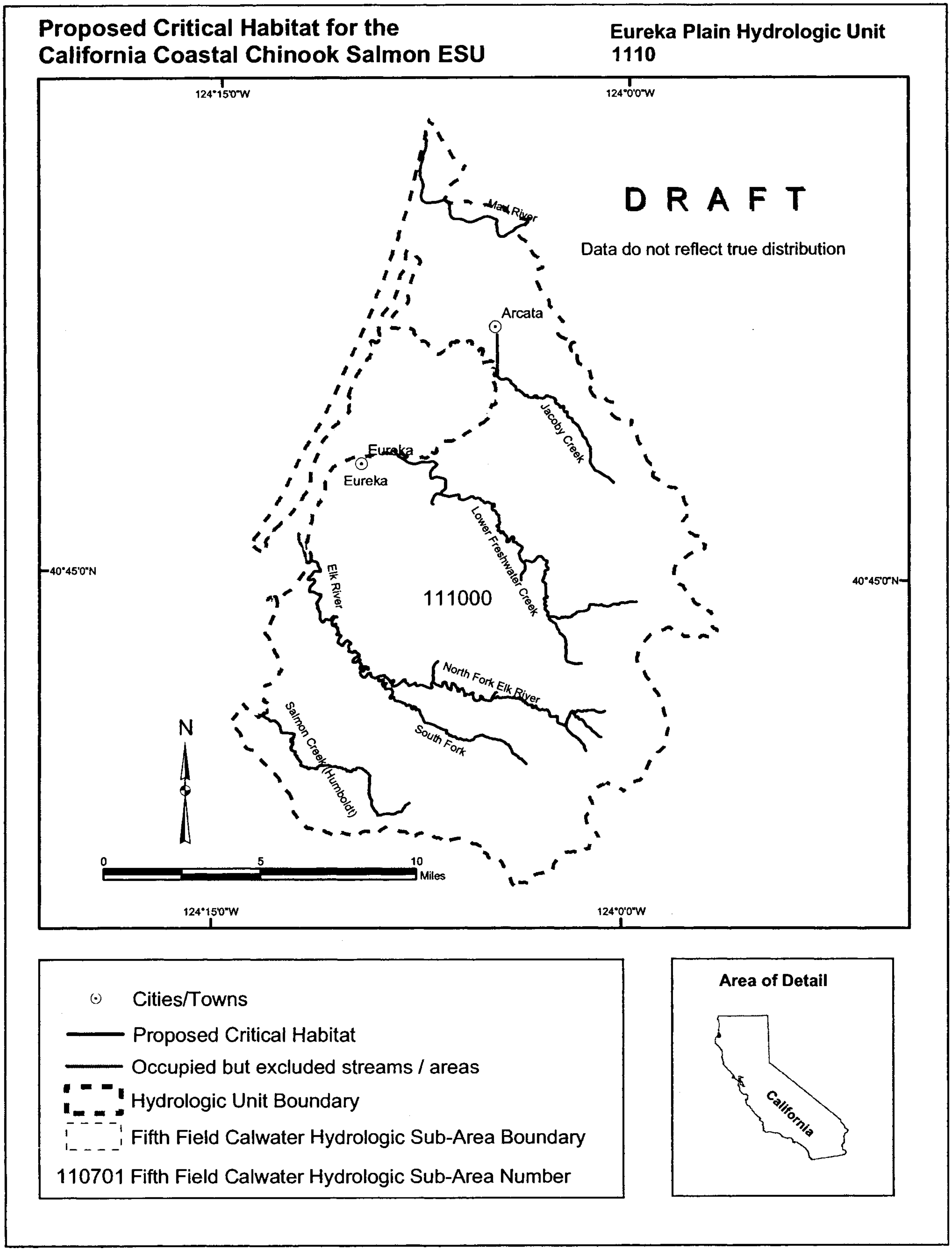
BILLING CODE 3510–22–P


Proposed Critical Habitat for the
California Coastal Chinook Salmon ESU
Redwood Creek Hydrologic Unit
1107
DRAFT
Data do not reflect true distribution
124°15'0"W
124°0'0"W
123°45'0"W
123°30'0"W
41°15'0"N
41°0'0"N
40°45'0"N
Prairie Creek
Orick
110710
Bridge Creek
Redwood Creek
Lacks Creek
110720
Minor Creek
Redwood Creek
110730
N
0
10
20
Miles
Cities/Towns
Proposed Critical Habitat
Calwater Hydrologic Unit Boundary
Fifth Field Calwater Hydrologic Sub-Area Boundary
110701 Fifth Field Calwater Hydrologic Sub-Area Number
Area of Detail
California


Proposed Critical Habitat for the
California Coastal Chinook Salmon ESU
Trinidad Hydrologic Unit
1108
124°15'0"W
124°0'0"W
41°15'0"N
D R A F T
Data do not reflect true distribution
41°0'0"N
Maple Creek
110810
Trinidad
Westhaven
Moonstone
Railroad Creek
Crannell
Little River
Carson Creek
Lower South Fork Little River
110820
N
0
5
Miles
Cities/Towns
Proposed Critical Habitat
Calwater Hydrologic Unit Boundary
Fifth Field Calwater Hydrologic Sub-Area Boundary
110701 Fifth Field Calwater Hydrologic Sub-Area Number
Area of Detail
California

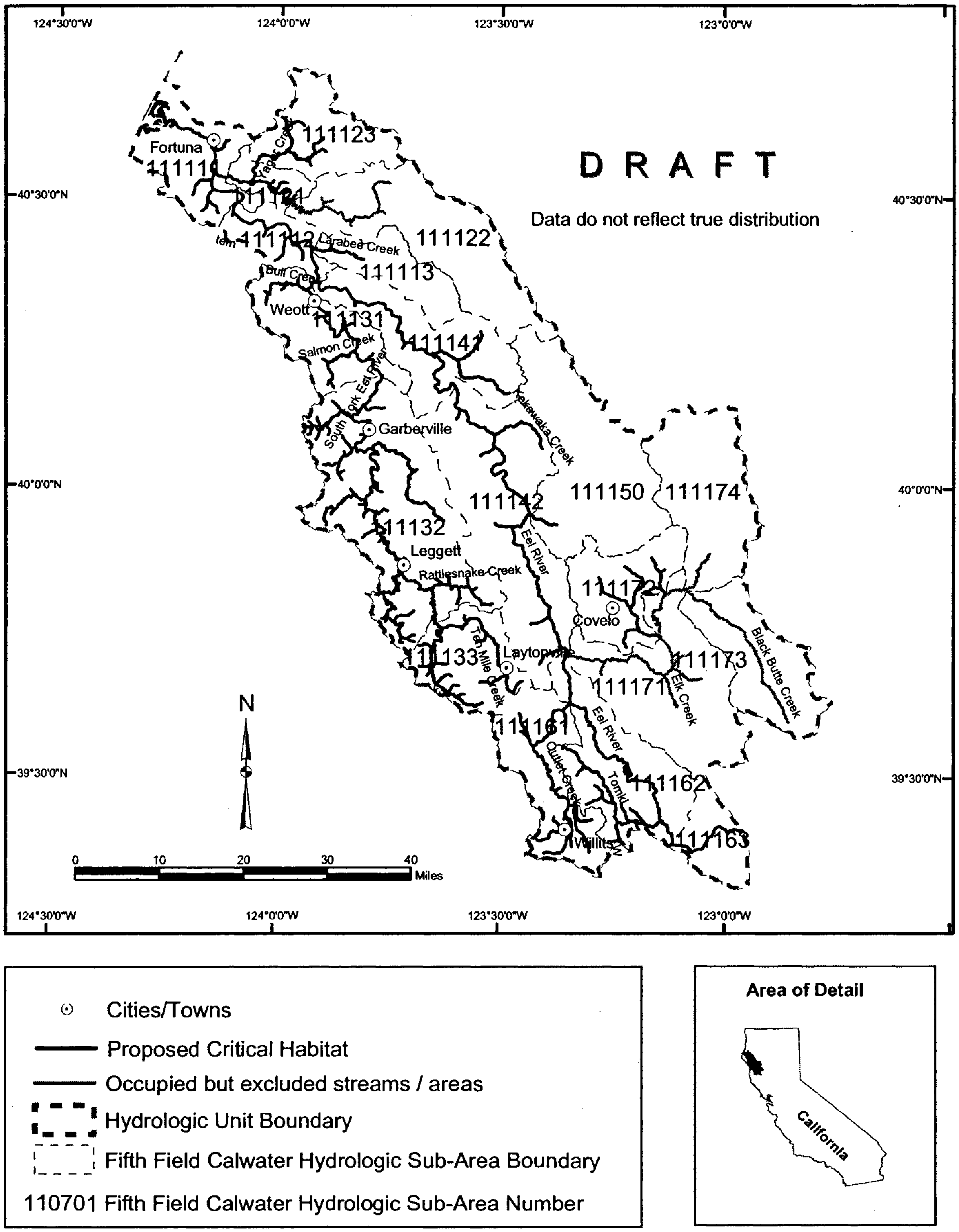


Proposed Critical Habitat for the
California Coastal Chinook Salmon ESU
Mad River Hydrologic Unit
1109
124°15'0"W
124°0'0"W
123°45'0"W
123°30'0"W
123°15'0"W
123°0'0"W
41°0'0"N
40°45'0"N
40°30'0"N
40°15'0"N
110910
McKinleyville
110920
NF Mad River
Korbel
Cannon Cr
Mad River
Maple Creek
110930
110940
DRAFT
Data do not reflect true distribution
N
0
10
20
Miles
Cities/Towns
Proposed Critical Habitat
Calwater Hydrologic Unit Boundary
Fifth Field Calwater Hydrologic Sub-Area Boundary
110701 Fifth Field Calwater Hydrologic Sub-Area Number
Area of Detail
California


Proposed Critical Habitat for the
California Coastal Chinook Salmon ESU
Eureka Plain Hydrologic Unit
1110
DRAFT
Data do not reflect true distribution
124°15'0"W
124°0'0"W
40°45'0"N
Mad River
Arcata
Jacoby Creek
Eureka
Eureka
Lower Freshwater Creek
Elk River
111000
North Fork Elk River
South Fork
Salmon Creek (Humboldt)
N
0
5
10
Miles
Cities/Towns
Proposed Critical Habitat
Occupied but excluded streams / areas
Hydrologic Unit Boundary
Fifth Field Calwater Hydrologic Sub-Area Boundary
110701 Fifth Field Calwater Hydrologic Sub-Area Number
Area of Detail
California

Proposed Critical Habitat for the California Coastal Chinook Salmon ESU

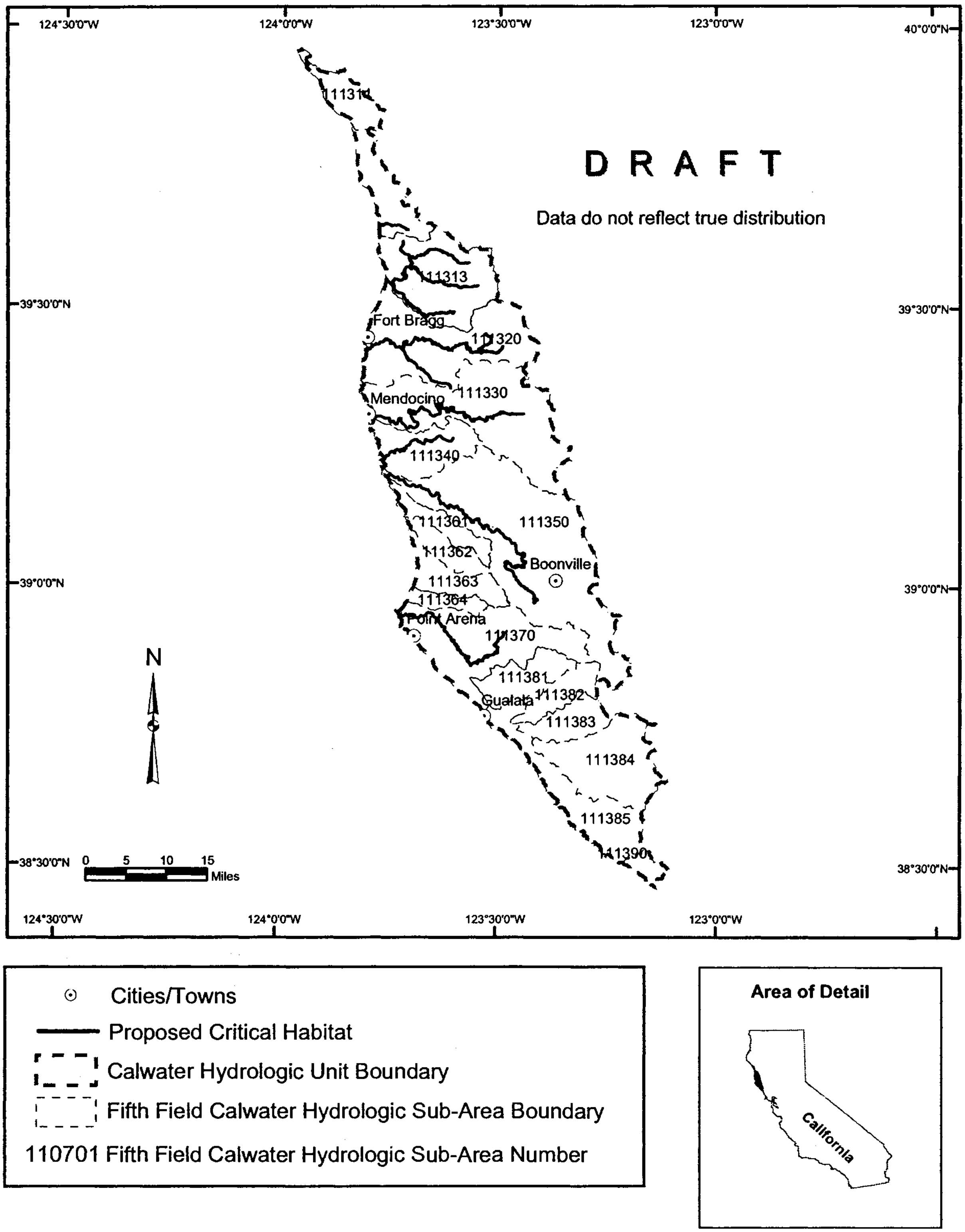
Eel River Hydrologic Unit 1111

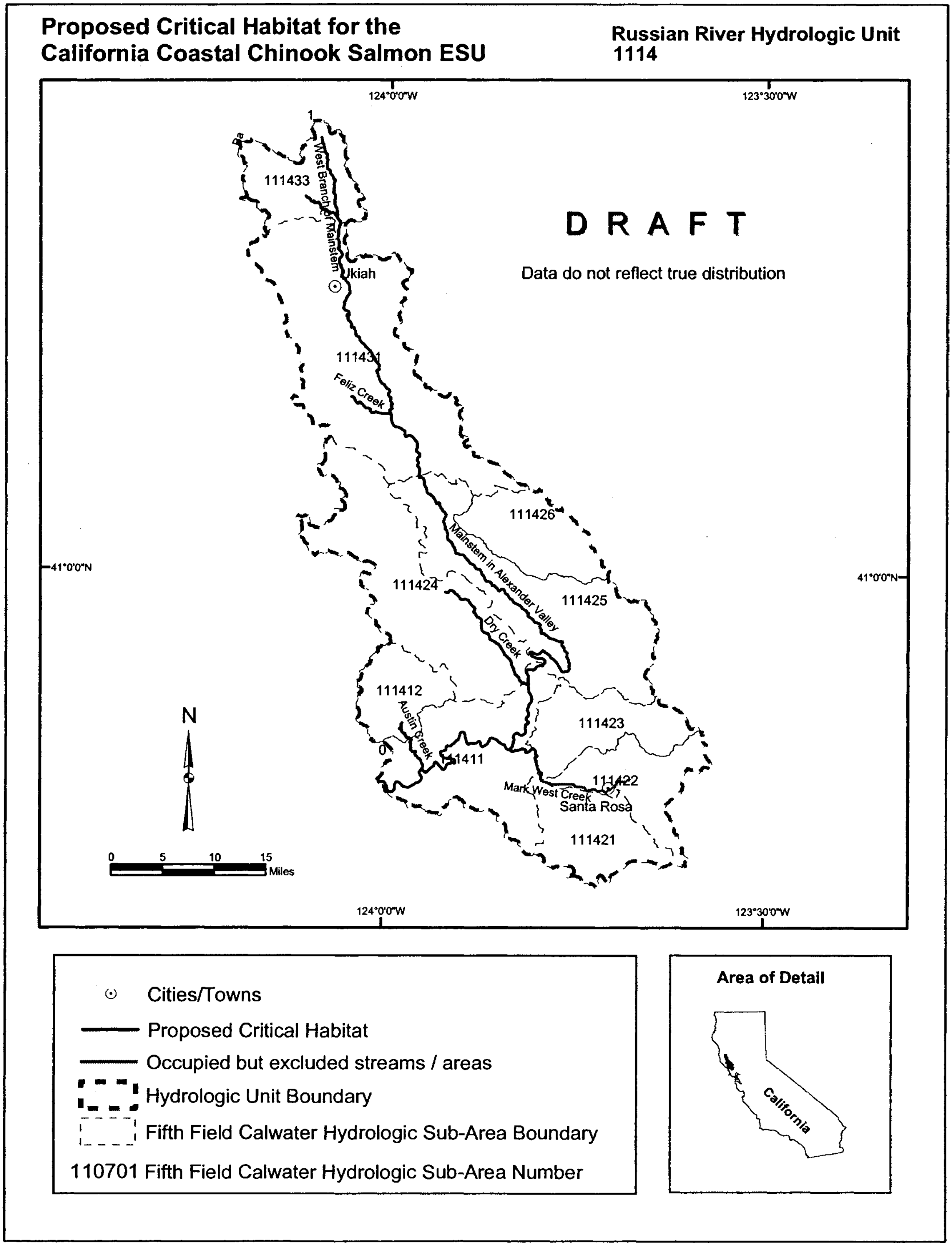


Proposed Critical Habitat for the California Coastal Chinook Salmon ESU
Cape Mendocino Hydrologic Unit 1112
124°30'0"W
124°0'0"W
40°30'0"N
40°0'0"N
111210
111220
111230
Bear River mainstem
DRAFT
Data do not reflect true distribution
North Fork
Petrolia
Mattole River
Honeydew
Squaw Creek
South Fork Bear Creek
Whitethorn
N
0 5 10 15 Miles
Cities/Towns
Proposed Critical Habitat
Calwater Hydrologic Unit Boundary
Fifth Field Calwater Hydrologic Sub-Area Boundary
110701 Fifth Field Calwater Hydrologic Sub-Area Number
Area of Detail
California

Proposed Critical Habitat for the California Coastal Chinook Salmon ESU

Mendocino Coast Hydrologic Unit 1113





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(g) *Northern California O. mykiss (Oncorhynchus mykiss).* Critical habitat is proposed to include the areas defined in the following units:

(1) Redwood Creek Hydrologic Unit 1107—*(i) Orick Hydrologic Sub-area 110710.* Outlet(s) = Boat Creek (Lat 41.4059, Long —124.0675); Home Creek (41.4027, −124.0683); Redwood Creek (41.2923, −124.0917); Squashan Creek (41.389, −124.0703) upstream to endpoint(s) in: Boat Creek (41.4110, −124.0583); Bond Creek (41.2326, −124.0262); Boyes Creek (41.3701, −124.9891); Bridge Creek (41.1694, −123.9964); Brown Creek (41.3986, −124.0012); Cloquet Creek (41.2456, −124.0116); Cole Creek (41.2187, −124.0087); Copper Creek (41.1516, −123.9258); Dolason Creek (41.1969, −123.9667); Elam Creek (41.2613, −124.0321); Emerald Creek (41.2164, −123.9808); Forty Four Creek (41.2187, −124.0195); Gans South Creek (41.2617, −124.0157); Godwood Creek (41.3787, −124.0354); Hayes Creek (41.2889, −124.0295); Home Creek (41.3951, −124.0386); Larry Dam Creek (41.3441, −123.9966); Little Lost Man Creek (41.3078, −124.0084); Lost Man Creek (41.3187, −123.9892); May Creek (41.3521, −124.0164); McArthur Creek (41.2702, −124.0427); Miller Creek (41.2290, −124.0116); North Fork Lost Man Creek (41.3405, −123.9859); Oscar Larson Creek (41.2559, −123.9943); Prairie Creek (41.4440, −124.0411); Redwood Creek (41.1367, −123.9309); Skunk Cabbage Creek (41.3211, −124.0802); Slide Creek (41.1736, −123.9450); Squashan Creek (41.3739, −124.0440); Streelow Creek (41.3622, −124.0472); Tom McDonald Creek (41.1933, −124.0164); Unnamed Tributary (41.3619, −123.9967); Unnamed Tributary (41.3424, −124.0572).

(ii) Beaver Hydrologic Sub-area 110720. Outlet(s) = Redwood Creek (Lat 41.1367, Long —123.9309) upstream to endpoint(s) in: Beaver Creek (41.0208, −123.8608); Captain Creek (40.9199, −123.7944); Cashmere Creek (41.0132, −123.8862); Coyote Creek (41.1249, −123.8796); Devils Creek (41.1224, −123.9384); Garcia Creek (41.0180, −123.8923); Garrett Creek (41.0904, −123.8712); Karen Court Creek (41.0368, −123.8953); Lacks Creek (41.0306, −123.8096); Loin Creek (40.9465, −123.8454); Lupton Creek (40.9058, −123.8286); Mill Creek (41.0045, −123.8525); Minor Creek (40.9706, −123.7899); Molasses Creek (40.9986, −123.8490); Moon Creek (40.9807, −123.8368); Panther Creek (41.0732, −123.9275); Pilchuck Creek (41.9986, −123.8710); Roaring Gulch (41.0319, −123.8674); Santa Fe Creek (40.9368, −123.8397); Sweathouse Creek (40.9332, −123.8131); Toss-Up Creek (40.9845, −123.8656); Wiregrass Creek (40.9652, −123.8553).

(iii) Lake Prairie Hydrologic Sub-area 110730. Outlet(s) = Redwood Creek (Lat 40.9070, Long —123.8170) upstream to endpoint(s) in: Bradford Creek (40.7812, −123.7215); Cut-Off Meander (40.8507, −123.7729); Emmy Lou Creek (40.8655, −123.7771); Gunrack Creek (40.8391, −123.7650); High Prairie Creek (40.8191, −123.7723); Jena Creek (40.8742, −123.8065); Lake Prairie Creek (40.7984, −123.7558); Lupton Creek (40.9069, −123.8172); Minon Creek (40.8140, −123.7372); Noisy Creek (40.8613, −123.8044); Pardee Creek (40.7779, −123.7416); Redwood Creek (40.7432, −123.7206); Simion Creek (40.8241, −123.7560); Six Rivers Creek (40.8352, −123.7842); Smokehouse Creek (40.7405, −123.7278); Snowcamp Creek (40.7415, −123.7296); Squirrel Trail Creek (40.8692, −123.7844); Twin Lakes Creek (40.7369, −123.7214); Panther Creek (40.8019, −123.7094); Windy Creek (40.8866, −123.7956).

(2) Trinidad Hydrologic Unit 1108—*(i) Big Lagoon Hydrologic Sub-area 110810.* Outlet(s) = Maple Creek (Lat 41.1555, Long —124.1380); McDonald Creek (41.2521, −124.0919) upstream to endpoint(s) in: Beach Creek (41.0716, −124.0239); Clear Creek (41.1031, −124.0030); Diamond Creek (41.1571, −124.0926); Maple Creek (41.0836, −123.9790); McDonald Creek (41.1850, −124.0773); M-Line Creek (41.0752, −124.0787); North Fork McDonald Creek (41.2107, −124.0664); North Fork of Maple Creek (41.1254, −124.0539); Pitcher Creek (41.1521, −124.0897); South Fork Maple Creek (41.1003, −124.1119); Tom Creek (41.1773, −124.0966); Unnamed Tributary (41.1004, −124.0155); Unnamed Tributary (41.0780, −124.0676); Unnamed Tributary (41.1168, −124.0886); Unnamed Tributary (41.0851, −124.0966); Unnamed Tributary (41.1132, −124.0827); Unnamed Tributary (41.0749, −124.0889); Unnamed Tributary (41.1052, −124.0675); Unnamed Tributary (41.0714, −124.0611); Unnamed Tributary (41.0948, −124.0016).

(ii) Little River Hydrologic Sub-area 110820. Outlet(s) = Little River (Lat 41.0277, Long —124.1112) upstream to endpoint(s) in: South Fork Little River (40.9899, −124.0394); Freeman Creek (41.0283, −124.0585); Little River (41.0530, −123.9689); Lower South Fork Little River (40.9893, −124.0007); Railroad Creek (41.0468, −124.0466); Strawberry Creek (40.9963, −124.1155); Unnamed Tributary (41.0356, −123.9958); Unnamed Tributary (41.0407, −124.0598); Unnamed Tributary (41.0068, −123.9830); Unnamed Tributary (41.0365, −124.0361); Unnamed Tributary (41.0444, −124.0194); Unnamed Tributary (41.0431, −124.0125); Upper South Fork Little River (41.0131, −123.9852).

(3) Mad River Hydrologic Unit 1109—*(i) Blue Lake Hydrologic Sub-area 110910.* Outlet(s) = Mad River (Lat 40.9139, Long —124.0642); Strawberry Creek (40.9964, −124.1155); Widow White Creek (40.9635, −124.1253) upstream to endpoint(s) in: Boundary Creek (40.8395, −123.9920); Grassy Creek (40.9314, −124.0188); Hall Creek (40.9162, −124.0141); Kelly Creek (40.8656, −124.0260); Leggit Creek (40.8808, −124.0269); Lindsay Creek (40.9838, −124.0283); Mather Creek (40.9796, −124.0526); Mill Creek (40.9296, −124.1037); Mill Creek (40.8521, −123.9617); North Fork Mad River (40.8687, −123.9649); Norton Creek (40.9572, −124.1003); Palmer Creek (40.8633, −124.0193); Puter Creek (40.8474, −123.9966); Quarry Creek (40.8526, −124.0098); Squaw Creek (40.9426, −124.0202); Strawberry Creek (40.9761, −124.0630); Unnamed Tributary (40.9624, −124.0179); Unnamed Tribitary (40.9713, −124.0477); Unnamed Tributary (40.9549, -124.0554); Unnamed Tributary (40.9672, −124.0218); Warren Creek (40.8860, −124.0351); Widow White Creek (40.9522, −124.0784).

(ii) North Fork Mad River Hydrologic Sub-area 110920. Outlet(s) = North Fork Mad River (Lat 40.8687, Long −123.9649) upstream to endpoint(s) in: Bald Mountain Creek (40.8922, −123.9097); Denman Creek (40.9293, −123.9429); East Fork North Fork (40.9702, −123.9449); Gosinta Creek (40.9169, −123.9420); Hutchery Creek (40.8712, −123.9450); Jackson Creek (40.9388, −123.9462); Krueger Creek (40.9505, −123.9611); Long Prairie Creek (40.9235, −123.8945); Mule Creek (40.9416, −123.9309); North Fork Mad River (40.9918, −123.9610); Pine Creek (40.9299, −123.9114); Pollock Creek (40.9081, −123.9071); Sullivan Gulch (40.8512, −123.9401); Tyson Creek (40.9559, −123.9738); Unnamed Tributary (40.9879, −123.9511); Unnamed Tributary (40.9906, −123.9540); Unnamed Tributary (40.9294, −123.8842); Unnamed Tributary (40.9866, −123.9788); Unnamed Tributary (40.9927, −123.9736).

(iii) Butler Valley Hydrologic Sub-area 110930. Outlet(s) = Mad River (Lat 40.8449, Long −123.9807) upstream to endpoint(s) in: Bear Creek (40.5468, −123.6728); Black Creek (40.7521,

−123.9080); Black Dog Creek (40.8334, −123.9805); Blue Slide Creek (40.7333, −123.9225); Boulder Creek (40.7634, −123.8667); Bug Creek (40.6587, −123.7356); Cannon Creek (40.8535, −123.8850); Coyote Creek (40.6147, −123.6488); Devil Creek (40.8032, −123.9175); Dry Creek (40.8218, −123.9751); East Creek (40.5403, −123.5579); Maple Creek (40.7933, −123.8353); Pilot Creek (40.5950, −123.5888); Simpson Creek (40.8138, −123.9156); Unnamed Tributary (40.7306, −123.9019); Unnamed Tributary (40.7739, −123.9255); Unnamed Tributary (40.7744, −123.9137); Unnamed Tributary (40.8029, −123.8716); Unnamed Tributary (40.8038, −123.8691); Unnamed Tributary (40.8363, −123.8973).

(4) Eureka Plain Hydrologic Unit 1110—*(i) Eureka Plain Hydrologic Sub-area 111000.* Outlet(s) = Elk River (Lat 40.7568, Long −124.1948); Freshwater Creek (40.8088, −124.1442); Jacoby Creek (40.8436, −124.0834); Mad River (40.9560, −124.1278); Rocky Gulch (40.8309, −124.0813); Salmon Creek (40.6868, −124.2194); Washington Gulch (40.8317, −124.0805) upstream to endpoint(s) in: Bridge Creek (40.6958, −124.0805); Browns Gulch (40.7038, −124.1074); Clapp Gulch (40.6967, −124.1684); Cloney Gulch (40.7826, −124.0347); Doe Creek (40.6964, −124.0201); Dunlap Gulch (40.7076, −124.1182); Falls Gulch (40.7655, −124.0261); Fay Slough (40.8033, −124.0574); Freshwater Creek (40.7385, −124.0035); Golf Course Creek (40.8406, −124.0402); Graham Gulch (40.7540, −124.0228); Guptil Gulch (40.7530, −124.1202); Henderson Gulch (40.7357, −124.1394); Jacoby Creek (40.7951, −124.0087); Lake Creek (40.6848, −124.0831); Line Creek (40.6578, −124.0460); Little Freshwater Creek (40.7371, −124.0649); Little North Fork Elk River (40.6972, −124.0100); Little South Fork Elk River (40.6555, −124.0877); Martin Slough (40.7679, −124.1578); McCready Gulch (40.7824, −124.0441); McWinney Creek (40.6968, −124.0616); Morrison Gulch (40.8105, −124.0437); North Branch of the North Fork Elk River (40.6879, −124.0130); North Fork Elk River (40.6794−123.9834); Railroad Gulch (40.6955, −124.1545); Rocky Gulch (40.8079, −124.0528); Ryan Creek (40.7352, −124.0996); Salmon Creek (40.6438, −124.1318); South Branch of the North Fork Elk River (40.6700, −124.0251); South Fork Freshwater Creek (40.7110, −124.0367); South Fork Elk River (40.6437, −124.0388); Swain Slough (40.7524, −124.1825); Tom Gulch (40.6794, −124.1452); Unnamed Tributary (40.7850, −124.0561); Unnamed Tributary (40.7496, −124.1651); Unnamed Tributary (40.7785,—124.1081); Unnamed Tributary (40.7667, −124.1054); Unnamed Tributary (40.7559, −124.0870); Unnamed Tributary (40.7952, −124.0568); Unnamed Tributary (40.7408, −124.1118); Unnamed Tributary (40.7186, −124.1385); Unnamed Tributary (40.7224, −124.1038); Unnamed Tributary (40.8194, −124.0305); Unnamed Tributary (40.8106, −124.0083); Unnamed Tributary (40.7585, −124.1456); Unnamed Tributary (40.7457, −124.1138); Unnamed Tributary (40.8085, −124.0713); Unnamed Tributary (40.6634, −124.1193); Unnamed Tributary (40.7576, −124.1576); Washington Gulch (40.8116, −124.0491).

(5) Eel River Hydrologic Unit 1111—*(i) Ferndale Hydrologic Sub-area 111111.* Outlet(s) = Eel River (Lat 40.6275, Long −124.2520) upstream to endpoint(s) in: Atwell Creek (40.4824, −124.1498); Dean Creek (40.4847, −124.1217); Horse Creek (40.5198, −124.1702); House Creek (40.4654, −124.1916); Howe Creek (40.4956, −124.1690); Nanning Creek (40.4914, −124.0652); North Fork Strongs Creek (40.6077, −124.1047); Price Creek (40.5101, −124.2731); Rohner Creek (40.6151, −124.1408); Strongs Creek (40.5999, −124.0985); Sweet Creek (40.4900, −124.2007); Van Duzen River (40.5337, −124.1262).

(ii) Scotia Hydrologic Sub-area 111112. Outlet(s) = Eel River (Lat 40.4918, Long −124.0988) upstream to endpoint(s) in: Bear Creek (40.3942, −124.0262); Bridge Creek (40.4278, −123.9317); Chadd Creek (40.3919, −123.9540); Darnell Creek (40.4533, −123.9808); Dinner Creek (40.4406, −124.0855); Greenlaw Creek (40.4315, −124.0231); Jordan Creek (40.4171, −124.0517); Kiler Creek (40.4465, −124.0952); Larabee Creek (40.4089, −123.9331); Monument Creek (40.4371, −124.1165); Shively Creek (40.4454, −123.9539); South Fork Bear Creek (40.3856, −124.0182); South Fork Eel River (40.3558, −123.9194); Stitz Creek (40.4649, −124.0531); Twin Creek (40.4419, −124.0714); Unnamed Tributary (40.3933, −123.9984); Weber Creek (40.3767, −123.9094).

(iii) Larabee Creek Hydrologic Sub-area 111113. Outlet(s) = Larabee Creek (Lat 40.4089, Long -123.9331) upstream to endpoint(s) in: Arnold Creek (40.4006, -123.8583); Balcom Creek (40.4030, -123.8986); Bosworth Creek (40.3584, -123.7089); Boulder Flat Creek (40.3530, -123.6381); Burr Creek (40.4250, -123.7767); Carson Creek (40.4181, -123.8879); Chris Creek (40.4146, -123.9235); Cooper Creek (40.3123, -123.6463); Dauphiny Creek (40.4049, -123.8893); Frost Creek (40.3765, -123.7357); Hayfield Creek (40.3350, -123.6535); Knack Creek (40.3788, -123.7385); Larabee Creek (40.2807, -123.6445); Martin Creek (40.3730, -123.7060); Maxwell Creek (40.3959, -123.8049); McMahon Creek (40.3269, -123.6363); Mill Creek (40.3849, -123.7440); Mountain Creek (40.2955, -123.6378); Scott Creek (40.4020, -123.8738); Smith Creek (40.4194, -123.8568); Thurman Creek (40.3506, -123.6669); Unnamed Tributary (40.3842, -123.8062); Unnamed Tributary (40.3982, -123.7862); Unnamed Tributary (40.3806, -123.7564); Unnamed Tributary (40.3661, -123.7398); Unnamed Tributary (40.3524, -123.7330).

(iv) Hydesville Hydrologic Sub-area 111121. Outlet(s) = Van Duzen River (Lat 40.5337, Long -124.1262) upstream to endpoint(s) in: Cuddeback Creek (40.5421, -124.0263); Cummings Creek (40.5282, -123.9770); Fiedler Creek (40.5351, -124.0106); Hely Creek (40.5165, -123.9531); Yager Creek (40.5583, -124.0577); Unnamed Tributary (40.5718, -124.0946); Unnamed Tributary (40.4915, -124.0000).

(v) Bridgeville Hydrologic Sub-area 111122. Outlet(s) = Van Duzen River (Lat 40.4942, Long -123.9720) upstream to endpoint(s) in: Bear Creek (40.3455, -123.5763); Blanket Creek (40.3635, -123.5710); Browns Creek (40.4958, -123.8103); Butte Creek (40.4119, -123.7047); Dairy Creek (40.4174, -123.5981); Fish Creek (40.4525, -123.8434); Grizzly Creek (40.5193, -123.8470); Little Larabee Creek (40.4708, -123.7395); Little Van Duzen River (40.3021, -123.5540); North Fork Van Duzen (40.4881, -123.6411); Panther Creek (40.3921, -123.5866); Root Creek (40.4490, -123.9018); Stevens Creek (40.5062, -123.9073); Thompson Creek (40.4222, -123.6084); Van Duzen River (40.4820, -123.6629); Unnamed Tributary (40.4932, -123.9120); Unnamed Tributary (40.4724, -123.8836); Unnamed Tributary (40.4850, -123.8468); Unnamed Tributary (40.3994, -123.6821); Unnamed Tributary (40.3074, -123.5834).

(vi) Yager Creek Hydrologic Sub-area 111123. Outlet(s) = Yager Creek (Lat 40.5583, Long -124.0577) upstream to endpoint(s) in: Bell Creek (40.6809, -123.9685); Blanten Creek (40.5839, -124.0165); Booths Run (40.6584,

-123.9428); Corner Creek (40.6179, -124.0010); Fish Creek (40.6390, -124.0024); Yager Creek (40.5673, -123.9403); Lawrence Creek (40.6986, -123.9314); Middle Fork Yager Creek (40.5782, -123.9243); North Fork Yager Creek (40.6056, -123.9080); Shaw Creek (40.6231, -123.9509); South Fork Yager Creek (40.5451, -123.9409); Unnamed Tributary (40.5892, -123.9663); Unnamed Tributary (40.5891, -124.0608).

(vii) Weott Hydrologic Sub-area 111131. Outlet(s) = South Fork Eel River (Lat 40.3500, Long —123.9305) upstream to endpoint(s) in: Albee Creek (40.3592, -124.0088); Bridge Creek (40.2960, -123.8561); Bull Creek (40.3587, -123.9624); Burns Creek (40.3194, -124.0420); Butte Creek (40.1982, -123.8387); Canoe Creek (40.2669, -123.9556); Coon Creek (40.2702, -123.9013); Cow Creek (40.2664, -123.9838); Cuneo Creek (40.3401, -124.0494); Decker Creek (40.3312, -123.9501); Elk Creek (40.2609, -123.7957); Fish Creek (40.2459, -123.7729); Harper Creek (40.3591, -123.9930); Mill Creek (40.3568, -124.0333); Mowry Creek (40.2937, -123.8895); North Fork Cuneo Creek (40.3443, -124.0488); Ohman Creek (40.1924, -123.7648); Panther Creek (40.2775, -124.0289); Preacher Gulch (40.2944, -124.0047); Salmon Creek (40.2145, -123.8926); Slide Creek (40.3011, -124.0390); South Fork Salmon Creek (40.1769, -123.8929); Squaw Creek (40.3167, -123.9988); Unnamed Tributary (40.3065, -124.0074); Unnamed Tributary (40.2831, -124.0359).

(viii) Benbow Hydrologic Sub-area 111132. Outlet(s) = South Fork Eel River (Lat 40.1932, Long -123.7692) upstream to endpoint(s) in: Anderson Creek (39.9325, -123.8928); Bear Creek (39.7885, -123.7620); Bear Pen Creek (39.9201, -123.7986); Bear Wallow Creek (39.7270, -123.7140); Big Dan Creek (39.8430, -123.6992); Bond Creek (39.7778, -123.7060); Bridges Creek (39.9087, -123.7142); Buck Mountain Creek (40.0944, -123.7423); Butler Creek (39.7423, -123.6987); Cedar Creek (39.8834, -123.6216); China Creek (40.1035, -123.9493); Connick Creek (40.0912, -123.8154); Couborn Creek (39.9820, -123.8973); Cox Creek (40.0310, -123.8398); Cruso Cabin Creek (39.9281, -123.5842); Dean Creek (40.1342, -123.7363); Durphy Creek (40.0205, -123.8271); East Branch South Fork Eel River (39.9359, -123.6204); Elkhorn Creek (39.9272, -123.6279); Fish Creek (40.0390, -123.7630); Hartsook Creek (40.0081, -123.8113); Hollow Tree Creek (39.7250, -123.6924); Huckleberry Creek (39.7292, -123.7275); Indian Creek (39.9470, -123.9008); Islam John Creek (39.8062, -123.7363); Jones Creek (39.9958, -123.8374); Leggett Creek (40.1470, -123.8375); Little Sproul Creek (40.0890, -123.8577); Lost Man Creek (39.7983, -123.7287); Low Gap Creek (39.8029, -123.6803); Low Gap Creek (39.9933, -123.7601); McCoy Creek (39.9572, -123.7369); Michael's Creek (39.7665, -123.7035); Middle Creek (39.8052, -123.7691); Milk Ranch Creek (40.0102, -123.7514); Mill Creek (39.8673, -123.7605); Miller Creek (40.1319, -123.9302); Mitchell Creek (39.7350, -123.6862); Moody Creek (39.9471, -123.8827); Mule Creek (39.8169, -123.7745); North Fork Cedar Creek (39.8864, -123.6363); North Fork McCoy Creek (39.9723, -123.7496); North Fork Standley Creek (39.9442, -123.8330); Ohman Creek (40.1929, -123.7687); Piercy Creek (39.9597, -123.8442); Pollock Creek (40.0802, -123.9341); Rattlesnake Creek (39.7912, -123.5428); Red Mountain Creek (39.9363, -123.7203); Redwood Creek (39.7723, -123.7648); Redwood Creek (40.0974, -123.9104); Rock Creek (39.8962, -123.7065); Sebbas Creek (39.9934, -123.8903); Somerville Creek (40.1006, -123.8884); South Fork Mule Creek (39.8174, -123.7788); South Fork Redwood Creek (39.7662, -123.7579); Sproul Creek (40.0226, -123.8649); Squaw Creek (40.0760, -123.7257); Standly Creek (39.9327, -123.8309); Tom Long Creek (40.0175, -123.6551); Waldron Creek (39.7469, -123.7465); Walter's Creek (39.7921, -123.7250); Warden Creek (40.0629, -123.8551); West Fork Sproul Creek (40.0587, -123.9170); Wildcat Creek (39.8956, -123.7820); Wilson Creek (39.8362, -123.6345); Unnamed tributary (39.9927, -123.8807).

(ix) Laytonville Hydrologic Sub-area 111133. Outlet(s) = South Fork Eel River (Lat 39.7665, Long -123.6484) upstream to endpoint(s) in: Bear Creek (39.6446, -123.5766); Big Rick Creek (39.7117, -123.5512); Cahto Creek (39.6527, -123.5579); Dark Canyon Creek (39.7333, -123.6614); Dutch Charlie Creek (39.6843, -123.7023); Elder Creek (39.7234, -123.6192); Fox Creek (39.7441, -123.6142); Grub Creek (39.7777, -123.5809); Jack of Hearts Creek (39.7136, -123.6896); Kenny Creek (39.6838, -123.5929); Little Case Creek (39.6892, -123.5441); Mill Creek (39.6839, -123.5118); Mud Creek (39.6713, -123.5741); Mud Springs Creek (39.6929, -123.5629); Redwood Creek (39.6545, -123.6753); Rock Creek (39.6922, -123.6090); Section Four Creek (39.6137, -123.5297); South Fork Eel River (39.6242, -123.5468); Streeter Creek (39.7340, -123.5606); Ten Mile Creek (39.6652, -123.4486); Unnamed Tributary (39.7004, -123.5678).

(x) Sequoia Hydrologic Sub-area 111141. Outlet(s) = Eel River (Lat 40.3557, Long −123.9191) upstream to endpoint(s) in: Beatty Creek (40.3198, −123.7500); Brock Creek (40.2410, −123.7246); Cameron Creek (40.3313, −123.7707); Kapple Creek (40.3531, −123.8585); Dobbyn Creek (40.2216, −123.6029); Mud Creek (40.2078, −123.5143); North Fork Dobbyn Creek (40.2669, −123.5467); Sonoma Creek (40.2974, −123.7953); South Fork Dobbyn Creek (40.1723, −123.5112); Line Gulch Creek (40.1640, −123.4783); South Fork Eel River (40.3500, −123.9305); South Fork Thompson Creek (40.3447, −123.8334); Thompson Creek (40.3552, −123.8417); Unnamed Tributary (40.2745, −123.5487).

(xi) Spy Rock Hydrologic Sub-area 111142. Outlet(s) = Eel River (Lat 40.1736, Long −123.6043) upstream to endpoint(s) in: Bear Pen Canyon (39.6943, −123.4359); Bell Springs Creek (39.9457, −123.5313); Blue Rock Creek (39.8937, −123.5018); Burger Creek (39.6693, −123.4034); Chamise Creek (40.0035, −123.5945); Gill Creek (39.7879, −123.3465); Iron Creek (39.7993, −123.4747); Jewett Creek (40.1122, −123.6171); Kekawaka Creek (40.0686, −123.4087); Rock Creek (39.9347, −123.5187); Shell Rock Creek (39.8414, −123.4614); Unnamed Tributary (39.7579, −123.4709); White Rock Creek (39.7646, −123.4684); Woodman Creek (39.7612, −123.4364).

(xii) Outlet Creek Hydrologic Sub-area 111161. Outlet(s) = Outlet Creek (Lat 39.4248, Long −123.3453) upstream to endpoint(s) in: Baechtel Creek (39.3623, −123.4143); Berry Creek (39.4271, −123.2777); Bloody Run Creek (39.5864, −123.3545); Broaddus Creek (39.3869, −123.4282); Cherry Creek (39.6043, −123.4073); Conklin Creek (39.3756, −123.2570); Davis Creek (39.3354, −123.2945); Haehl Creek (39.3735, −123.3172); Long Valley Creek (39.6246, −123.4651); Mill Creek (39.4196, −123.3919); Outlet Creek (39.4526, −123.3338); Ryan Creek (39.4804, −123.3644); Unnamed Tributary (39.4956, −123.3591); Unnamed Tributary (39.4322, −123.3848); Unnamed Tributary (39.5793, −123.4546); Unnamed Tributary (39.3703, −123.3419); Upp Creek (39.4479, −123.3825); Willts Creek (39.4445, −123.3898).

(xiii) Tomki Creek Hydrologic Sub-area 111162. Outlet(s) = Eel River (Lat 39.7138, Long −123.3532) upstream to endpoint(s) in: Cave Creek (39.3842, −123.2148); Dean Creek (39.6924, −123.3727); Garcia Creek (39.5153, −123.1512); Little Cave Creek (39.3915,

−123.2462); Little Creek (39.4146, −123.2595); Long Branch Creek (39.4074, −123.1897); Outlet Creek (39.6263, −123.3453); Rocktree Creek (39.4534, −123.3053); Salmon Creek (39.4367, −123.1939); Scott Creek (39.4492, −123.2286); String Creek (39.4658, −123.3206); Tarter Creek (39.4715, −123.2976); Thomas Creek (39.4768, −123.1230); Tomki Creek (39.5483, −123.3687); Unnamed Tributary (39.5064, −123.3574); Whitney Creek (39.4399, −123.1084); Wheelbarrow Creek (39.4851, −123.3391).

(xiv) Eden Valley Hydrologic Sub-area 111171. Outlet(s) = Middle Fork Eel River (Lat 39.7136, Long −123.3530) upstream to endpoint(s) in: Black Butte River (39.8238, −123.0877); Crocker Creek (39.5559, −123.0409); Eden Creek (39.5992, −123.1746); Elk Creek (39.5371, −123.0101); Hayshed Creek (39.7082, −123.0967); Mill Creek (39.7398, −123.1431); Salt Creek (39.6765, −123.2740); Sportsmans Creek (39.5373, −123.0247); Sulper Springs (39.5536, −123.0365); Thatcher Creek (39.6686, −123.0639); Williams Creek (39.8147, −123.1335).

(xv) Round Valley Hydrologic Sub-area 111172. Outlet(s) = Mill Creek (Lat 39.7398, Long −123.1431); Williams Creek (39.8147, −123.1335) upstream to endpoint(s) in: Cold Creek (39.8714, −123.2991); Grist Creek (39.7640, −123.2883); Mill Creek (39.8481, −123.2896); Murphy Creek (39.8885, −123.1612); Short Creek (39.8703, −123.2352); Town Creek (39.7991, −123.2889); Turner Creek (39.7218, −123.2175); Williams Creek (39.8903, −123.1212); Unnamed Tributary (39.7428, −123.2757); Unnamed Tributary (39.7493, −123.2584).

(xvi) Black Butte River Hydrologic Sub-area 111173. Outlet(s) = Black Butte River (Lat 39.8234, Long −123.0862) upstream to endpoint(s) in: Black Butte River (39.5946, −122.8579); Buckhorn Creek (39.6563, −122.9225); Cold Creek (39.6960, −122.9063); Estell Creek (39.5966, −122.8224); Spanish Creek (39.6287, −122.8331).

(xvii) Wilderness Hydrologic Sub-area 111174. Outlet(s) = Middle Fork Eel River (Lat 39.8240, Long −123.0877) upstream to endpoint(s) in: Beaver Creek (39.9352, −122.9943); Fossil Creek (39.9447, −123.0403); Middle Fork Eel River (40.0780, −123.0442); North Fork Middle Fork Eel River (40.0727, −123.1364); Palm of Gileade Creek (40.0229, −123.0647); Pothole Creek (39.9347, −123.0440).

(6) Cape Mendocino Hydrologic Unit 1112—*(i) Oil Creek Hydrologic Sub-area 111210.* Outlet(s) = Guthrie Creek (Lat 40.5407, Long −124.3626); Oil Creek (40.5195, −124.3767) upstream to endpoint(s) in: Guthrie Creek (40.5320, −124.3128); Oil Creek (40.5061, −124.2875); Unnamed Tributary (40.4946, −124.3091); Unnamed Tributary (40.4982, −124.3549); Unnamed Tributary (40.5141, −124.3573); Unnamed Tributary (40.4992, −124.3070).

(ii) Capetown Hydrologic Sub-area 111220. Outlet(s) = Bear River (Lat 40.4744, Long −124.3881); Davis Creek (40.3850, −124.3691); Singley Creek (40.4311, −124.4034) upstream to endpoint(s) in: Antone Creek (40.4281, −124.2114); Bear River (40.3591, −124.0536); Beer Bottle Gulch (40.3949, −124.1410); Bonanza Gulch (40.4777, −124.2966); Brushy Creek (40.4102, −124.1050); Davis Creek (40.3945, −124.2912); Harmonica Creek (40.3775, −124.0735); Hollister Creek (40.4109, −124.2891); Nelson Creek (40.3536, −124.1154); Peaked Creek (40.4123, −124.1897); Pullen Creek (40.4057, −124.0814); Singley Creek (40.4177, −124.3305); South Fork Bear River (40.4047, −124.2631); Unnamed Tributary (40.4271, −124.3107); Unnamed Tributary (40.4814, −124.2741); Unnamed Tributary (40.3633, −124.0651); Unnamed Tributary (40.3785, −124.0599); Unnamed Tributary (40.4179, −124.2391); Unnamed Tributary (40.4040, −124.0923); Unnamed Tributary (40.3996, −124.3175); Unnamed Tributary (40.4045, −124.0745); Unnamed Tributary (40.4668, −124.2364); Unnamed Tributary (40.4389, −124.2350); Unnamed Tributary (40.4516, −124.2238); Unnamed Tributary (40.4136, −124.1594); Unnamed Tributary (40.4350, −124.1504); Unnamed Tributary (40.4394, −124.3745); West Side Creek (40.4751, −124.2432).

(iii) Mattole River Hydrologic Sub-area 111230. Outlet(s) = Big Creek (Lat 40.1567, Long −124.2114); Big Flat Creek (40.1275, −124.1764); Buck Creek (40.1086, −124.1218); Cooskie Creek (40.2192, −124.3105); Fourmile Creek (40.256, −124.3578); Gitchell Creek (40.0938, −124.1023); Horse Mountain Creek (40.0685, −124.0822); Kinsey Creek (40.1717, −124.2310); Mattole River (40.2942, −124.3536); McNutt Gulch (40.3541, −124.3619); Oat Creek (40.1785, −124.2445); Randall Creek (40.2004, −124.2831); Shipman Creek (40.1175, −124.1449); Spanish Creek (40.1835, −124.2569); Telegraph Creek (40.0473, −124.0798); Whale Gulch (39.9623, −123.9785) upstream to endpoint(s) in: Anderson Creek (40.0329, −123.9674); Baker Creek (40.0143, −123.9048); Bear Creek (40.1262, −124.0631); Bear Creek (40.2819, −124.3336); Bear Trap Creek (40.2157, −124.1422); Big Creek (40.1742, −124.1924); Big Finley Creek (40.0910, −124.0179); Big Flat Creek (40.1444, −124.1636); Blue Slide Creek (40.1562, −123.9283); Box Canyon Creek (40.1078, −123.9854); Bridge Creek (40.0447, −124.0118); Buck Creek (40.1166, −124.1142); Conklin Creek (40.3197, −124.2055); Cooskie Creek (40.2286, −124.2986); Devils Creek (40.3432, −124.1365); Dry Creek (40.2646, −124.0660); East Branch North Fork Mattole River (40.3333, −124.1490); East Fork Honeydew Creek (40.1625, −124.0929); Eubank Creek (40.0997, −123.9661); Fire Creek (40.1533, −123.9509); Fourmile Creek (40.2604, −124.3079); Fourmile Creek (40.1767, −124.0759); French Creek (40.1384, −124.0072); Gibson Creek (40.0304, −123.9279); Gilham Creek (40.2078, −124.0085); Gitchell Creek (40.1086, −124.0947); Green Ridge Creek (40.3254, −124.1258); Grindstone Creek (40.2019, −123.9890); Harris Creek (40.0381, −123.9304); Harrow Creek (40.1612, −124.0292); Helen Barnum Creek (40.0036, −123.9101); Honeydew Creek (40.1747, −124.1410); Horse Mountain Creek (40.0769, −124.0729); Indian Creek (40.2772, −124.2759); Jewett Creek (40.1465, −124.0414); Kinsey Creek (40.1765, −124.2220); Lost Man Creek (39.9754, −123.9179); Mattole Canyon (40.2021, −123.9570); Mattole River (39.9714, −123.9623); McGinnis Creek (40.3186, −124.1801); McKee Creek (40.0864, −123.9480); McNutt Gulch (40.3458, −124.3418); Middle Creek (40.2591, −124.0366); Mill Creek (40.0158, −123.9693); Mill Creek (40.3305, −124.2598); Mill Creek (40.2839, −124.2946); Nooning Creek (40.0616, −124.0050); North Fork Mattole River (40.3866, −124.1867); North Fork Bear Creek (40.1494, −124.1060); North Fork Fourmile Creek (40.2019, −124.0722); Oat Creek (40.1884, −124.2296); Oil Creek (40.3214, −124.1601); Painter Creek (40.0844, −123.9639); Prichett Creek (40.2892, −124.1704); Randall Creek (40.2092, −124.2668); Rattlesnake Creek (40.3250, −124.0981); Shipman Creek (40.1250, −124.1384); Sholes Creek (40.1603, −124.0619); South Branch West Fork Bridge Creek (40.0326, −123.9853); South Fork Bear Creek (40.0176, −124.0016); Spanish Creek (40.1965, −124.2429); Squaw Creek (40.1934, −124.2002); Stanley Creek (40.0273, −123.9166); Sulphur Creek (40.3647, −124.1586); Telegraph Creek (40.0439, −124.0640); Thompson Creek (39.9913, −123.9707); Unnamed Tributary

(40.3475, −124.1606); Unnamed Tributary (40.3522, −124.1533); Unnamed Tributary (40.0891, −123.9839); Unnamed Tributary (40.2223, −124.0172); Unnamed Tributary (40.1733, −123.9515); Unnamed Tributary (40.2899, −124.0955); Unnamed Tributary (40.2853, −124.3227); Unnamed Tributary (39.9969, −123.9071); Upper East Fork Honeydew Creek (40.1759, −124.1182); Upper North Fork Mattole River (40.2907, −124.1115); Vanauken Creek (40.0674, −123.9422); West Fork Bridge Creek (40.0343, −123.9990); West Fork Honeydew Creek (40.1870, −124.1614); Westlund Creek (40.2440, −124.0036); Whale Gulch (39.9747, −123.9812); Woods Creek (40.2119, −124.1611); Yew Creek (40.0018, −123.9762).

(7) Mendocino Coast Hydrologic Unit 1113—*(i) Usal Creek Hydrologic Sub-area 111311.* Outlet(s) = Jackass Creek (Lat 39.8806, Long −123.9155); Usal Creek (39.8316, −123.8507) upstream to endpoint(s) in: Bear Creek (39.8898, −123.8344); Jackass Creek (39.8901, −123.8928); Little Bear Creek (39.8782, −123.8250); Waterfall Gulch (39.8725, −123.8784); North Fork Jackass Creek (39.9095, −123.9101); North Fork Julias Creek (39.8634, −123.7967); Soldier Creek (39.8679, −123.8162); South Fork Usal Creek (39.8356, −123.7865); Julias Creek (39.8574, −123.7912); Unnamed Tributary (39.9279, −123.8666); Unnamed Tributary (39.8890, −123.8480); Usal Creek (39.9160, −123.8787).

(ii) Wages Creek Hydrologic Sub-area 111312. Outlet(s) = Cottaneva Creek (Lat 39.7360, Long −123.8293); Hardy Creek (39.7107, −123.8082); Howard Creek (39.6778, −123.7915); Juan Creek (39.7028, −123.8042); DeHaven Creek (39.6592, −123.7863); Wages Creek (39.6513, −123.7851) upstream to endpoint(s) in: Cottaneva Creek (39.7825, −123.8210); Dunn Creek (39.8103, −123.8320); Hardy Creek (39.7221, −123.7822); Howard Creek (39.6808, −123.7463); Juan Creek (39.7107, −123.7472); Kimball Gulch (39.7559, −123.7828); Little Juan Creek (39.7003, −123.7609); DeHaven Creek (39.6572, −123.7350); Middle Fork Cottaneva Creek (39.7738, −123.8058); North Fork Cottaneva Creek (39.8011, −123.8047); North Fork Dehaven Creek (39.6660, −123.7382); North Fork Wages Creek (39.6457, −123.7066); Rider Gulch (39.6348, −123.7621); Rockport Creek (39.7346, −123.8021); Slaughterhouse Gulch (39.7594, −123.7914); South Fork Cottaneva Creek (39.7447, −123.7773); South Fork Wages Creek (39.6297, −123.6862); Upper Wages Creek (39.6396, −123.6773).

(iii) Ten Mile River Hydrologic Sub-area 111313. Outlet(s) = Abalobadiah Creek (Lat 39.5654, Long −123.7672); Chadbourne Gulch (39.6133, −123.7822); Ten Mile River (39.5529, −123.7658); Seaside Creek (39.5592, −123.7655) upstream to endpoint(s) in: Abalobadiah Creek (39.5878, −123.7503); Bald Hill Creek (39.6278, −123.6461); Barlow Gulch (39.6044, −123.7501); Bear Pen Creek (39.5824, −123.6402); Booth Gulch (39.5598, −123.5908); Buckhorn Creek (39.6093, −123.6980); Campbell Creek (39.5053, −123.6610); Cavanough Gulch (39.6164, −123.6853); Chadbourne Gulch (39.6190, −123.7682); Clark Fork (39.5409, −123.5403); Curchman Creek (39.4789, −123.6398); Gulch 11 (39.4686, −123.5764); Gulch 19 (39.5993, −123.5730); Little Bear Haven Creek (39.5654, −123.6050); Little North Fork (39.6264, −123.7350); Mill Creek (39.5392, −123.7068); North Fork Ten Mile River (39.5870, −123.5480); O'Conner Gulch (39.6205, −123.6655); Patsy Creek (39.5714, −123.5669); Redwood Creek (39.5142, −123.5620); Seaside Creek (39.5612, −123.7501); Smith Creek (39.5251, −123.6499); South Fork Bear Haven Creek (39.5688, −123.6527); South Fork Ten Mile River (39.5083, −123.5395); Ten Mile River (39.5721, −123.7098); Unnamed Tributary (39.5234, −123.5893); Unnamed Tributary (39.5191, −123.6263); Unnamed Tributary (39.5558, −123.5450); Unnamed Tributary (39.5898, −123.7657); Unnamed Tributary (39.5813, −123.7526); Unnamed Tributary (39.6032, −123.5893).

(iv) Noyo River Hydrologic Sub-area 111320. Outlet(s) = Digger Creek (Lat 39.4088, Long −123.8164); Hare Creek (39.4171, −123.8128); Jug Handle Creek (39.3767, −123.8176); Mill Creek (39.4894, −123.7967); Mitchell Creek (39.3923, −123.8165); Noyo River (39.4274, −123.8096); Pudding Creek (39.4588, −123.8089); Virgin Creek (39.4714, −123.8045) upstream to endpoint(s) in: Bear Gulch (39.3881, −123.6614); Brandon Gulch (39.4191, −123.6645); Bunker Gulch (39.3969, −123.7153); Burbeck Creek (39.4354, −123.4235); Covington Gulch (39.4099, −123.7546); Digger Creek (39.4058, −123.8092); Duffy Gulch (39.4469, −123.6023); Gulch Creek (39.4441, −123.4684); Gulch Seven (39.4523, −123.5183); Hare Creek (39.3781, −123.6922); Hayworth Creek (39.4857, −123.4769); Hayshed Creek (39.4200, −123.7391); Jug Handle Creek (39.3647, −123.7523); Kass Creek (39.4273, −123.6797); Little North Fork (39.4532, −123.6636); Little Valley Creek (39.5026, −123.7277); Marble Gulch (39.4423, −123.5479); McMullen Creek (39.4383, −123.4488); Middle Fork North Fork (39.4924, −123.5231); Mill Creek (39.4843, −123.7575); Mitchell Creek (39.3813, −123.7734); North Fork Hayworth Creek (39.4891, −123.5026); North Fork Noyo (39.4974, −123.5405); North Fork Noyo (39.4765, −123.5535); North Fork South Fork Noyo River (39.3971, −123.6108); Noyo River (39.4242, −123.4356); Olds Creek (39.3964, −123.4448); Parlin Creek (39.3700, −123.6111); Pudding Creek (39.4591, −123.6516); Redwood Creek (39.4660, −123.4571); South Fork Hare Creek (39.3785, −123.7384); South Fork Noyo River (39.3620, −123.6188); Unnamed Tributary (39.4113, −123.5621); Unnamed Tributary (39.3918, −123.6425);Unnamed Tributary (39.4168, −123.4578); Unnamed Tributary (39.4653, −123.7549); Unnamed Tributary (39.4640, −123.7473); Unnamed Tributary (39.4931, −123.7371); Unnamed Tributary (39.4922, −123.7381); Unnamed Tributary (39.4939, −123.7184); Unnamed Tributary (39.4158, −123.6428); Unnamed Tributary (39.4002, −123.7347); Unnamed Tributary (39.3831, −123.6177); Unnamed Tributary (39.4926, −123.4764); Virgin Creek (39.4621, −123.7855);

(v) Big River Hydrologic Sub-area 111330. Outlet(s) = Big River (Lat 39.3030, Long −123.7957); Casper Creek (39.3617, −123.8169); Doyle Creek (39.3603, −123.8187); Jack Peters Creek (39.3193, −123.8006); Russian Gulch (39.3288, −123.8050) upstream to endpoint(s) in: Berry Gulch (39.3585, −123.6930); Big River (39.3166, −123.3733); Casper Creek (39.3462, −123.7556); Chamberlain Creek (39.4007, −123.5317); Daugherty Creek (39.1700, −123.3699); Doyle Creek (39.3517, −123.8007); East Branch Little North Fork Big River (39.3372, −123.6410); East Branch North Fork Big River (39.3354, −123.4652); Gates Creek (39.2083, −123.3944); Jack Peters Gulch (39.3225, −123.7850); James Creek (39.3922, −123.4747); Johnson Creek (39.1963, −123.3927); Johnson Creek (39.2556, −123.4485); Laguna Creek (39.2914, −123.6301); Little North Fork Big River (39.3497, −123.6242); Marten Creek (39.3290, −123.4279); Mettick Creek (39.2591, −123.5193); Middle Fork North Fork Casper Creek (39.3575, −123.7170); North Fork Big River (39.3762, −123.4591); North Fork Casper Creek (39.3610, −123.7356); North Fork James Creek (39.3980, −123.4939); North Fork Ramone Creek

(39.2760, −123.4846); Pig Pen Gulch (39.3226, −123.4609); Pruitt Creek (39.2592, −123.3812); Ramone Creek (39.2714, −123.4415); Rice Creek (39.2809, −123.3963); Russell Brook (39.2863, −123.4461); Russian Gulch (39.3237, −123.7650); Snuffins Creek (39.1836, −123.3854); Soda Creek (39.2230, −123.4239); South Fork Big River (39.2317, −123.3687); South Fork Casper Creek (39.3493, −123.7216); Two Log Creek (39.3484, −123.5781); Unnamed Tributary (39.3897, −123.5556); Unnamed Tributary (39.3637, −123.5464); Unnamed Tributary (39.3776, −123.5274); Unnamed Tributary (39.4029, −123.5771); Unnamed Tributary (39.3209, −123.5964); Valentine Creek (39.2694, −123.3957); Water Gulch (39.3608, −123.5916).

(vi) Albion River Hydrologic Sub-area 111340. Outlet(s) = Albion River (Lat 39.2253, Long −123.7679); Big Salmon Creek (39.2150, −123.7660); Buckhorn Creek (39.2593, −123.7839); Dark Gulch (39.2397, −123.7740); Little Salmon Creek (39.2150, −123.7660); Little River (39.2734, −123.7914) upstream to endpoint(s) in: Albion River (39.2613, −123.5766); Big Salmon Creek (39.2045, −123.6425); Buckhorn Creek (39.2513, −123.7595); Dark Gulch (39.2379, −123.7592); Duck Pond Gulch (39.2456, −123.6960); East Railroad Gulch (39.2604, −123.6381); Hazel Gulch (39.2141, −123.6418); Kaison Gulch (39.2733, −123.6803); Little North Fork South Fork Albion River (39.2350, −123.6431); Little River (39.2683, −123.7190); Little Salmon Creek (39.2168, −123.7515); Marsh Creek (39.2325, −123.5596); Nordon Gulch (39.2489, −123.6503); North Fork Albion River (39.2854, −123.5752); Pleasant Valley Gulch (39.2379, −123.6965); Railroad Gulch (39.2182, −123.6932); Soda Springs Creek (39.2943, −123.5944); South Fork Albion River (39.2474, −123.6107); Tom Bell Creek (39.2805, −123.6519); Unnamed Tributary (39.2279, −123.6972); Unnamed Tributary (39.2194, −123.7100); Unnamed Tributary (39.2744, −123.5889); Unnamed Tributary (39.2318, −123.6800).

(vii) Navarro River Hydrologic Sub-area 111350. Outlet(s) = Navarro River (Lat 39.1921, Long −123.7611) upstream to endpoint(s) in: Alder Creek (38.9830, −123.3946); Anderson Creek (38.9644, −123.2907); Bailey Creek (39.1733, −123.4804); Barton Gulch (39.1804, −123.6783); Bear Creek (39.1425, −123.4326); Bear Wallow Creek (39.0053, −123.4075); Beasley Creek (38.9366, −123.3265); Bottom Creek (39.2117, −123.4607); Camp 16 Gulch (39.1937, −123.6095); Camp Creek (38.9310, −123.3527); Cold Spring Creek (39.0376, −123.5027); Con Creek (39.0374, −123.3816); Cook Creek (39.1879, −123.5109); Cune Creek (39.1622, −123.6014); Dago Creek (39.0731, −123.5068); Dead Horse Gulch (39.1576, −123.6124); Dutch Henry Creek (39.2112, −123.5794); Floodgate Creek (39.1291, −123.5365); Fluem Gulch (39.1615, −123.6695); Flynn Creek (39.2099, −123.6032); German Creek (38.9452, −123.4269); Gut Creek (39.0803, −123.3312); Ham Canyon (39.0164, −123.4265); Horse Creek (39.0144, −123.4960); Hungry Hollow Creek (39.1327, −123.4488); Indian Creek (39.0708, −123.3301); Jimmy Creek (39.0117, −123.2888); John Smith Creek (39.2275, −123.5366); Little North Fork Navarro River (39.1941, −123.4553); Low Gap Creek (39.1590, −123.3783); Navarro River (39.0537, −123.4409); Marsh Gulch (39.1692, −123.7049); McCarvey Creek (39.1589, −123.4048); Mill Creek (39.1270, −123.4315); Minnie Creek (38.9751, −123.4529); Murray Gulch (39.1755, −123.6966); Mustard Gulch (39.1673, −123.6393); North Branch (39.2069, −123.5361); North Fork Indian Creek (39.1213, −123.3345); North Fork Navarro River (39.1708, −123.5606); Parkinson Gulch (39.0768, −123.4070); Perry Gulch (39.1342, −123.5707); Rancheria Creek (38.8626, −123.2417); Ray Gulch (39.1792, −123.6494); Robinson Creek (38.9845, −123.3513); Rose Creek (39.1358, −123.3672); Shingle Mill Creek (39.1671, −123.4223); Soda Creek (39.0238, −123.3149); Soda Creek (39.1531, −123.3734); South Branch (39.1534, −123.4173); Spooner Creek (39.2221, −123.4811); Tramway Gulch (39.1481, −123.5958); Yale Creek (38.8882, −123.2785).

(viii) Greenwood Creek Hydrologic Sub-area 111361. Outlet(s) = Greenwood Creek (Lat 39.1262, Long −123.7181) upstream to endpoint(s) in: Greenwood Creek (39.1245, −123.6474).

(ix) Elk Creek Hydrologic Sub-area 111362. Outlet(s) = Elk Creek (Lat 39.1024, Long −123.7080) upstream to endpoint(s) in: Elk Creek (39.0657, −123.6245).

(x) Alder Creek Hydrologic Sub-area 111363. Outlet(s) = Alder Creek (Lat 39.0044, Long −123.6969); Mallo Pass Creek (39.0341, −123.6896) upstream to endpoint(s) in: Alder Creek (338.9961, −123.6471); Mallo Pass Creek (39.0287, −123.6373).

(xi) Brush Creek Hydrologic Sub-area 111364. Outlet(s) = Brush Creek (Lat 38.9760, Long −123.7120) upstream to endpoint(s) in: Brush Creek (38.9730, −123.5563); Mill Creek (38.9678, −123.6515); Unnamed Tributary (38.9724, −123.6571).

(xii) Garcia River Hydrologic Sub-area 111370. Outlet(s) = Garcia River (Lat 38.9550, Long −123.7338); Point Arena Creek (38.9141, −123.7103); Schooner Gulch (38.8667, −123.6550) upstream to endpoint(s) in: Blue Water Hole Creek (38.9378, −123.5023); Flemming Creek (38.8384, −123.5361); Garcia River (38.8965, −123.3681); Hathaway Creek (38.9351, −123.7098); Inman Creek (38.8804, −123.4370); Larmour Creek (38.9419, −123.4469); Mill Creek (38.9078, −123.3143); North Fork Garcia River (38.9233, −123.5339); North Fork Schooner Gulch (38.8758, −123.6281); Pardaloe Creek (38.8895, −123.3423); Point Arena Creek (38.9069, −123.6838); Redwood Creek (38.9241, −123.3343); Rolling Brook (38.8965, −123.5716); Schooner Gulch (38.8677, −123.6198); South Fork Garcia River (38.8450, −123.5420); Stansburry Creek (38.9422, −123.4720); Signal Creek (38.8639, −123.4414); Unnamed Tributary (38.8758, −123.5692); Unnamed Tributary (38.8818, −123.5723); Whitlow Creek (38.9141, −123.4624).

(xiii) North Fork Gualala River Hydrologic Sub-area 111381. Outlet(s) = North Fork Gualala River (Lat 38.7784, Long −123.4992) upstream to endpoint(s) in: Bear Creek (38.8347, −123.3842); Billings Creek (38.8652, −123.3496); Doty Creek (38.8495, −123.5131); Dry Creek (38.8416, −123.4455); McGann Gulch (38.8026, −123.4458); North Fork Gualala River (38.8479, −123.4113); Robinson Creek (38.8416, −123.3725); Robinson Creek (38.8386, −123.4991); Stewart Creek (38.8109, −123.4157); Unnamed Tributary (38.8295, −123.5570); Unnamed Tributary (38.8353, −123.3760); Unnamed Tributary (38.8487, −123.3820).

(xiv) Rockpile Creek Hydrologic Sub-area 111382. Outlet(s) = Rockpile Creek (Lat 38.7507, Long −123.4706) upstream to endpoint(s) in: Rockpile Creek (38.7966, −123.3872).

(xv) Buckeye Creek Hydrologic Sub-area 111383. Outlet(s) = Buckeye Creek (Lat 38.7405, Long −123.4573) upstream to endpoint(s) in: Buckeye Creek (38.7400, −123.2697); Flat Ridge Creek (38.7616, −123.2400); Franchini Creek (38.7500, −123.3708); North Fork Buckeye (38.7991, −123.3166).

(xvi) Wheatfield Fork Hydrologic Sub-area 111384. Outlet(s) = Wheatfield Fork Gualala River (Lat 38.7014, Long −123.4154) upstream to endpoint(s) in: Danfield Creek (38.6369, −123.1431); Haupt Creek (38.6220, −123.2551); House Creek (38.6545, −123.1184);

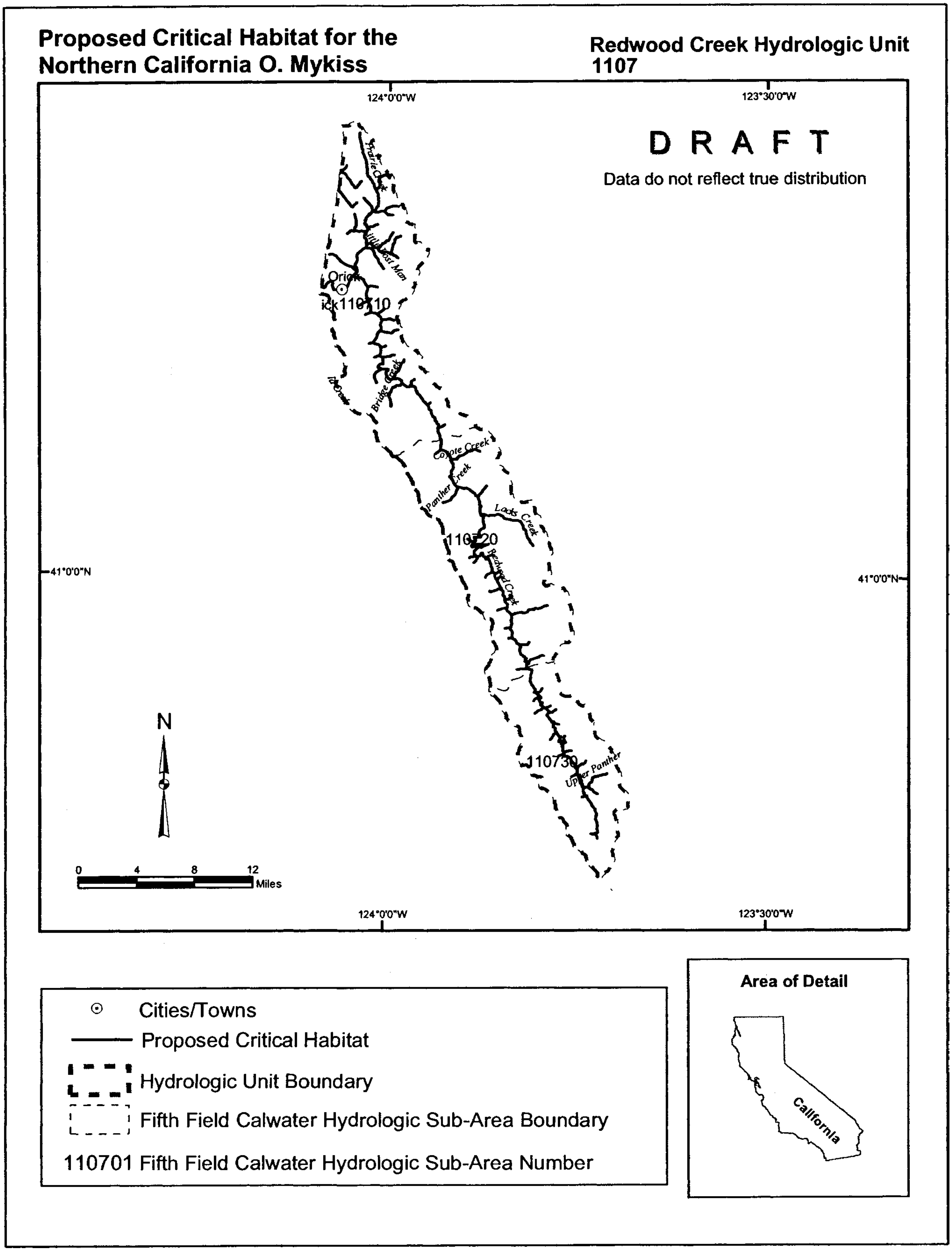
North Fork Fuller Creek (38.7252, −123.2968); Pepperwood Creek (38.6205, −123.1665); South Fork Fuller Creek (38.6973, −123.2860); Tombs Creek (38.6989, −123.1616); Unnamed Tributary (38.7175, −123.2744); Wheatfield Fork Gualala River (38.7497, −123.2215); Fuller Creek (38.7109, −123.3256).

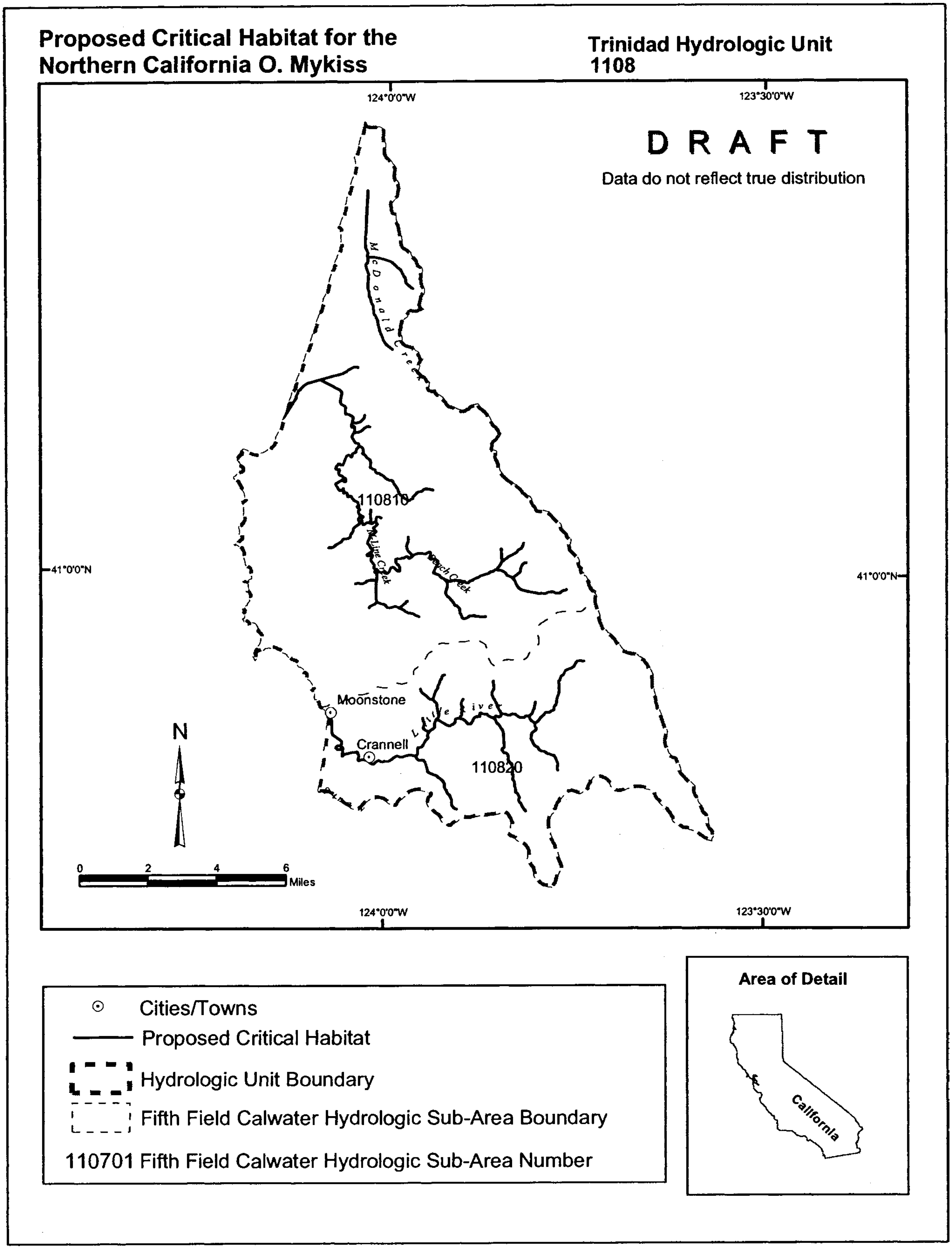
(xvii) Gualala Hydrologic Sub-area 111385. Outlet(s) = Fort Ross Creek (Lat 38.5119, Long −123.2436); Gualala River (38.7687, −123.5334); Kolmer Gulch (38.5238, −123.2646) upstream to endpoint(s) in: Big Pepperwood Creek (38.7951, −123.4638); Carson Creek (38.5653, −123.1906); Fort Ross Creek (38.5174, −123.2363); Groshong Gulch (38.7814, −123.4904); Gualala River (38.7780, −123.4991); Kolmer Gulch (38.5369, −123.2247); Little Pepperwood (38.7738, −123.4427); McKenzie Creek (38.5895, −123.1730); Palmer Canyon Creek (38.6002, −123.2167); Sproule Creek (38.6122, −123.2739); Unknown Tributary (38.5634, −123.2003); Turner Canyon (38.5294, −123.1672); South Fork Gualala River (38.5646, −123.1689); Marshall Creek (38.5647, −123.2058).

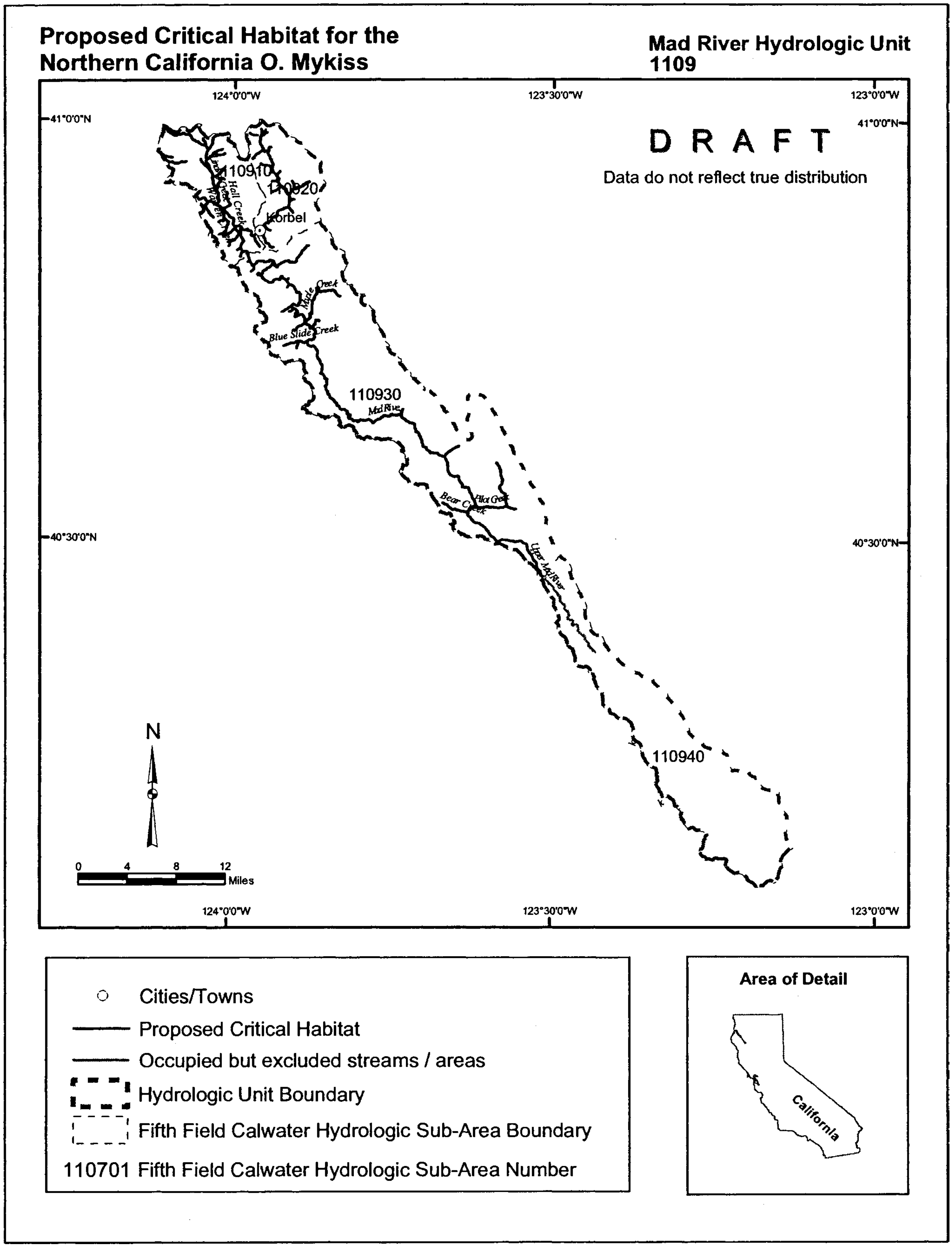
(xviii) Russian Gulch Hydrologic Sub-area 111390. Outlet(s) = Russian Gulch Creek (Lat 38.4669, Long −123.1569) upstream to endpoint(s) in: Russian Gulch Creek (38.4956, −123.1535); West Branch Russian Gulch Creek (38.4968, −123.1631).

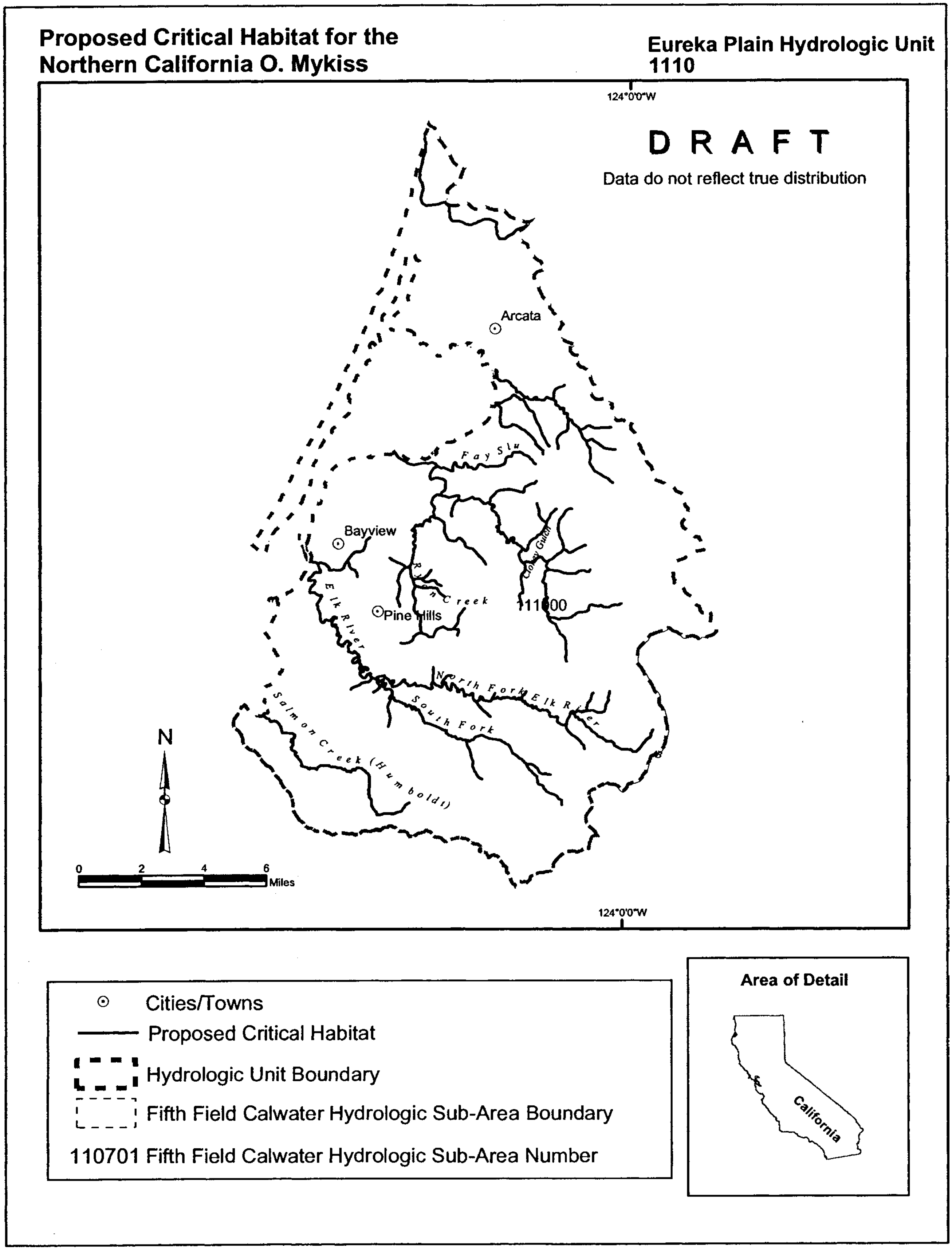
(8) Maps of proposed critical habitat for the Northern California *O. mykiss* ESU follow:

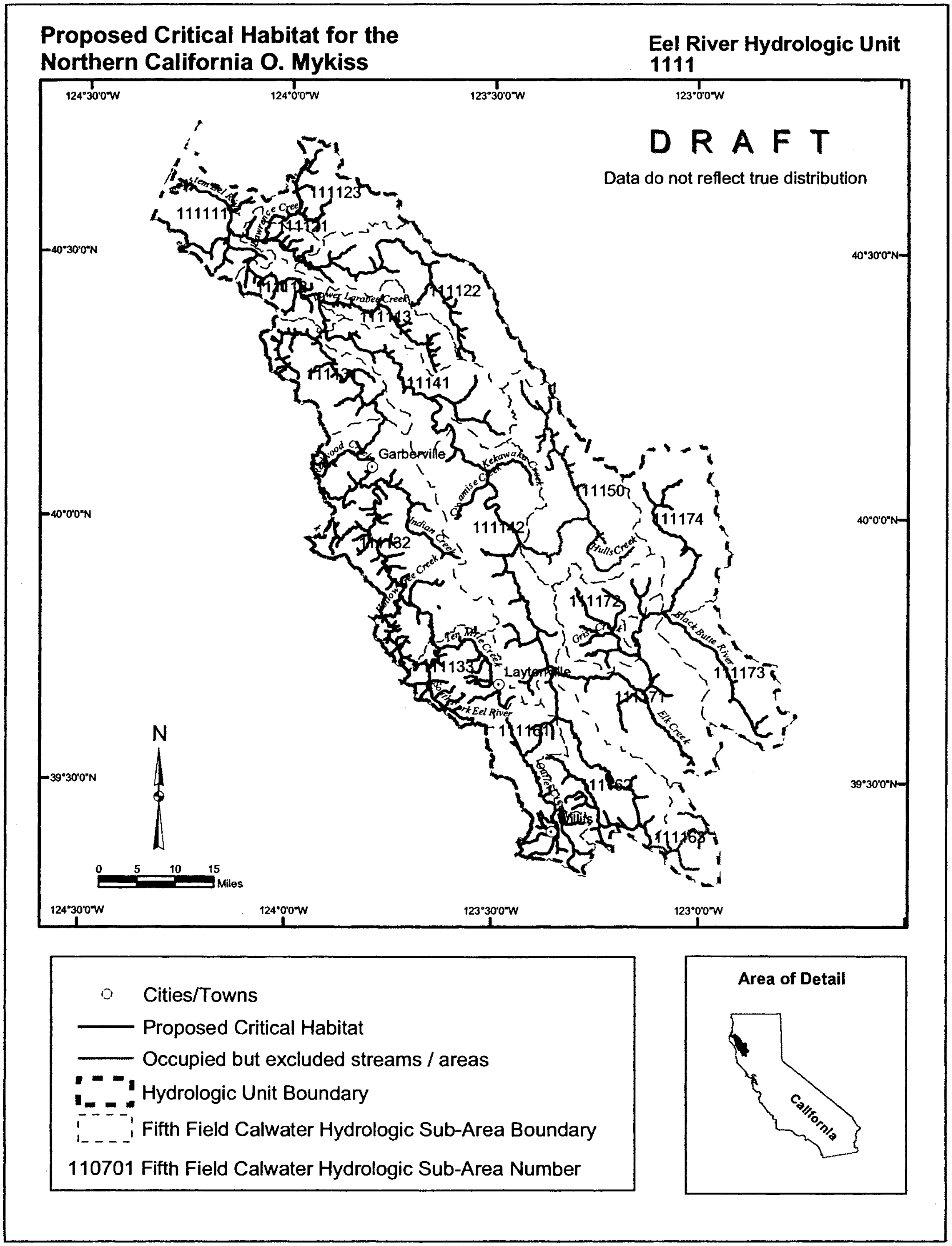
BILLING CODE 3510–22–P


Proposed Critical Habitat for the Northern California O. Mykiss
Redwood Creek Hydrologic Unit 1107
DRAFT
Data do not reflect true distribution
124°0'0"W
123°30'0"W
41°0'0"N
Orick
110720
110730
Bridge Creek
Coyote Creek
Panther Creek
Lacks Creek
Redwood Creek
Upper Panther
N
0 4 8 12 Miles
Cities/Towns
Proposed Critical Habitat
Hydrologic Unit Boundary
Fifth Field Calwater Hydrologic Sub-Area Boundary
110701 Fifth Field Calwater Hydrologic Sub-Area Number
Area of Detail
California


Proposed Critical Habitat for the
Northern California O. Mykiss
Trinidad Hydrologic Unit
1108
124°0'0"W
123°30'0"W
DRAFT
Data do not reflect true distribution
McDonald Creek
110810
Line Creek
Creek
41°0'0"N
41°0'0"N
Moonstone
Crannell
110820
N
0
2
4
6
Miles
Cities/Towns
Proposed Critical Habitat
Hydrologic Unit Boundary
Fifth Field Calwater Hydrologic Sub-Area Boundary
110701 Fifth Field Calwater Hydrologic Sub-Area Number
Area of Detail
California

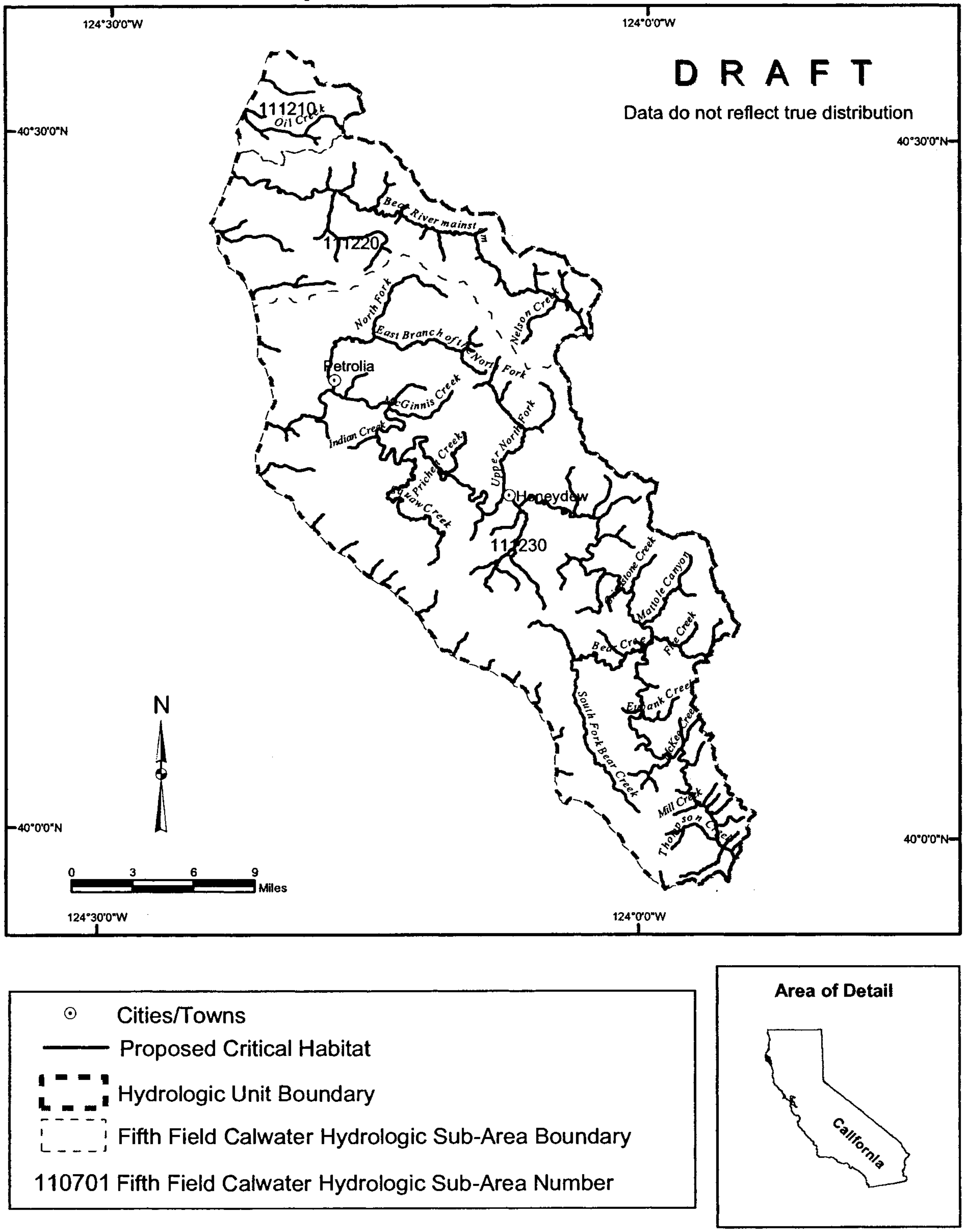

Proposed Critical Habitat for the
Northern California O. Mykiss
Mad River Hydrologic Unit
1109
D R A F T
Data do not reflect true distribution
124°0'0"W
123°30'0"W
123°0'0"W
41°0'0"N
40°30'0"N
110910
110920
Korbel
Hall Creek
Maple Creek
Blue Slide Creek
110930
Mad River
Bear Creek
Pilot Creek
Upper Mad River
110940
N
0 4 8 12
Miles
Cities/Towns
Proposed Critical Habitat
Occupied but excluded streams / areas
Hydrologic Unit Boundary
Fifth Field Calwater Hydrologic Sub-Area Boundary
110701 Fifth Field Calwater Hydrologic Sub-Area Number
Area of Detail
California

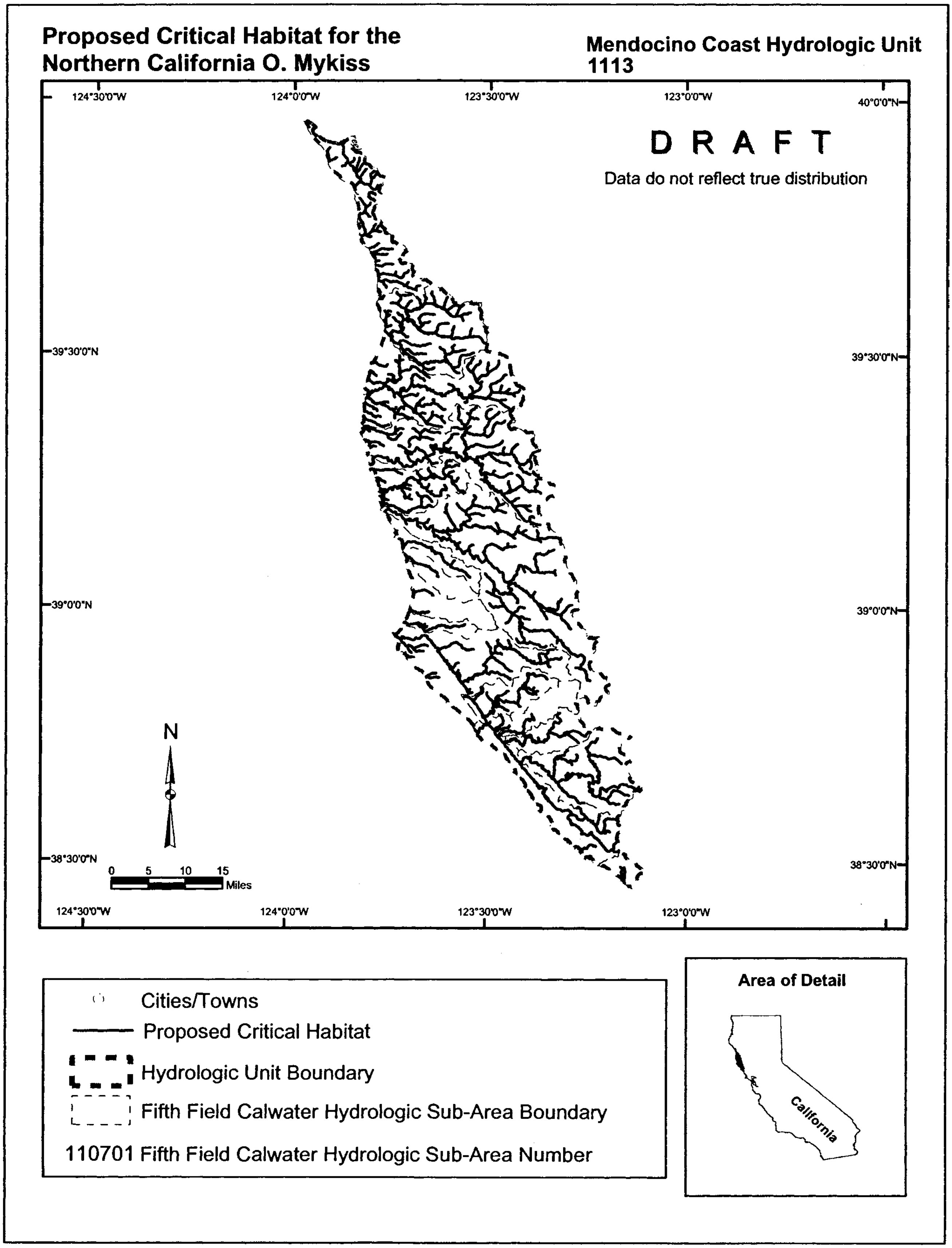

Proposed Critical Habitat for the
Northern California O. Mykiss
Eureka Plain Hydrologic Unit
1110
124°0'0"W
DRAFT
Data do not reflect true distribution
Arcata
Fay Slu
Bayview
Elk River
Ryan Creek
Pine Hills
111000
North Fork Elk River
South Fork
Salmon Creek (Humboldt)
N
0
2
4
6
Miles
124°0'0"W
Cities/Towns
Proposed Critical Habitat
Hydrologic Unit Boundary
Fifth Field Calwater Hydrologic Sub-Area Boundary
110701 Fifth Field Calwater Hydrologic Sub-Area Number
Area of Detail
California


Proposed Critical Habitat for the
Northern California O. Mykiss
Eel River Hydrologic Unit
1111
DRAFT
Data do not reflect true distribution
124°30'0"W
124°0'0"W
123°30'0"W
123°0'0"W
40°30'0"N
40°0'0"N
39°30'0"N
111123
111111
111122
111141
111150
111174
111172
111173
Garberville
Laytonville
Willits
Hulls Creek
Black Butte River
Elk Creek
Ten Mile Creek
Indian Creek
Kekawaka Creek
N
0 5 10 15
Miles
Cities/Towns
Proposed Critical Habitat
Occupied but excluded streams / areas
Hydrologic Unit Boundary
Fifth Field Calwater Hydrologic Sub-Area Boundary
110701 Fifth Field Calwater Hydrologic Sub-Area Number
Area of Detail
California

Proposed Critical Habitat for the Northern California O. Mykiss

Cape Mendocino Hydrologic Unit 1112





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(h) *Central California Coast O. mykiss (Oncorhynchus mykiss).* Critical habitat is proposed to include the areas defined in the following units:

(1) Russian River Hydrologic Unit 1114—*(i) Guerneville Hydrologic Sub-area 111411.* Outlet(s) = Russian River (Lat 38.4507, Long −123.1289) upstream to endpoint(s) in: Atascadero Creek (38.3473, −122.8626); Austin Creek (38.5098, −123.0680); Baumert Springs (38.4195, −122.9658); Dutch Bill Creek (38.4132, −122.9508); Duvoul Creek (38.4527, −122.9525); Fife Creek (38.5584, −122.9922); Freezeout Creek (38.4405, −123.0360); Green Valley Creek, (38.4445, −122.9185); Grub Creek (38.4411, −122.9636); Hobson Creek (38.5334, −122.9401); Hulbert Creek (38.5548, −123.0362); Jenner Gulch (38.4869, −123.0996); Kidd Creek (38.5029, −123.0935); Lancel Creek (38.4247, −122.9322); Mark West Creek (38.4961, −122.8489); Mays Canyon (38.4800, −122.9715); North Fork Lancel Creek (38.4447, −122.9444); Pocket Canyon (38.4650, −122.9267); Porter Creek (38.5435, −122.9332); Purrington Creek (38.4083, −122.9307); Sheep House Creek (38.4820, −123.0921); Smith Creek (38.4622, −122.9585); Unnamed Tributary (38.4560, −123.0246); Unnamed Tributary (38.3976, −122.8994); Unnamed Tributary (38.3772, −122.8938); Willow Creek (38.4249, −123.0022).

(ii) Austin Creek Hydrologic Sub-area 111412. Outlet(s) = Austin Creek (Lat 38.5098, Long −123.0680) upstream to endpoint(s) in: Bear Pen Creek (38.5939, −123.1644); Big Oat Creek (38.5615, −123.1299); Blue Jay Creek (38.5618, −123.1399); Conshea Creek (38.5830, −123.0824); Devil Creek (38.6163, −123.0425); Black Rock Creek (38.5586, −123.0730); Thompson Creek (38.5747, −123.0300); Pole Mountain Creek (38.5122, −123.1168); Red Slide Creek (38.6039, −123.1141); Saint Elmo Creek (38.5130, −123.1125); Schoolhouse Creek (38.5595, −123.0175); Spring Creek (38.5041, −123.1364); Sulphur Creek (38.6187, −123.0553); Austin Creek (38.6262, −123.1347); East Austin Creek (38.6349, −123.1238); Gilliam Creek (38.5803, −123.0152); Gray Creek (38.6132, −123.0107); Ward Creek (38.5720, −123.1547).

(iii) Laguna Hydrologic Sub-area 111421. Outlet(s) = Laguna de Santa Rosa (Lat 38.4522, Long −122.8347) upstream to endpoint(s) in: Crane Creek (38.3521, −122.6022); Hinebaugh Creek (38.3509, −122.6913); Laguna de Santa Rosa (38.3431, −122.7229); Blucher Creek (38.3509, −122.8258); Copeland Creek (38.3371, −122.6038).

(iv) Mark West Hydrologic Sub-area 111423. Outlet(s) = Mark West Creek (Lat 38.4858, Long −122.8419) upstream to endpoint(s) in: Humbug Creek (38.5412, −122.6249); Laguna de Santa Rosa (38.4526, −122.8347); Mark West Creek (38.5187, −122.5995); Pool Creek (38.5486, −122.7641); Pruit Creek (38.5313, −122.7615); Windsor Creek (38.5484, −122.8101).

(v) Warm Springs Hydrologic Sub-area 111424. Outlet(s) = Dry Creek (Lat 38.5862, Long −122.8577) upstream to endpoint(s) in: Angel Creek (38.6101, −122.9833); Crane Creek (38.6434, −122.9451); Dry Creek (38.7181, −123.0091); Dutcher Creek (38.7223, −122.9770); Felta (38.5679, −122.9379); Foss Creek (38.6244, −122.8754); Grape Creek (38.6593, −122.9707); Mill Creek (38.5976, −122.9914); North Slough Creek (38.6392, −122.8888); Palmer Creek (38.5770, −122.9904); Redwood Log Creek (38.6705, −123.0725); Salt Creek (38.5543, −122.9133); Pena Creek (38.6384, −123.0743); Wallace Creek (38.6260, −122.9651); Wine Creek (38.6662, −122.9682); Woods Creek (38.6069, −123.0272).

(vi) Geyserville Hydrologic Sub-area 111425. Outlet(s) = Russian River (Lat 38.6132, Long −122.8321) upstream to endpoint(s) in: Ash Creek (38.8556, −123.0082); Bear Creek (38.7253, −122.7038); Bidwell Creek (38.6229, −122.6320); Big Sulphur Creek (38.8279, −122.9914); Bluegum Creek (38.6988, −122.7596); Briggs Creek (38.6845, −122.6811); Coon Creek (38.7105, −122.6957); Crocker Creek (38.7771, −122.9595); Edwards Creek (38.8592, −123.0758); Foss Creek (38.6373, −122.8753); Franz Creek (38.5726, −122.6343); Gill Creek (38.7552, −122.8840); Gird Creek (38.7055, −122.8311); Ingalls Creek (38.7344, −122.7192); Kellog Creek (38.6753, −122.6422); Little Briggs Creek (38.7082, −122.7014); Maacama Creek (38.6743, −122.7431); McDonnell Creek (38.7354, −122.7338); Mill Creek (38.7009, −122.6490); Miller Creek (38.7211, −122.8608); Oat Valley Creek (38.8461, −123.0712); Redwood Creek (38.6342, −122.6720); Foote Creek (38.6433, −122.6797); Sausal Creek (38.6924, −122.7930); South Fork Gill Creek (38.7420, −122.8760); Unnamed Tributary (38.7329, −122.8601); Yellowjacket Creek (38.6666, −122.6308).

(vii) Sulphur Creek Hydrologic Sub-area 111426. Outlet(s) = Big Sulphur Creek (Lat 38.8279, Long −122.9914) upstream to endpoint(s) in: Alder Creek (38.8503, −122.8953); Anna Belcher Creek (38.7537, −122.7586); Big Sulphur Creek (38.8243, −122.8774); Cobb Creek (38.7953, −122.7909); Frasier Creek (38.8439, −122.9341); Humming Bird Creek (38.8460, −122.8596); Lovers Gulch (38.7396, −122.8275); North Branch Little Sulphur Creek (38.7783, −122.8119); Squaw Creek (38.8199, −122.7945); Little Sulphur Creek (38.7469, −122.7425).

(viii) Ukiah Hydrologic Sub-area 111431. Outlet(s) = Russian River (Lat 38.8828, Long −123.0557) upstream to endpoint(s) in: Pieta Creek (38.8622, −122.9329).

(ix) Forsythe Creek Hydrologic Sub-area 111433. Outlet(s) = West Branch Russian River (Lat 39.2257, Long −123.2012) upstream to endpoint(s) in: Bakers Creek (39.2859, −123.2432); Eldridge Creek (39.2250, −123.3309); Forsythe Creek (39.2976, −123.2963); Jack Smith Creek (39.2754, −123.3421); Mariposa Creek (39.3472, −123.2625); Mill Creek (39.2969, −123.3360); Salt Hollow Creek (39.2585, −123.1881); Seward Creek (39.2606, −123.2646); West Branch Russian River (39.3642, −123.2334).

(2) Bodega Hydrologic Unit 1115—*(i) Salmon Creek Hydrologic Sub-area 111510.* Outlet(s) = Salmon Creek (Lat 38.3554, Long −123.0675) upstream to endpoint(s) in: Coleman Valley Creek (38.3956, −123.0097); Faye Creek (38.3749, −123.0000); Finley Creek (38.3707, −123.0258); Salmon Creek (38.3877, −122.9318); Tannery Creek (38.3660, −122.9808).

(ii) Estero Americano Hydrologic Sub-area 111530. Outlet(s) = Estero Americano (Lat 38.2939, Long −123.0011) upstream to endpoint(s) in: Estero Americano (38.3117, −122.9748); Ebabias Creek (38.3345, −122.9759).

(3) Marin Coastal Hydrologic Unit 2201—*(i) Walker Creek Hydrologic Sub-area 220112.* Outlet(s) = Walker Creek (Lat 38.2213, Long −122.9228); Millerton Gulch (38.1055, −122.8416) upstream to endpoint(s) in: Chileno Creek (38.2145, −122.8579); Frink Canyon (38.1761, −122.8405); Millerton Gulch (38.1376, −122.8052); Verde Canyon (38.1630, −122.8116); Unnamed Trib (38.1224, −122.8095); Walker Creek (38.1617, −122.7815).

(ii) Lagunitas Creek Hydrologic Sub-area 220113. Outlet(s) = Lagunitas Creek (Lat 38.0827, Long −122.8274) upstream to endpoint(s) in: Cheda Creek (38.0483, −122.7329); Devil's Gulch (38.0393, −122.7128); Giacomini Creek (38.0032, −122.7617); Horse Camp Gulch (38.0078, −122.7624); Lagunitas Creek (37.9974, −122.7045); Olema Creek (37.9719, −122.7125); Quarry Gulch (38.0345, −122.7639); San Geronimo Creek (38.0131, −122.6499); Unnamed Tributary (37.9893, −122.7328); Unnamed Tributary (37.9976, −122.7553).

(iii) Point Reyes Hydrologic Sub-area 220120. Outlet(s) = Creamery Bay Creek

(Lat 38.0809, Long −122.9561); East Schooner Creek (38.0913, −122.9293); Home Ranch (38.0705, −122.9119); Laguna Creek (38.0235, −122.8732); Muddy Hollow Creek (38.0329, −122.8842) upstream to endpoint(s) in: Creamery Bay Creek (38.0779, −122.9572); East Schooner Creek (38.0928, −122.9159); Home Ranch Creek (38.0784, −122.9038); Laguna Creek (38.0436, −122.8559); Muddy Hollow Creek (38.0549, −122.8666).

(iv) Bolinas Hydrologic Sub-area 220130. Outlet(s) = Easkoot Creek (Lat 37.9026, Long −122.6474); McKinnon Gulch (37.9126, −122.6639); Morse Gulch (37.9189, −122.6710); Pine Gulch Creek (37.9218, −122.6882); Redwood Creek (37.8595, −122.5787); Stinson Gulch (37.9068, −122.6517); Wilkins Creek (37.9343, −122.6967) upstream to endpoint(s) in: Easkoot Creek (37.8987, −122.6370); Kent Canyon (37.8866, −122.5800); McKinnon Gulch (37.9197, −122.6564); Morse Gulch (37.9240, −122.6618); Pine Gulch Creek (37.9557, −122.7197); Redwood Creek (37.9006, −122.5787); Stinson Gulch (37.9141, −122.6426); Wilkins Creek (37.9450, −122.6910).

(4) San Mateo Hydrologic Unit 2202—*(i) San Mateo Coastal Hydrologic Sub-area 220221.* Outlet(s) = Arroyo de en Medio (Lat 37.4929, Long −122.4606); Denniston Creek (37.5033, −122.4869); Frenchmans Creek (37.4804, −122.4518); San Pedro Creek (37.5964, −122.5057) upstream to endpoint(s) in: Arroyo De En Medio (37.5202, −122.4562); Denniston Creek (37.5184, −122.4896); Frenchmans Creek (37.5170, −122.4332); Middle Fork San Pedro Creek (37.5758, −122.4591); North Fork San Pedro Creek (37.5996, −122.4635); San Pedro Creek (37.5825, −122.4771).

(ii) Half Moon Bay Hydrologic Sub-area 220222. Outlet(s) = Arroyo Leon Creek (Lat 37.4758, Long −122.4493) upstream to endpoint(s) in: Apanolio Creek (37.5202, −122.4158); Arroyo Leon Creek (37.4560, −122.3442); Mills Creek (37.4629, −122.3721); Pilarcitos Creek (37.5259, −122.3980); Unnamed Tributary (37.4705, −122.3616).

(iii) Tunitas Creek Hydrologic Sub-area 220223. Outlet(s) = Lobitos Creek (Lat 37.3762, Long −122.4093); Tunitas Creek (37.3567, −122.3999) upstream to endpoint(s) in: East Fork Tunitas Creek (37.3981, −122.3404); Lobitos Creek (37.4246, −122.3586); Tunitas Creek (37.4086, −122.3502).

(iv) San Gregorio Creek Hydrologic Sub-area 220230. Outlet(s) = San Gregorio Creek (Lat 37.3215, Long −122.4030) upstream to endpoint(s) in: Alpine Creek (37.3062, −122.2003); Bogess Creek (37.3740, −122.3010); El Corte Madera Creek (37.3650, −122.3307); Harrington Creek (37.3811, −122.2936); La Honda Creek (37.3680, −122.2655); Langley Creek (37.3302, −122.2420); Mindego Creek (37.3204, −122.2239); San Gregorio Creek (37.3099, −122.2779); Woodruff Creek (37.3415, −122.2495).

(v) Pescadero Creek Hydrologic Sub-area 220240. Outlet(s) = Pescadero Creek (Lat 37.2669, Long −122.4122); Pomponio Creek (37.2979, −122.4061) upstream to endpoint(s) in: Bradley Creek (37.2819, −122.3802); Butano Creek (37.2419, −122.3165); Evans Creek (37.2659, −122.2163); Honsinger Creek (37.2828, −122.3316); Little Boulder Creek (37.2145, −122.1964); Little Butano Creek (37.2040, −122.3492); Oil Creek (37.2572, −122.1325); Pescadero Creek (37.2320, −122.1553); Lambert Creek (37.3014, −122.1789); Peters Creek (37.2883, −122.1694); Pomponio Creek (37.3030, −122.3805); Slate Creek (37.2530, −122.1935); Tarwater Creek (37.2731, −122.2387); Waterman Creek (37.2455, −122.1568).

(5) Bay Bridges Hydrologic Unit 2203—*San Rafael Hydrologic Sub-area 220320.* Outlet(s) = Corte Madera Creek (Lat 37.9425, Long −122.5059) upstream to endpoint(s) in: Cascade Creek (37.9867, −122.6287); Corte Madera Creek (37.9859, −122.5842); Larkspur Creek (37.9305, −122.5514); Ross Creek (37.9558, −122.5752); San Anselmo Creek (37.9825, −122.6420); Sleepy Hollow Creek (38.0074, −122.5794); Tamalpais Creek (37.9481, −122.5674).

(6) South Bay Hydrologic Unit 2204—*(i) Eastbay Cities Hydrologic Sub-area 220420.* Outlet(s) = Alameda Creek (Lat 37.5942, Long −122.1422) upstream.

(ii) Alameda Creek Hydrologic Sub-area 220430. Outlet(s) = Alameda Creek (Lat 37.5812, Long −121.9644) upstream to endpoint(s) in: Alameda Creek (37.4569, −121.6996); Arroyo Honda (37.3661, −121.6684); Arroyo Mocho (37.5572, −121.5807); Arroyo de Laguna (37.6771, −121.9124); Arroyo del Valle (37.6141, −121.7466); Arroyo las Positias (37.7029, −121.7594); Calveras Creek (37.4642, −121.7766); Colorado Creek (37.4301, −121.5092); Sinbad Creek (37.6509, −121.9353); Stoneybrook Creek (37.6377, −121.9608).

(7) Santa Clara Hydrologic Unit 2205—*(i) Freemont Bayside Hydrologic Sub-area 220520.* Outlet(s) = Alameda Creek (Lat 37.5777, Long −122.0251) upstream to endpoint(s) in: Alameda Creek (37.5812, −121.9644).

(ii) Coyote Creek Hydrologic Sub-area 220530. Outlet(s) = Coyote Creek (Lat 37.4629, Long −121.9894; 37.2275, −121.7514) upstream to endpoint(s) in: Arroyo Aguague (37.3907, −121.7836); Coyote Creek (37.2778, −121.8033); Coyote Creek (37.1677, −121.6301); Upper Penitencia Creek (37.3969, −121.7577).

(iii) Palo Alto Hydrologic Sub-area 220550. Outlet(s) = Guadalupe River (Lat 37.4614, Long −122.0240); San Francisquito Creek (37.4658, −122.1152); Stevens Creek (37.4456, −122.0641) upstream to endpoint(s) in: Bear Creek (37.4528, −122.3020); Guadalupe River (37.3499, −.121.9094); Los Trancos (37.3293, −122.1786); San Francisquito Creek (37.4098, −122.2389); Stevens Creek (37.2990, −122.0778).

(8) San Pablo Hydrologic Unit 2206—*(i) Petaluma River Hydrologic Sub-area 220630.* Outlet(s) = Petaluma River (Lat 38.1111, Long −122.4944) upstream to endpoint(s) in: Adobe Creek (38.2940, −122.5834); Lichau Creek (38.2848, −122.6654); Lynch Creek (38.2748, −122.6194); Petaluma River (38.3010, −122.7149); Schultz Slough (38.1892, −122.5953); San Antonio Creek (38.2049, −122.7408); Unnamed Tributary (38.3105, −122.6146); Willow Brook (38.3165, −122.6113).

(ii) Sonoma Creek Hydrologic Sub-area 220640. Outlet(s) = Sonoma Creek (Lat 38.1525, Long −122.4050) upstream to endpoint(s) in: Agua Caliente Creek (38.3368, −122.4518); Asbury Creek (38.3401, −122.5590); Bear Creek (38.4656, −122.5253); Calabazas Creek (38.4033, −122.4803); Carriger Creek (38.3031, −122.5336); Graham Creek (38.3474, −122.5607); Hooker Creek (38.3809, −122.4562); Mill Creek (38.3395, −122.5454); Nathanson Creek (38.3350, −122.4290); Rodgers Creek (38.2924, −122.5543); Schell Creek (38.2554, −122.4510); Sonoma Creek (38.4507, −122.4819); Stuart Creek (38.3936, −122.4708); Yulupa Creek (38.3986, −122.5934).

(iii) Napa River Hydrologic Sub-area 220650. Outlet(s) = Napa River (Lat 38.0786, Long −122.2468) upstream to endpoint(s) in: Bale Slough (38.4806, −122.4578); Bear Canyon Creek (38.4512, −122.4415); Bell Canyon Creek (38.5551, −122.4827); Brown's Valley Creek (38.3251, −122.3686); Carneros Creek (38.3108, −122.3914); Conn Creek (38.4843, −122.3824); Cyrus Creek (38.5776, −122.6032); Diamond Mountain Creek (38.5645, −122.5903); Dry Creek (38.4334, −122.4791); Dutch Henery Creek (38.6080, −122.5253); Garnett Creek (38.6236, −122.5860); Huichica Creek (38.2811, −122.3936); Jericho Canyon Creek (38.6219, −122.5933); Miliken Creek (38.3773, −122.2280); Mill Creek (38.5299, −122.5513); Murphy Creek

(38.3155, −122.2111); Napa Creek (38.3047, −122.3134); Napa River (38.6210, −122.6129); Pickle Canyon Creek (38.3672, −122.4071); Rector Creek (38.4410, −122.3451); Redwood Creek (38.3765, −122.4466); Ritchie Creek (38.5369, −122.5652); Sarco Creek (38.3567, −122.2071); Soda Creek (38.4156, −122.2953); Spencer Creek (38.2729, −122.1909); Sulphur Creek (38.4839, −122.5161); Suscol Creek (38.2522, −122.2157); Tulucay Creek (38.2929, −122.2389); Unnamed Tributary (38.4248, −122.4935); York Creek (38.5128, −122.5023).

(9) Suisun Hydrologic Unit 2207—*Suisun Creek Hydrologic Sub-area 220722.* Outlet(s) = Suisun Creek (Lat 38.2020, Long −122.1035) upstream to endpoint(s) in: Suisun Creek (38.3301, −122.1371); Wooden Valley Creek (38.3749, −122.1830).

(10) Big Basin Hydrologic Unit 3304—*(i) Davenport Hydrologic Sub-area 330411* Outlet(s) = Baldwin Creek (Lat 36.9669, −122.1232); Davenport Landing Creek (37.0231, −122.2153); Laguna Creek (36.9824, −122.1560); Liddell Creek (37.0001, −122.1816); Majors Creek (36.9762, −122.1423); Molino Creek (37.0368, −122.2292); San Vicente Creek (37.0093, −122.1940); Scott Creek (37.0404, −122.2307); Waddell Creek (37.0935, −122.2762); Wilder Creek (36.9535, −122.0775) upstream to endpoint(s) in: Baldwin Creek (37.0126, −122.1006); Bettencourt Creek (37.1081, −122.2386); Big Creek (37.0832, −122.2175); Davenport Landing Creek (37.0475, −122.1920); East Branch Waddell Creek (37.1482, −122.2531); East Fork Liddell Creek (37.0204, −122.1521); Henry Creek (37.1695, −122.2751); Laguna Creek (37.0185, −122.1287); Liddell Creek (37.0030, −122.1768); Little Creek (37.0688, −122.2097); Majors Creek (36.9815, −122.1374); Middle Fork East Fork Liddell Creek (37.0194, −122.1608); Mill Creek (37.1034, −122.2218); Molino Creek (37.0384, −122.2125); Peasley Gulch (36.9824, −122.0861); Queseria Creek (37.0521, −122.2042); San Vicente Creek (37.0417, −122.1741); Scott Creek (37.1338, −122.2306); Waddell Creek (37.1338, −122.2677); West Branch Waddell Creek (37.1697, −122.2642); West Fork Liddell Creek (37.0117, −122.1763); Unnamed Tributary (37.0103, −122.0701); Wilder Creek (37.0107, −122.0770).

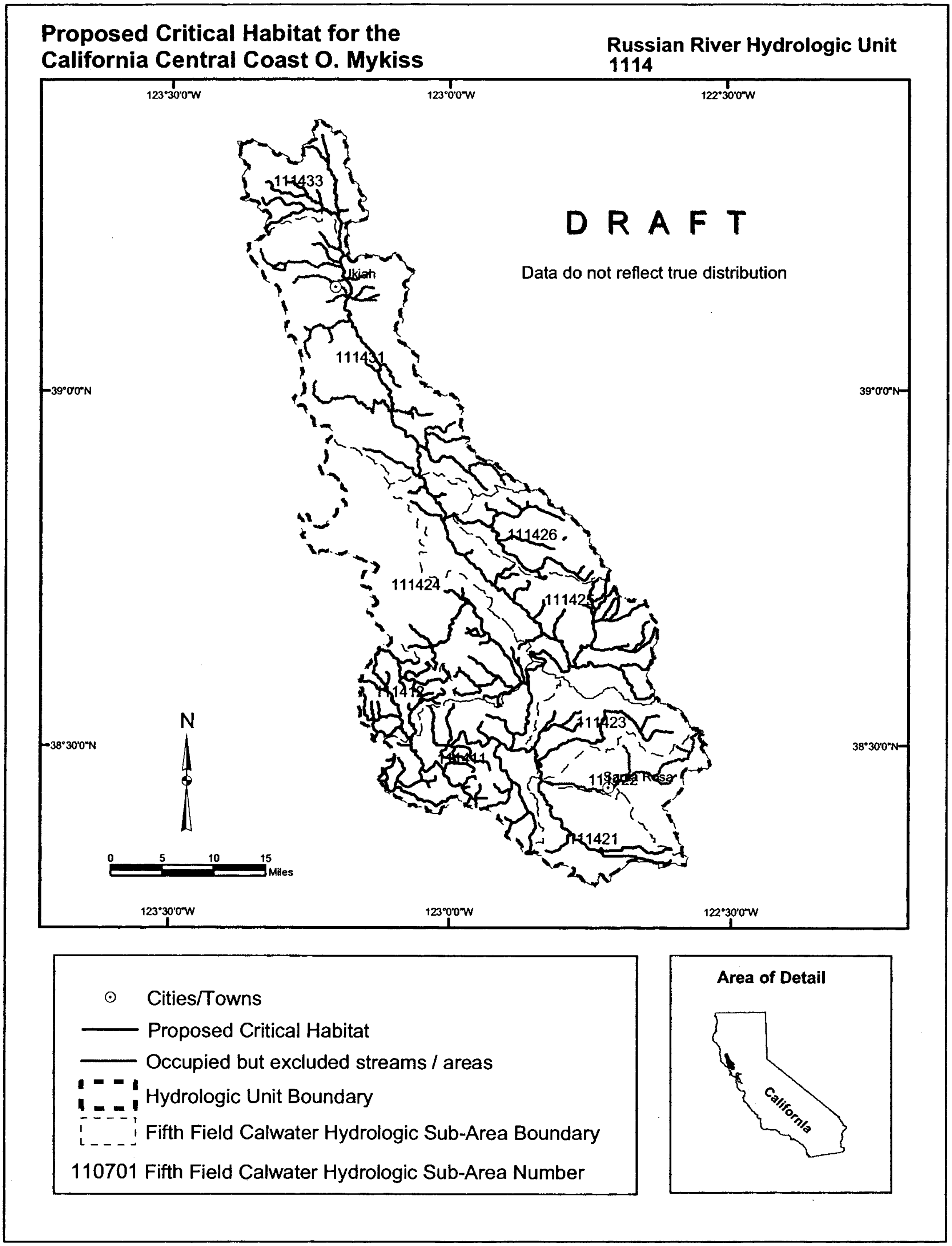
(ii) San Lorenzo Hydrologic Sub-area 330412. Outlet(s) = Arana Gulch Creek (Lat 36.9676, Long −122.0028); San Lorenzo River (36.9641, −122.0125) upstream to endpoint(s) in: Arana Gulch Creek (37.0270, −121.9739); Bean Creek (37.0956, −122.0022); Bear Creek (37.1711, −122.0750); Boulder Creek (37.1952, −122.1892); Bracken Brae Creek (37.1441, −122.1459); Branciforte Creek (37.0701, −121.9749); Crystal Creek (37.0333, −121.9825); Carbonera Creek (37.0286, −122.0202); Central Branch Arana Gulch Creek (37.0170, −121.9874); Deer Creek (37.2215, −122.0799); Fall Creek (37.0705, −122.1063); Gold Gulch Creek (37.0427, −122.1018); Granite Creek (37.0490, −121.9979); Hare Creek (37.1544, −122.1690); Jameson Creek (37.1485, −122.1904); Kings Creek (37.2262, −122.1059); Lompico Creek (37.1250, −122.0496); Mackenzie Creek (37.0866, −122.0176); Mountain Charlie Creek (37.1385, −121.9914); Newell Creek (37.1019, −122.0724); San Lorenzo River (37.2276, −122.1384); Two Bar Creek (37.1833, −122.0929); Unnamed Tributary (37.2106, −122.0952); Unnamed Tributary (37.2032, −122.0699); Zayante Creek (37.1062, −122.0224).

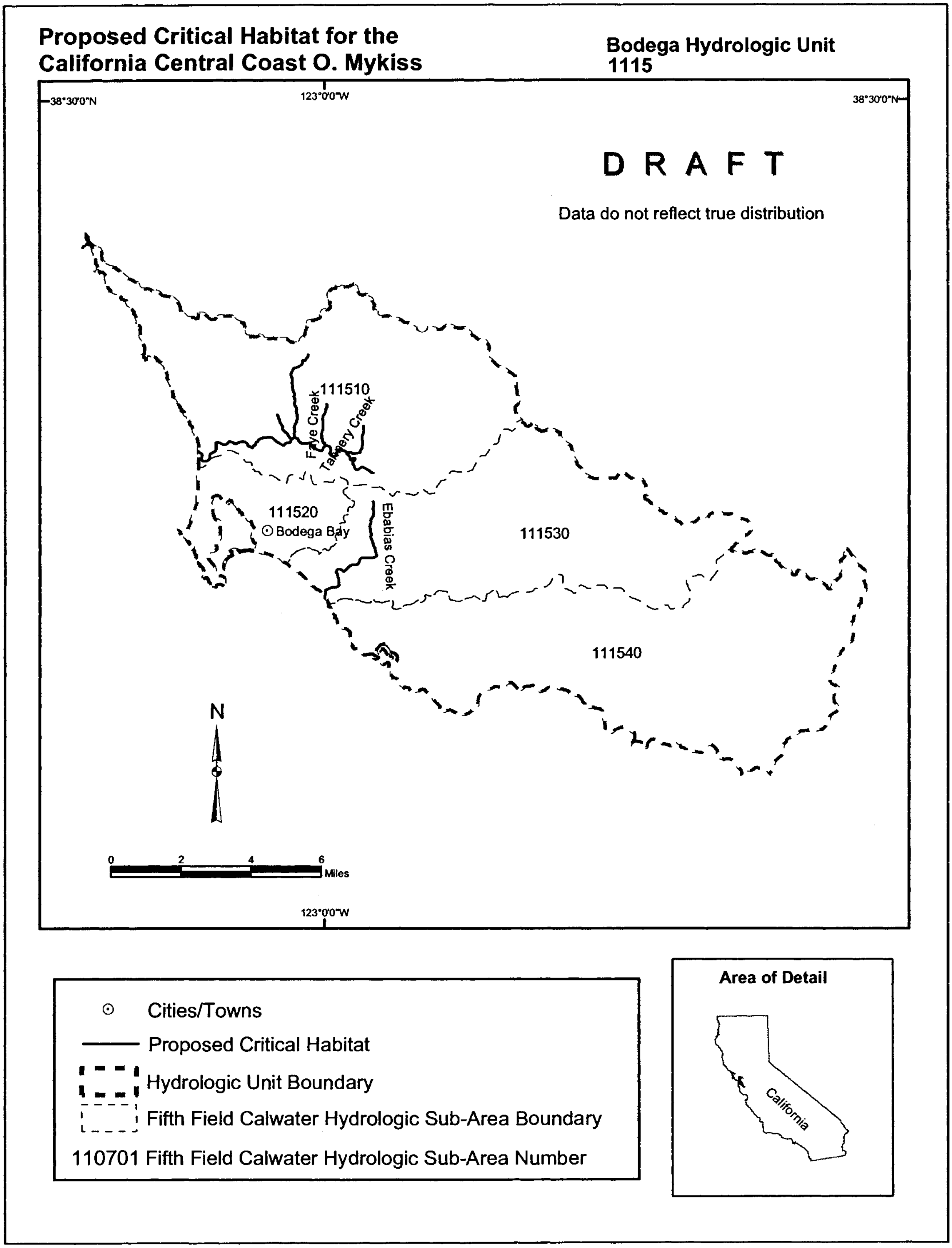
(iii) Aptos-Soquel Hydrologic Sub-area 330413. Outlet(s)=Aptos Creek (Lat 36.9692, Long −121.9065); Soquel Creek (36.9720, −121.9526) upstream to endpoint(s) in: Amaya Creek (37.0930, −121.9297); Aptos Creek (37.0545, −121.8568); Bates Creek (37.0099, −121.9353); Bridge Creek (37.0464, −121.8969); East Branch Soquel Creek (37.0690, −121.8297); Hester Creek (37.0967, −121.9458); Hinckley Creek (37.0671, −121.9069); Moores Gulch (37.0573, −121.9579); Soquel Creek (37.0443, −121.9404); Valencia Creek (37.0323, −121.8493); West Branch Soquel Creek (37.1095, −121.9606).

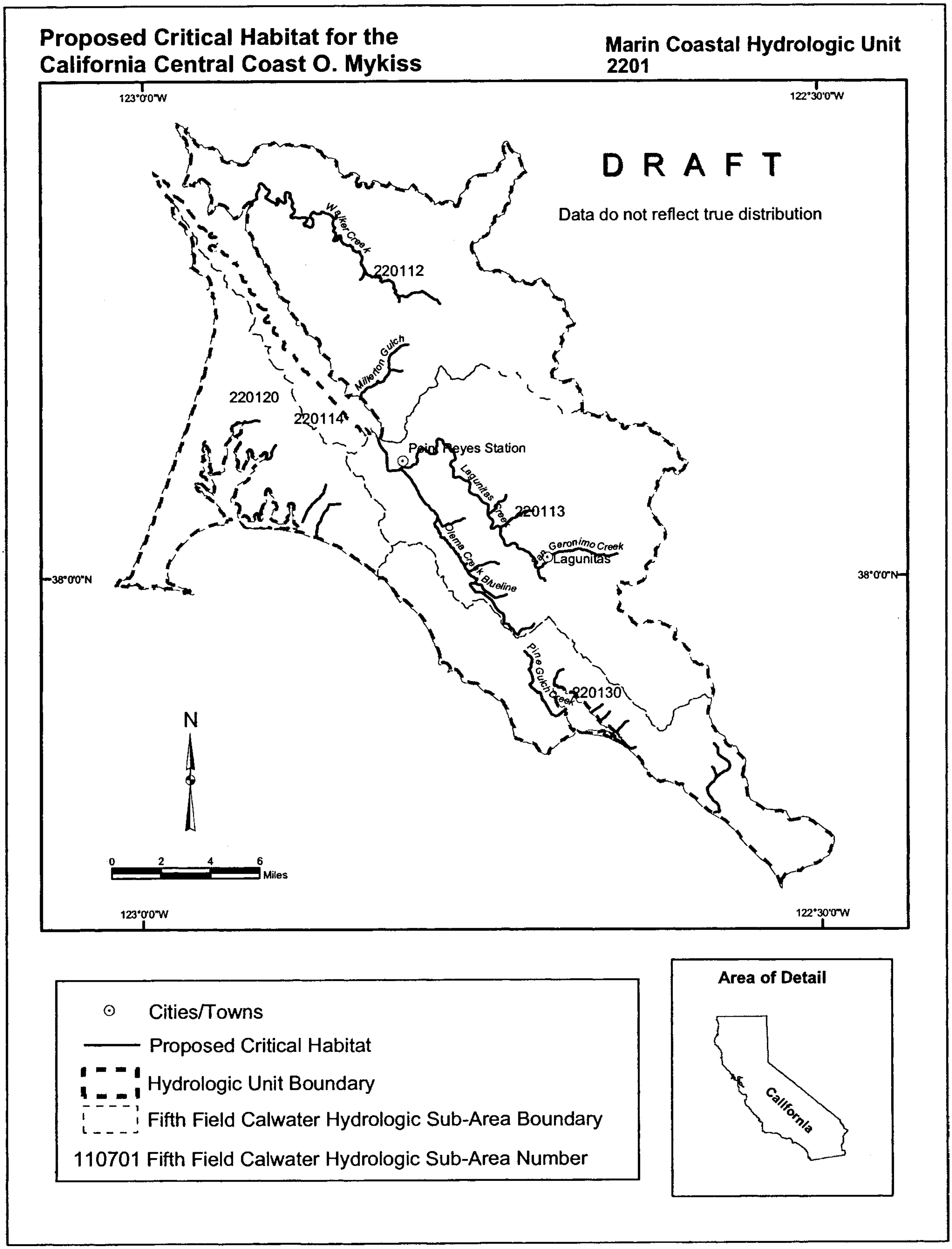
(iv) Ano Nuevo Hydrologic Sub-area 330420. Outlet(s)=Ano Nuevo Creek (Lat 37.1163, Long −22.3060); Gazos Creek (37.1646, −122.3625); Whitehouse Creek (37.1457, −122.3469) upstream to endpoint(s) in: Ano Nuevo Creek (37.1269, −122.3039); Bear Gulch (37.1965, −122.2773); Gazos Creek (37.2088, −122.2868); Old Womans Creek (37.1829, −122.3033); Whitehouse Creek (37.1775, −122.2900).

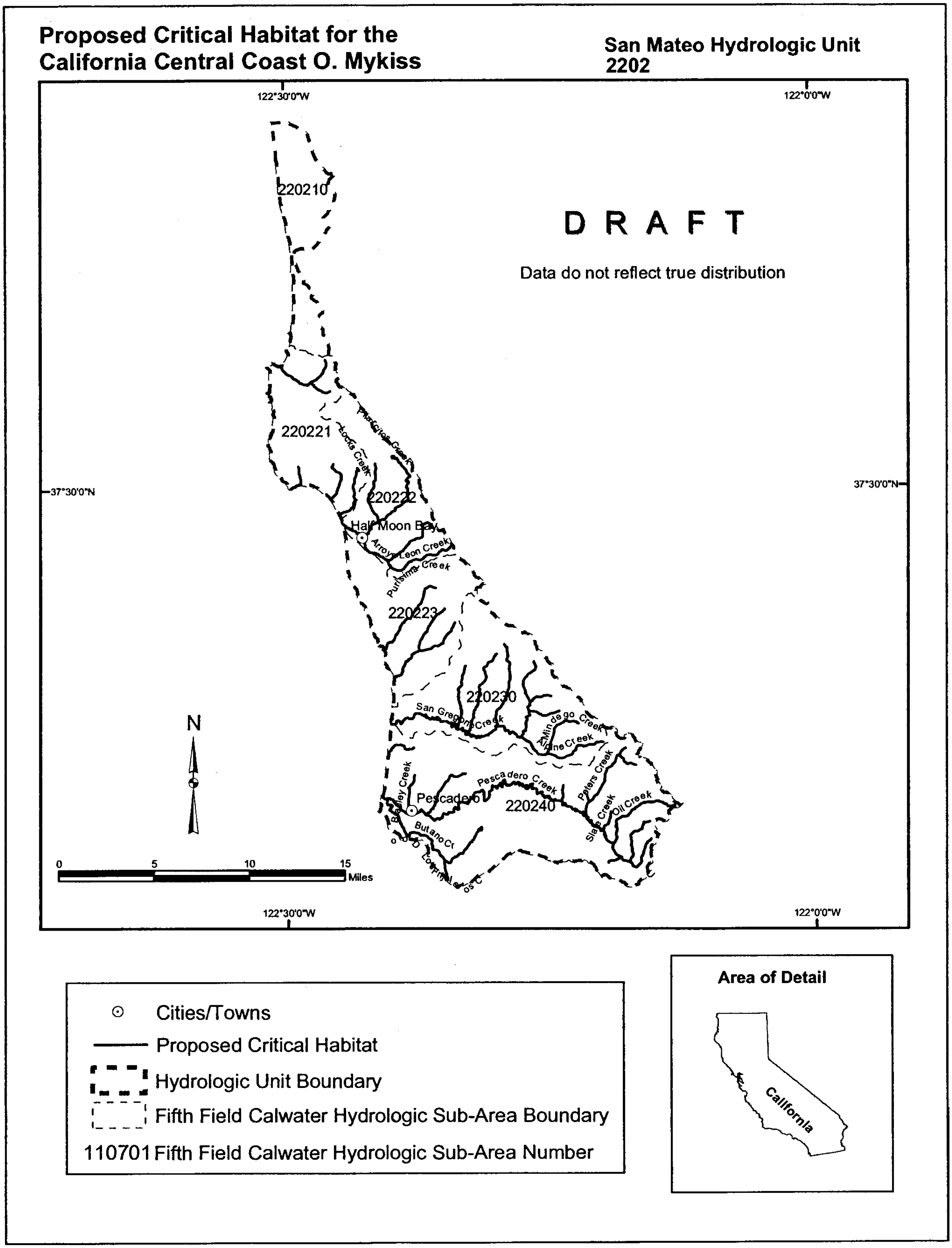
(11) Maps of proposed critical habitat for the Central California Coast O. mykiss ESU follow:

BILLING CODE 3510–22–P

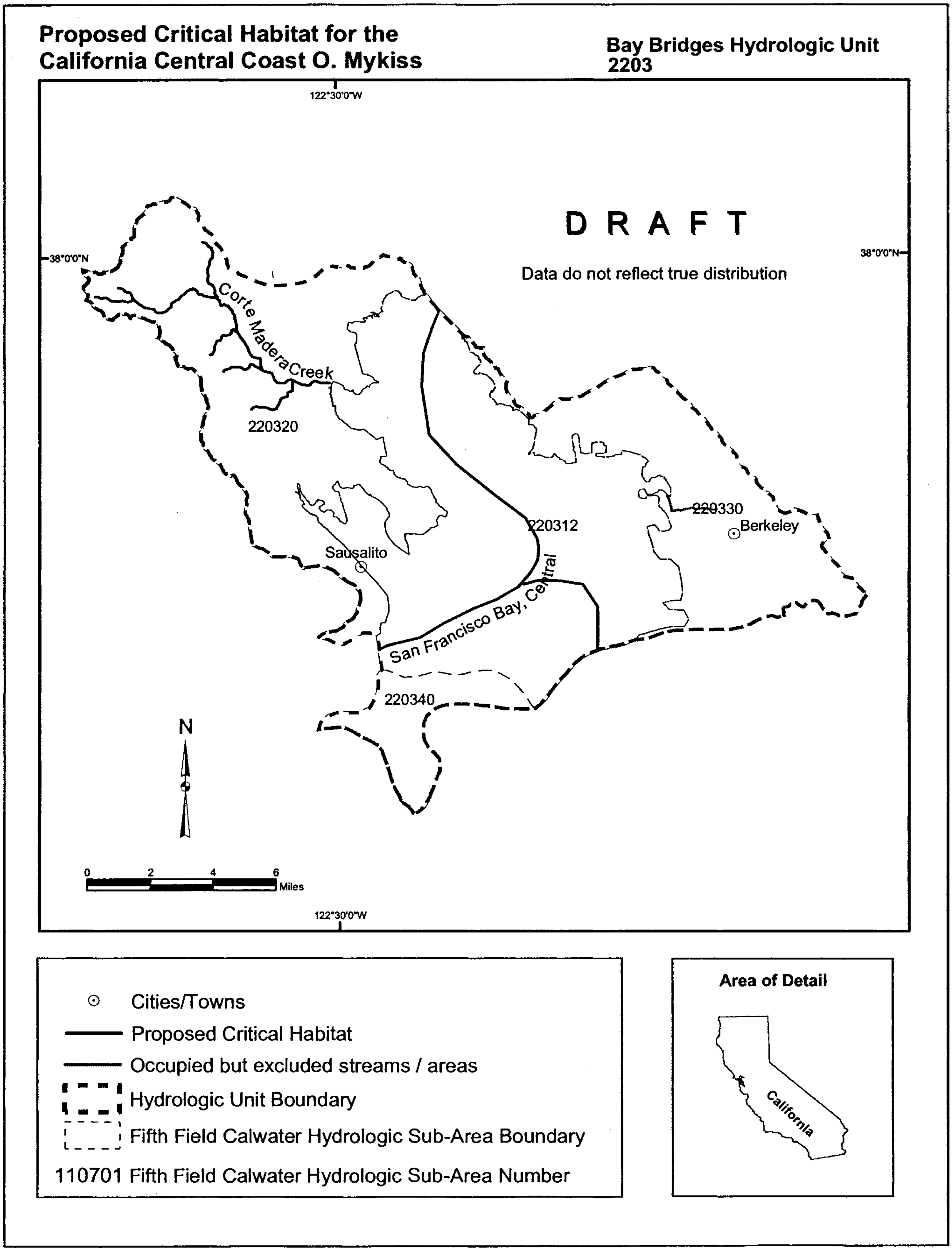

Proposed Critical Habitat for the
California Central Coast O. Mykiss
Russian River Hydrologic Unit
1114
123°30'0"W
123°0'0"W
122°30'0"W
39°0'0"N
38°30'0"N
DRAFT
Data do not reflect true distribution
111433
Ukiah
111431
111426
111424
111425
111412
111423
111411
111422
Santa Rosa
111421
N
0
5
10
15
Miles
Cities/Towns
Proposed Critical Habitat
Occupied but excluded streams / areas
Hydrologic Unit Boundary
Fifth Field Calwater Hydrologic Sub-Area Boundary
110701 Fifth Field Calwater Hydrologic Sub-Area Number
Area of Detail
California

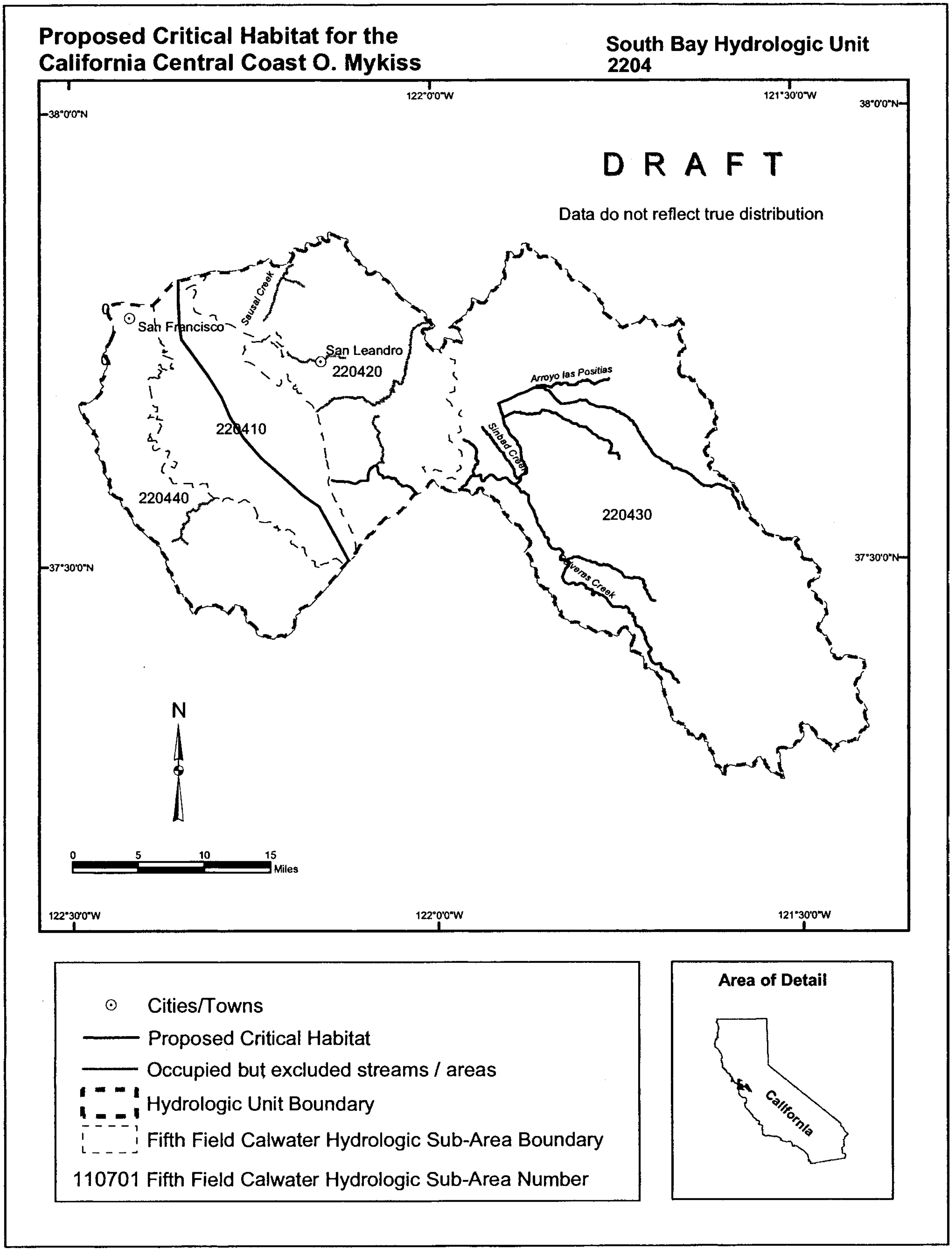

Proposed Critical Habitat for the
California Central Coast O. Mykiss
Bodega Hydrologic Unit
1115
38°30'0"N
123°0'0"W
38°30'0"N
DRAFT
Data do not reflect true distribution
111510
Fay Creek
Tannery Creek
111520
Bodega Bay
Ebabias Creek
111530
111540
N
0
2
4
6
Miles
123°0'0"W
Cities/Towns
Proposed Critical Habitat
Hydrologic Unit Boundary
Fifth Field Calwater Hydrologic Sub-Area Boundary
110701 Fifth Field Calwater Hydrologic Sub-Area Number
Area of Detail
California


Proposed Critical Habitat for the California Central Coast O. Mykiss
Marin Coastal Hydrologic Unit 2201
DRAFT
Data do not reflect true distribution
123°0'0"W
122°30'0"W
38°0'0"N
Walker Creek
220112
Millerton Gulch
220120
220114
Point Reyes Station
Lagunitas Creek
220113
Geronimo Creek
Lagunitas
Olema Creek Blueline
Pine Gulch Creek
220130
N
0 2 4 6 Miles
Cities/Towns
Proposed Critical Habitat
Hydrologic Unit Boundary
Fifth Field Calwater Hydrologic Sub-Area Boundary
110701 Fifth Field Calwater Hydrologic Sub-Area Number
Area of Detail
California

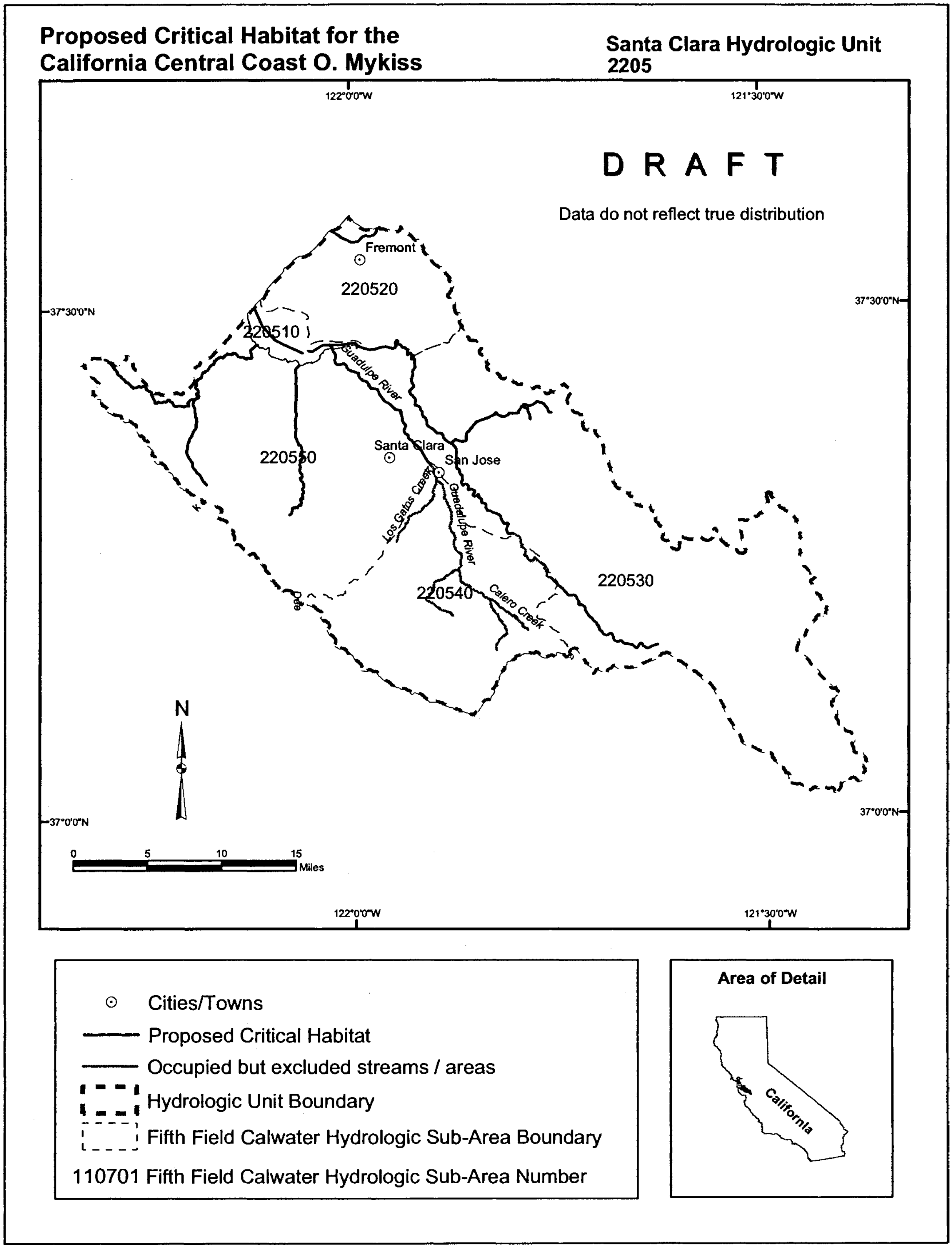


Proposed Critical Habitat for the
California Central Coast O. Mykiss
San Mateo Hydrologic Unit
2202
DRAFT
Data do not reflect true distribution
122°30'0"W
122°0'0"W
37°30'0"N
220210
220221
220222
220223
220230
220240
Half Moon Bay
Pescadero
Arroyo Leon Creek
Purisima Creek
San Gregorio Creek
Pescadero Creek
Butano Cr
Peters Creek
Oil Creek
Locks Creek
N
0
5
10
15
Miles
Cities/Towns
Proposed Critical Habitat
Hydrologic Unit Boundary
Fifth Field Calwater Hydrologic Sub-Area Boundary
110701 Fifth Field Calwater Hydrologic Sub-Area Number
Area of Detail
California


Proposed Critical Habitat for the
California Central Coast O. Mykiss
Bay Bridges Hydrologic Unit
2203
122°30'0"W
38°0'0"N
DRAFT
Data do not reflect true distribution
Corte Madera Creek
220320
220330
Berkeley
220312
Sausalito
San Francisco Bay, Central
220340
N
0 2 4 6 Miles
Cities/Towns
Proposed Critical Habitat
Occupied but excluded streams / areas
Hydrologic Unit Boundary
Fifth Field Calwater Hydrologic Sub-Area Boundary
110701 Fifth Field Calwater Hydrologic Sub-Area Number
Area of Detail
California

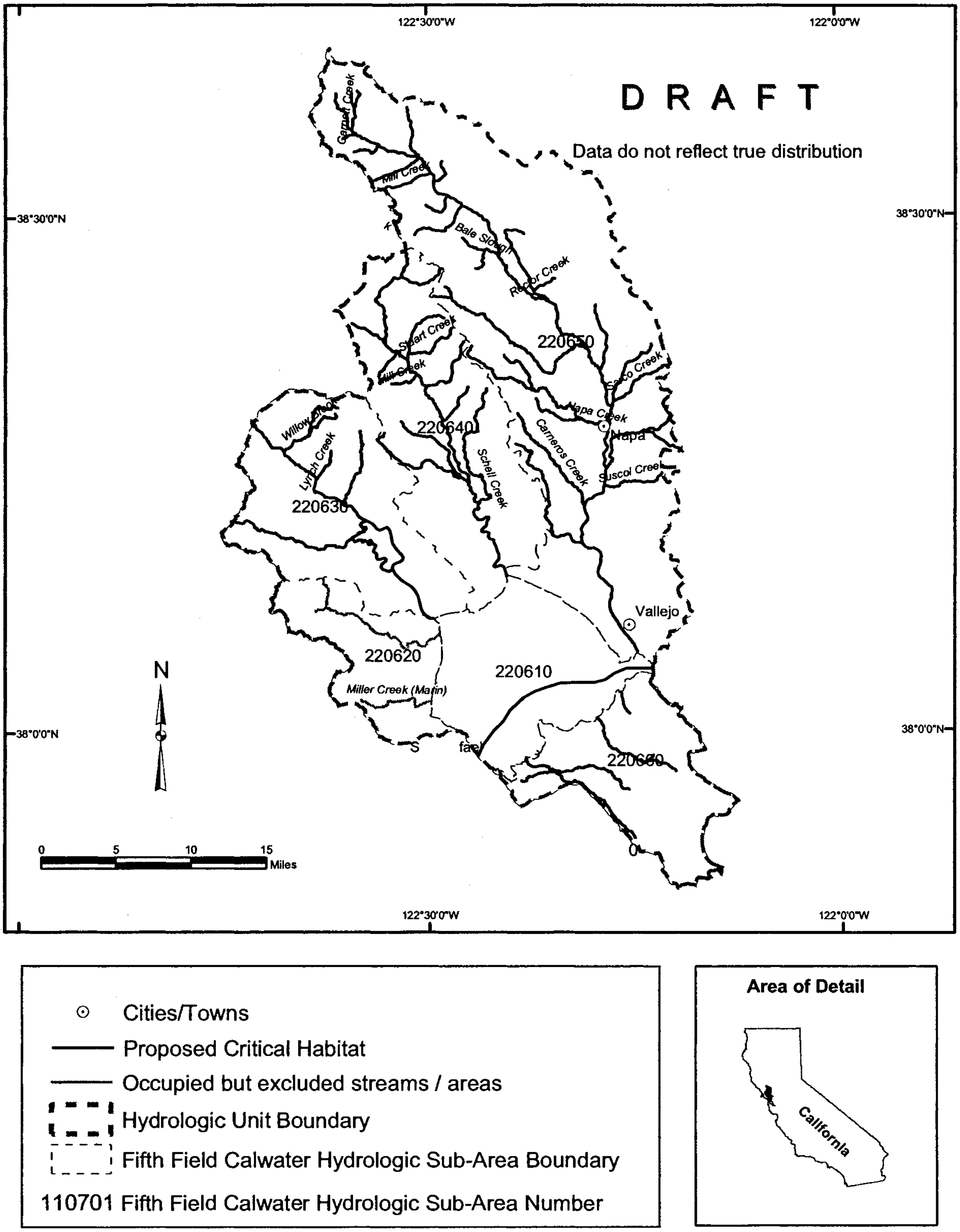


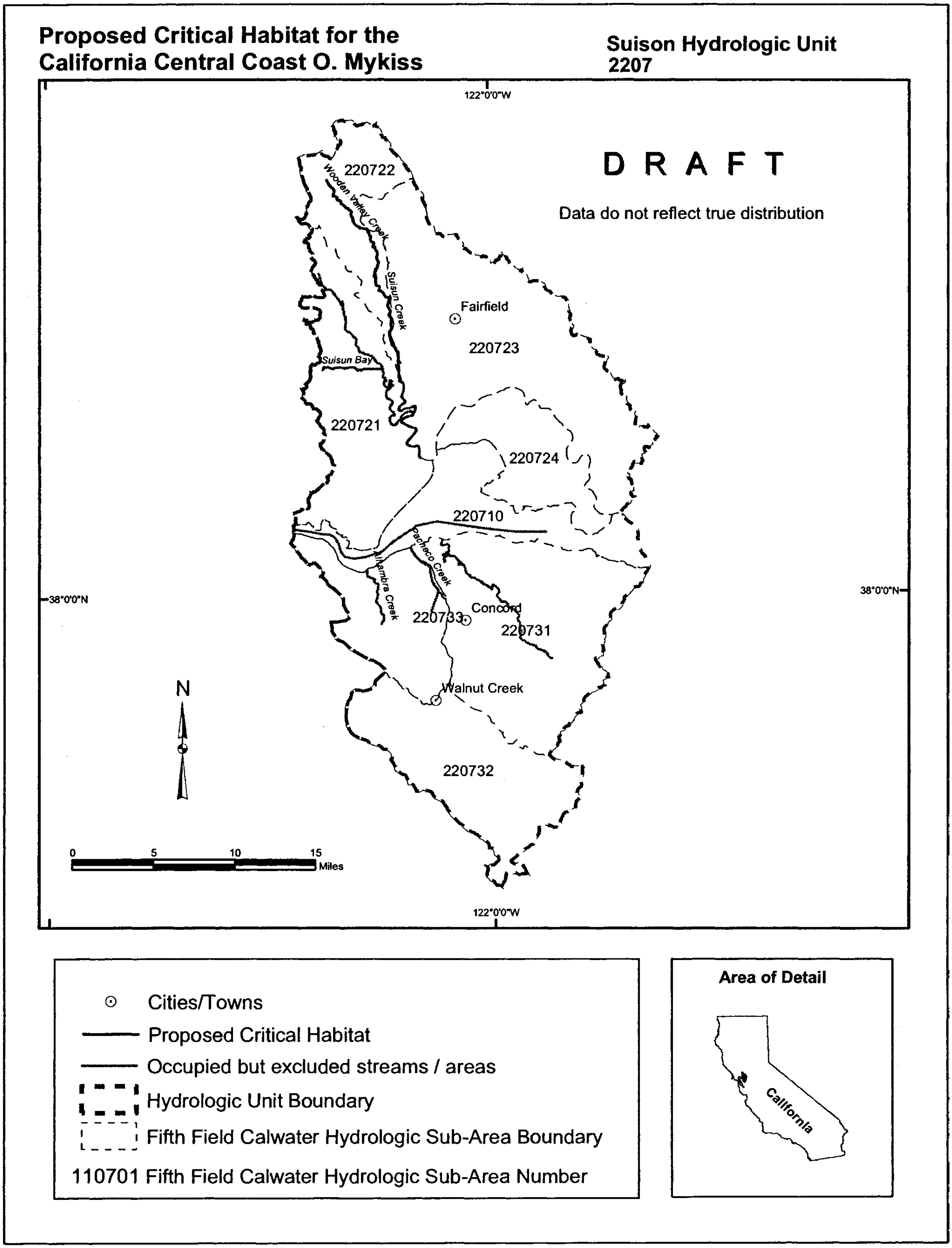
Proposed Critical Habitat for the
California Central Coast O. Mykiss
South Bay Hydrologic Unit
2204
122°0'0"W
121°30'0"W
38°0'0"N
DRAFT
Data do not reflect true distribution
San Francisco
Sausal Creek
San Leandro
220420
220410
220440
Arroyo las Positias
Sinbad Creek
220430
Calaveras Creek
37°30'0"N
N
0 5 10 15 Miles
122°30'0"W
Cities/Towns
Proposed Critical Habitat
Occupied but excluded streams / areas
Hydrologic Unit Boundary
Fifth Field Calwater Hydrologic Sub-Area Boundary
110701 Fifth Field Calwater Hydrologic Sub-Area Number
Area of Detail
California

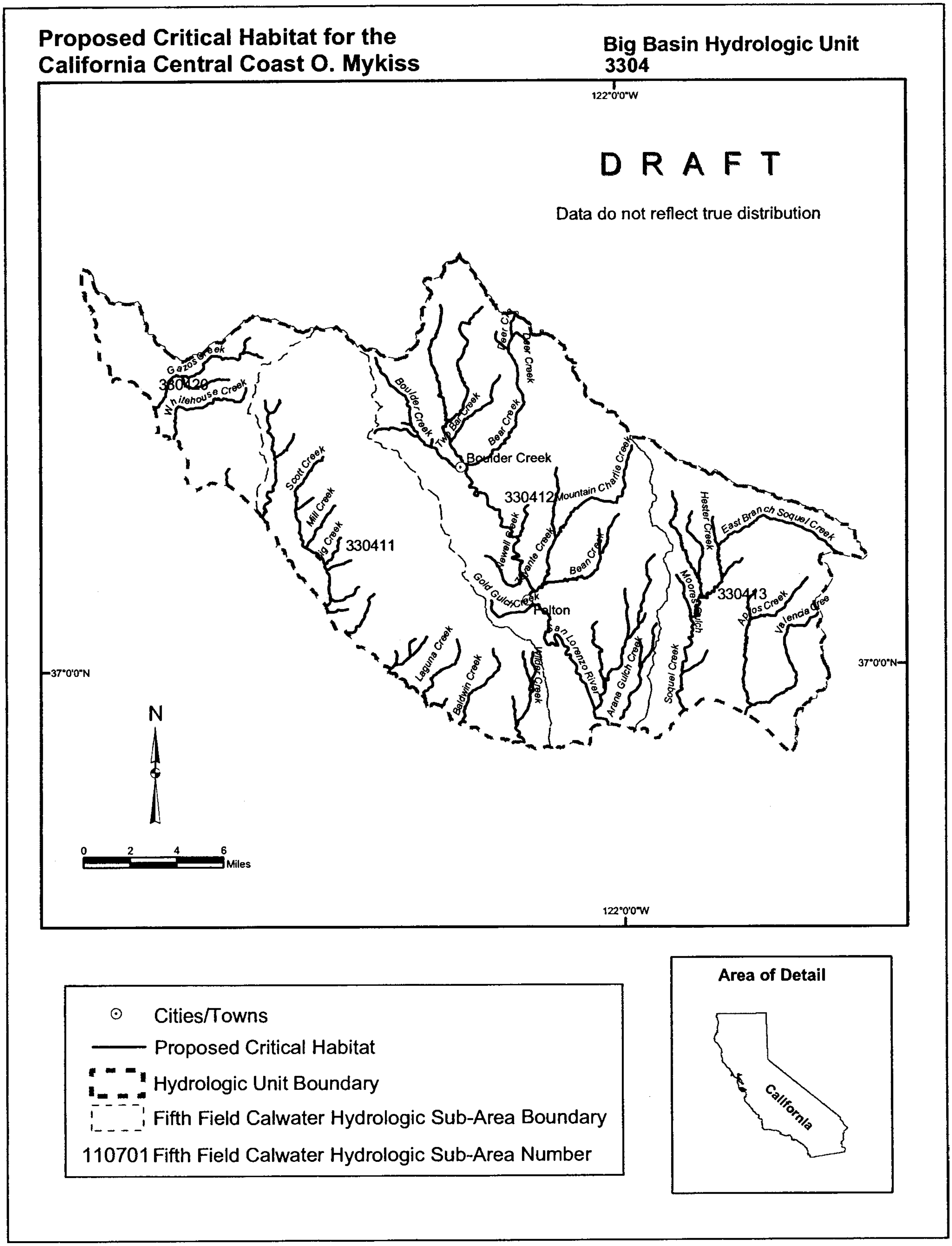

Proposed Critical Habitat for the
California Central Coast O. Mykiss
Santa Clara Hydrologic Unit
2205
DRAFT
Data do not reflect true distribution
122°0'0"W
121°30'0"W
37°30'0"N
37°0'0"N
Fremont
220520
220510
220550
220530
220540
Guadalupe River
Santa Clara
San Jose
Los Gatos Creek
Calero Creek
N
0 5 10 15 Miles
Cities/Towns
Proposed Critical Habitat
Occupied but excluded streams / areas
Hydrologic Unit Boundary
Fifth Field Calwater Hydrologic Sub-Area Boundary
110701 Fifth Field Calwater Hydrologic Sub-Area Number
Area of Detail
California

Proposed Critical Habitat for the California Central Coast O. Mykiss

San Pablo Hydrologic Unit 2206




Proposed Critical Habitat for the
California Central Coast O. Mykiss
Suison Hydrologic Unit
2207
DRAFT
Data do not reflect true distribution
122°0'0"W
38°0'0"N
220722
Wooden Valley Creek
Suisun Creek
Fairfield
220723
Suisun Bay
220721
220724
220710
Pacheco Creek
Alhambra Creek
220733
Concord
220731
Walnut Creek
220732
N
0
5
10
15
Miles
Cities/Towns
Proposed Critical Habitat
Occupied but excluded streams / areas
Hydrologic Unit Boundary
Fifth Field Calwater Hydrologic Sub-Area Boundary
110701 Fifth Field Calwater Hydrologic Sub-Area Number
Area of Detail
California



BILLING CODE 3510–22–C

(i) *South-central California Coast O. mykiss (Oncorhynchus mykiss).* Critical habitat is proposed to include the areas defined in the following units:

(1) Pajaro River Hydrologic Unit 3305—*(i) Watsonville Hydrologic Sub-area 330510.* Outlet(s) = Pajaro River (Lat 36.8506, Long −121.8101) upstream to endpoint(s) in: Banks Canyon Creek (36.9958, −121.7264); Browns Creek (37.0255, −121.7754); Casserly Creek (36.9902, −121.7359); Corralitos Creek (37.0666, −121.8359); Gaffey Creek (36.9905, −121.7132); Gamecock Canyon (37.0362, −121.7587); Green Valley Creek (37.0073, −121.7256); Ramsey Gulch (37.0447, −121.7755); Redwood Canyon (37.0342, −121.7975); Salsipuedes Creek (36.9350, −121.7426); Shingle Mill Gulch (37.0446, −121.7971).

(ii) Santa Cruz Mountains Hydrologic Sub-area 330520. Outlet(s) = Pajaro River (Lat 36.8963, Long −121.5620); Bodfish Creek (37.0020, −121.6715); Pescadero Creek (36.9125, −121.5882); Tar Creek (36.9304, −121.5520); Uvas Creek (37.0251, −121.6430) upstream to endpoint(s) in: Blackhawk Canyon (37.0168, −121.6912); Bodfish Creek (36.9985, −121.6859); Little Arthur Creek (37.0299, −121.6874); Pescadero Creek (36.9826, −121.6274); Tar Creek (36.9558, −121.6009); Uvas Creek (37.0660, −121.6912).

(iii) South Santa Clara Valley Hydrologic Sub-area 330530. Outlet(s) = San Benito River (Lat 36.8961, Long −121.5625); Pajaro River (36.9222, −121.5388) upstream to endpoint(s) in: Arroyo Dos Picachos (36.8866, −121.3184); Bird Creek (36.7837, −121.3731); Bodfish Creek (37.0080, −121.6652); Bodfish Creek (37.0041, −121.6667); Carnadero Creek (36.9603, −121.532); Llagas Creek (37.1159, −121.6938); Miller Canal (36.9516, −121.5115); San Felipe Lake (36.9835, −121.4604); Tar Creek (36.9297, −121.5419); Tequisquita Slough (36.9170, −121.3887); Uvas Creek (37.0146, −121.6314).

(iv) Pacheco-Santa Ana Creek Hydrologic Sub-area 330540. Outlet(s) = Arroyo Dos Picachos (Lat 36.8866, Long −121.3184); Pacheco Creek (37.0055, −121.3598) upstream to endpoint(s) in: Arroyo Dos Picachos (36.8912, −121.2305); Cedar Creek (37.0922, −121.3641); North Fork Pacheco Creek (37.0514, −121.2911); Pacheco Creek (37.0445, −121.2662); South Fork Pacheco Creek (37.0227, −121.2603).

(v) San Benito River Hyddrologic Sub-area 330550. Outlet(s) = San Benito River (Lat 36.7838, Long −121.3731) upstream to endpoint(s) in: Bird Creek (36.7604, −121.4506); Pescadero Creek (36.7202, −121.4187); San Benito River (36.3324, −120.6316); Sawmill Creek (36.3593, −120.6284).

(2) Carmel River Hydrologic Unit 3307—*Carmel River Hydrologic Sub-area 330700.* Outlet(s) = Carmel River (Lat36.5362, Long −121.9285) upstream to endpoint(s) in: Aqua Mojo Creek (36.4711, −121.5407); Big Creek (36.3935, −121.5419); Blue Creek (36.2796, −121.6530); Boronda Creek (36.3542, −121.6091); Bruce Fork (36.3221, −121.6385); Cachagua Creek (36.3909 , −121.5950); Carmel River (36.3701, −121.6621); Danish Creek (36.3730, −121.7590); Hitchcock Canyon Creek (36.4470, −121.7597); James Creek (36.3235, −121.5804); Las Garzas Creek (36.4607, −121.7944); Millers Fork (36.2961, −121.5697); Pinch Creek (36.3236, −121.5574); Pine Creek (36.3827, −121.7727); Potrero Creek (36.4801, −121.8258); Rana Creek (36.4877, −121.5840); Rattlesnake Creek (36.3442, −121.7080); Robertson Canyon Creek (36.4776, −121.8048); Robertson Creek (36.3658, −121.5165); San Clemente Creek (36.4227, −121.8115); Tularcitos Creek (36.4369, −121.5163); Ventana Mesa Creek (36.2977, −121.7116).

(3) Santa Lucia Hydrologic Unit 3308—*Santa Lucia Hydrologic Sub-area 330800.* Outlet(s) = Alder Creek (Lat 35.8578, Long −121.4165); Big Creek (36.0696, −121.6005); Big Sur River (36.2815, −121.8593); Bixby Creek (36.3713, −121.9029); Garrapata Creek (36.4176, −121.9157); Limekiln Creek (36.0084, −121.5196); Little Sur River (36.3327, −121.8853); Malpaso Creek (36.4814, −121.9384); Mill Creek (35.9825, −121.4917); Partington Creek (36.1753, −121.6973); Plaskett Creek (35.9195, −121.4717); Prewitt Creek (35.9353, −121.4760); Rocky Creek (36.3798, −121.9028); San Jose Creek (36.5259, −121.9253); Vicente Creek (36.0442, −121.5855); Villa Creek (35.8495, −121.4087); Willow Creek (35.8935, −121.4619) upstream to endpoint(s) in: Alder Creek (35.8685, −121.3974); Big Creek (36.0830, −121.5884); Bixby Creek (36.3715, −121.8440); Devil's Canyon Creek (36.0773, −121.5695); Garrapata Creek (36.4042, −121.8594); Joshua Creek (36.4182, −121.9000); Limekiln Creek (36.0154, −121.5146); Little Sur River (36.3327, −121.8853); Logwood Creek (36.2105, −121.6719); Malpaso Creek (36.4681, −121.8800); Mill Creek (35.9907, −121.4632); North Fork Big Sur River (36.2178, −121.5948); Partington Creek (36.1929, −121.6825); Plaskett Creek (35.9228, −121.4493); Prewitt Creek (35.9419, −121.4598); Redwood Creek (36.2825, −121.6745); Rocky Creek (36.3805, −121.84400); San Jose Creek (36.4662, −121.8118); South Fork Big Sur River (36.1903, −121.6114); South Fork Little Sur River (36.3026, −121.8093); Unnamed Tributary (36.2045, −121.6075); Vicente Creek (36.0463, −121.5780); Villa Creek (35.8525, −121.3973); Wildcat Canyon Creek (36.4124, −121.8680); Williams Canyon Creek (36.4466, −121.8526); Willow Creek (35.9050, −121.3851).

(4) Salinas River Hydrologic Unit 3309—*(i) Neponset Hydrologic Sub-area 330911.* Outlet(s) = Salinas River (Lat 36.7498, Long −121.8055); Old Salinas River (36.8080, −121.7854) upstream to endpoint(s) in: Gabilan Creek (36.6923, −121.6300); Old Salinas River (36.7728, −121.7884); Tembladero Slough (36.6865, −121.6409).

(ii) Chualar Hydrologic Sub-area 330920. Outlet(s) = Gabilan Creek (Lat 36.6923, Long −121.6300) upstream.

(iii) Soledad Hydrologic Sub-area 330930. Outlet(s) = Salinas River (Lat36.4878, Long −121.4688) upstream to endpoint(s) in: Arroyo Seco River (36.2644, −121.3812); Reliz Creek (36.2438, −121.2881).

(iv) Upper Salinas Valley Hydrologic Sub-area 330940. Outlet(s) = Salinas River (Lat 36.3183, Long −121.1837) upstream.

(v) Arroyo Seco Hydrologic Sub-area 330960. Outlet(s) = Arroyo Seco River (Lat 36.2644, Long −121.3812); Reliz Creek (36.2438, −121.2881); Vaqueros Creek (36.2642, −121.3369) upstream to endpoint(s) in: Arroyo Seco River (36.2041, −121.5002); Calaboose Creek (36.2942, −121.5082); Church Creek (36.2762, −121.5877); Paloma Creek (36.3195, −121.4894); Piney Creek (36.3023, −121.5629); Reliz Creek (36.1935, −121.2777); Rocky Creek (36.2676, −121.5225); Santa Lucia Creek (36.1999, −121.4785); Tassajara Creek (36.2679, −121.6149); Vaqueros Creek (36.2479, −121.3369); Willow Creek (36.2059, −121.5642); Zigzag Creek (36.1763, −121.5475).

(vi) Gabilan Range Hydrologic Sub-area 330970. Outlet(s) = Gabilan Creek (Lat 36.7800, −121.5836) upstream to endpoint(s) in: Gabilan Creek (36.7335, −121.4939).

(vii) Paso Robles Hydrologic Sub-area 330981. Outlet(s) = Salinas River (Lat 35.9241, Long −120.8650) upstream to endpoint(s) in: Atascadero Creek (35.4468, −120.7010); Eagle Creek (35.4209, −120.6760); Graves Creek (35.4838, −120.7631); Hale Creek (35.3964, −120.6702); Jack Creek (35.5815, −120.8560); Nacimiento River (35.7610, −120.8853); Paso Robles Creek (35.5636, −120.8455); Salinas River (35.3886, −120.5582); San Antonio River (35.7991, −120.8849); San Marcos Creek (35.6734, −120.8140); Santa Margarita Creek (35.3923, −120.6619); Santa Rita Creek (35.5262, −120.8396); Sheepcamp Creek (35.6145, −120.7795); Summit

Creek (35.6441, −120.8046); Tassajera Creek (35.3895, −120.6926); Trout Creek (35.3394, −120.5881); Willow Creek (35.6107, −120.7720).

(5) Estero Bay Hydrologic Unit 3310—*(i) San Carpoforo Hydrologic Sub-area 331011.* Outlet(s) = San Carpoforo Creek (Lat 35.7646, Long −121.3247) upstream to endpoint(s) in: Dutra Creek (−121.3273, 35.8197); Estrada Creek (−121.2661, 35.7710); San Carpoforo Creek (−121.2745, 35.8202); Unnamed Tributary (−121.2703, 35.7503); Wagner Creek (−121.2387, 35.8166).

(ii) Arroyo De La Cruz Hydrologic Sub-area 331012. Outlet(s) = Arroyo De La Cruz (Lat 35.7097, Long −121.3080) upstream to endpoint(s) in: Arroyo De La Cruz (−121.1722, 35.6986); Burnett Creek (−121.1920, 35.7520); Green Canyon Creek (−121.2314, 35.7375); Marmolejo Creek (−121.1082, 35.6774); Spanish Cabin Creek (−121.1497, 35.7234); Unnamed Tributary (−121.1977, 35.7291); West Fork Burnett Creek (−121.2075, 35.7516).

(iii) San Simeon Hydrologic Sub-area 331013. Outlet(s) = Arroyo del Corral (Lat 35.6838, Long −121.2875); Arroyo del Puerto (35.6432, −121.1889); Little Pico Creek (35.6336, −121.1639); Oak Knoll Creek (35.6512, −121.2197); Pico Creek (35.6155, −121.1495); San Simeon Creek (35.5950, −121.1272) upstream to endpoint(s) in: Arroyo Laguna (35.6895, −121.2337); Arroyo del Corral (35.6885, −121.2537); Arroyo del Puerto (35.6773, −121.1713); Little Pico Creek (35.6890, −121.1375); Oak Knoll Creek (35.6718, −121.2010); North Fork Pico Creek (35.6886, −121.0861); Pico Creek (35.6640, −121.0685); San Simeon Creek (35.6228, −121.0561); Steiner Creek (35.6032, −121.0640); Unnamed Tributary (35.6482, −121.1067); Unnamed Tributary (35.6616, −121.0639); Unnamed Tributary (35.6741, −121.0981); Unnamed Tributary (35.6777, −121.1503); Unnamed Tributary (35.6604, −121.1571); Unnamed Tributary (35.6579, −121.1356); Unnamed Tributary (35.6744, −121.1187); Unnamed Tributary (35.6460, −121.1373); Unnamed Tributary (35.6839, −121.0955); Unnamed Tributary (35.6431, −121.0795); Unnamed Tributary (35.6820, −121.2130); Unnamed Tributary (35.6977, −121.2613); Unnamed Tributary (35.6702, −121.1884); Unnamed Tributary (35.6817, −121.0885); Van Gordon Creek (35.6286, −121.0942).

(iv) Santa Rosa Hydrologic Sub-area 331014. Outlet(s) = Santa Rosa Creek (Lat 35.5685, Long −121.1113) upstream to endpoint(s) in: Green Valley Creek (35.5511, −120.9471); Perry Creek (35.5323–121.0491); Santa Rosa Creek (35.5525, −120.9278); Unnamed Tributary (35.5965, −120.9413); Unnamed Tributary (35.5684, −120.9211); Unnamed Tributary (35.5746, −120.9746).

(v) Villa Hydrologic Sub-area 331015. Outlet(s) = Villa Creek (Lat 35.4601, Long −120.9704) upstream to endpoint(s) in: Unnamed Tributary (35.4798, −120.9630); Unnamed Tributary (35.5080, −121.0171); Unnamed Tributary (35.5348, −120.8878); Unnamed Tributary (35.5510, −120.9406); Unnamed Tributary (35.5151, −120.9497); Unnamed Tributary (35.4917, −120.9584); Unnamed Tributary (35.5173, −120.0171); Villa Creek (35.5352, −120.8942).

(vi) Cayucos Hydrologic Sub-area 331016. Outlet(s) = Cayucos Creek (Lat 35.4491, Long −120.9079) upstream to endpoint(s) in: Cayucos Creek (35.4887, −120.8968); Unnamed Tributary (35.5157, −120.9005); Unnamed Tributary (35.4943, −120.9513); Unnamed Tributary (35.5257, −120.9271).

(vii) Old Hydrologic Sub-area 331017. Outlet(s) = Old Creek (Lat 35.4345, Long −120.8868) upstream to endpoint(s) in: Old Creek (35.4480, −120.8871)

(viii) Toro Hydrologic Sub-area 331018. Outlet(s) = Toro Creek (Lat 35.4126, Long −120.8739) upstream to endpoint(s) in: Toro Creek (35.4945, −120.7934); Unnamed Tributary (35.4917, −120.7983).

(ix) Morro Hydrologic Sub-area 331021. Outlet(s) = Morro Creek (Lat 35.3762, Long −120.8642) upstream to endpoint(s) in: East Fork Morro Creek (35.4218, −120.7282); Little Morro Creek (35.4155, −120.7532); Morro Creek (35.4280, −120.7518); Unnamed Tributary (35.4292, −120.8122); Unnamed Tributary (35.4458, −120.7906); Unnamed Tributary (35.4122, −120.8335); Unnamed Tributary (35.4420, −120.7796).

(x) Chorro Hydrologic Sub-area 331022. Outlet(s) = Chorro Creek (Lat 35.3413, Long −120.8388) upstream to endpoint(s) in: Chorro Creek (35.3340, −120.6897); Dairy Creek (35.3699, −120.6911); Pennington Creek (35.3655, −120.7144); San Bernardo Creek (35.3935, −120.7638); San Luisito (35.3755, −120.7100); Unnamed Tributary (35.3821, −120.7217); Unnamed Tributary (35.3815, −120.7350).

(xi) Los Osos Hydrologic Sub-area 331023. Outlet(s) = Los Osos Creek (Lat 35.3166, Long −120.8112) upstream to endpoint(s) in: Los Osos Creek (35.2727, −120.7636).

(xii) San Luis Obispo Creek Hydrologic Sub-area 331024. Outlet(s) = San Luis Obispo Creek (Lat 35.1822, Long −120.7303) upstream to endpoint(s) in: Brizziolari Creek (35.3236, −120.6411); Froom Creek (35.2525, −120.7144); Prefumo Creek (35.2615, −120.7081); San Luis Obispo Creek (35.3393, −120.6301); See Canyon Creek (35.2306, −120.7675); Stenner Creek (35.3447, −120.6584); Unnamed Tributary (35.2443, −120.7655).

(xiii) Point San Luis Hydrologic Sub-area 331025. Outlet(s) = Coon Creek (Lat 35.2590, Long −120.8951); Islay Creek (35.2753, −120.8884) upstream to endpoint(s) in: Coon Creek (35.2493, −120.7774); Islay Creek (35.2574, −120.7810); Unnamed Tributary (35.2753, −120.8146); Unnamed Tributary (35.2809, −120.8147); Unnamed Tributary (35.2648, −120.7936).

(xiv) Pismo Hydrologic Sub-area 331026. Outlet(s) = Pismo Creek (Lat 35.1336, Long −120.6408) upstream to endpoint(s) in: East Corral de Piedra Creek (35.2343, −120.5571); Pismo Creek (35.1969, −120.6107); Unnamed Tributary (35.2462, −120.5856).

(xvi) Oceano Hydrologic Sub-area 331031. Outlet(s) = Arroyo Grande Creek (Lat 35.1011, Long −120.6308) upstream to endpoint(s) in: Arroyo Grande Creek (35.1868, −120.4881); Los Berros Creek (35.0791, −120.4423).

(6) Maps of proposed critical habitat for the South-central California Coast *O. mykiss* ESU follow:

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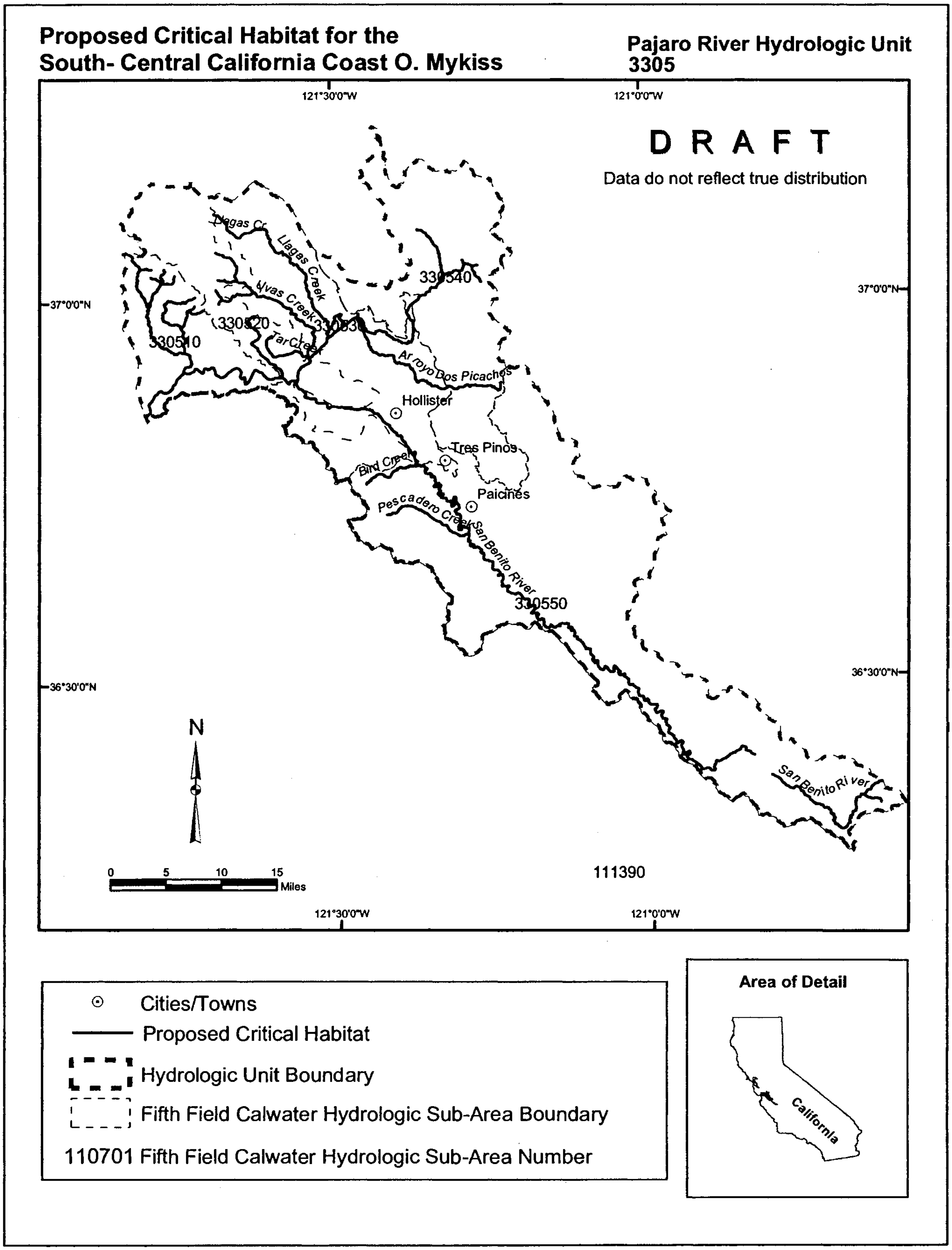
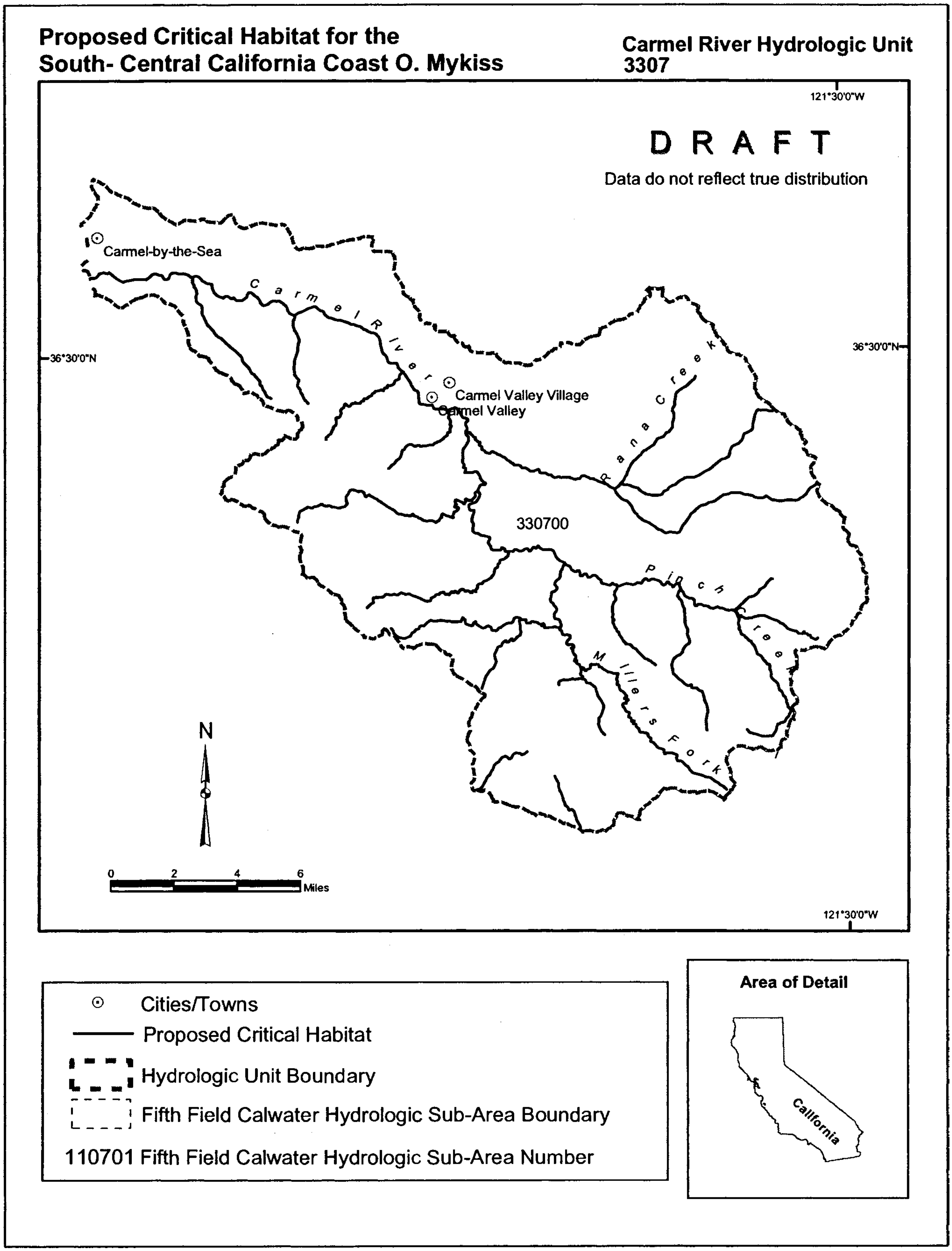
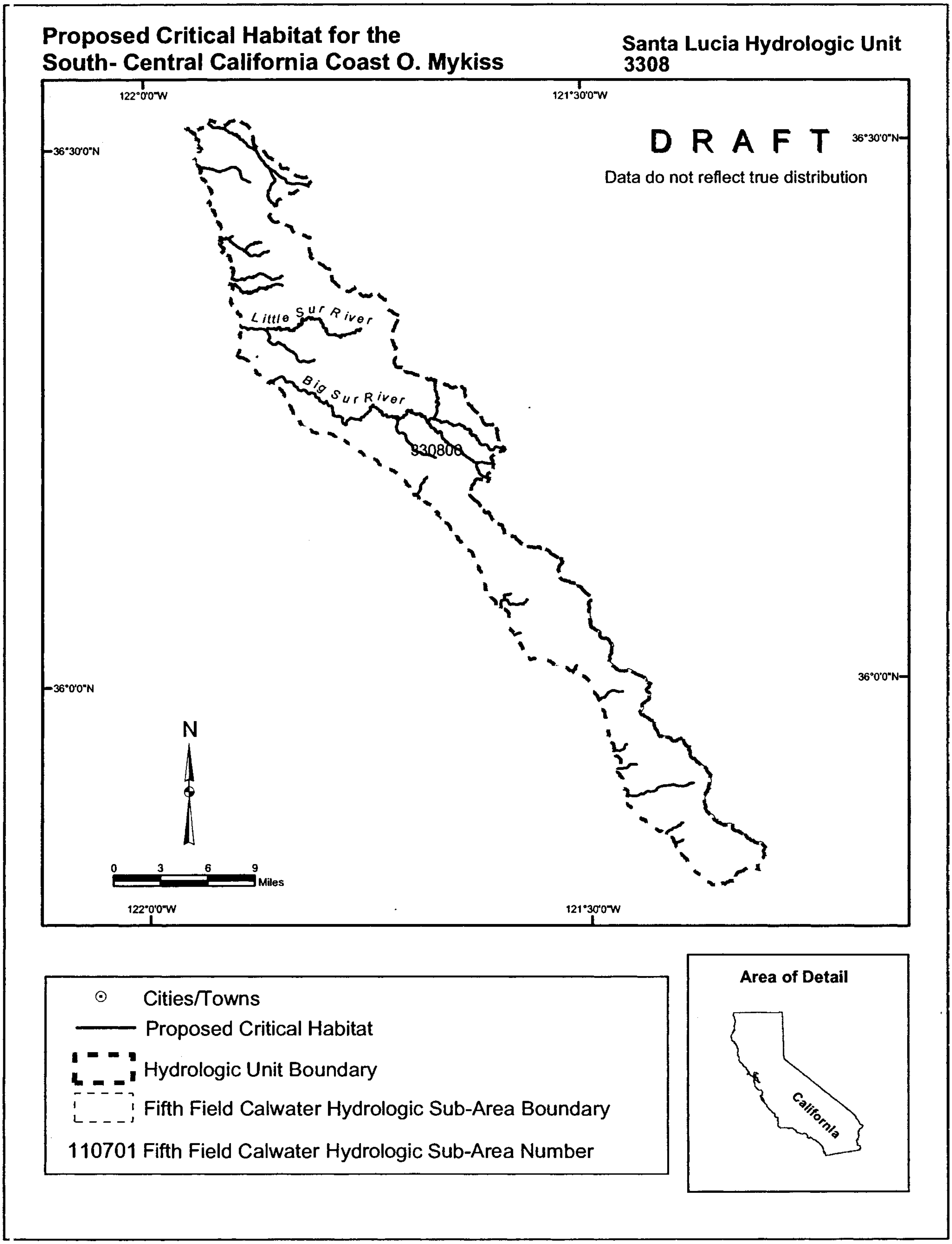
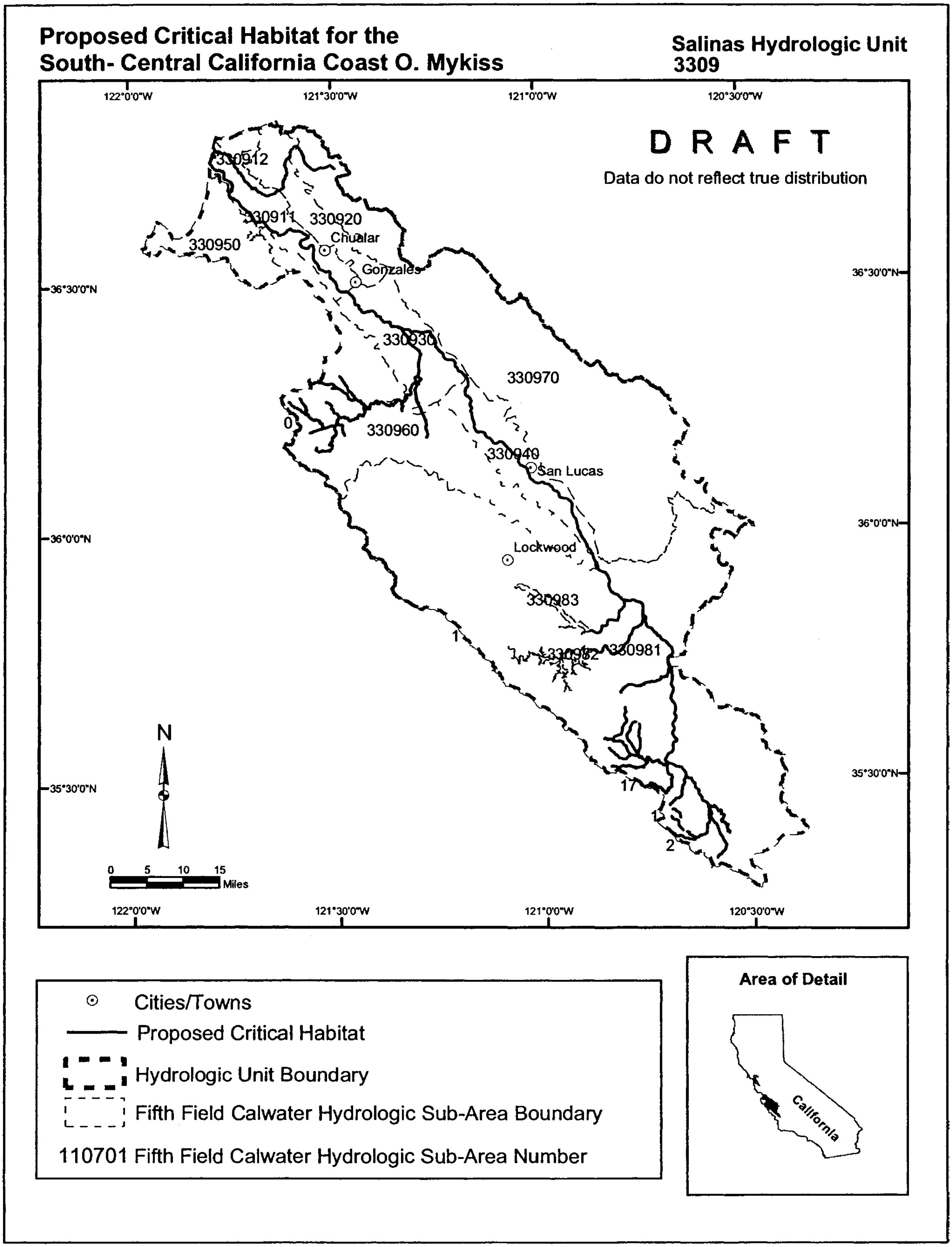
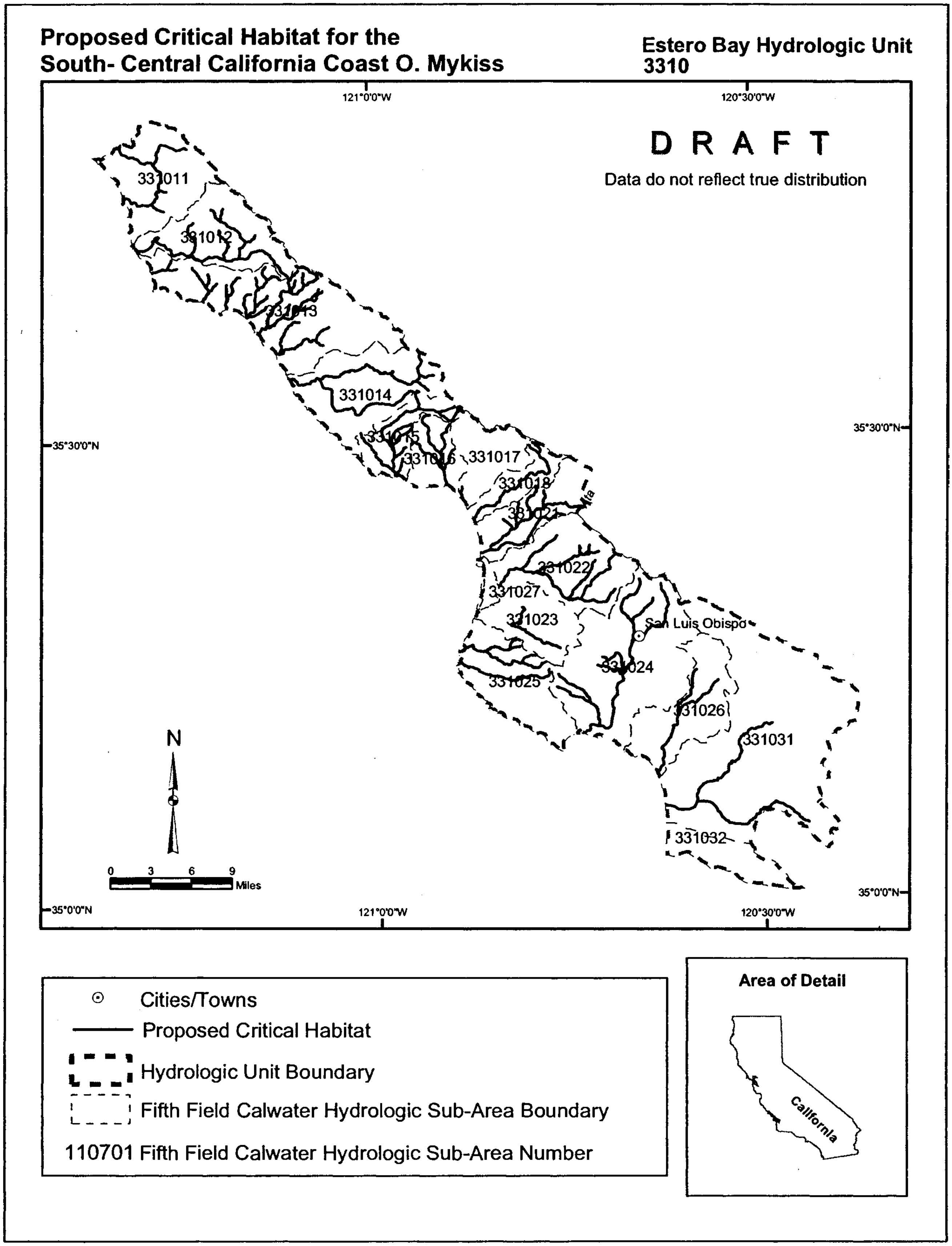

Proposed Critical Habitat for the
South- Central California Coast O. Mykiss
Pajaro River Hydrologic Unit
3305
121°30'0"W
121°0'0"W
D R A F T
Data do not reflect true distribution
37°0'0"N
36°30'0"N
Llagas Cr
Llagas Creek
Uvas Creek
Tar Cr
Arroyo Dos Picachos
Hollister
Tres Pinos
Bird Creek
Paicines
Pescadero Creek
San Benito River
330540
330520
330510
330530
330550
111390
N
0 5 10 15
Miles
Cities/Towns
Proposed Critical Habitat
Hydrologic Unit Boundary
Fifth Field Calwater Hydrologic Sub-Area Boundary
110701 Fifth Field Calwater Hydrologic Sub-Area Number
Area of Detail
California



Proposed Critical Habitat for the
South- Central California Coast O. Mykiss
Carmel River Hydrologic Unit
3307
121°30'0"W
DRAFT
Data do not reflect true distribution
Carmel-by-the-Sea
Carmel River
36°30'0"N
36°30'0"N
Carmel Valley Village
Carmel Valley
Cachagua Creek
330700
Pinch Creek
Millers Fork
N
0
2
4
6
Miles
121°30'0"W
Cities/Towns
Proposed Critical Habitat
Hydrologic Unit Boundary
Fifth Field Calwater Hydrologic Sub-Area Boundary
110701 Fifth Field Calwater Hydrologic Sub-Area Number
Area of Detail
California


Proposed Critical Habitat for the
South- Central California Coast O. Mykiss
Santa Lucia Hydrologic Unit
3308
122°0'0"W
121°30'0"W
36°30'0"N
36°0'0"N
DRAFT
Data do not reflect true distribution
Little Sur River
Big Sur River
330800
N
0 3 6 9
Miles
Cities/Towns
Proposed Critical Habitat
Hydrologic Unit Boundary
Fifth Field Calwater Hydrologic Sub-Area Boundary
110701 Fifth Field Calwater Hydrologic Sub-Area Number
Area of Detail
California


Proposed Critical Habitat for the
South- Central California Coast O. Mykiss
Salinas Hydrologic Unit
3309
DRAFT
Data do not reflect true distribution
122°0'0"W
121°30'0"W
121°0'0"W
120°30'0"W
36°30'0"N
36°0'0"N
35°30'0"N
330912
330911
330920
330950
Chualar
Gonzales
330930
330970
330960
330940
San Lucas
Lockwood
330983
330982
330981
N
0 5 10 15
Miles
Cities/Towns
Proposed Critical Habitat
Hydrologic Unit Boundary
Fifth Field Calwater Hydrologic Sub-Area Boundary
110701 Fifth Field Calwater Hydrologic Sub-Area Number
Area of Detail
California



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(j) *Southern California O. mykiss (Oncorhynchus mykiss).* Critical habitat is proposed to include the areas defined in the following units:

(1) Santa Maria River Hydrologic Unit 3312—*(i) Santa Maria Hydrologic Sub-area 331210.* Outlet(s) = Santa Maria River (Lat 34.9710, Long −120.6494); Sisquoc River (Lat 34.9042, Long −120.3067); Cuyama River (Lat 34.9042, Long −120.3067) upstream to endpoint(s) in: Santa Maria River (Lat 34.9042, Long −120.3067); Cuyama River (Lat 34.9058, Long −120.3018).

(ii) Sisquoc Hydrologic Sub-area 331220. Outlet(s) = Sisquoc River (Lat 34.8942, Long −120.3053) upstream to endpoint(s) in: La Brea Creek (Lat 34.8804, Long −120.1308); South Fork La Brea Creek (Lat 34.9543, Long −119.9783); Unnamed Tributary (Lat 34.9342, Long −120.0579); Unnamed Tributary (Lat 34.9511, Long −120.0130); North Fork La Brea Creek (Lat 34.9681, Long −120.0102); Unnamed Tributary (Lat 34.9687, Long −120.1410); Unnamed Tributary (Lat 34.9626, Long −120.1490); Unnamed Tributary (Lat 34.9672, Long −120.1184); Unnamed Tributary (Lat 34.9682, Long −120.0980); Unnamed Tributary (Lat 34.9973, Long −120.0652); Unnamed Tributary (Lat 34.9922, Long −120.0284); Unnamed Tributary (Lat 35.0158, Long −120.0328); Unnamed Tributary (Lat 34.9464, Long −120.0298); Horse Creek (Lat 34.8373, Long −120.0161); Manzana Creek (Lat 34.7082, Long −119.8314); Davey Brown Creek (Lat 34.7541, Long −119.9641); Unnamed Tributary (Lat 34.7544, Long −119.9466); Fish Creek (Lat 34.7532, Long −119.9090); Unnamed Tributary (Lat 34.7466, Long −119.9038); Unnamed Tributary (Lat 34.7647, Long −119.8664); Water Canyon (Lat 34.8754, Long −119.9314); Unnamed Tributary (Lat 34.8726, Long −119.9515); Unnamed Tributary (Lat 34.8884, Long −119.9315); Unnamed Tributary (Lat 34.8660, Long −119.8972); Abel Canyon (Lat 34.8662, Long −119.8344); Unnamed Tributary (Lat 34.8677, Long −119.8503); Unnamed Tributary (Lat 34.8608, Long −119.8531); Unnamed Tributary (Lat 34.8785, Long −119.8448); Unnamed Tributary (Lat 34.8615, Long −119.8149); Unnamed Tributary (Lat 34.8694, Long −119.8220); Unnamed Tributary (Lat 34.7931, Long −119.8475); Unnamed Tributary (Lat 34.7846, Long −119.8327); Foresters Leap (Lat 34.8112, Long −119.7445); Unnamed Tributary (Lat 34.7873, Long −119.7674); Unnamed Tributary (Lat 34.7866, Long −119.7542); Unnamed Tributary (Lat 34.8129, Long −119.7704); Unnamed Tributary (Lat 34.7760, Long −119.7439); South Fork Sisquoc River (Lat 34.7300, Long −119.7868); Unnamed Tributary (Lat 34.7579, Long −119.7989); Unnamed Tributary (Lat 34.7510, Long −119.7912); Unnamed Tributary (Lat 34.7769, Long −119.7139); Unnamed Tributary (Lat 34.7617, Long −119.6868); Judell Creek (Lat 34.7613, Long −119.6486); Unnamed Tributary (Lat 34.7680, Long −119.6494); Unnamed Tributary (Lat 34.7738, Long −119.6483); Unnamed Tributary (Lat 34.7333, Long −119.6277); Unnamed Tributary (Lat 34.7519, Long −119.6199); Unnamed Tributary (Lat 34.7188, Long −119.6663); Sisquoc River (Lat 34.7087, Long −119.6399).

(2) Santa Ynez Hydrologic Unit 3314—*(i) Mouth of Santa Ynez Hydrologic Sub-area 331410.* Outlet(s) = Santa Ynez River (Lat 34.6930, Long −120.6023) upstream to endpoint(s) in: San Miguelito Creek (Lat 34.6310, Long −120.4623).

(ii) Santa Ynez, Salsipuedes Hydrologic Sub-area 331420. Outlet(s) = Santa Ynez River (Lat 34.6335, Long −120.4116) upstream to endpoint(s) in: Salsipuedes Creek (Lat 34.5711, Long −120.4066); El Jaro Cr (Lat 34.5327, Long −120.2851); Llanito Cr (Lat 34.5500, Long −120.2752); El Callejon (Lat 34.5476, Long −120.2691).

(iii) Santa Ynez, Zaca Hydrologic Sub-area 331430. Outlet(s) = Santa Ynez River (Lat 34.6172, Long −120.2352) upstream.

(iv) Santa Ynez to Bradbury Hydrologic Sub-area 331440. Outlet(s) = Santa Ynez River (Lat 34.5847, Long −120.1435) upstream to endpoint(s) in: Alisal Creek (Lat 34.5465, Long −120.1348); Alamo Pintado Creek (Lat 34.7207, Long −120.1047); Quiota Creek (Lat 34.5370, Long −120.0311); Santa Agueda Creek (Lat 34.7288, Long −119.9720); San Lucas Creek (Lat 34.5558, Long −120.0109); Unnamed Tributary (Lat 34.5646, Long −120.0033); Hilton Creek (Lat 34.5839, Long −119.9845); Santa Ynez River (Lat 34.5829, Long −119.9795).

(3) South Coast Hydrologic Unit 3315—*(i) Arroyo Hondo Hydrologic Sub-area 331510.* Outlet(s) = Jalama Creek (Lat 34.5119, Long −120.5013); Cojo Creek (Lat 34.4531, Long −120.4155); San Augustine Creek (Lat 34.4588, Long −120.3532); Santa Anita Creek (Lat 34.4669, Long −120.3056); Sacate Creek (Lat 34.4935, Long −120.2990); Alegria Creek (Lat 34.4688, Long −120.2710); Gaviota Creek (Lat 34.4706, Long −120.2257); San Onofre Creek (Lat 34.4699, Long −120.1863); Arroyo Hondo Creek (Lat 34.4735, Long −120.1405); Refugio Creek (Lat 34.4627, Long −120.0686); El Capitan Creek (Lat 34.4577, Long −120.0215); Gato Creek (Lat 34.4498, Long −119.9876); Dos Pueblos Creek (Lat 34.4408, Long −119.9636); Tecolote Creek (Lat 34.4306, Long −119.9163) upstream to endpoint(s) in: Jalama Creek (Lat 34.5031, Long −120.3605); Escondido Creek (Lat 34.5663, Long −120.4633); Unnamed Tributary (Lat 34.5527, Long −120.4538); Cojo Creek (Lat 34.4840, Long −120.4096); La Olla (Lat 34.4836, Long −120.4061); San Augustine Creek (Lat 34.4598, Long −120.3551); Santa Anita Creek (Lat 34.4742, Long −120.3075); Sacate Creek (Lat 34.4984, Long −120.2983); Unnamed Tributary (Lat 34.4972, Long −120.3016); Alegria Creek (Lat 34.4713, Long −120.2704); Gaviota Creek (Lat 34.5176, Long −120.2170); San Onofre Creek (Lat 34.4853, Long −120.1881); Arroyo Hondo Creek (Lat 34.5112, Long −120.1694); Refugio Creek (Lat 34.5110, Long −120.0499); El Capitan Creek (Lat 34.5238, Long −119.9796); Gato Creek (Lat 34.5204, Long −119.9748); Dos Pueblos Creek (Lat 34.5230, Long −119.9239); Tecolote Creek (Lat 34.5133, Long −119.9049).

(ii) UCSB Slough Hydrologic Sub-area 331531. Outlet(s) = Tecolito Creek (Lat 34.4179, Long −119.8285); San Pedro Creek (Lat 34.4179, Long −119.8285) upstream to endpoint(s) in: Carneros Creek (Lat 34.4674, Long −119.8574); Tecolito Creek (Lat 34.4478, Long −119.8754); Glen Annie Creek (Lat 34.4985, Long −119.8657); Unnamed Tributary (Lat 34.4774, Long −119.8836); Maria Ygnacio Creek (Lat 34.4900, Long −119.7820); San Antonio Creek (Lat 34.4553, Long −119.7816); Atascadero Creek (Lat 34.4690, Long −119.7555); San Jose Creek (Lat 34.4919, Long −119.8023); San Pedro Creek (Lat 34.4774, Long −119.8349).

(iii) Mission Hydrologic Sub-area 331532. Outlet(s) = Arroyo Burro Creek (Lat 34.4023, Long −119.7420); Mission Creek (Lat 34.4124, Long −119.6866); Sycamore Creek (Lat 34.4166, Long −119.6658) upsream to endpoint(s) in: San Roque Creek (Lat 34.4530, Long −119.7314); Arroyo Burro Creek (Lat 34.4620, Long −119.7451); Rattlesnake Creek (Lat 34.4633, Long −119.6893); Mission Creek (Lat 34.4482, Long −119.7079); Sycamore Creek (Lat 34.4609, Long −119.6832).

(iv) San Ysidro Hydrologic Sub-area 331533. Outlet(s) = Montecito Creek (Lat 34.4167, Long −119.6334); San Ysidro Creek (Lat 34.4191, Long −119.6244); Romero Creek (Lat 34.4186, Long −119.6198) upstream to endpoint(s) in: Montecito Creek (Lat 34.4594, Long −119.6532); Unnamed Tributary (Lat 34.4753, Long −119.6428); Cold Springs Creek (Lat 34.4794, Long −119.6594); San Ysidro Creek (Lat

34.4686, Long −119.6220); Romero Creek (Lat 34.4452, Long −119.5914).

(v) Carpinteria Hydrologic Sub-area 331534. Outlet(s) = Arroyo Paredon (Lat 34.4146, Long −119.5551); Carpenteria Salt Marsh (Santa Monica Creek) (Lat 34.3961, Long −119.5365); Carpenteria Lagoon (Carpenteria Creek) (Lat 34.3904, Long −119.5195); Rincon Lagoon (Rincon Creek) (Lat 34.3733, Long −119.4759) upstream to endpoint(s) in: Arroyo Paredon (Lat 34.4371, Long −119.5471); Carpenteria Salt Marsh (Santa Monica Creek) (Lat 34.4003, Long −119.5289); Carpenteria Salt Marsh (Franklin Creek) (Lat 34.3992, Long −119.5265); Carpinteria Creek (Lat 34.4429, Long −119.4955); Unnamed Tributary (Lat 34.4481, Long −119.5102); Gobernador Creek (Lat 34.4249, Long −119.4737); Steer Creek (Lat 34.4687, Long −119.4586); El Dorado Creek (Lat 34.4682, Long −119.4800); Rincon Lagoon (Rincon Creek) (Lat 34.3757, Long −119.4767).

(4) Ventura River Hydrologic Unit 4402—*(i) Ventura Hydrologic Sub-area 440210.* Outlet(s) = Ventura Estuary (Ventura River) (Lat 34.2742, Long −119.3067) upstream to endpoint(s) in: Canada Larga (Lat 34.3675, Long −119.2367); Sulphur Canyon (Lat 34.3727, Long −119.2353); Hammond Canyon (Lat 34.3903, Long −119.2220); Unnamed Tributary (Lat 34.3344, Long −119.2416); Unnamed Tributary (Lat 34.3901, Long −119.2737).

(ii) Ventura Hydrologic Sub-area 440220. Outlet(s) = Ventura River (Lat 34.3517, Long −119.3059); San Antonio Creek (Lat 34.3797, Long −119.3063) upstream to endpoint(s) in: Ventura River (Lat 34.4852, Long −119.2985); Matilija Creek (Lat 34.4846, Long −119.3076); North Fork Matilija Creek (Lat 34.5129, Long −119.2728); Coyote Creek (lower) (Lat 34.3735, Long −119.3327).

(iii) Lions Hydrologic Sub-area 440231. Outlet(s) = Lion Creek (Lat 34.4222, Long −119.2632) upstream to endpoint(s) in: Lion Creek (Lat 34.4331, Long −119.1995).

(iv) Thatcher Hydrologic Sub-area 440232. Outlet(s) = San Antonio Creek (Lat 34.4224, Long −119.2635) upstream to endpoint(s) in: San Antonio Creek (Lat 34.4674, Long −119.2029); Unnamed Tributary (Lat 34.4729, Long −119.2250); Unnamed Tributary (Lat 34.4948, Long −119.1934); Thacher Creek (Lat 34.5016, Long −119.1863); Unnamed Tributary (Lat 34.4876, Long −119.2127); Unnamed Tributary (Lat 34.4992, Long −119.2125); Thacher Creek (Lat 34.4876, Long −119.1675); Reeves Creek (Lat 34.4902, Long −119.1426).

(5) Santa Clara-Calleguas Hydrologic Unit 4403—*(i) Mouth of Santa Clara Hydrologic Sub-area 440310.* Outlet(s) = Santa Clara River (Lat 34.2348, Long −119.2559) upstream.

(ii) Santa Clara, Santa Paula Hydrologic Sub-area 440321. Outlet(s) = Santa Clara River (Lat 34.2731, Long −119.1464) upstream to endpoint(s) in: Santa Paula Creek (Lat 34.4500, Long −119.0554).

(iii) Sisar Hydrologic Sub-area 440322. Outlet(s) = Sisar Creek (Lat 34.4271, Long −119.0900) upstream to endpoint(s) in: Sisar Creek (Lat 34.4615, Long −119.1303).

(iv) Sespe, Santa Clara Hydrologic Sub-area 440331. Outlet(s) = Santa Clara River (Lat 34.3513, Long −119.0388); Sespe Creek (Lat 34.3774, Long −118.9562) upstream to endpoint(s) in: Pole Creek (Lat 34.4384, Long −118.8876).

(v) Sespe Hydrologic Sub-area 440332. Outlet(s) = Sespe Creek (Lat 34.4509, Long −118.9249) upstream to endpoint(s) in: Little Sespe Creek (Lat 34.4598, Long −118.8929); Fourfork Creek (Lat 34.4735, Long −118.8884); Pine Canyon Creek (Lat 34.4488, Long −118.9651); Unnamed Tributary (Lat 34.5125, Long −118.9302); West Fork Sespe Creek (Lat 34.5106, Long −119.0492); Alder Creek (Lat 34.5691, Long −118.9519); Unnamed Tributary (Lat 34.5537, Long −119.0039); Unnamed Tributary (Lat 34.5537, Long −119.0078); Park Creek (Lat 34.5537, Long −119.0019); Red Reef Creek (Lat 34.5344, Long −119.0432); Timber Creek (Lat 34.5184, Long −119.0688); Bear Creek (Lat 34.5314, Long −119.1031); Trout Creek (Lat 34.5869, Long −119.1350); Piedra Blanca Creek (Lat 34.6109, Long −119.1828); Lion Creek (Lat 34.5047, Long −119.1092); Howard Creek (Lat 34.5459, Long −119.2144); Rose Valley Creek (Lat 34.5195, Long −119.1747); Tule Creek (Lat 34.5615, Long −119.2977); Unnamed Tributary (Lat 34.5757, Long −119.3042); Unnamed Tributary (Lat 34.5988, Long −119.2726); Portrero John Creek (Lat 34.6010, Long −119.2685); Munson Creek (Lat 34.6152, Long −119.2954); Chorro Grande Creek (Lat 34.6285, Long −119.3236); Unnamed Tributary (Lat 34.5691, Long −119.3418); Lady Bug Creek (Lat 34.5724, Long −119.3163); Abadi Creek (Lat 34.6099, Long −119.4213); Sespe Creek (Lat 34.6295, Long −119.4402).

(vi) Santa Clara, Hopper Canyon, Piru Hydrologic Sub-area 440341. Outlet(s) = Santa Clara River (Lat 34.3860, Long −118.8702) upstream to endpoint(s) in: Hopper Creek (Lat 34.4264, Long −118.8299); Santa Clara River (Lat 34.3996, Long −118.7828); Piru Creek (Lat 34.4613, Long −118.7528).

(6) Santa Monica Bay Hydrologic Unit 4404—*(i) Topanga Hydrologic Sub-area 440411.* Outlet(s) = Topanga Creek (Lat 34.0397, Long −118.5821) upstream to endpoint(s) in: Topanga Creek (Lat 34.0838, Long −118.5971).

(ii) Malibu Hydrologic Sub-area 440421. Outlet(s) = Malibu Creek (Lat 34.0322, Long −118.6787) upstream to endpoint(s) in: Malibu Creek (Lat 34.0648, Long −118.6978).

(iii) Arroyo Sequit Hydrologic Sub-area 440444. Outlet(s) = Arroyo Sequit (Lat 34.0445, Long −118.9329) upstream to endpoint(s) in: Arroyo Sequit (Lat 34.0834, Long −118.9178); West Fork Arroyo Sequit (Lat 34.0909, Long −118.9225).

(7) Calleguas Hydrologic Unit 4408—*Calleguas Estuary Hydrologic Sub-area 440813.* Outlet(s) = Mugu Lagoon (Calleguas Creek) (Lat 34.1093, Long −119.0917) upstream to endpoint(s) in: Mugu Lagoon (Calleguas Creek) (Lat 34.1125, Long −119.0816).

(8) San Juan Hydrologic Unit 4901—*(i) Trabuco Hydrologic Sub-area 490121.* Outlet(s) = Trabuco Creek (Lat 33.5164, Long −117.6718); upstream.

(ii) Upper Trabuco Hydrologic Sub-area 490122. Outlet(s) = Trabuco Creek (Lat 33.6619, Long −117.5789) upstream to endpoint(s) in: Trabuco Creek (Lat 33.6827, Long −117.4572).

(iii) Middle Trabuco Hydrologic Sub-area 490123. Outlet(s) = Trabuco Creek (Lat 33.5185, Long −117.6718) upstream.

(iv) Middle San Juan Hydrologic Sub-area 490124. Outlet(s) = San Juan Creek (Lat 33.5238, Long −117.6127) upstream.

(v) Upper San Juan Hydrologic Sub-area 490125. Outlet(s) = San Juan Creek (Lat 33.5199, Long −117.5605) upstream to endpoint(s) in: San Juan Creek (Lat 33.6092, Long −117.4387).

(vi) Mid-upper San Juan Hydrologic Sub-area 490126. Outlet(s) = San Juan Creek (Lat 33.5241, Long −117.6124) upstream.

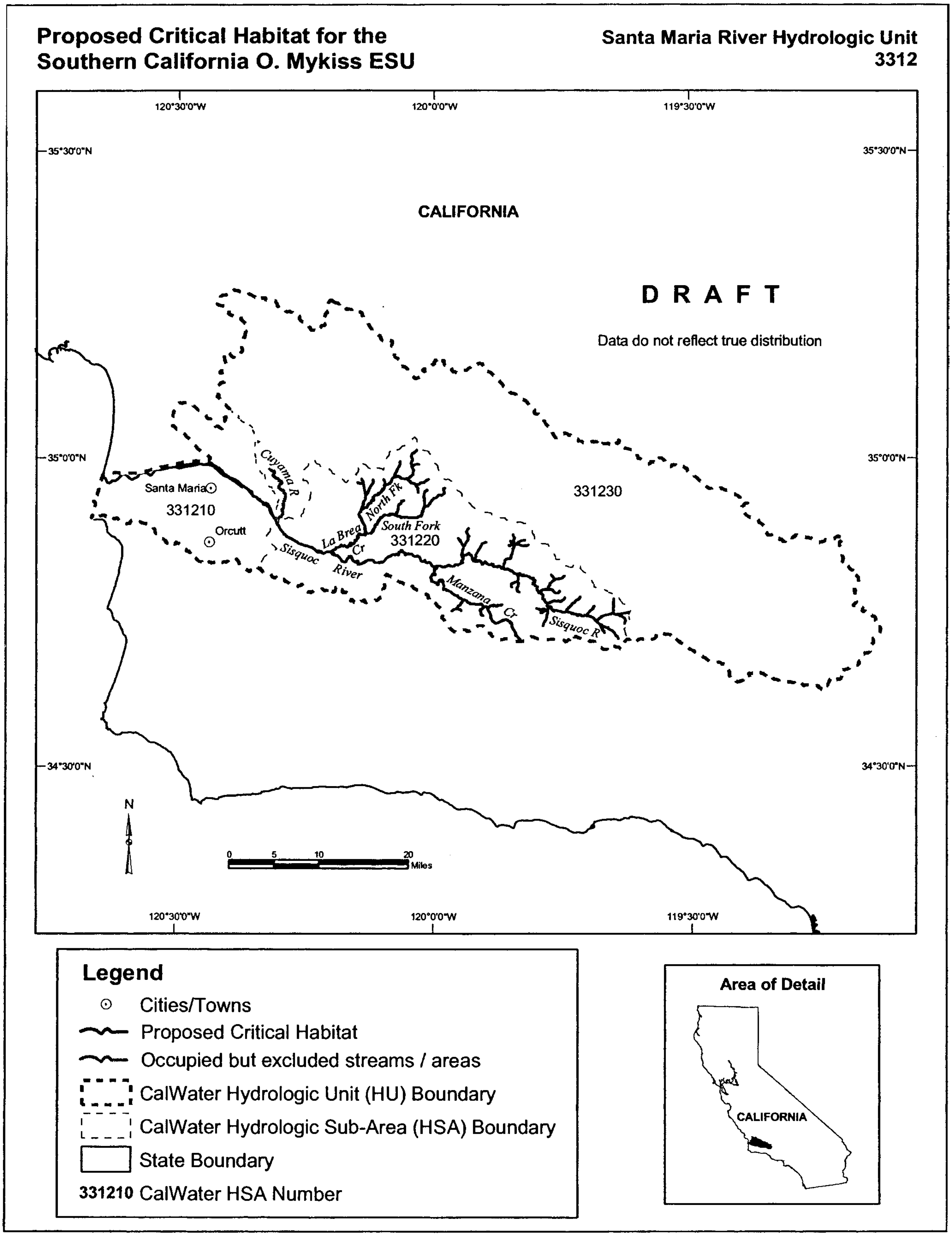
(vii) Lower San Juan Hydrologic Sub-area 490127. Outlet(s) = San Juan Creek (Lat 33.4621, Long −117.6833); Trabuco Creek (Lat 33.5164, Long −117.6718) upstream.

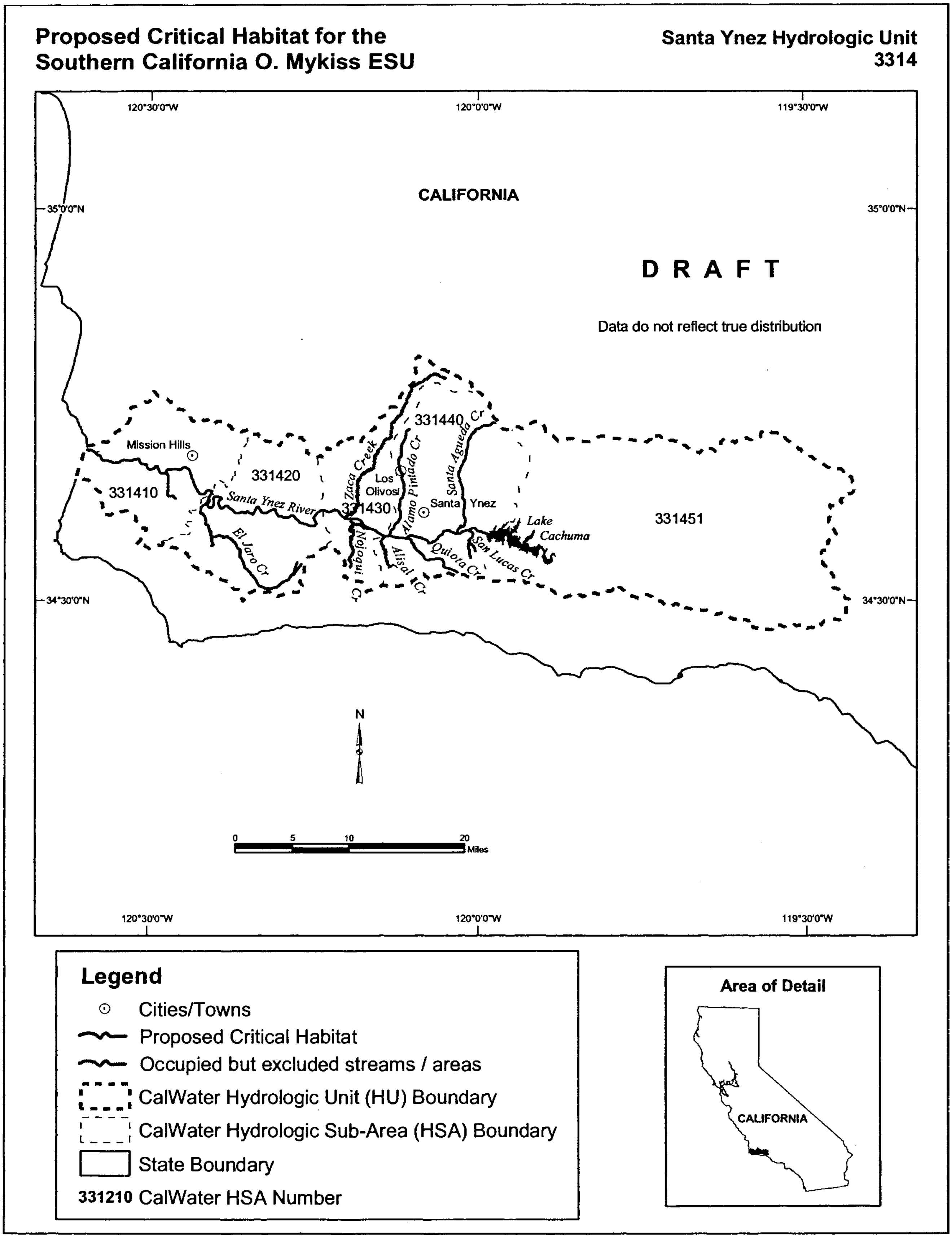
(viii) Middle San Juan Hydrologic Sub-area 490128. Outlet(s) = San Juan Creek (Lat 33.4969, Long −117.6551) upstream.

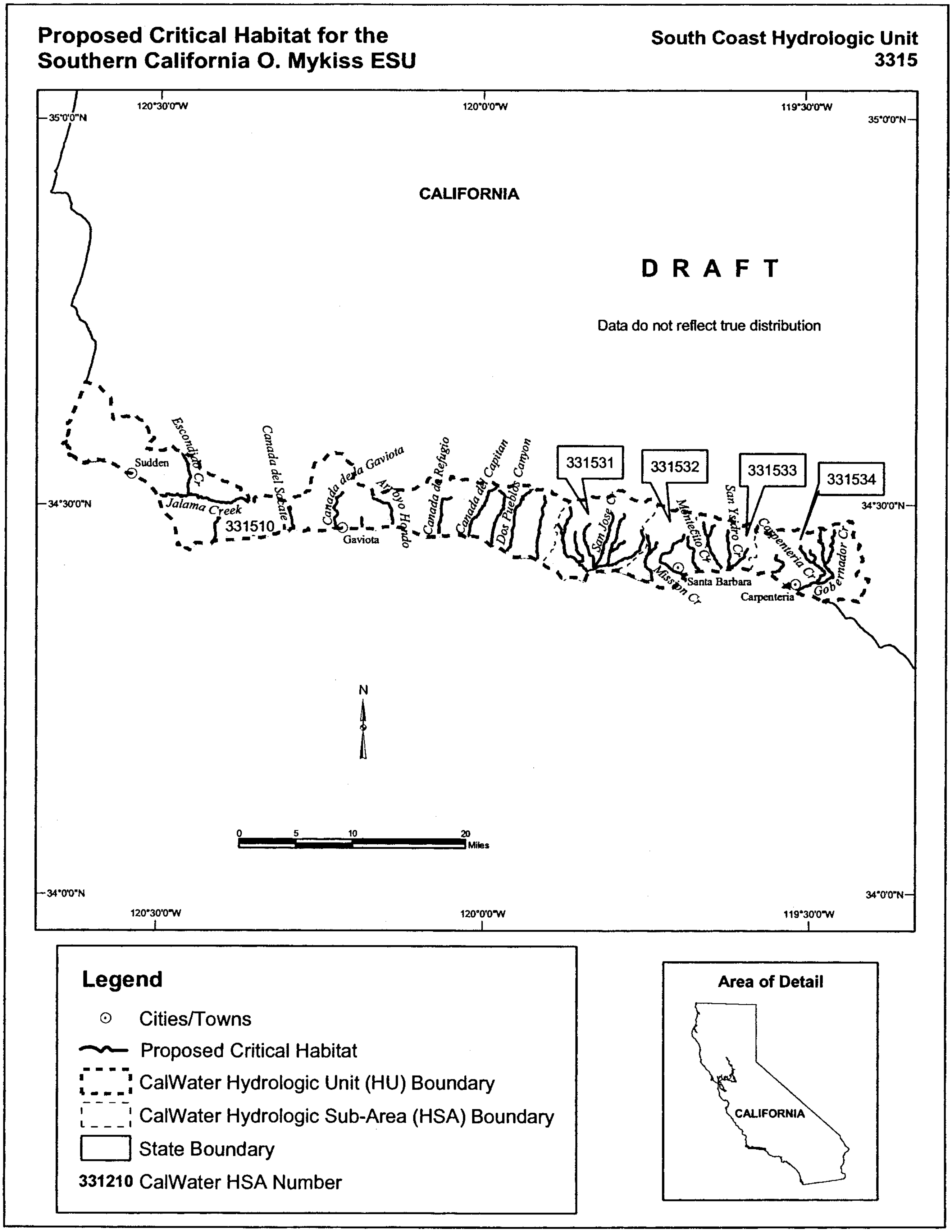
(ix) San Mateo Hydrologic Sub-area 490140. Outlet(s) = San Mateo Creek (Lat 33.3851, Long −117.5924) upstream to endpoint(s) in: San Mateo Creek (Lat 33.4827, Long −117.3692); San Mateo Canyon (Lat 33.4957, Long −117.4513).

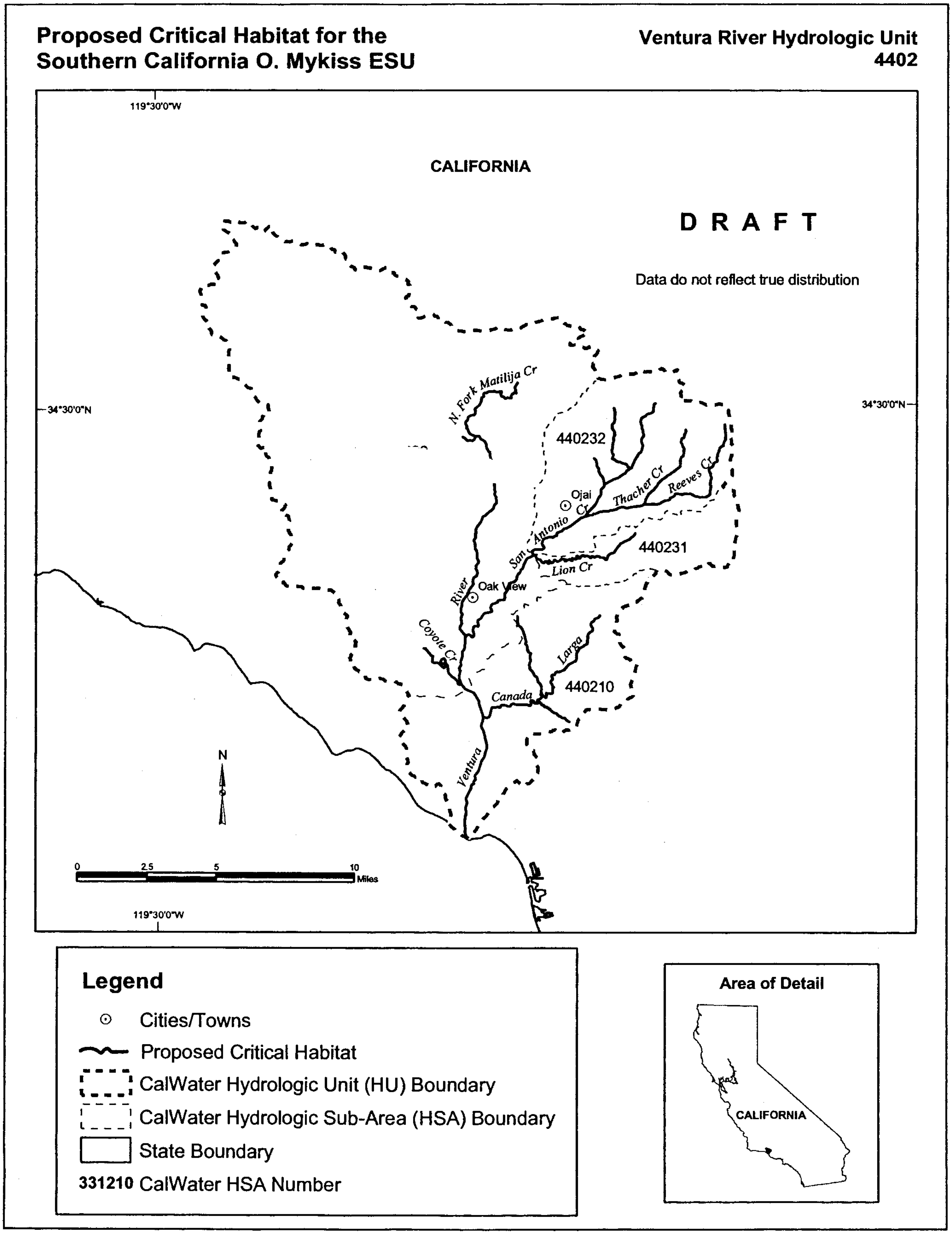
(9) Maps of proposed critical habitat for the Southern California *O. mykiss* ESU follow:

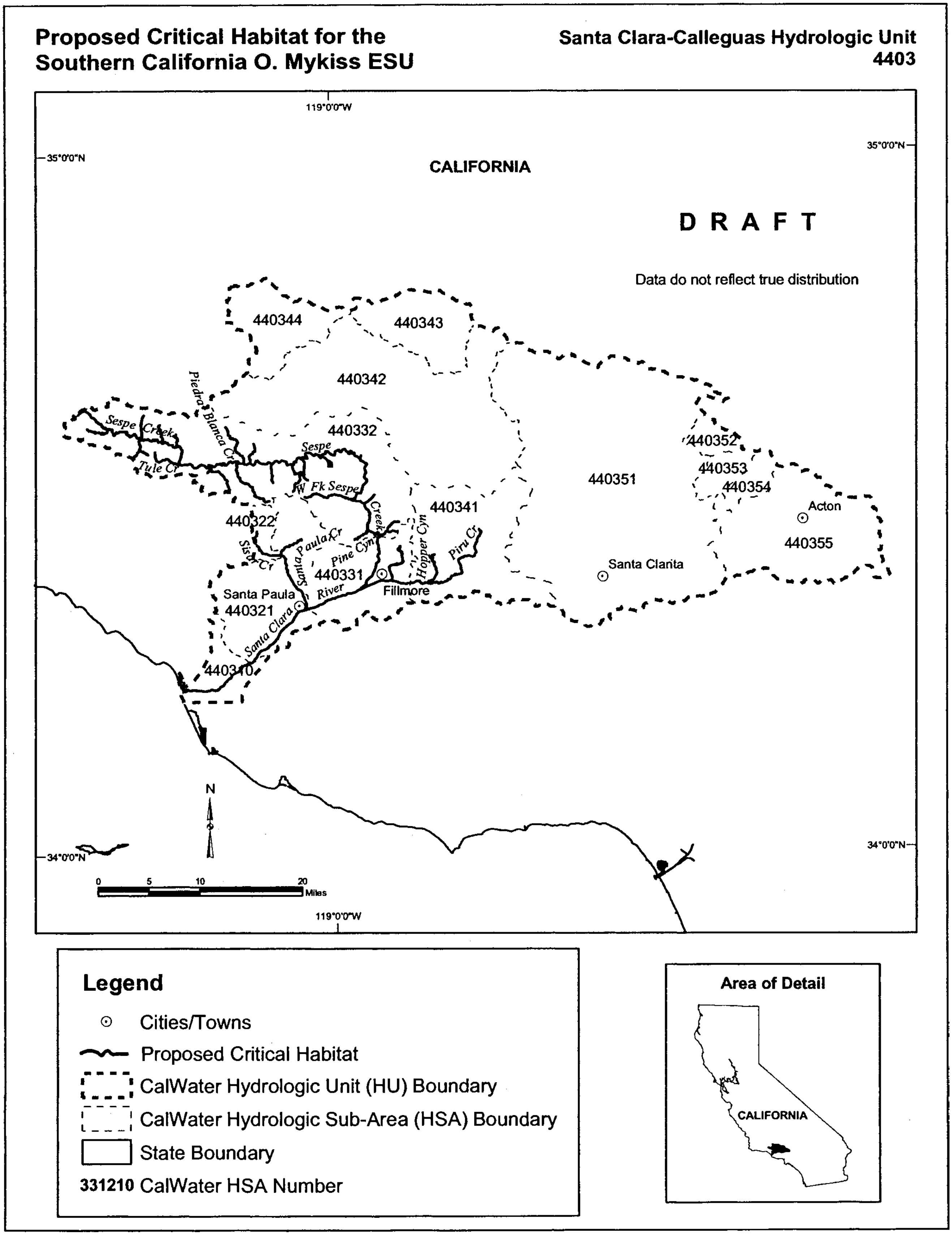
BILLING CODE 3510–22–P

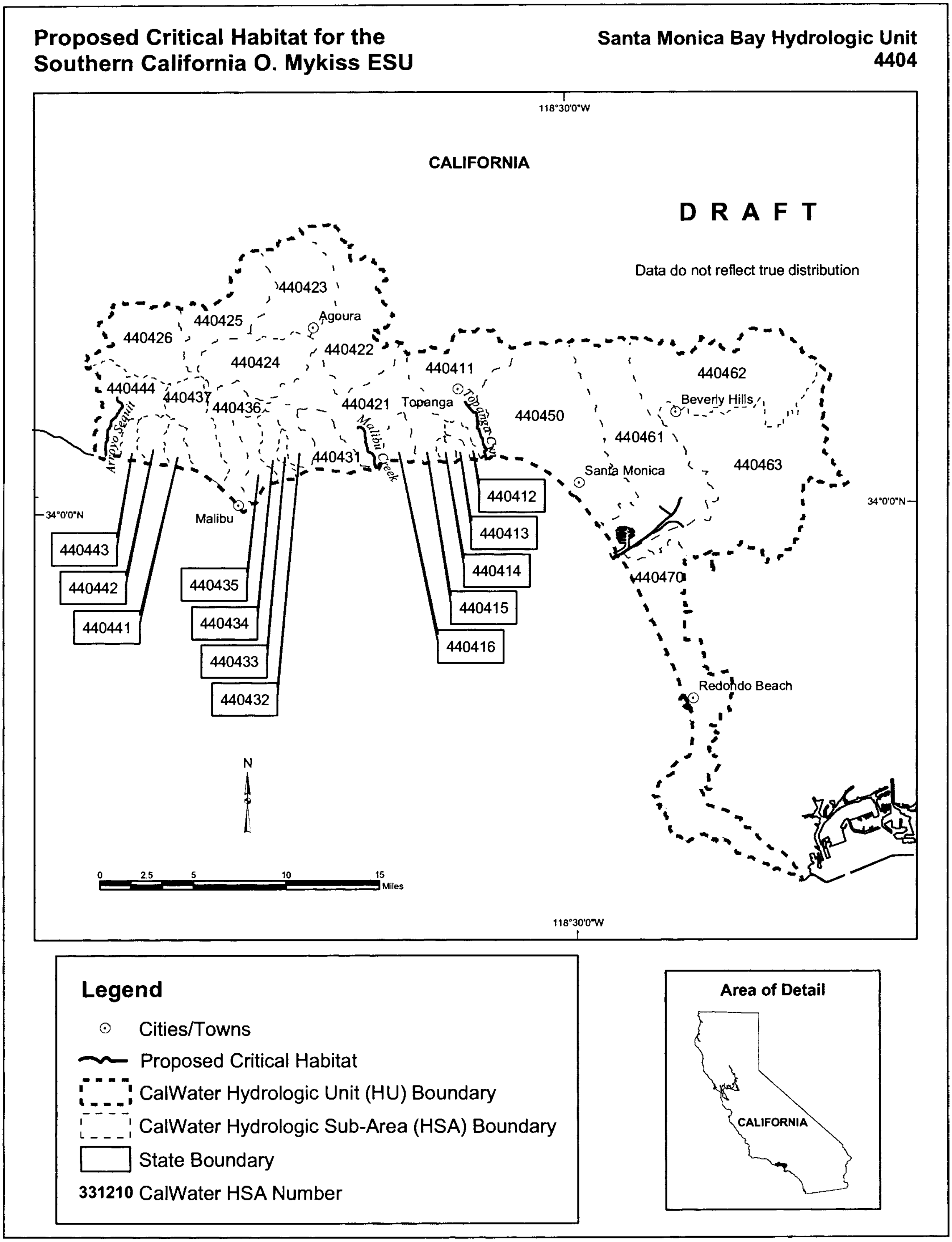

Proposed Critical Habitat for the
Southern California O. Mykiss ESU
Santa Maria River Hydrologic Unit
3312
120°30'0"W
120°0'0"W
119°30'0"W
35°30'0"N
35°0'0"N
34°30'0"N
CALIFORNIA
DRAFT
Data do not reflect true distribution
Santa Maria
331210
Orcutt
Cuyama R
North Fk
La Brea Cr
South Fork
331220
Sisquoc River
Manzana Cr
Sisquoc R
331230
N
0 5 10 20 Miles
Legend
Cities/Towns
Proposed Critical Habitat
Occupied but excluded streams / areas
CalWater Hydrologic Unit (HU) Boundary
CalWater Hydrologic Sub-Area (HSA) Boundary
State Boundary
331210 CalWater HSA Number
Area of Detail
CALIFORNIA

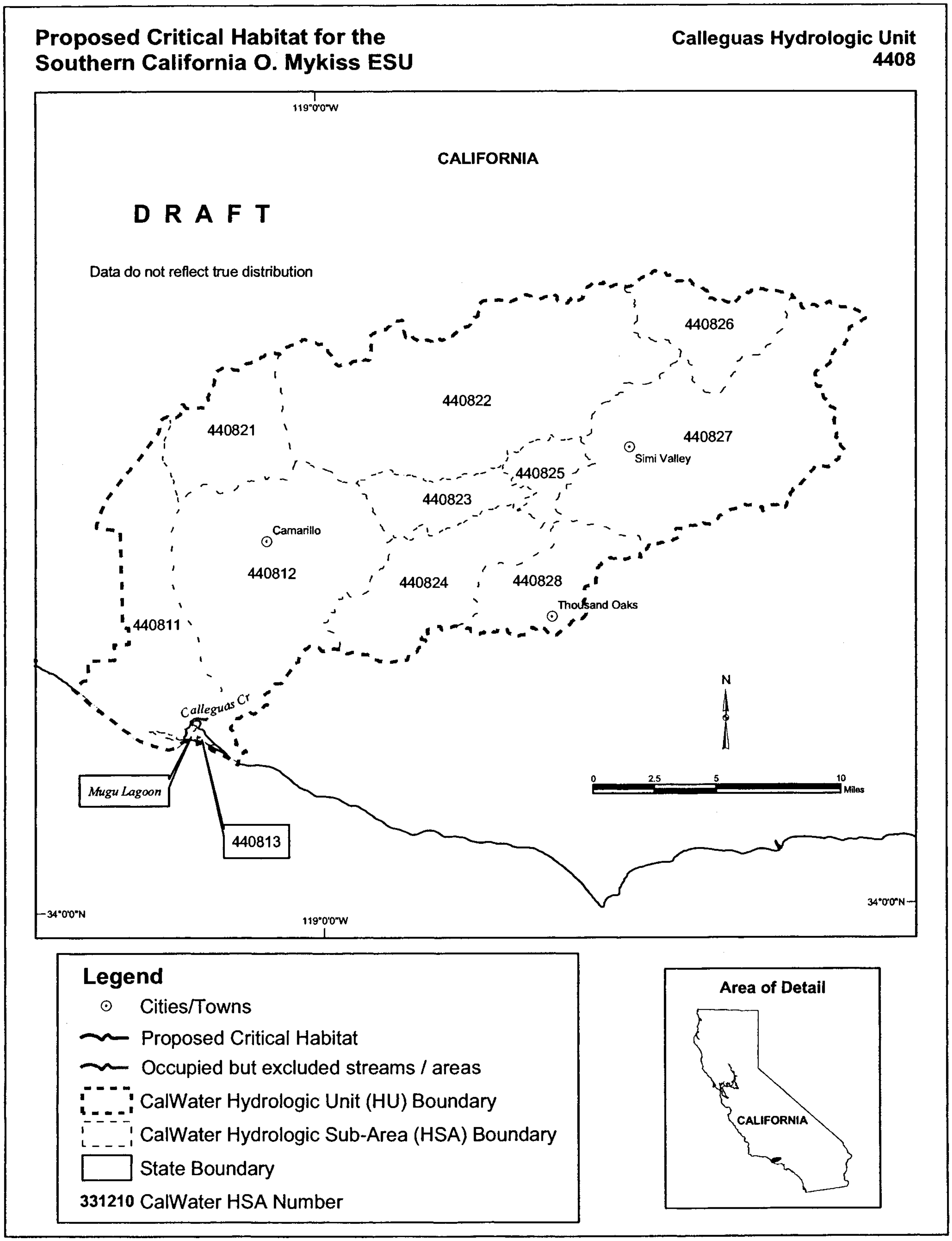

Proposed Critical Habitat for the
Southern California O. Mykiss ESU
Santa Ynez Hydrologic Unit
3314
120°30'0"W
120°0'0"W
119°30'0"W
CALIFORNIA
35°0'0"N
DRAFT
Data do not reflect true distribution
Mission Hills
331410
331420
331430
331440
331451
Santa Ynez River
Zaca Creek
Los Olivos
Alamo Pinfado Cr
Santa Agueda Cr
Santa Ynez
Lake Cachuma
El Jaro Cr
Nojoqui Cr
Alisal Cr
Quiota Cr
San Lucas Cr
34°30'0"N
N
0 5 10 20 Miles
Legend
Cities/Towns
Proposed Critical Habitat
Occupied but excluded streams / areas
CalWater Hydrologic Unit (HU) Boundary
CalWater Hydrologic Sub-Area (HSA) Boundary
State Boundary
331210 CalWater HSA Number
Area of Detail
CALIFORNIA

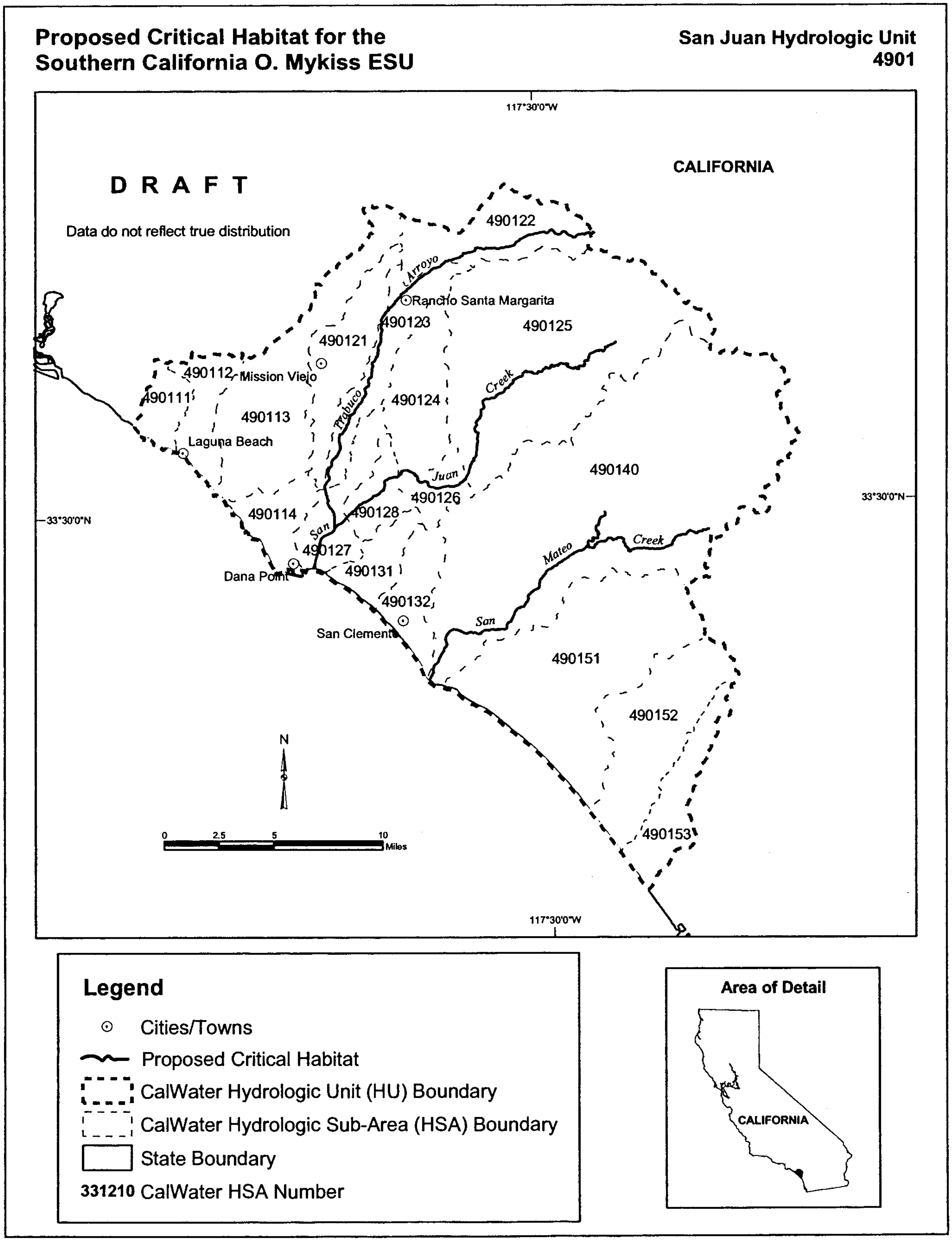

Proposed Critical Habitat for the
Southern California O. Mykiss ESU
South Coast Hydrologic Unit
3315
CALIFORNIA
D R A F T
Data do not reflect true distribution
120°30'0"W
120°0'0"W
119°30'0"W
35°0'0"N
34°30'0"N
34°0'0"N
Sudden
Escondido Cr
Jalama Creek
331510
Canada del Sacate
Canada de la Gaviota
Gaviota
Arroyo Hondo
Canada de Refugio
Canada del Capitan
Dos Pueblos Canyon
331531
331532
331533
331534
San Jose Cr
Montecito Cr
San Ysidro Cr
Carpenteria Cr
Gobernador Cr
Mission Cr
Santa Barbara
Carpenteria
N
0
5
10
20
Miles
Legend
Cities/Towns
Proposed Critical Habitat
CalWater Hydrologic Unit (HU) Boundary
CalWater Hydrologic Sub-Area (HSA) Boundary
State Boundary
331210 CalWater HSA Number
Area of Detail
CALIFORNIA


Proposed Critical Habitat for the
Southern California O. Mykiss ESU
Ventura River Hydrologic Unit
4402
119°30'0"W
CALIFORNIA
D R A F T
Data do not reflect true distribution
34°30'0"N
N. Fork Matilija Cr
440232
Ojai
Cr
Thacher Cr
Reeves Cr
San Antonio
440231
Lion Cr
Oak View
River
Coyote Cr
Larga
440210
Canada
Ventura
N
0
2.5
5
10
Miles
Legend
Cities/Towns
Proposed Critical Habitat
CalWater Hydrologic Unit (HU) Boundary
CalWater Hydrologic Sub-Area (HSA) Boundary
State Boundary
331210 CalWater HSA Number
Area of Detail
CALIFORNIA


Proposed Critical Habitat for the
Southern California O. Mykiss ESU
Santa Clara-Calleguas Hydrologic Unit
4403
119°0'0"W
35°0'0"N
CALIFORNIA
D R A F T
Data do not reflect true distribution
440344
440343
440342
440332
440341
440351
440352
440353
440354
440355
440322
440331
440321
440310
Sespe Creek
Tule Cr
Piedra Blanca Cr
Sespe
W Fk Sespe
Creek
Santa Paula Cr
Pine Cyn
Hopper Cyn
Piru Cr
Sisar Cr
Santa Clara River
Santa Paula
Fillmore
Santa Clarita
Acton
N
34°0'0"N
0 5 10 20 Miles
Legend
Cities/Towns
Proposed Critical Habitat
CalWater Hydrologic Unit (HU) Boundary
CalWater Hydrologic Sub-Area (HSA) Boundary
State Boundary
331210 CalWater HSA Number
Area of Detail
CALIFORNIA


Proposed Critical Habitat for the
Southern California O. Mykiss ESU
Santa Monica Bay Hydrologic Unit
4404
118°30'0"W
CALIFORNIA
D R A F T
Data do not reflect true distribution
440423
440425
Agoura
440426
440422
440424
440411
440462
440444
440437
440436
440421
Topanga
Topanga Cyn
440450
Beverly Hills
Arroyo Sequit
Malibu Creek
440461
440431
Santa Monica
440463
440412
34°0'0"N
Malibu
440413
440443
440414
440442
440435
440470
440415
440441
440434
440416
440433
440432
Redondo Beach
N
0
2.5
5
10
15
Miles
118°30'0"W
Legend
Cities/Towns
Proposed Critical Habitat
CalWater Hydrologic Unit (HU) Boundary
CalWater Hydrologic Sub-Area (HSA) Boundary
State Boundary
331210 CalWater HSA Number
Area of Detail
CALIFORNIA


Proposed Critical Habitat for the Southern California O. Mykiss ESU
Calleguas Hydrologic Unit 4408
119°0'0"W
CALIFORNIA
DRAFT
Data do not reflect true distribution
440826
440822
440821
440827
Simi Valley
440825
440823
Camarillo
440812
440824
440828
Thousand Oaks
440811
Calleguas Cr
Mugu Lagoon
440813
N
0 2.5 5 10 Miles
34°0'0"N
Legend
Cities/Towns
Proposed Critical Habitat
Occupied but excluded streams / areas
CalWater Hydrologic Unit (HU) Boundary
CalWater Hydrologic Sub-Area (HSA) Boundary
State Boundary
331210 CalWater HSA Number
Area of Detail
CALIFORNIA



BILLING CODE 3510–22–C

(k) *Central Valley spring-run chinook (Oncorhynchus tshawytscha).* Critical habitat is proposed to include the areas defined in the following units:

(1) Tehama Hydrologic Unit 5504—*(i) Lower Stony Creek Hydrologic Sub-area 550410.* Outlet(s) = Glenn-Colusa Canal (Lat 39.6762, Long −122.0151); Stony Creek (39.7122, −122.0072) upstream to endpoint(s) in: Glenn−Colusa Canal (39.7122, −122.0072); Stony Creek (39.8178, −122.3253).

(ii) Red Bluff Hydrologic Sub-area 550420. Outlet(s) = Sacramento River (Lat 39.6998, Long −121.9419) upstream to endpoint(s) in: Antelope Creek (40.2023, −122.1275); Big Chico Creek (39.7757, −121.7525); Blue Tent Creek (40.2284, −122.2551); Burch Creek (39.8526, −122.1502); Coyote Creek (40.0929, −122.1621); Craig Creek (40.1617, −122.1350); Deer Creek (40.0144, −121.9481); Dibble Creek (40.2003, −122.2420); Dye Creek (40.0904, −122.0767); Elder Creek (40.0526, −122.1717); Jewet Creek (39.8913, −122.1005); Kusal Slough (39.7577, −121.9699); Lindo Channel (39.7623, −121.7923); McClure Creek (40.0074, −122.1729); Mill Creek (40.0550, −122.0317); Mud Creek (39.7931, −121.8865); New Creek (40.1873, −122.1350); Oat Creek (40.0847, −122.1658); Pine Creek (39.8760, −121.9777); Red Bank Creek (40.1391, −122.2157); Reeds Creek (40.1687, −122.2377); Rice Creek (39.8495, −122.1626); Rock Creek (39.8189, −121.9124); Salt Creek (40.1869, −122.1845); Singer Creek (39.9200, −121.9612); Thomes Creek (39.8822, −122.5527); Toomes Creek (39.9808, −122.0642); Unnamed Tributary (39.8532, −122.1627); Unnamed Tributary (40.1682, −122.1459).

(2) Whitmore Hydrologic Unit 5507—*(i) Inks Creek Hydrologic Sub-area 550711.* Outlet(s) = Inks Creek (Lat 40.3305, Long −122.1520) upstream to endpoint(s) in: Inks Creek (40.3418, −122.1332).

(ii) Battle Creek Hydrologic Sub-area 550712. Outlet(s) = Battle Creek (Lat 40.4083, Long −122.1102) upstream to endpoint(s) in: Battle Creek (40.4228, −121.9975); North Fork Battle Creek (40.4746, −121.8436); South Fork Battle Creek (40.3549, −121.6861).

(iii) Inwood Hydrologic Sub-area 550722. Outlet(s) = Bear Creek (Lat 40.4352, Long −122.2039) upstream to endpoint(s) in: Bear Creek (40.4859, −122.1529); Dry Creek (40.4574, −122.1993).

(3) Redding Hydrologic Unit 5508—*(i) Enterprise Flat Hydrologic Sub-area 550810.* Outlet(s) = Sacramento River (Lat 40.2526, Long −122.1707) upstream to endpoint(s) in: Anderson Creek (40.3910, −122.1984); Ash Creek (40.4451, −122.1815); Battle Creek (40.4083, −122.1102); Churn Creek (40.5431, −122.3395); Clear Creek (40.5158, −122.5256); Cow Creek (40.5438, −122.1318); Olney Creek (40.5262, −122.3783); Paynes Creek (40.2810, −122.1587); South Cow Creek (40.5440, −122.1314); Stillwater Creek (40.4789, −122.2597).

(ii) Lower Cottonwood Hydrologic Sub-area 550820. Outlet(s) = Cottonwood Creek (Lat 40.3777, Long −122.1991) upstream to endpoint(s) in: Cottonwood Creek (40.3943, −122.5254); Middle Fork Cottonwood Creek (40.3314, −122.6663); South Fork Cottonwood Creek (40.1578, −122.5809).

(4) Eastern Tehama Hydrologic Unit 5509—*(i) Big Chico Creek Hydrologic Sub-area 550914.* Outlet(s) = Big Chico Creek (Lat 39.7777, Long −121.7495) upstream to endpoint(s) in: Big Chico Creek (39.8873, −121.6979).

(ii) Deer Creek Hydrologic Sub-area 550920. Outlet(s) = Deer Creek (Lat 40.0144, Long −121.9481) upstream to endpoint(s) in: Deer Creek (40.2019, −121.5130).

(iii) Upper Mill Creek Hydrologic Sub-area 550942. Outlet(s) = Mill Creek (Lat 40.0550, Long −122.0317) upstream to endpoint(s) in: Mill Creek (40.3997, −121.5135).

(iv) Antelope Creek Hydrologic Sub-area 550963. Outlet(s) = Antelope Creek (Lat 40.2023, Long −122.1272) upstream to endpoint(s) in: Antelope Creek (40.2416, −121.8630); North Fork Antelope Creek (40.2691, −121.8226); South Fork Antelope Creek (40.2309, −121.8325).

(5) Sacramento Delta Hydrologic Unit 5510—*Sacramento Delta Hydrologic Sub-area 551000.* Outlet(s) = Sacramento River (Lat 38.0612, Long −121.7948) upstream to endpoint(s) in: Cache Slough (38.3078, −121.7592); Delta Cross Channel (38.2433, −121.4964); Elk Slough (38.4140, −121.5212); Elkhorn Slough (38.2898, −121.6271); Georgiana Slough (38.2401, −121.5172); Miners Slough (38.2864, −121.6051); Prospect Slough (38.1477, −121.6641); Sevenmile Slough (38.1171, −121.6298); Steamboat Slough (38.1123, −121.5966); Sutter Slough (38.3321, −121.5838); Threemile Slough (38.1155, −121.6835); Yolo Bypass (38.5800, −121.5838).

(6) Valley-Putah-Cache Hydrologic Unit 5511—*Lower Putah Creek Hydrologic Sub-area 551120.* Outlet(s) = Yolo Bypass (Lat 38.5800, Long −121.5838) upstream to endpoint(s) in: Sacramento Bypass (38.6057, −121.5563); Yolo Bypass (38.7627, −121.6325).

(7) Marysville Hydrologic Unit 5515—*(i) Lower Yuba River Hydrologic Sub-area 551530.* Outlet(s) = Yuba River (Lat 39.1270, Long −121.5981) upstream to endpoint(s) in: Yuba River (39.2203, −121.3314).

(ii) Lower Feather River Hydrologic Sub-area 551540. Outlet(s) = Feather River (Lat 39.1270, Long −121.5981) upstream to endpoint(s) in: Feather River (39.5203, −121.5475).

(8) Yuba River Hydrologic Unit 5517—*(i) Browns Valley Hydrologic Sub-area 551712.* Outlet(s) = Dry Creek (Lat 39.2207, Long −121.4088); Yuba River (39.2203, −121.3314) upstream to endpoint(s) in: Dry Creek (39.3201, −121.3117); Yuba River (39.2305, −121.2813).

(ii) Englebright Hydrologic Sub-area 551714. Outlet(s) = Yuba River (Lat 39.2305, Long −121.2813) upstream to endpoint(s) in: Yuba River (39.2388, −121.2698).

(iii) Nevada City Hydrologic Sub-area 551720. Outlet(s) = Deer Creek (Lat 39.2303, Long −121.2813) upstream to endpoint(s) in: Deer Creek (39.2354, −121.2192).

(9) Valley-American Hydrologic Unit 5519—*Pleasant Grove Hydrologic Sub-area 551922.* Outlet(s) = Sacramento River (Lat 38.5965, Long −121.5086) upstream to endpoint(s) in: Feather River (39.1264, −121.5984).

(10) Colusa Basin Hydrologic Unit 5520—*(i) Sycamore-Sutter Hydrologic Sub-area 552010.* Outlet(s) = Sacramento River (Lat 38.7604, Long −121.6767) upstream.

(ii) Sutter Bypass Hydrologic Sub-area 552030. Outlet(s) = Sacramento River (Lat 38.7851, Long −121.6238) upstream to endpoint(s) in: Butte Creek (39.1987, −121.9285); Butte Slough (39.1987, −121.9285); Nelson Slough (38.8901, −121.6352); Sacramento Slough (38.7843, −121.6544); Sutter Bypass (39.1417, −121.8196; 39.1484, −121.8386); Unnamed Tributary (39.1586, −121.8747).

(iii) Butte Basin Hydrologic Sub-area 552040. Outlet(s) = Butte Creek (Lat 39.1990, Long −121.9286); Sacramento River (39.4141, −122.0087) upstream to endpoint(s) in: Butte creek (39.1949, −121.9361); Colusa Bypass (39.2276, −121.9402); Unnamed Tributary (39.6762, −122.0151).

(11) Butte Creek Hydrologic Unit 5521—*Upper Little Chico Hydrologic Sub-area 552130.* Outlet(s) = Butte Creek (Lat 39.7096, −121.7504) upstream to endpoint(s) in Butte Creek 3(9.8665, −121.6344).

(12) Shasta Bally Hydrologic Unit 5524—*(i) Platina Hydrologic Sub-area 552436.* Outlet(s) = Middle Fork Cottonwood Creek (Lat 40.3314, −122.6663) upstream to endpoint(s) in Beegum Creek (40.3066, −122.9205);

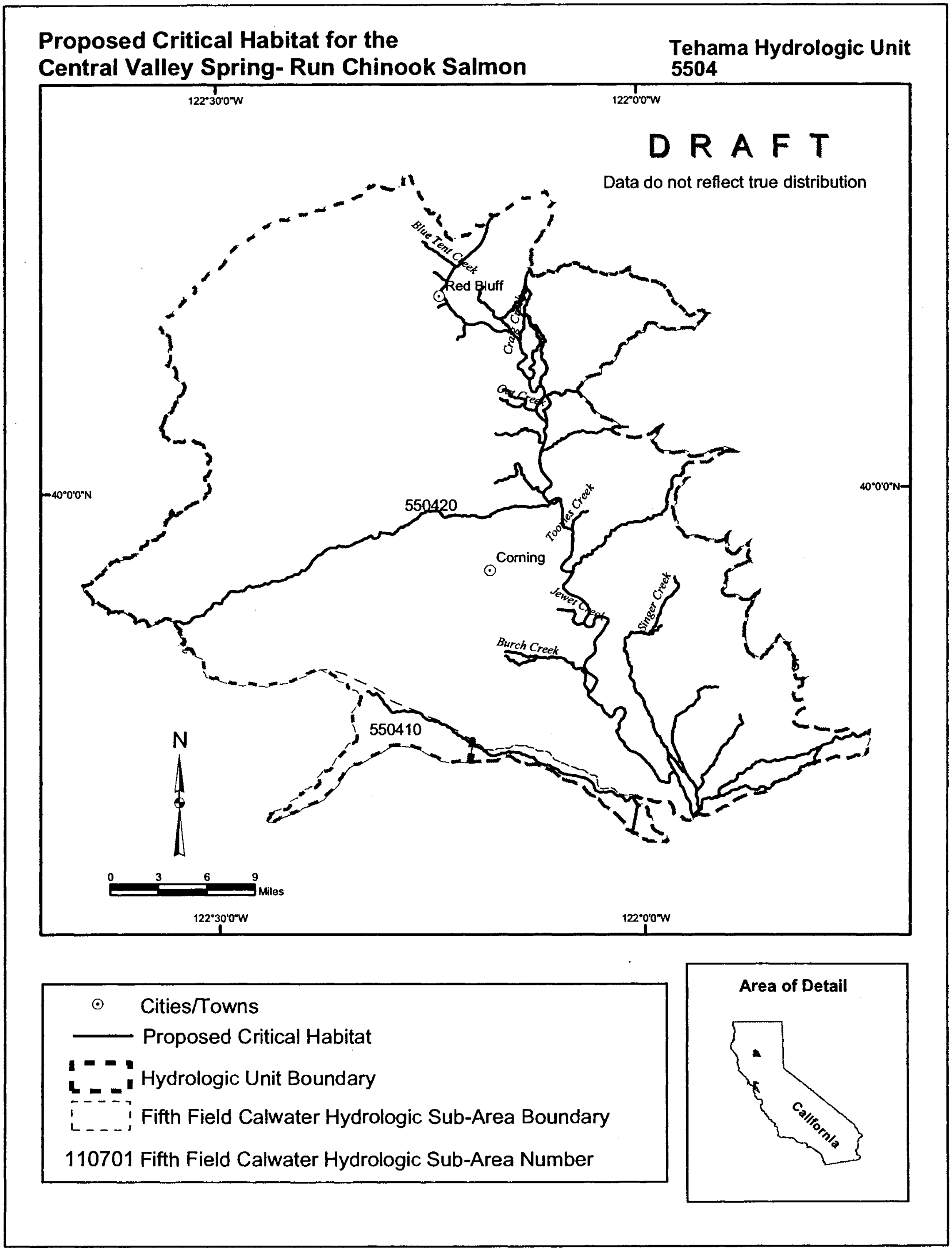
Middle Fork Cottonwood Creek (40.3655, −122.7451).

(ii) Spring Creek Hydrologic Sub-area 552440. Outlet(s) = Sacramento River (Lat 40.5943, Long −122.4343) upstream to endpoint(s) in: Sacramento River (40.6116, −122.4462)

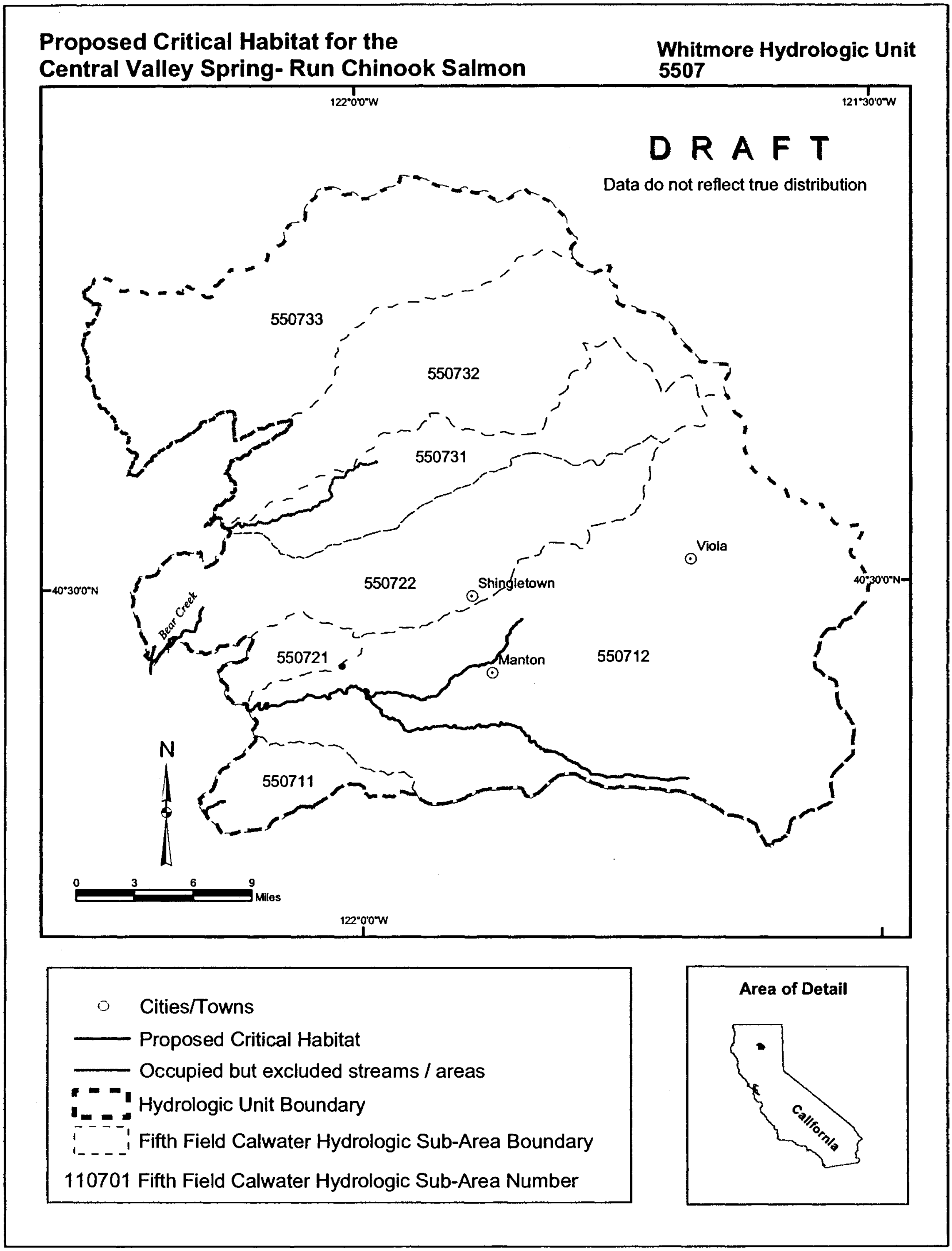
(iii) Kanaka Peak Hydrologic Sub-area 552462. Outlet(s) = Clear Creek (Lat 40.5158, Long −122.5256) upstream to endpoint(s) in: Clear Creek (40.5992, −122.5394).

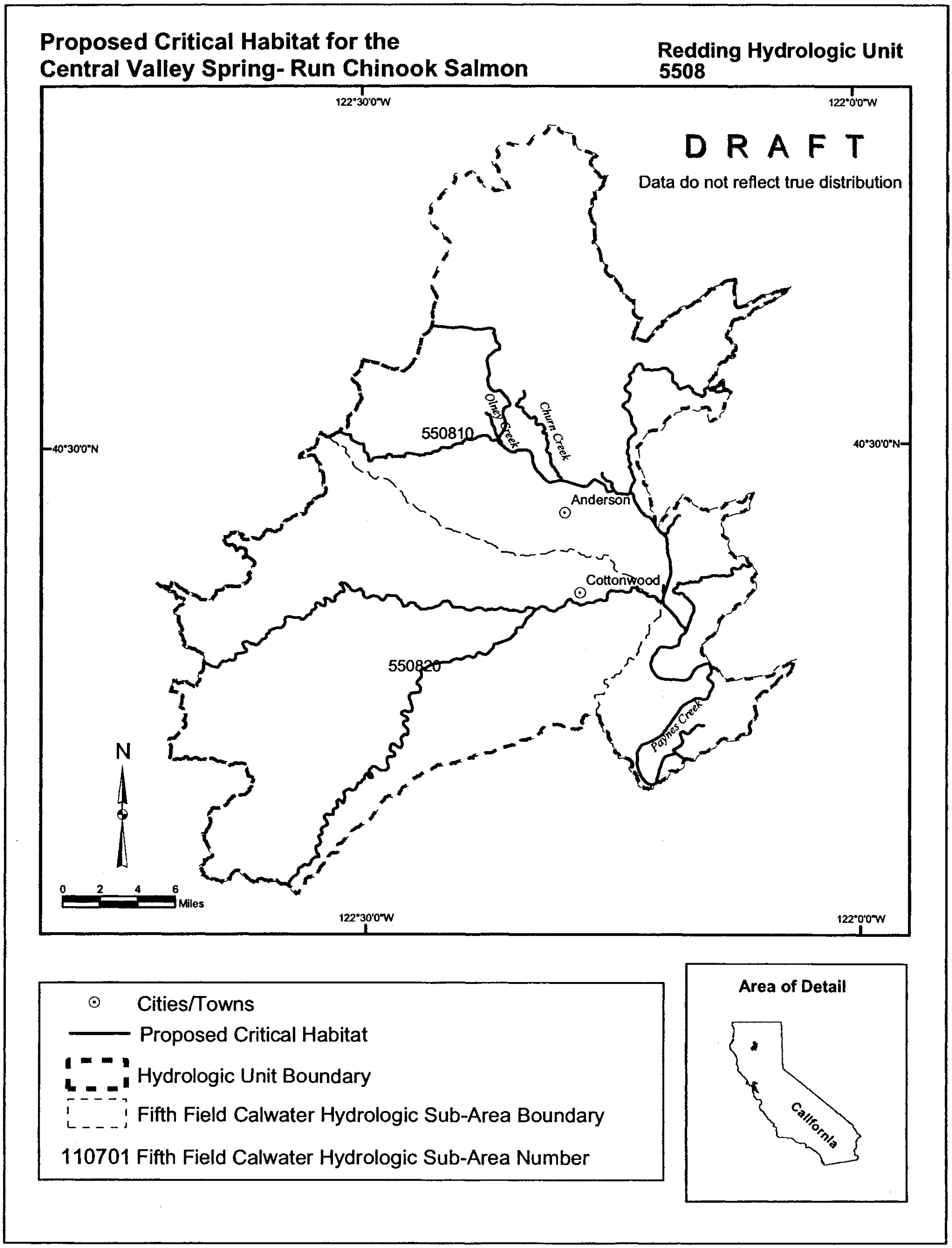
(13) Maps of proposed critical habitat for the Central Valley spring−run chinook salmon ESU follow:

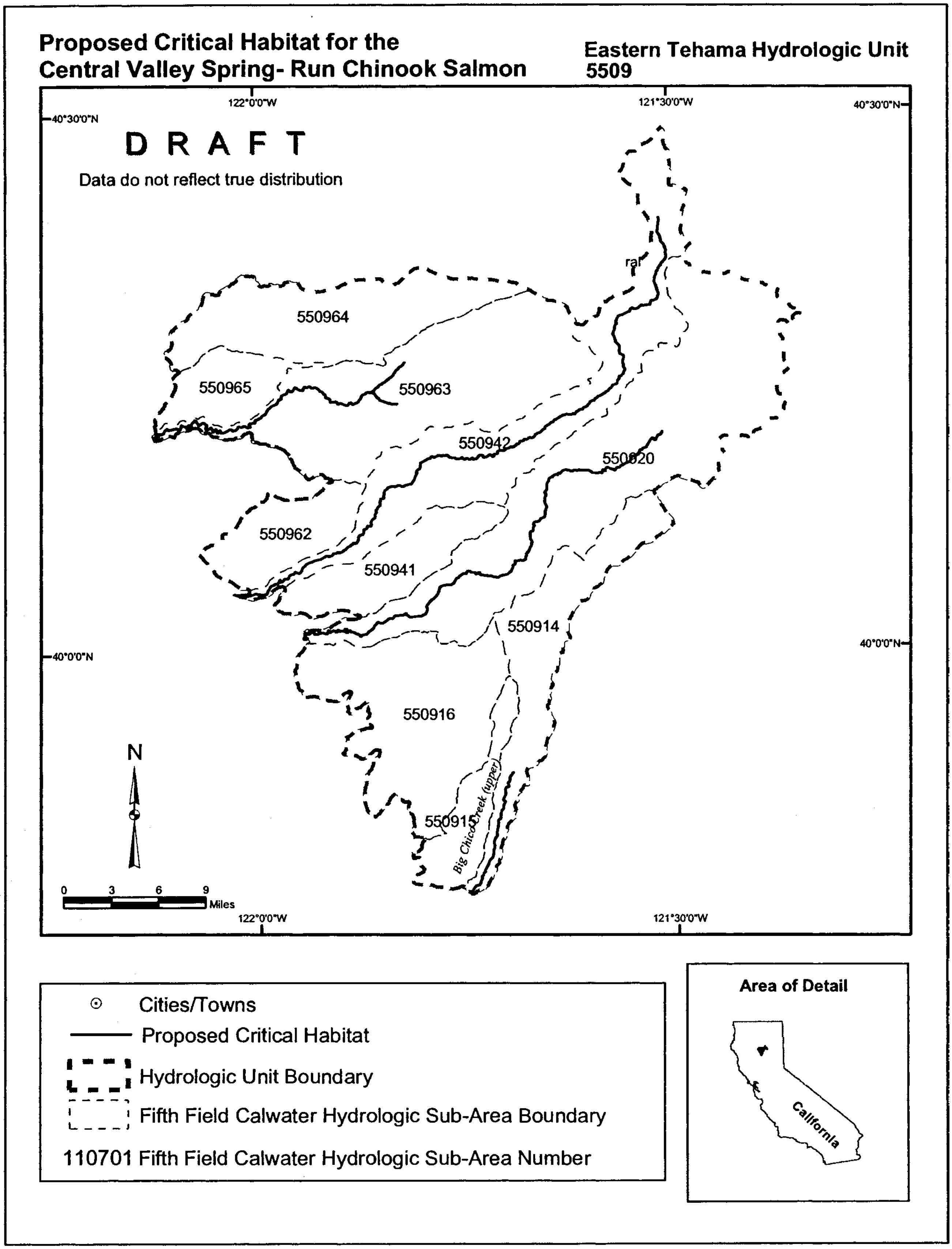
BILLING CODE 3510–22–P

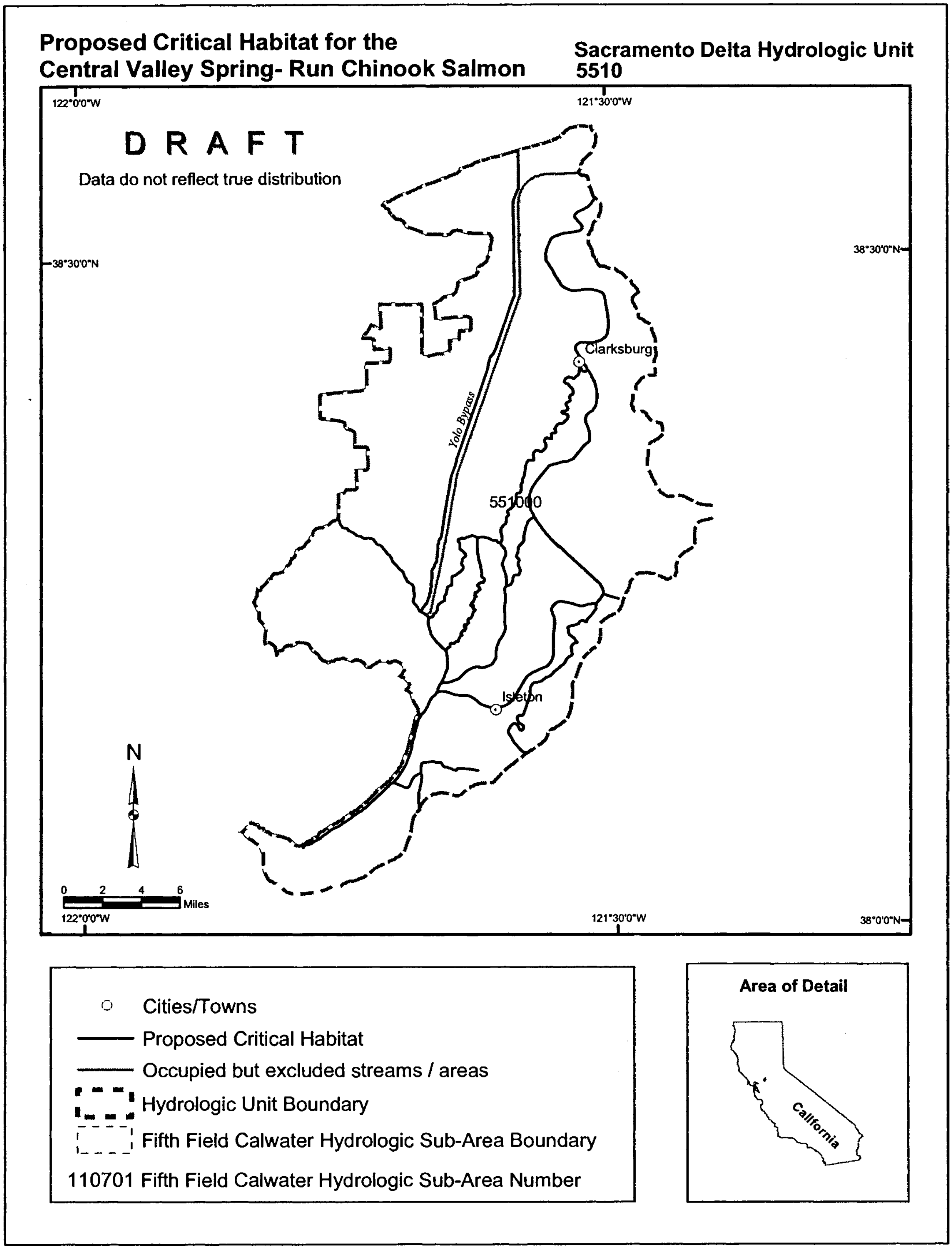


Proposed Critical Habitat for the
Central Valley Spring- Run Chinook Salmon
Tehama Hydrologic Unit
5504
122°30'0"W
122°0'0"W
DRAFT
Data do not reflect true distribution
Blue Tent Creek
Red Bluff
Craig Creek
Toomes Creek
Corning
Jewel Creek
Singer Creek
Burch Creek
550420
550410
40°0'0"N
N
0 3 6 9
Miles
Area of Detail
California
Cities/Towns
Proposed Critical Habitat
Hydrologic Unit Boundary
Fifth Field Calwater Hydrologic Sub-Area Boundary
110701 Fifth Field Calwater Hydrologic Sub-Area Number

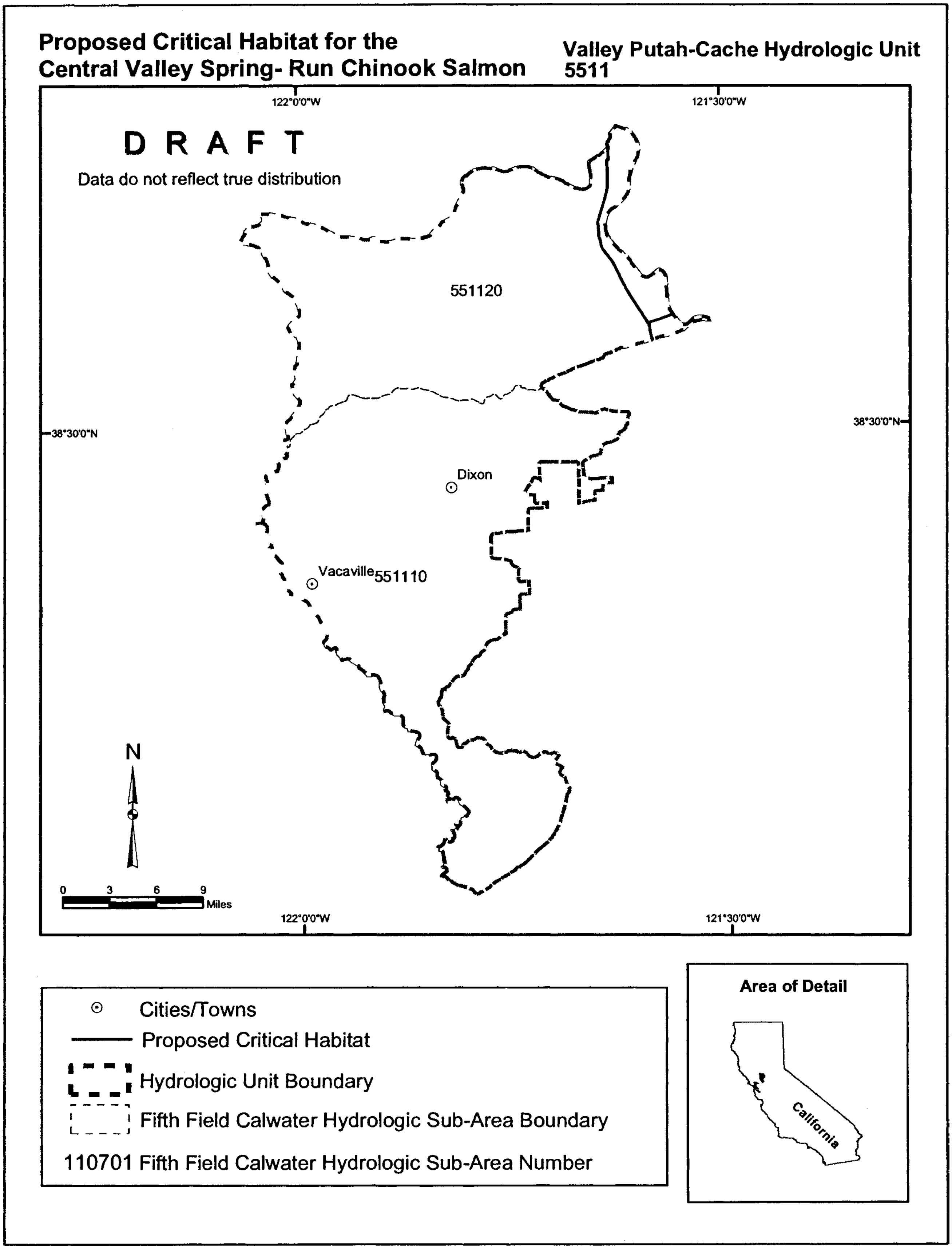

Proposed Critical Habitat for the
Central Valley Spring- Run Chinook Salmon
Whitmore Hydrologic Unit
5507
122°0'0"W
121°30'0"W
D R A F T
Data do not reflect true distribution
550733
550732
550731
550722
550721
550712
550711
Viola
Shingletown
Manton
Bear Creek
40°30'0"N
40°30'0"N
N
0
3
6
9
Miles
122°0'0"W
Cities/Towns
Proposed Critical Habitat
Occupied but excluded streams / areas
Hydrologic Unit Boundary
Fifth Field Calwater Hydrologic Sub-Area Boundary
110701 Fifth Field Calwater Hydrologic Sub-Area Number
Area of Detail
California

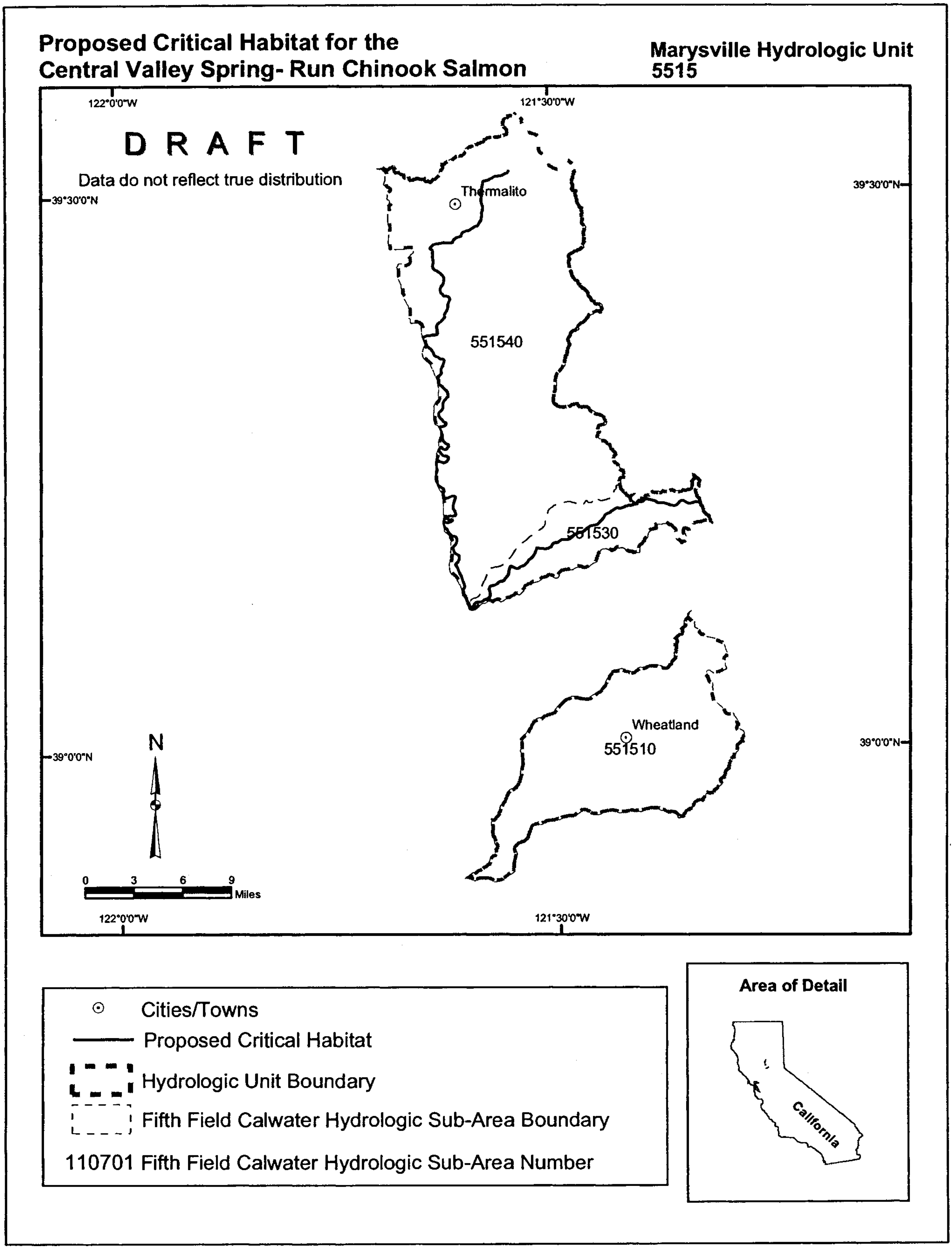

Proposed Critical Habitat for the
Central Valley Spring- Run Chinook Salmon
Redding Hydrologic Unit
5508
DRAFT
Data do not reflect true distribution
122°30'0"W
122°0'0"W
40°30'0"N
Olney Creek
Churn Creek
550810
Anderson
Cottonwood
550820
Paynes Creek
N
0 2 4 6
Miles
Cities/Towns
Proposed Critical Habitat
Hydrologic Unit Boundary
Fifth Field Calwater Hydrologic Sub-Area Boundary
110701 Fifth Field Calwater Hydrologic Sub-Area Number
Area of Detail
California


Proposed Critical Habitat for the
Central Valley Spring- Run Chinook Salmon
Eastern Tehama Hydrologic Unit
5509
DRAFT
Data do not reflect true distribution
122°0'0"W
121°30'0"W
40°30'0"N
40°0'0"N
550964
550965
550963
550942
550920
550962
550941
550914
550916
550915
Big Chico Creek (upper)
N
0 3 6 9
Miles
Cities/Towns
Proposed Critical Habitat
Hydrologic Unit Boundary
Fifth Field Calwater Hydrologic Sub-Area Boundary
110701 Fifth Field Calwater Hydrologic Sub-Area Number
Area of Detail
California



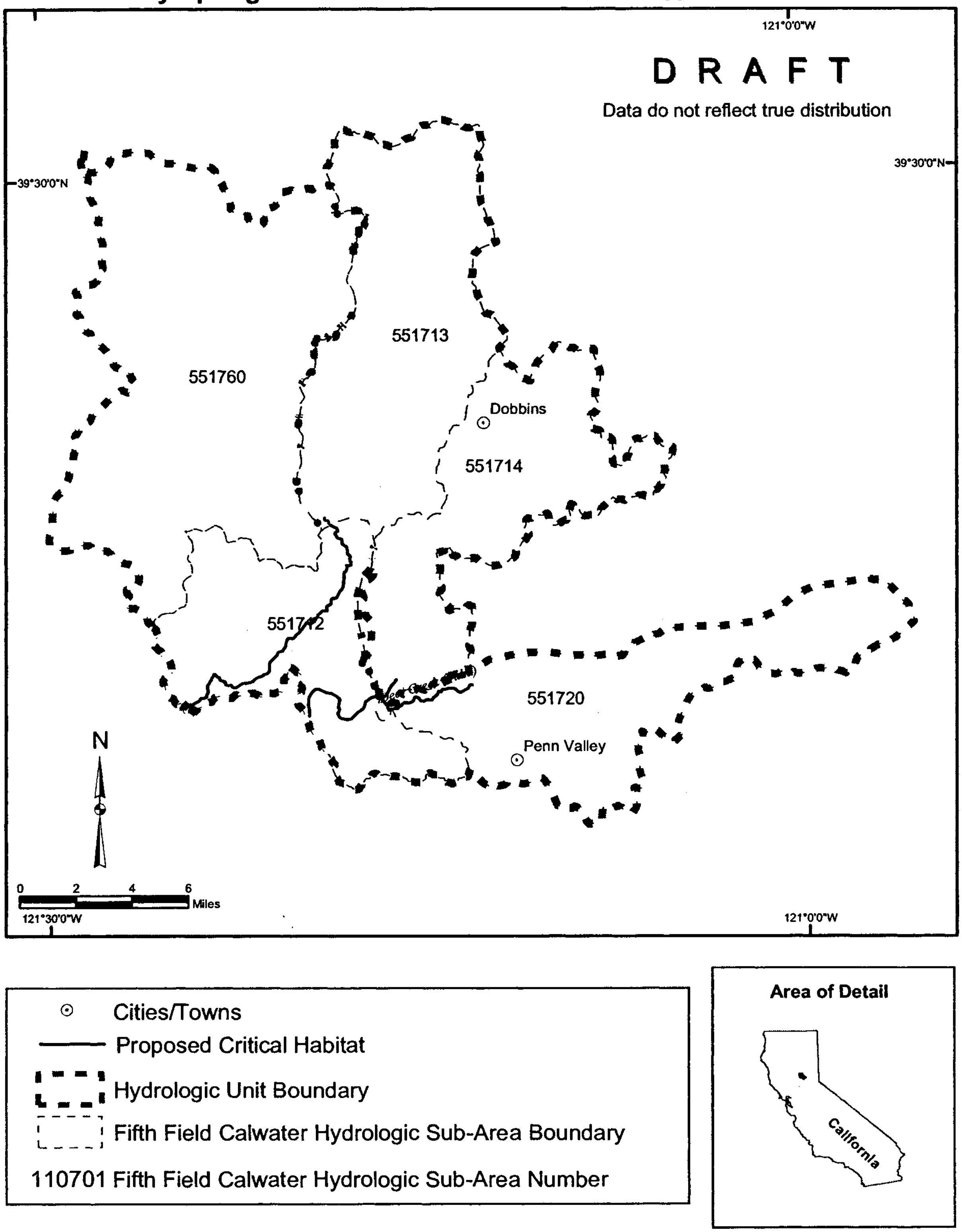
Proposed Critical Habitat for the
Central Valley Spring- Run Chinook Salmon
Sacramento Delta Hydrologic Unit
5510
122°0'0"W
121°30'0"W
D R A F T
Data do not reflect true distribution
38°30'0"N
Clarksburg
Yolo Bypass
551000
Isleton
N
0 2 4 6
Miles
38°0'0"N
○ Cities/Towns
Proposed Critical Habitat
Occupied but excluded streams / areas
Hydrologic Unit Boundary
Fifth Field Calwater Hydrologic Sub-Area Boundary
110701 Fifth Field Calwater Hydrologic Sub-Area Number
Area of Detail
California


Proposed Critical Habitat for the
Central Valley Spring- Run Chinook Salmon
Valley Putah-Cache Hydrologic Unit
5511
122°0'0"W
121°30'0"W
D R A F T
Data do not reflect true distribution
551120
38°30'0"N
Dixon
Vacaville
551110
N
0 3 6 9
Miles
Cities/Towns
Proposed Critical Habitat
Hydrologic Unit Boundary
Fifth Field Calwater Hydrologic Sub-Area Boundary
110701 Fifth Field Calwater Hydrologic Sub-Area Number
Area of Detail
California


Proposed Critical Habitat for the
Central Valley Spring- Run Chinook Salmon
Marysville Hydrologic Unit
5515
DRAFT
Data do not reflect true distribution
122°0'0"W
121°30'0"W
39°30'0"N
39°0'0"N
Thermalito
551540
551530
Wheatland
551510
N
0 3 6 9
Miles
Cities/Towns
Proposed Critical Habitat
Hydrologic Unit Boundary
Fifth Field Calwater Hydrologic Sub-Area Boundary
110701 Fifth Field Calwater Hydrologic Sub-Area Number
Area of Detail
California

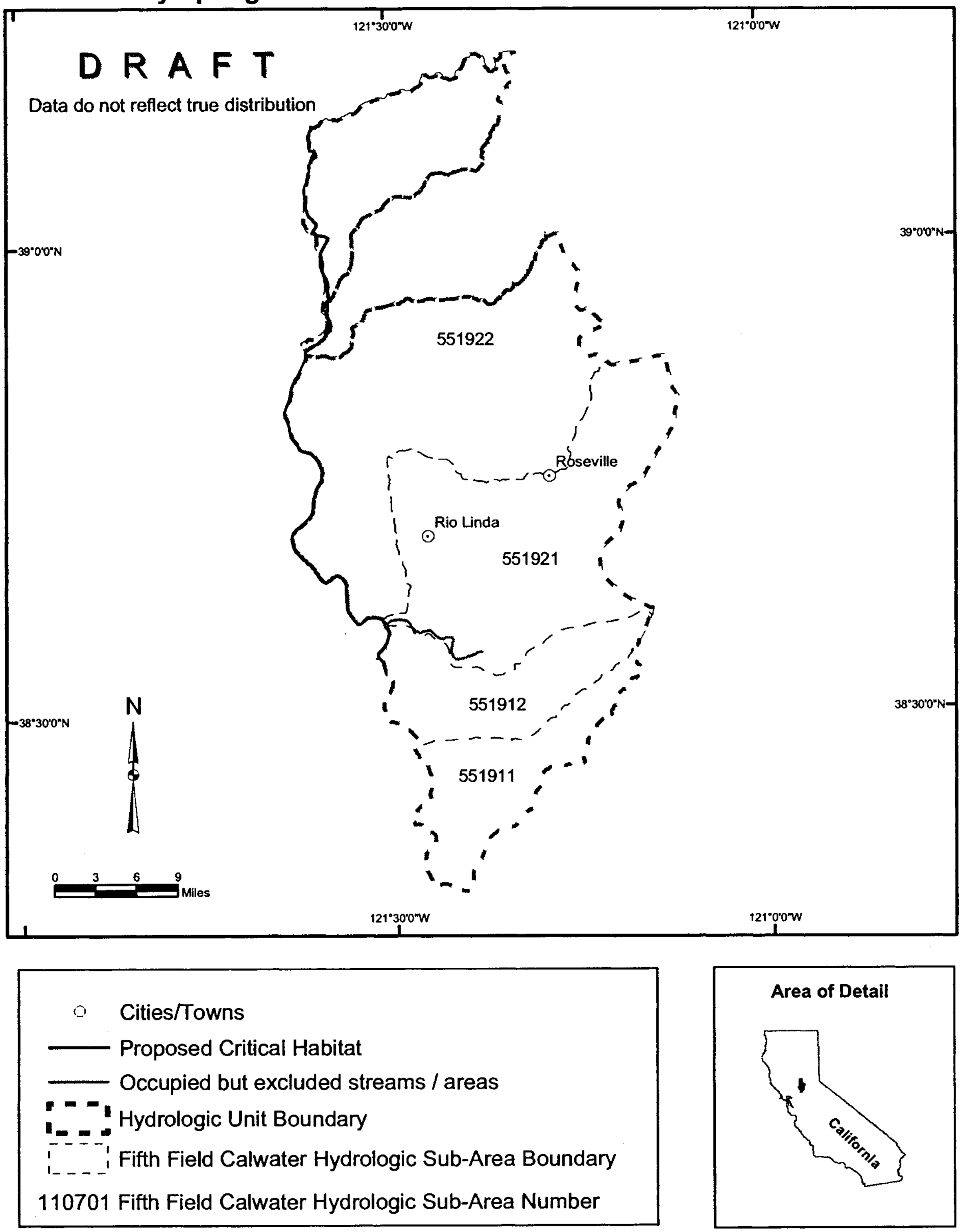
Proposed Critical Habitat for the Central Valley Spring- Run Chinook Salmon

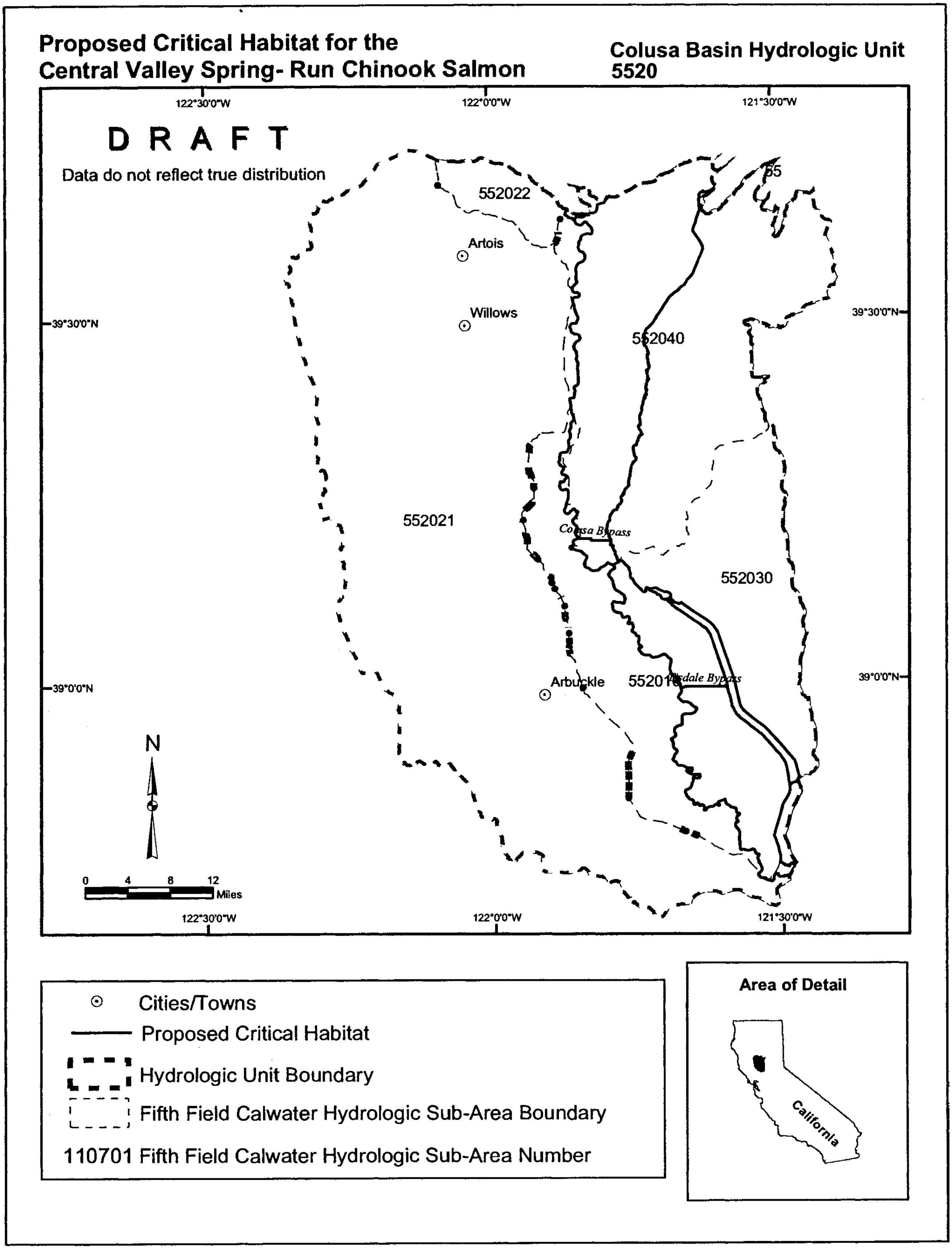
Yuba River Hydrologic Unit 5517



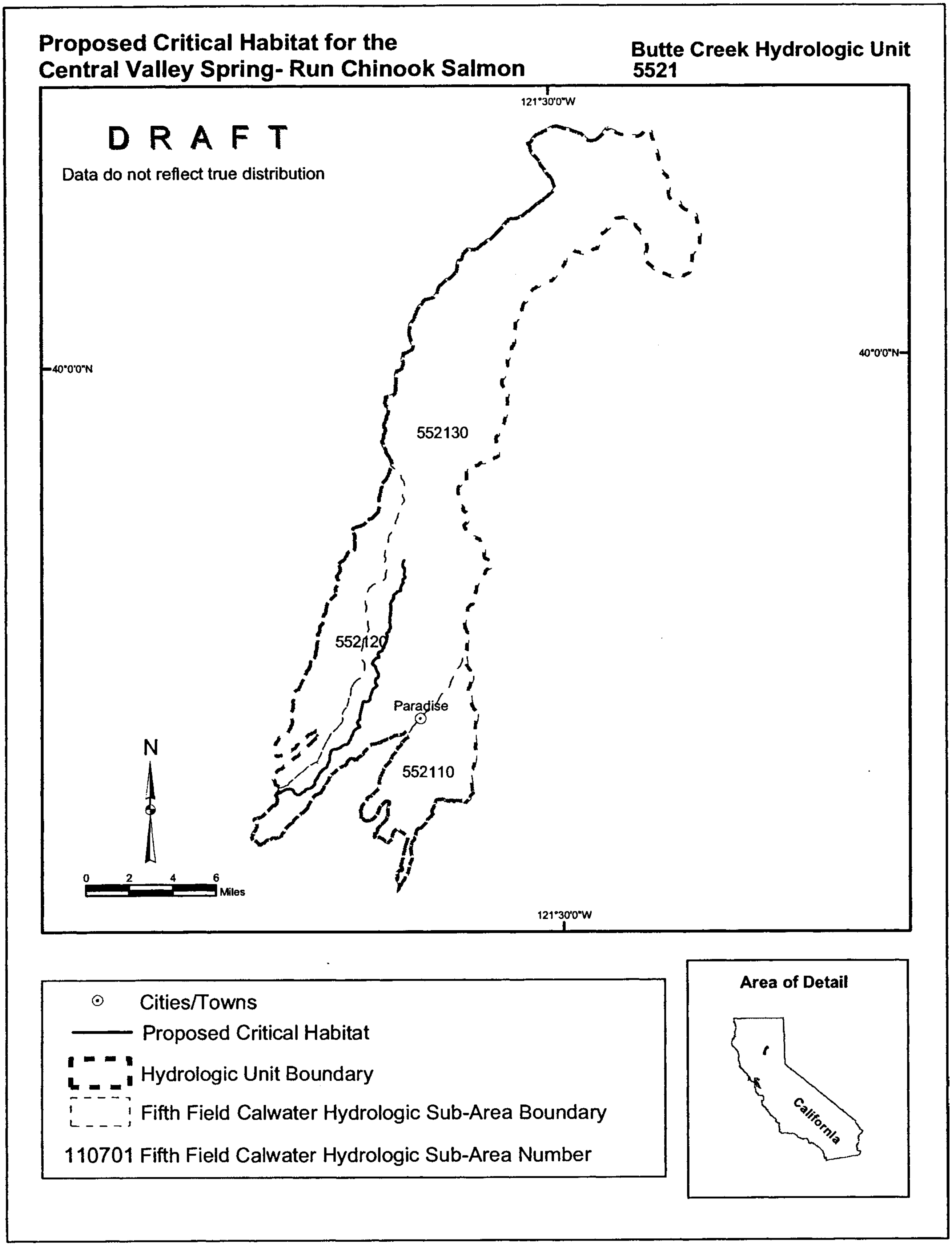
Proposed Critical Habitat for the Central Valley Spring- Run Chinook Salmon

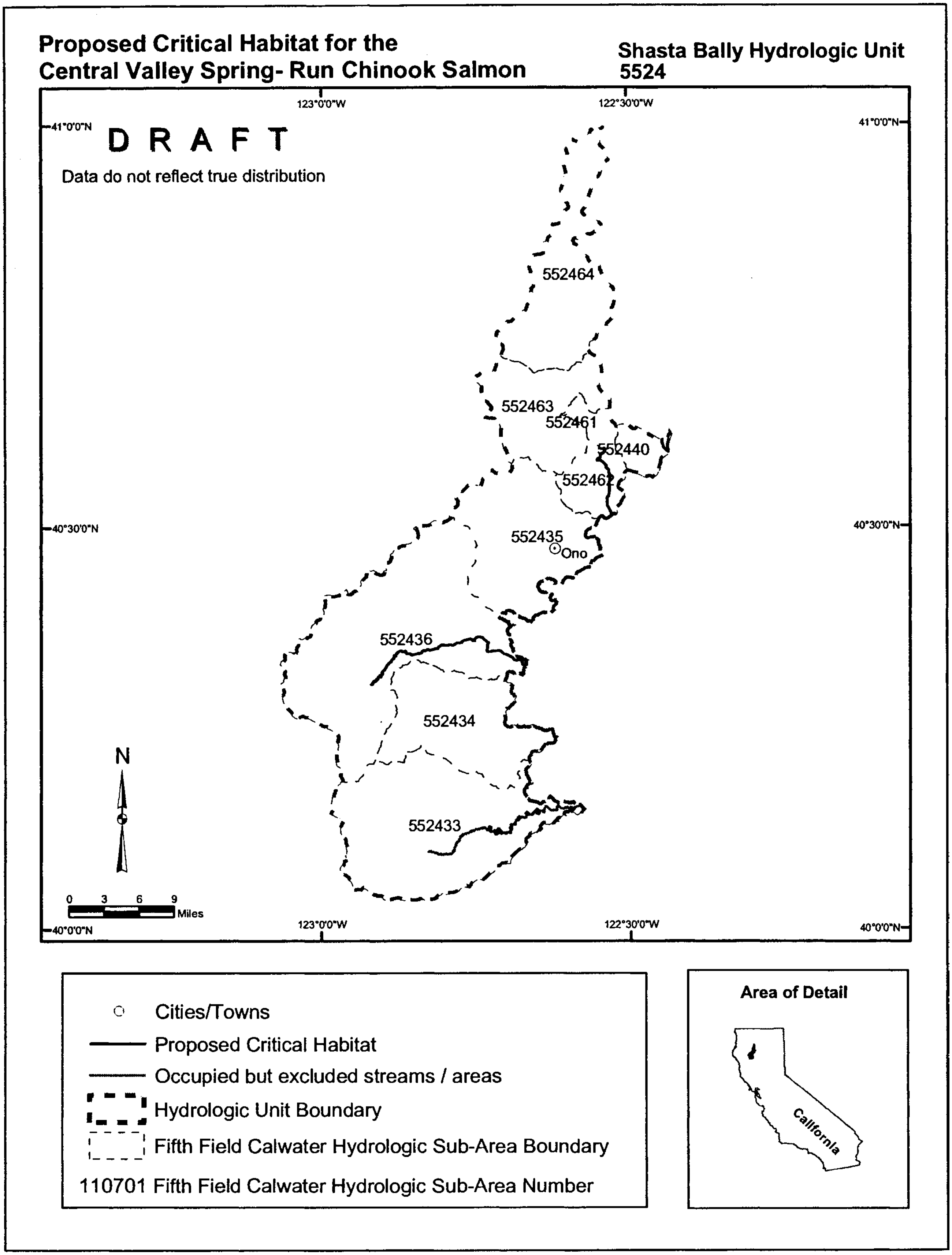
Valley-American Hydrologic Unit 5519





Proposed Critical Habitat for the
Central Valley Spring- Run Chinook Salmon
Colusa Basin Hydrologic Unit
5520
DRAFT
Data do not reflect true distribution
122°30'0"W
122°0'0"W
121°30'0"W
39°30'0"N
39°0'0"N
552022
Artois
Willows
552040
552021
552030
552010
Arbuckle
Colusa Bypass
N
0 4 8 12
Miles
Cities/Towns
Proposed Critical Habitat
Hydrologic Unit Boundary
Fifth Field Calwater Hydrologic Sub-Area Boundary
110701 Fifth Field Calwater Hydrologic Sub-Area Number
Area of Detail
California


Proposed Critical Habitat for the
Central Valley Spring- Run Chinook Salmon
Butte Creek Hydrologic Unit
5521
DRAFT
Data do not reflect true distribution
121°30'0"W
40°0'0"N
552130
552120
Paradise
552110
N
0 2 4 6
Miles
Cities/Towns
Proposed Critical Habitat
Hydrologic Unit Boundary
Fifth Field Calwater Hydrologic Sub-Area Boundary
110701 Fifth Field Calwater Hydrologic Sub-Area Number
Area of Detail
California



BILLING CODE 3510–22–C

(l) Central Valley O. mykiss (Oncorhynchus mykiss). Critical habitat is proposed to include the areas defined in the following units:

(1) Tehama Hydrologic Unit 5504—*(i) Lower Stony Creek Hydrologic Sub-area 550410.* Outlet(s) = Stony Creek (Lat 39.6760, Long −121.9732) upstream to endpoint(s) in: Stony Creek (39.8199, −122.3391).

(ii) Red Bluff Hydrologic Sub-area 550420. Outlet(s) = Sacramento River (Lat 39.6998, Long −121.9419) upstream to endpoint(s) in: Antelope Creek (40.2023, −122.1272); Big Chico Creek (39.7757, −121.7525); Blue Tent Creek (40.2166, −122.2362); Burch Creek (39.8495, −122.1615); Butler Slough (40.1579, −122.1320); Craig Creek (40.1617, −122.1350); Deer Creek (40.0144, −121.9481); Dibble Creek (40.2002, −122.2421); Dye Creek (40.0910, −122.0719); Elder Creek (40.0438, −122.2133); Lindo Channel (39.7623, −121.7923); McClure Creek (40.0074, −122.1723); Mill Creek (40.0550, −122.0317); Mud Creek (39.7985, −121.8803); New Creek (40.1873, −122.1350); Oat Creek (40.0769, −122.2168); Red Bank Creek (40.1421, −122.2399); Rice Creek (39.8484, −122.1252); Rock Creek (39.8034, −121.9403); Salt Creek (40.1572, −122.1646); Thomes Creek (39.8822, −122.5527); Unnamed Tributary (40.1867, −122.1353); Unnamed Tributary (40.1682, −122.1459); Unnamed Tributary (40.1143, −122.1259); Unnamed Tributary (40.0151, −122.1148); Unnamed Tributary (40.0403, −122.1009); Unnamed Tributary (40.0514, −122.0851); Unnamed Tributary (40.0530, −122.0769).

(2) Whitmore Hydrologic Unit 5507—*(i) Inks Creek Hydrologic Sub-area 550711.* Outlet(s) = Inks Creek (Lat 40.3305, Long −122.1520) upstream to endpoint(s) in: Inks Creek (40.3418, −122.1332).

(ii) Battle Creek Hydrologic Sub-area 550712. Outlet(s) = Battle Creek (Lat 40.4083, Long −122.1102) upstream to endpoint(s) in: Baldwin Creek (40.4369, −121.9885); Battle Creek (40.4228, −121.9975); Brush Creek (40.4913, −121.8664); Millseat Creek (40.4808, −121.8526); Morgan Creek (40.3654, −121.9132); North Fork Battle Creek (40.4877, −121.8185); Panther Creek (40.3897, −121.6106); South Ditch (40.3997, −121.9223); Ripley Creek (40.4099, −121.8683); Soap Creek (40.3904, −121.7569); South Fork Battle Creek (40.3531, −121.6682); Unnamed Tributary (40.3567, −121.8293); Unnamed Tributary (40.4592, −121.8671).

(iii) Ash Creek Hydrologic Sub-area 550721. Outlet(s) = Ash Creek (Lat 40.4401, Long −122.1375) upstream to endpoint(s) in: Ash Creek (40.4628, −122.0066).

(iv) Inwood Hydrologic Sub-area 550722. Outlet(s) = Ash Creek (Lat 40.4628, Long −122.0066); Bear Creek (40.4352, −122.2039) upstream to endpoint(s) in: Ash Creek (40.4859, −121.8993); Bear Creek (40.5368, −121.9560); North Fork Bear Creek (40.5736, −121.8683).

(v) South Cow Creek Hydrologic Sub-area 550731. Outlet(s) = South Cow Creek (Lat 40.5438, Long −122.1318) upstream to endpoint(s) in: South Cow Creek (40.6023, −121.8623).

(vi) Old Cow Creek Hydrologic Sub-area 550732. Outlet(s) = Clover Creek (Lat 40.5788, Long −122.1252); Old Cow Creek (40.5438, −122.1318) upstream to endpoint(s) in: Clover Creek (40.6305, −122.0304); Old Cow Creek (40.5442, −122.1317).

(vii) Little Cow Creek Hydrologic Sub-area 550733. Outlet(s) = Little Cow Creek (Lat 40.6148, −122.2271); Oak Run Creek (40.6171, −122.1225) upstream to endpoint(s) in: Little Cow Creek (40.7114, −122.0850); Oak Run Creek (40.6379, −122.0856).

(3) Redding Hydrologic Unit 5508—*(i) Enterprise Flat Hydrologic Sub-area 550810.* Outlet(s) = Sacramento River (Lat 40.2526, Long −122.1707) upstream to endpoint(s) in: Ash Creek (40.4401, −122.1375); Battle Creek (40.4083, −122.1102); Bear Creek (40.4360, −122.2036); Churn Creek (40.5986, −122.3418); Clear Creek (40.5158, −122.5256); Clover Creek (40.5788, −122.1252); Cottonwood Creek (40.3777, −122.1991); Cow Creek (40.5437, −122.1318); East Fork Stillwater Creek (40.6495, −122.2934); Inks Creek (40.3305, −122.1520); Little Cow Creek (40.6148, −122.2271); Oak Run (40.6171, −122.1225); Old Cow Creek (40.5442, −122.1317); Olney Creek (40.5439, −122.4687); Paynes Creek (40.3024, −122.1012); Stillwater Creek (40.6264, −122.3056); Sulphur Creek (40.6164, −122.4077).

(ii) Lower Cottonwood Hydrologic Sub-area 550820. Outlet(s) = Creek (Lat 40.3777, Long −122.1991) upstream to endpoint(s) in: Cold Fork Cottonwood Creek (40.2060, −122.6608); Cottonwood Creek (40.3943, −122.5254); Middle Fork Cottonwood Creek (40.3314, −122.6663); North Fork Cottonwood Creek (40.4539, −122.5610); South Fork Cottonwood Creek (40.1578, −122.5809).

(4) Eastern Tehama Hydrologic Unit 5509—*(i) Big Chico Creek Hydrologic Sub-area 550914.* Outlet(s) = Big Chico Creek (Lat 39.7757, Long −121.7525) upstream to endpoint(s) in: Big Chico Creek (39.8898, −121.6952).

(ii) Deer Creek Hydrologic Sub-area 550920. Outlet(s) = Deer Creek (Lat 40.0142, Long −121.9476) upstream to endpoint(s) in: Deer Creek (40.2025, −121.5130).

(iii) Upper Mill Creek Hydrologic Sub-area 550942. Outlet(s) = Mill Creek (Lat 40.0550, Long −122.0317) upstream to endpoint(s) in: Mill Creek (40.3766, −121.5098); Rocky Gulch Creek (40.2888, −121.5997).

(iv) Dye Creek Hydrologic Sub-area 550962. Outlet(s) = Dye Creek (Lat 40.0910, Long −122.0719) upstream to endpoint(s) in: Dye Creek (40.0996, −121.9612).

(v) Antelope Creek Hydrologic Sub-area 550963. Outlet(s) = Antelope Creek (Lat 40.2023, Long −122.1272) upstream to endpoint(s) in: Antelope Creek (40.2416, −121.8630); Middle Fork Antelope Creek (40.2673, −121.7744); North Fork Antelope Creek (40.2807, −121.7645); South Fork Antelope Creek (40.2521, −121.7575).

(vi) Paynes Creek Hydrologic Sub-area 550964. Outlet(s) = Paynes Creek (Lat 40.3024, Long −122.1012) upstream to endpoint(s) in: Paynes Creek (40.3357, −121.8300).

(5) Sacramento Delta Hydrologic Unit 5510—*Sacramento Delta Hydrologic Sub-area 551000.* Outlet(s) = Sacramento River (Lat 38.0653, Long −121.8418) upstream to endpoint(s) in: Cache Slough (38.2984, −121.7490); Elk Slough (38.4140, −121.5212); Elkhorn Slough (38.2898, −121.6271); Georgiana Slough (38.2401, −121.5172); Horseshoe Bend (38.1078, −121.7117); Lindsey Slough (38.2592, −121.7580); Miners Slough (38.2864, −121.6051); Prospect Slough (38.2830, −121.6641); Putah Creek (38.5155, −121.5885); Sevenmile Slough (38.1171, −121.6298); Streamboat Slough (38.3052, −121.5737); Sutter Slough (38.3321, −121.5838); Threemile Slough (38.1155, −121.6835); Ulatis Creek (38.2961, −121.7835); Unnamed Tributary (38.2937, −121.7803); Unnamed Tributary (38.2937, −121.7804); Yolo Bypass (38.5800, −121.5838).

(6) Valley−Putah−Cache Hydrologic Unit 5511—*Lower Putah Creek Hydrologic Sub-area 551120.* Outlet(s) = Sacramento Bypass (Lat 38.6057, Long −121.5563); Yolo Bypass (38.5800, −121.5838) upstream to endpoint(s) in: Sacramento Bypass (38.5969, −121.5888); Yolo Bypass (38.7627, −121.6325).

(7) American River Hydrologic Unit 5514—*Auburn Hydrologic Sub-area 551422.* Outlet(s) = Aubourn Ravine (Lat 38.8921, Long −121.2181); Coon Creek (38.9891, −121.2556); Doty Creek (38.9401, −121.2434) upstream to endpoint(s) in: Auburn Ravine (38.8888, −121.1151); Coon Creek (38.9659,

−121.1781); Doty Creek (38.9105, −121.1244).

(8) Marysville Hydrologic Unit 5515—*(i) Lower Yuba River Hydrologic Sub-area 551530.* Outlet(s) = Yuba River (Lat 39.1270, Long −121.5981) upstream to endpoint(s) in: Bear River (39.2203, −121.3314).

(ii) Lower Feather River Hydrologic Sub-area 551540. Outlet(s) = Feather River (Lat 39.1264, Long −121.5984) upstream to endpoint(s) in: Feather River (39.5205, −121.5475).

(9) Yuba River Hydrologic Unit 5517—*(i) Browns Valley Hydrologic Sub-area 551712.* Outlet(s) = Dry Creek (Lat 39.2215, Long −121.4082); Yuba River (39.2203, −121.3314) upstream to endpoint(s) in: Dry Creek (39.3232, Long −121.3155); Yuba River (39.2305, −121.2813).

(ii) Englebright Hydrologic Sub-area 551714. Outlet(s) = Yuba River (Lat 39.2305, Long −121.2813) upstream to endpoint(s) in: Yuba River (39.2399, −121.2689).

(10) Valley−American Hydrologic Unit 5519—*(i) Lower American Hydrologic Sub-area 551921.* Outlet(s) = American River (Lat 38.5971, −121.5088) upstream to endpoint(s) in: American River (38.6373, −121.2202); Dry Creek (38.7554, −121.2676); Miner's Ravine (38.8429, −121.1178); Natomas East Main Canal (38.6646, −121.4770); Secret Ravine(38.8541, −121.1223).

(ii) Pleasant Grove Hydrologic Sub-area 551922. Outlet(s) = Sacramento River (Lat 38.6026, Long −121.5155) upstream to endpoint(s) in: Auburn Ravine (38.8913, −121.2424); Coon Creek (38.9883, −121.2609); Doty Creek (38.9392, −121.2475); Feather River (39.1264, −121.5984).

(11) Colusa Basin Hydrologic Unit 5520—*(i) Sycamore−Sutter Hydrologic Sub-area 552010.* Outlet(s) = Sacramento River (Lat 38.7604, Long −121.6767) upstream to endpoint(s) in: Tisdale Bypass (39.0261, −121.7456).

(ii) Sutter Bypass Hydrologic Sub-area 552030. Outlet(s) = Sacramento River (Lat 38.7851, Long −121.6238) upstream to endpoint(s) in: Butte Creek (39.1990, −121.9286); Butte Slough (39.1987, −121.9285); Nelson Slough (38.8956, −121.6180); Sacramento Slough (38.7844, −121.6544); Sutter Bypass (39.1586, −121.8747).

(iii) Butte Basin Hydrologic Sub-area 552040. Outlet(s) = Butte Creek (Lat 39.1990, Long −121.9286); Sacramento River (39.4141, −122.0087) upstream to endpoint(s) in: Butte Creek (39.1949, −121.9361); Colusa Bypass (39.2276, −121.9402); Little Chico Creek (39.7380, −121.7490); Little Dry Creek (39.6781, −121.6580).

(12) Butte Creek Hydrologic Unit 5521—*(i) Upper Butte Creek Hydrologic Sub-area 552120.* Outlet(s) = Little Chico Creek (Lat 39.7380, Long −121.7490) upstream to endpoint(s) in: Little Chico Creek (39.8680, −121.6660).

(ii) Upper Little Chico Hydrologic Sub-area 552130. Outlet(s) = Butte Creek (Lat 39.7097, Long −121.7503) upstream to endpoint(s) in: Butte Creek (39.8215, −121.6468); Little Butte Creek (39.8159, −121.5819).

(13) Ball Mountain Hydrologic Unit 5523—*Thomes Creek Hydrologic Sub-area 552310.* Outlet(s) = Thomes Creek (39.8822, −122.5527) upstream to endpoint(s) in: Doll Creek (39.8941, −122.9209); Fish Creek (40.0176, −122.8142); Snake Creek (39.9945, −122.7788); Thomes Creek (39.9455, −122.8491); Willow Creek (39.8930, −122.9051).

(14) Shasta Bally Hydrologic Unit 5524—*(i) South Fork Hydrologic Sub-area 552433.* Outlet(s) = Cold Fork Cottonwood Creek (Lat 40.2060, Long −122.6608); South Fork Cottonwood Creek (40.1578, −122.5809) upstream to endpoint(s) in: Cold Fork Cottonwood Creek (40.1881, −122.8690); South Fork Cottonwood Creek (40.1232, −122.8761).

(ii) Ono Hydrologic Sub-area 552435. Outlet(s) = North Fork Cottonwood Creek (Lat 40.4539, Long −122.5610) upstream to endpoint(s) in: North Fork Cottonwood Creek (40.5005, −122.6972).

(iii) Platina Hydrologic Sub-area 552436. Outlet(s) = Middle Fork Cottonwood Creek (Lat 40.3314, Long −122.6663) upstream to endpoint(s) in: Beegum Creek (40.3149, −122.9776): Middle Fork Cottonwood Creek (40.3512, −122.9629).

(iv) Spring Creek Hydrologic Sub-area 552440. Outlet(s) = Sacramento River (Lat 40.5943, Long −122.4343) upstream to endpoint(s) in: Middle Creek (40.5904, −121.04825); Rock Creek (40.6137, −122.5180); Sacramento River (40.6116, −122.4462); Salt Creek (40.5830, −122.4586); Unnamed Tributary (40.5734, −122.4844).

(v) Kanaka Peak Hydrologic Sub-area 552462. Outlet(s) = Clear Creek (Lat 40.5158, Long −122.5256) upstream to endpoint(s) in: Clear Creek (40.5998, 122.5399).

(15) North Valley Floor Hydrologic Unit 5531—*(i) Lower Mokelumne Hydrologic Sub-area 553120.* Outlet(s) = Mokelumne River (Lat 38.2104, Long −121.3804) upstream to endpoint(s) in: Mokelumne River (38.2263, −121.0241); Murphy Creek (38.2491, −121.0119).

(ii) Lower Calaveras Hydrologic Sub-area 553130. Outlet(s) = Calaveras River (Lat 37.9836, Long −121.3110); Mormon Slough (37.9456, −121.2907) upstream to endpoint(s) in: Calaveras River (38.1025, −120.8503); Mormon Slough (38.0532, −121.0102); Stockton Diverting Canal (37.9594, −121.2024).

(16) Upper Calaveras Hydrologic Unit 5533—*New Hogan Reservoir Hydrologic Sub-area 553310.* Outlet(s) = Calaveras River (Lat 38.1025, Long −120.8503) upstream to endpoint(s) in: Calaveras River (38.1502, −120.8143).

(17) Stanislaus River Hydrologic Unit 5534—*Table Mountain Hydrologic Sub-area 553410.* Outlet(s) = Stanislaus River (Lat 37.8355, Long −120.6513) upstream to endpoint(s) in: Stanislaus River (37.8631, −120.6298).

(18) San Joaquin Valley Floor Hydrologic Unit 5535—*(i) Riverbank Hydrologic Sub-area 553530.* Outlet(s) = Stanislaus River (Lat 37.6648, Long −121.2414) upstream to endpoint(s) in: Stanislaus River (37.8355, −120.6513).

(ii) Turlock Hydrologic Sub-area 553550. Outlet(s) = Tuolumne River (Lat 37.6059, Long −121.1739) upstream.

(iii) Montpelier Hydrologic Sub-area 553560. Outlet(s) = Tuolumne River (Lat 37.6401, Long −120.6526) upstream to endpoint(s) in: Tuolumne River (37.6721, −120.4445).

(iv) El Nido-Stevinson Hydrologic Sub-area 553570. Outlet(s) = Merced River (Lat 37.3505, Long −120.9619) upstream to endpoint(s) in: Merced River (37.3620, −120.8507).

(v) Merced Hydrologic Sub-area 553580. Outlet(s) = Merced River (Lat 37.3620, Long −120.8507) upstream to endpoint(s) in: Merced River (37.4982, −120.4612).

(vi) Fahr Creek Hydrologic Sub-area 553590. Outlet(s) = Merced River (Lat 37.4982, Long −120.4612) upstream to endpoint(s) in: Merced River (37.5081, −120.3581).

(19) Delta-Mendota Canal Hydrologic Unit 5541—*(i) Patterson Hydrologic Sub-area 554110.* Outlet(s) = San Joaquin River (Lat 37.6763, Long −121.2653) upstream to endpoint(s) in: San Joaquin River (37.3491, −120.9759).

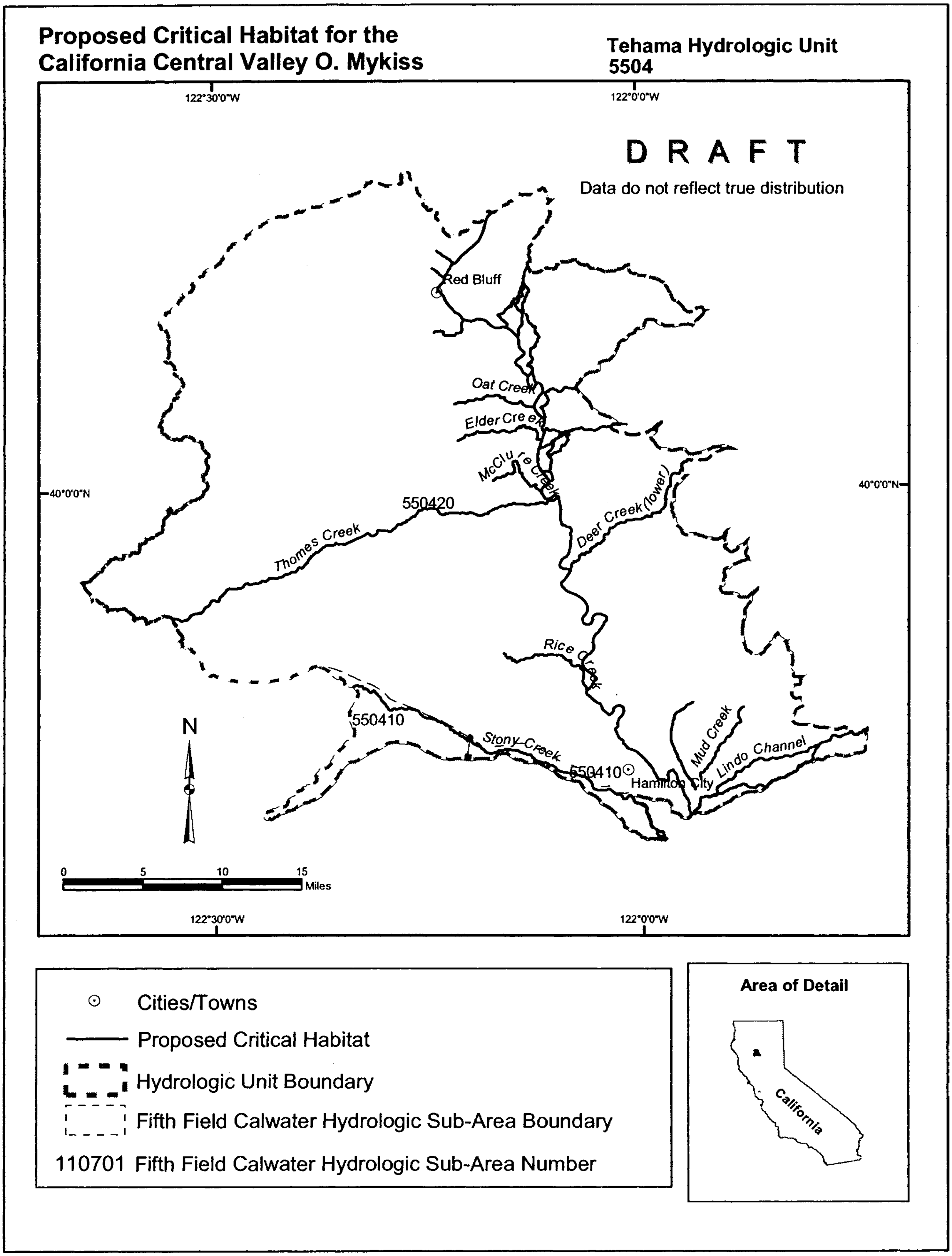
(ii) Los Banos Hydrologic Sub-area 554120. Outlet(s) = Merced River (Lat 37.3490, Long −120.9756) upstream to endpoint(s) in: Merced River (37.3505, −120.9619).

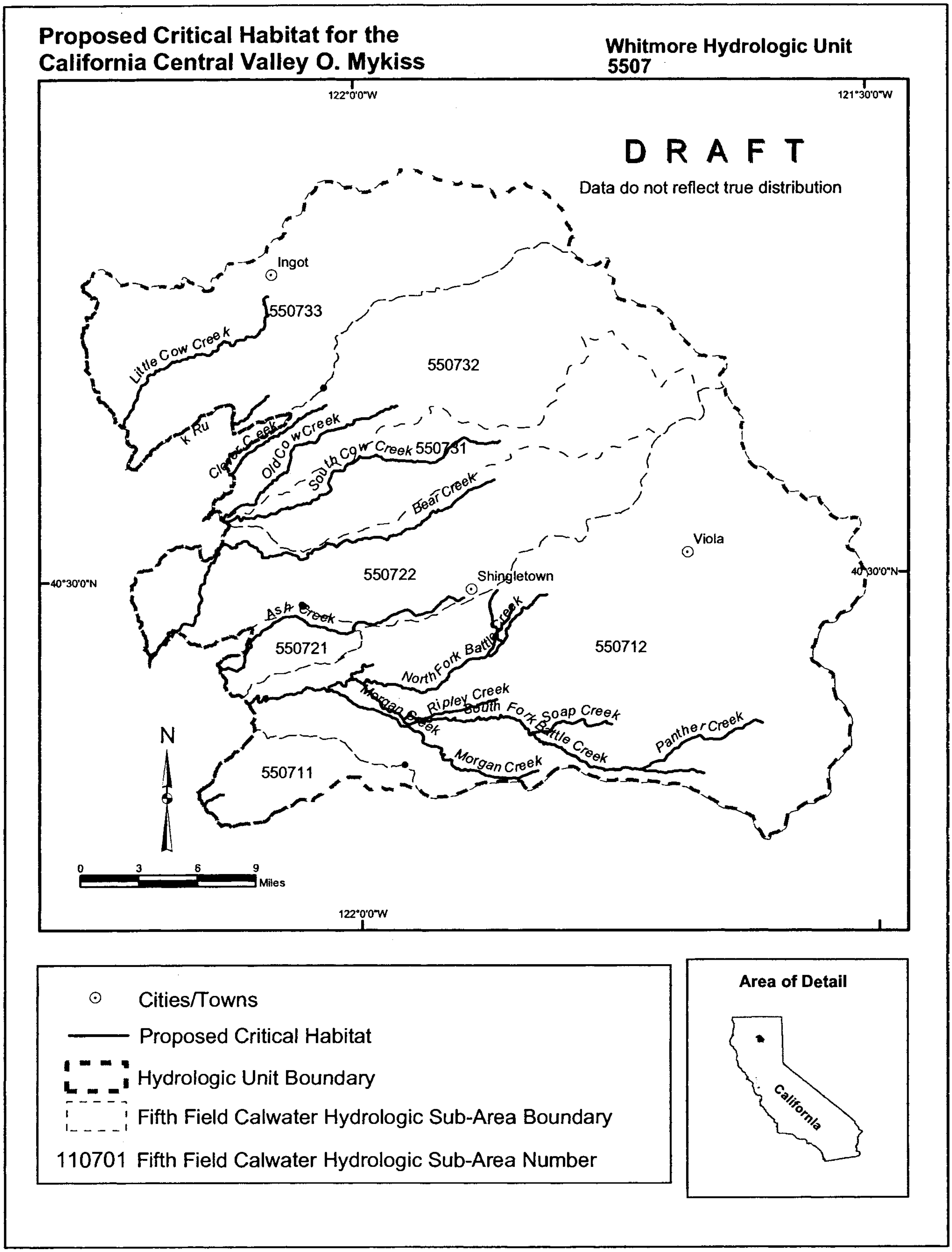
(20) San Joaquin Delta Hydrologic Unit 5544—*San Joaquin Delta Hydrologic Sub-area 554400.* Outlet(s) = San Joaquin River (Lat 38.0246, Long −121.7471) upstream to endpoint(s) in: Big Break (38.0160, −121.6849); Bishop Cut (38.0870, −121.4158); Calaveras River (37.9836, −121.3110); Cosumnes

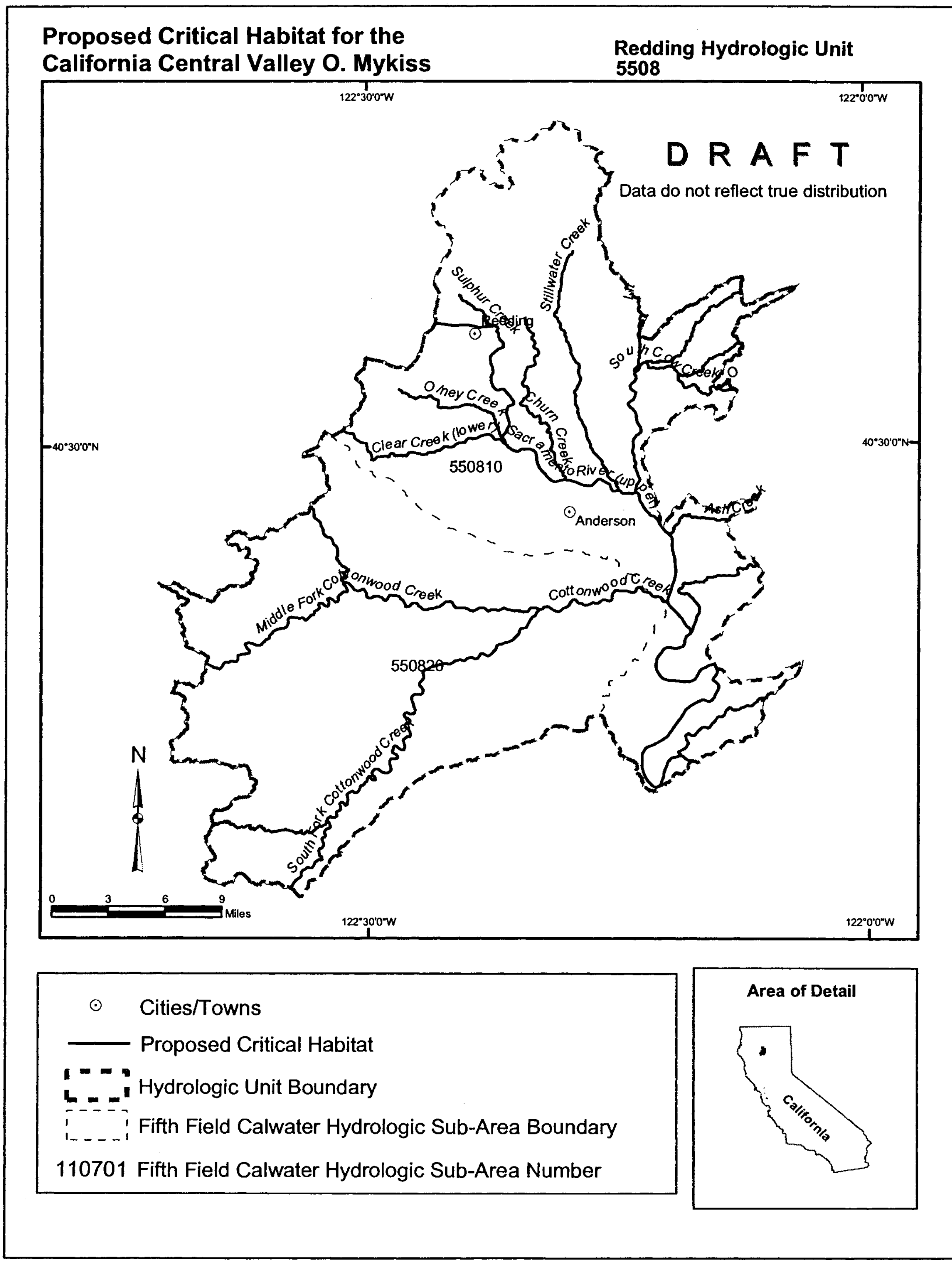
River (38.2538, −121.4074); Disappointment Slough (38.0439, −121.4201); Dutch Slough (38.0088, −121.6281); Empire Cut (37.9714, −121.4762); False River (38.0479, −121.6232); Frank's Tract (38.0220, −121.5997); Frank's Tract (38.0300, −121.5830); Holland Cut (37.9939, −121.5757); Honker Cut (38.0680, −121.4589); Kellog Creek (37.9158, −121.6051); Latham Slough (37.9716, −121.5122); Middle River (37.8216, −121.3747); Mokelumne River (38.2104, −121.3804); Mormon Slough (37.9456, −121.2907); Mosher Creek (38.0327, −121.3650); North Mokelumne River (38.2274, −121.4918); Old River (37.8086, −121.3274); Orwood Slough (37.9409, −121.5332); Paradise Cut (37.7605, −121.3085); Pixley Slough (38.0443, −121.3868); Potato Slough (38.0440, −121.4997); Rock Slough (37.9754, −121.5795); Sand Mound Slough (38.0220, −121.5997); Stockton Deep Water Channel (37.9957, −121.4201); Turner Cut (37.9972, −121.4434); Unnamed Tributary (38.1165, −121.4976); Victoria Canal (37.8891, −121.4895); White Slough (38.0818, −121.4156); Woodward Canal (37.9037, −121.4973).

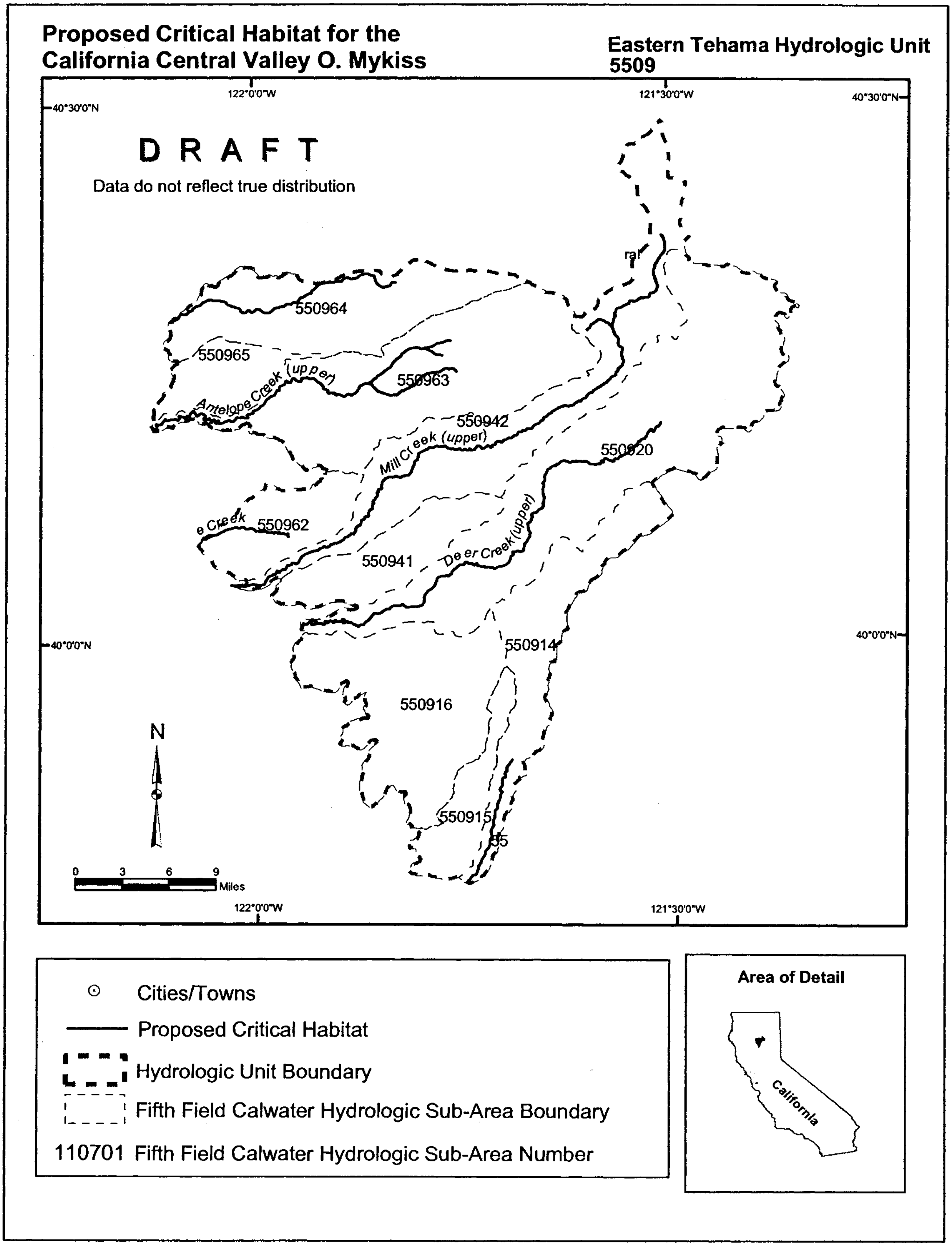
(21) Maps of the proposed critical habitat for the Central Valley *O. mykiss* ESU follow:

BILLING CODE 3510–22–P

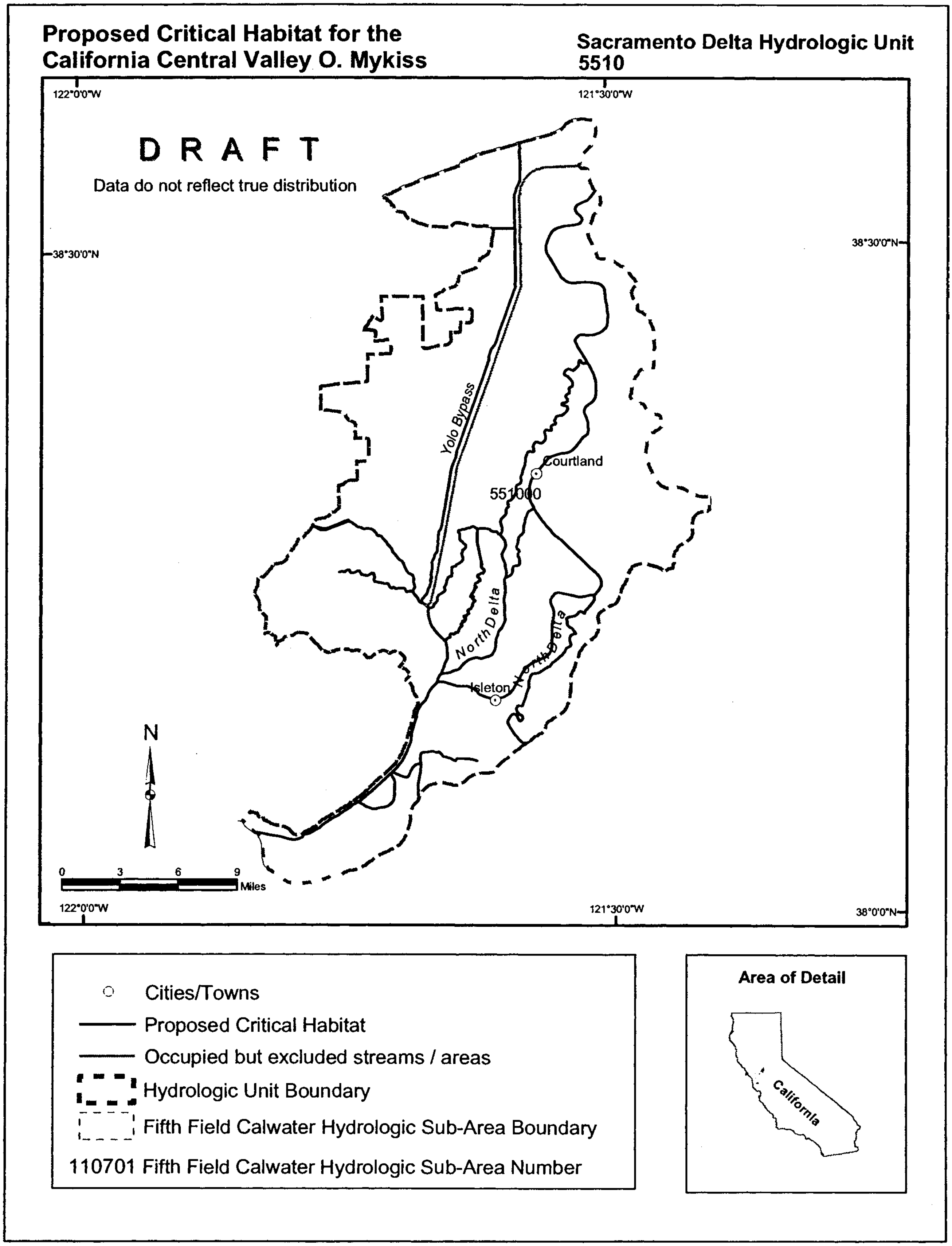

Proposed Critical Habitat for the
California Central Valley O. Mykiss
Tehama Hydrologic Unit
5504
122°30'0"W
122°0'0"W
DRAFT
Data do not reflect true distribution
Red Bluff
Oat Creek
Elder Creek
McClure Creek
550420
Thomes Creek
Deer Creek (lower)
40°0'0"N
Rice Creek
550410
Stony Creek
Mud Creek
Lindo Channel
Hamilton City
N
0 5 10 15 Miles
Cities/Towns
Proposed Critical Habitat
Hydrologic Unit Boundary
Fifth Field Calwater Hydrologic Sub-Area Boundary
110701 Fifth Field Calwater Hydrologic Sub-Area Number
Area of Detail
California

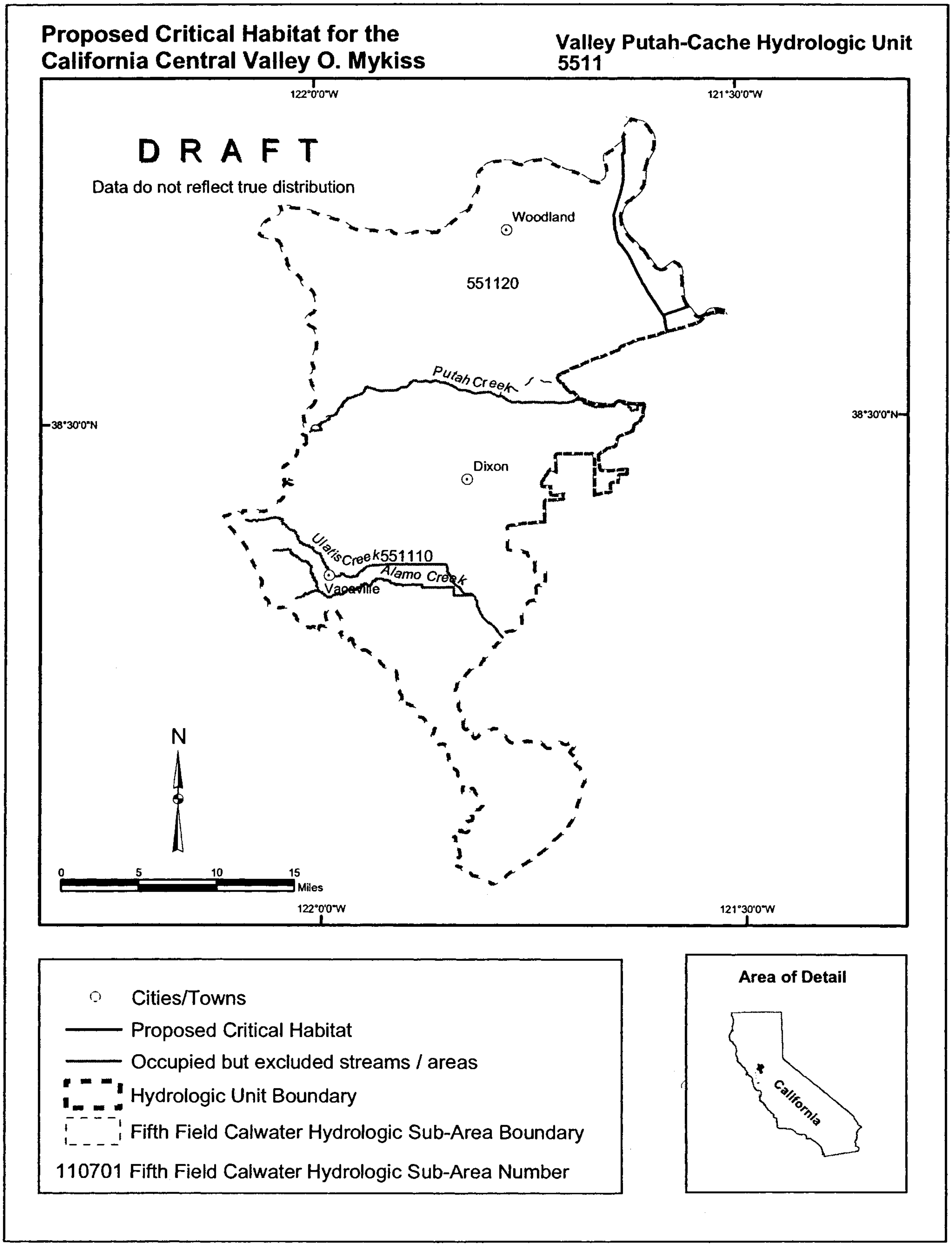

Proposed Critical Habitat for the
California Central Valley O. Mykiss
Whitmore Hydrologic Unit
5507
122°0'0"W
121°30'0"W
D R A F T
Data do not reflect true distribution
Ingot
550733
Little Cow Creek
550732
Clover Creek
Old Cow Creek
South Cow Creek
550731
Bear Creek
Viola
550722
Shingletown
40°30'0"N
Ash Creek
550721
North Fork Battle Creek
550712
Ripley Creek
South Fork Battle Creek
Soap Creek
Morgan Creek
Panther Creek
550711
N
0
3
6
9
Miles
Cities/Towns
Proposed Critical Habitat
Hydrologic Unit Boundary
Fifth Field Calwater Hydrologic Sub-Area Boundary
110701 Fifth Field Calwater Hydrologic Sub-Area Number
Area of Detail
California

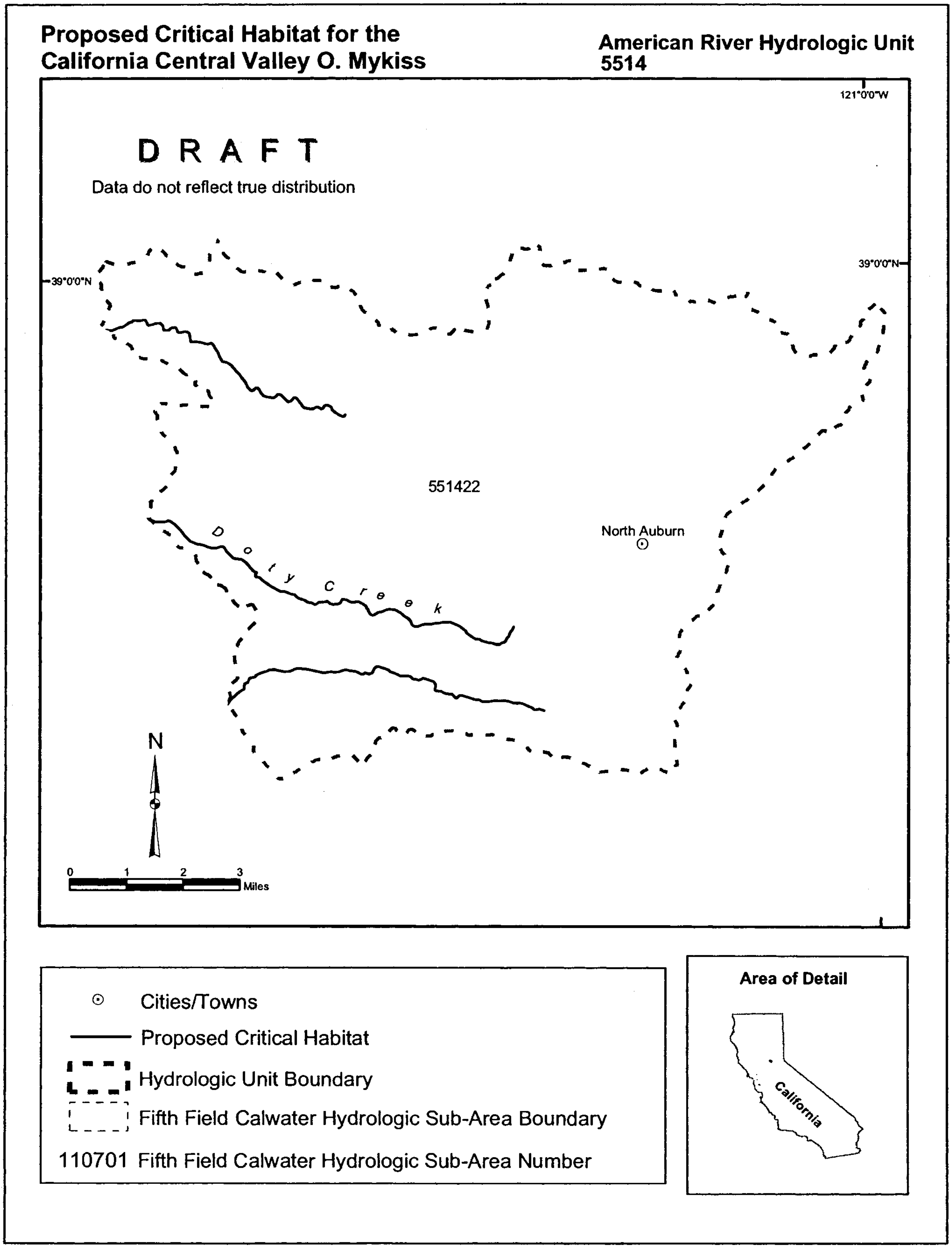

Proposed Critical Habitat for the
California Central Valley O. Mykiss
Redding Hydrologic Unit
5508
D R A F T
Data do not reflect true distribution
122°30'0"W
122°0'0"W
40°30'0"N
Stillwater Creek
Sulphur Creek
Redding
Churn Creek
Clear Creek (lower)
550810
Anderson
Middle Fork Cottonwood Creek
Cottonwood Creek
550820
South Fork Cottonwood Creek
N
0
3
6
9
Miles
Cities/Towns
Proposed Critical Habitat
Hydrologic Unit Boundary
Fifth Field Calwater Hydrologic Sub-Area Boundary
110701 Fifth Field Calwater Hydrologic Sub-Area Number
Area of Detail
California

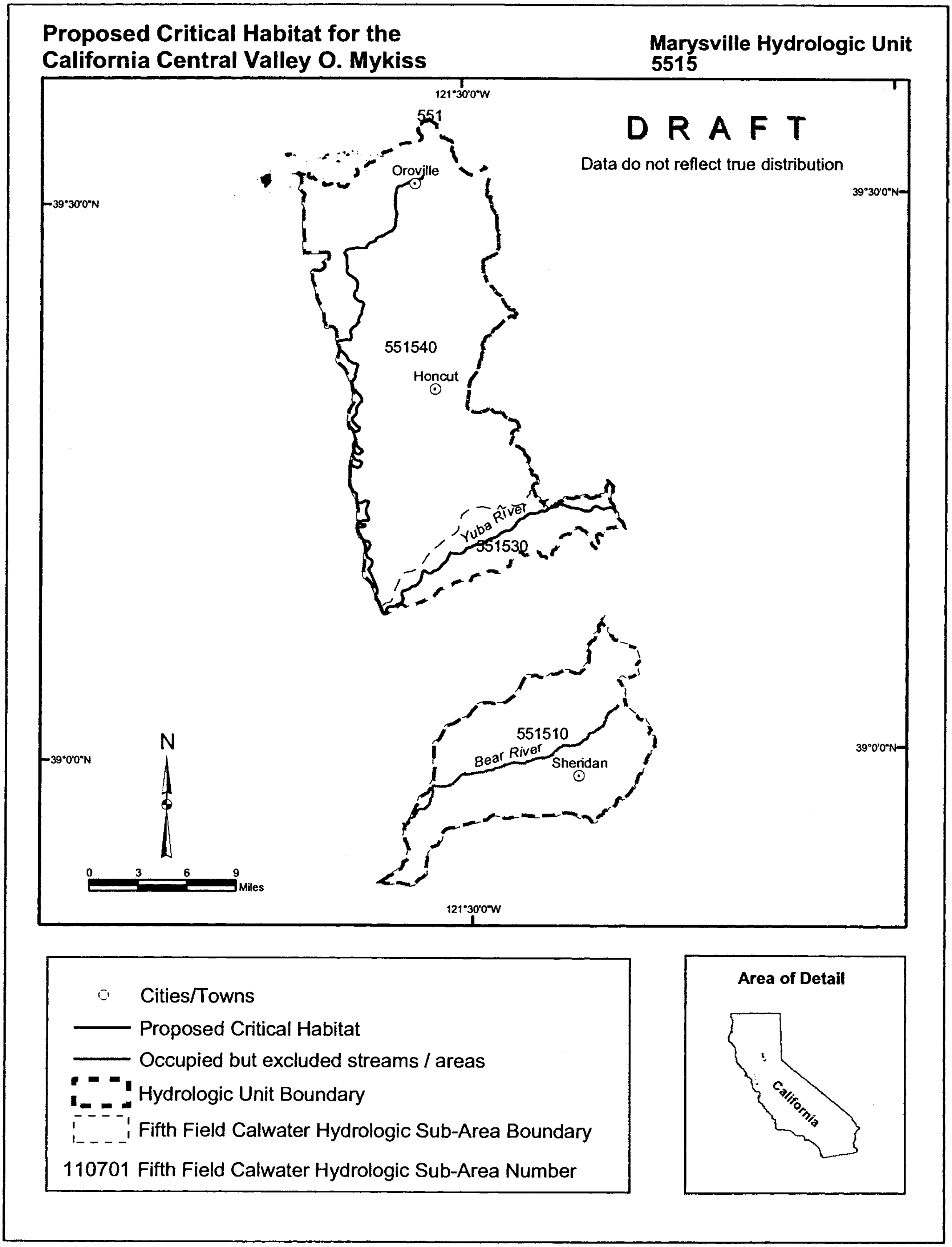


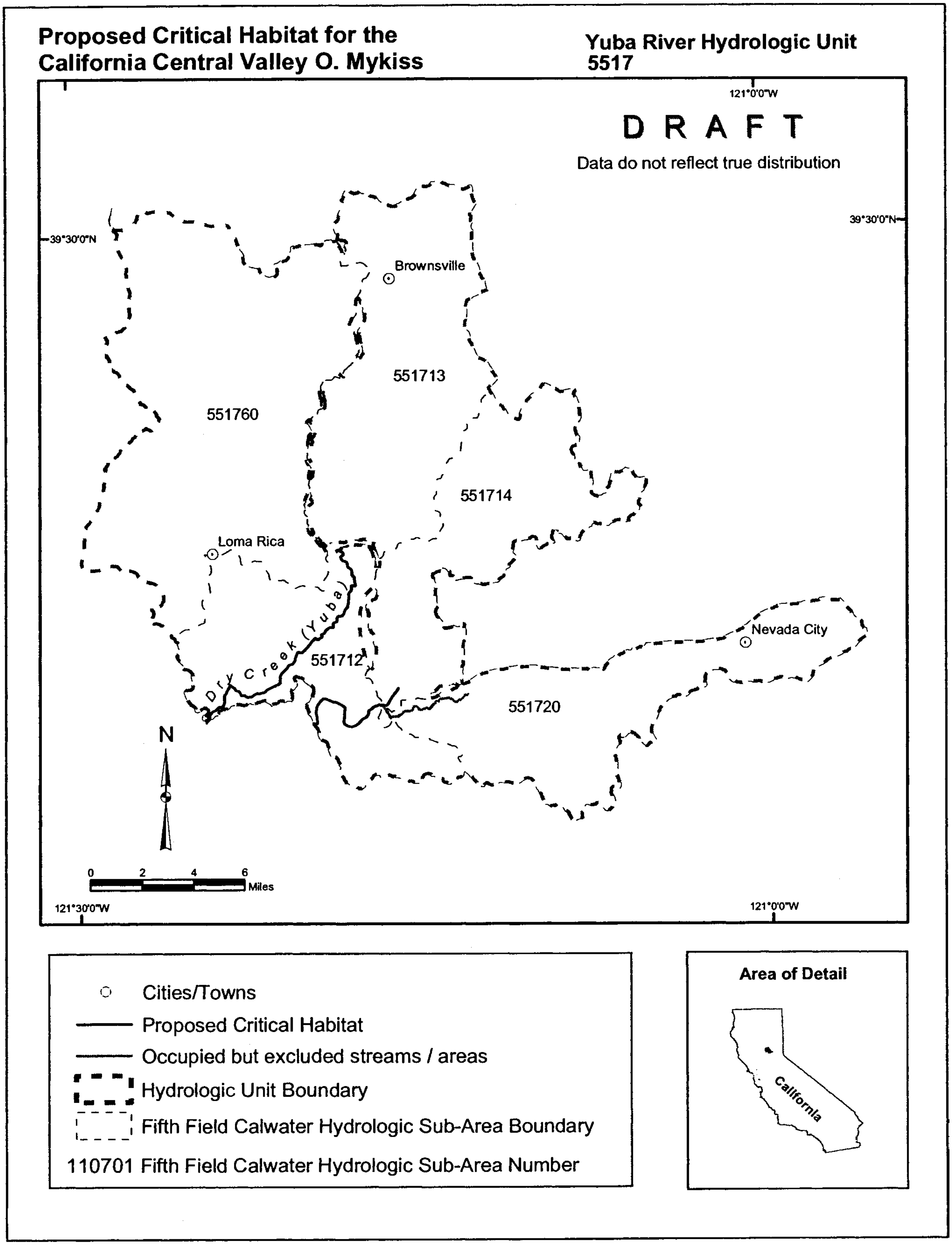
Proposed Critical Habitat for the
California Central Valley O. Mykiss
Eastern Tehama Hydrologic Unit
5509
122°0'0"W
121°30'0"W
40°30'0"N
40°0'0"N
DRAFT
Data do not reflect true distribution
550964
550965
550963
Antelope Creek (upper)
550942
Mill Creek (upper)
550920
550962
550941
Deer Creek (upper)
550914
550916
550915
N
0 3 6 9
Miles
Cities/Towns
Proposed Critical Habitat
Hydrologic Unit Boundary
Fifth Field Calwater Hydrologic Sub-Area Boundary
110701 Fifth Field Calwater Hydrologic Sub-Area Number
Area of Detail
California

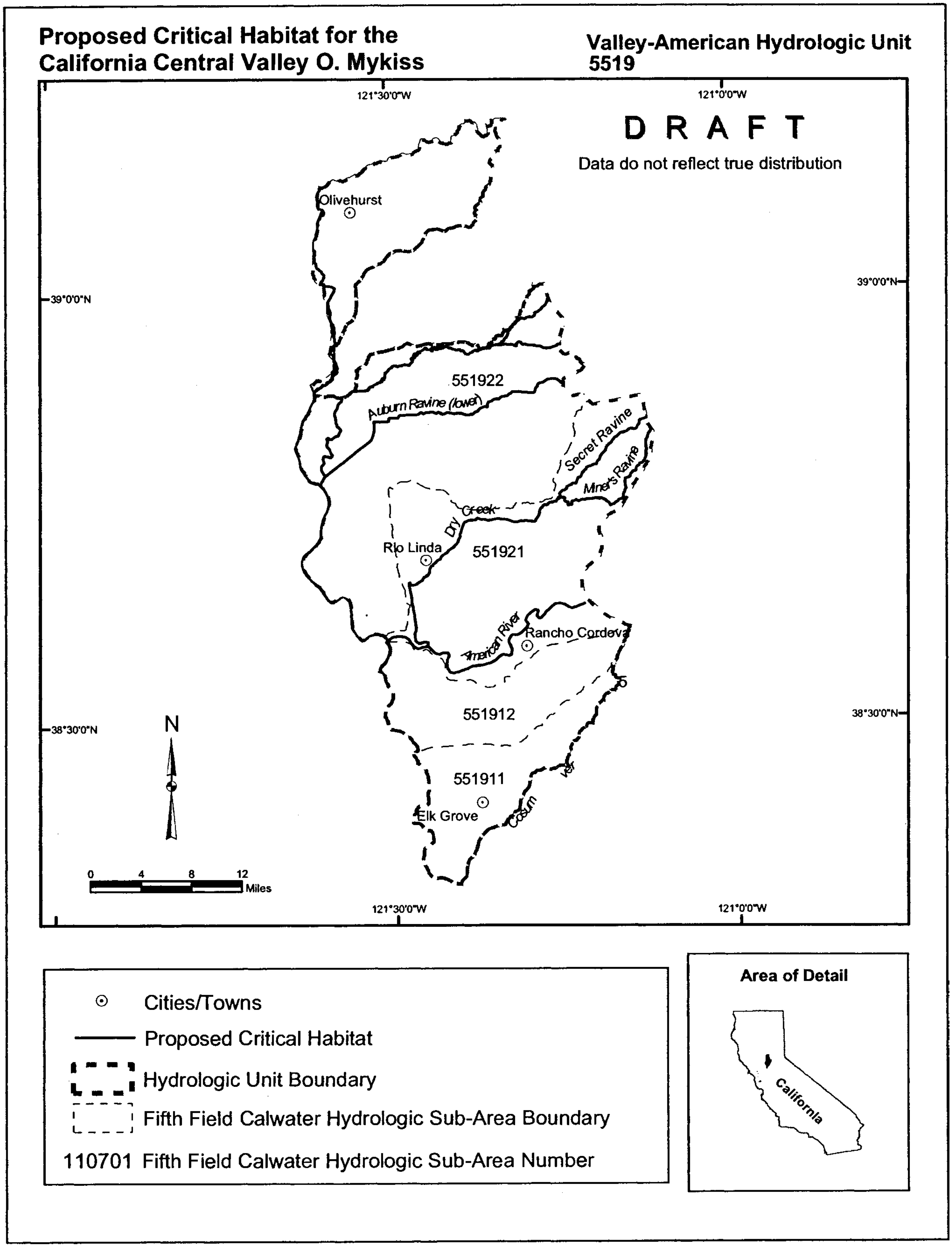

Proposed Critical Habitat for the California Central Valley O. Mykiss
Sacramento Delta Hydrologic Unit 5510
122°0'0"W
121°30'0"W
38°30'0"N
DRAFT
Data do not reflect true distribution
Yolo Bypass
Courtland
551000
North Delta
North Delta
Isleton
N
0 3 6 9 Miles
38°0'0"N
Cities/Towns
Proposed Critical Habitat
Occupied but excluded streams / areas
Hydrologic Unit Boundary
Fifth Field Calwater Hydrologic Sub-Area Boundary
110701 Fifth Field Calwater Hydrologic Sub-Area Number
Area of Detail
California


Proposed Critical Habitat for the
California Central Valley O. Mykiss
Valley Putah-Cache Hydrologic Unit
5511
122°0'0"W
121°30'0"W
DRAFT
Data do not reflect true distribution
Woodland
551120
Putah Creek
38°30'0"N
Dixon
Ulatis Creek
551110
Alamo Creek
Vacaville
N
0
5
10
15
Miles
Cities/Towns
Proposed Critical Habitat
Occupied but excluded streams / areas
Hydrologic Unit Boundary
Fifth Field Calwater Hydrologic Sub-Area Boundary
110701 Fifth Field Calwater Hydrologic Sub-Area Number
Area of Detail
California

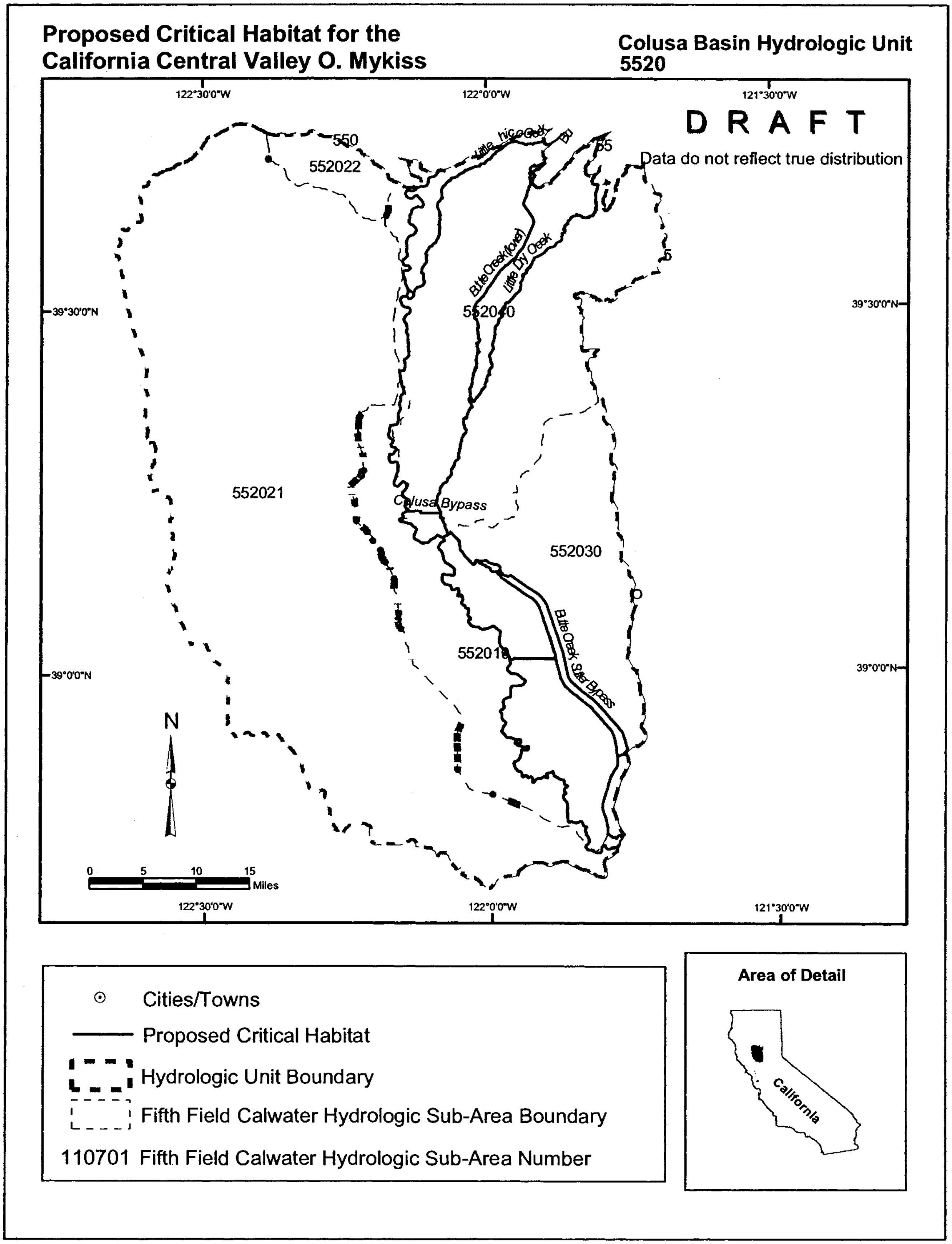

Proposed Critical Habitat for the
California Central Valley O. Mykiss
American River Hydrologic Unit
5514
121°0'0"W
39°0'0"N
DRAFT
Data do not reflect true distribution
551422
North Auburn
Doty Creek
N
0 1 2 3 Miles
Cities/Towns
Proposed Critical Habitat
Hydrologic Unit Boundary
Fifth Field Calwater Hydrologic Sub-Area Boundary
110701 Fifth Field Calwater Hydrologic Sub-Area Number
Area of Detail
California

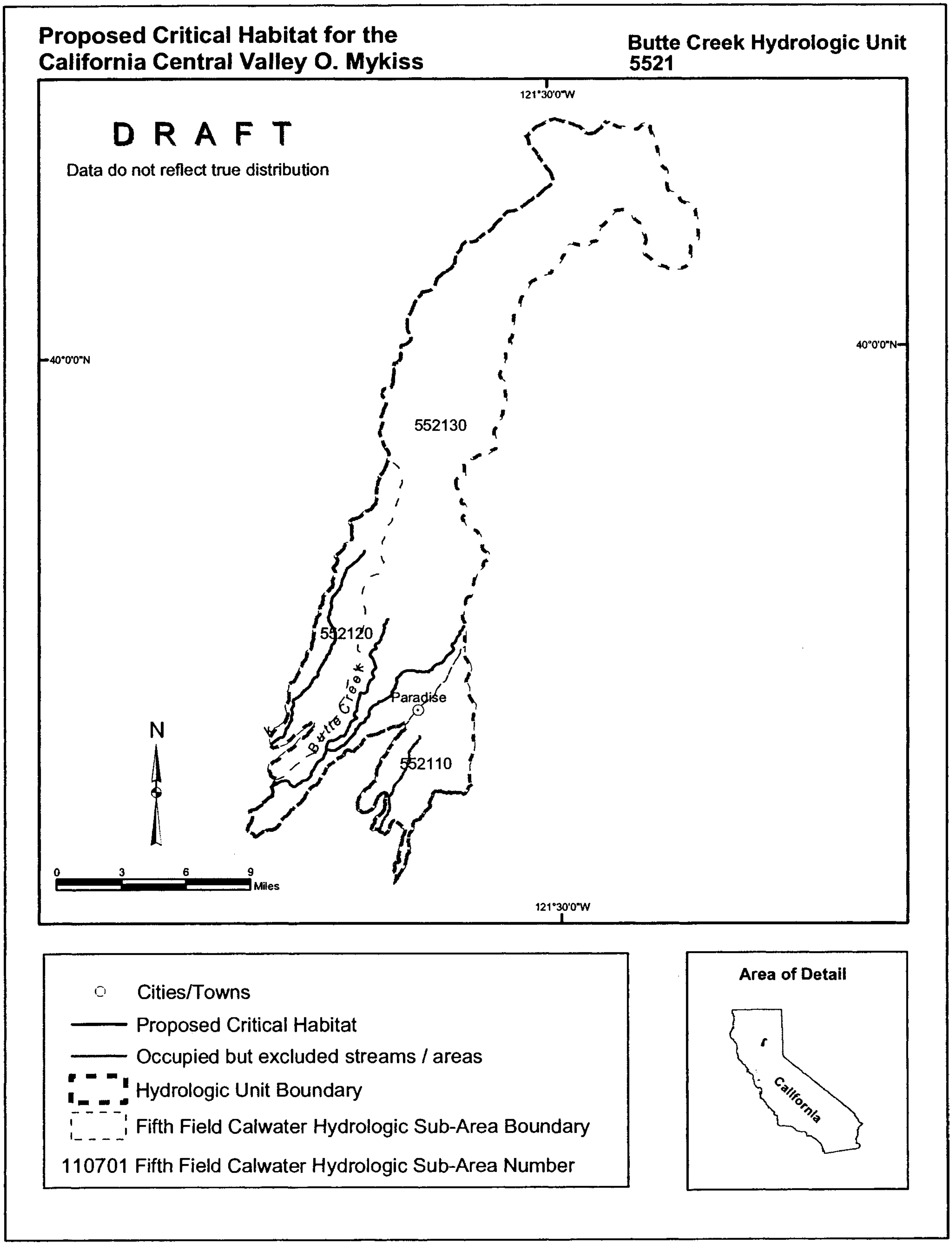

Proposed Critical Habitat for the
California Central Valley O. Mykiss
Marysville Hydrologic Unit
5515
DRAFT
Data do not reflect true distribution
121°30'0"W
39°30'0"N
39°0'0"N
551
Oroville
551540
Honcut
Yuba River
551530
551510
Bear River
Sheridan
N
0 3 6 9 Miles
Cities/Towns
Proposed Critical Habitat
Occupied but excluded streams / areas
Hydrologic Unit Boundary
Fifth Field Calwater Hydrologic Sub-Area Boundary
110701 Fifth Field Calwater Hydrologic Sub-Area Number
Area of Detail
California


Proposed Critical Habitat for the
California Central Valley O. Mykiss
Yuba River Hydrologic Unit
5517
DRAFT
Data do not reflect true distribution
121°0'0"W
39°30'0"N
Brownsville
551713
551760
551714
Loma Rica
Dry Creek (Yuba)
551712
Nevada City
551720
N
0 2 4 6 Miles
121°30'0"W
Cities/Towns
Proposed Critical Habitat
Occupied but excluded streams / areas
Hydrologic Unit Boundary
Fifth Field Calwater Hydrologic Sub-Area Boundary
110701 Fifth Field Calwater Hydrologic Sub-Area Number
Area of Detail
California



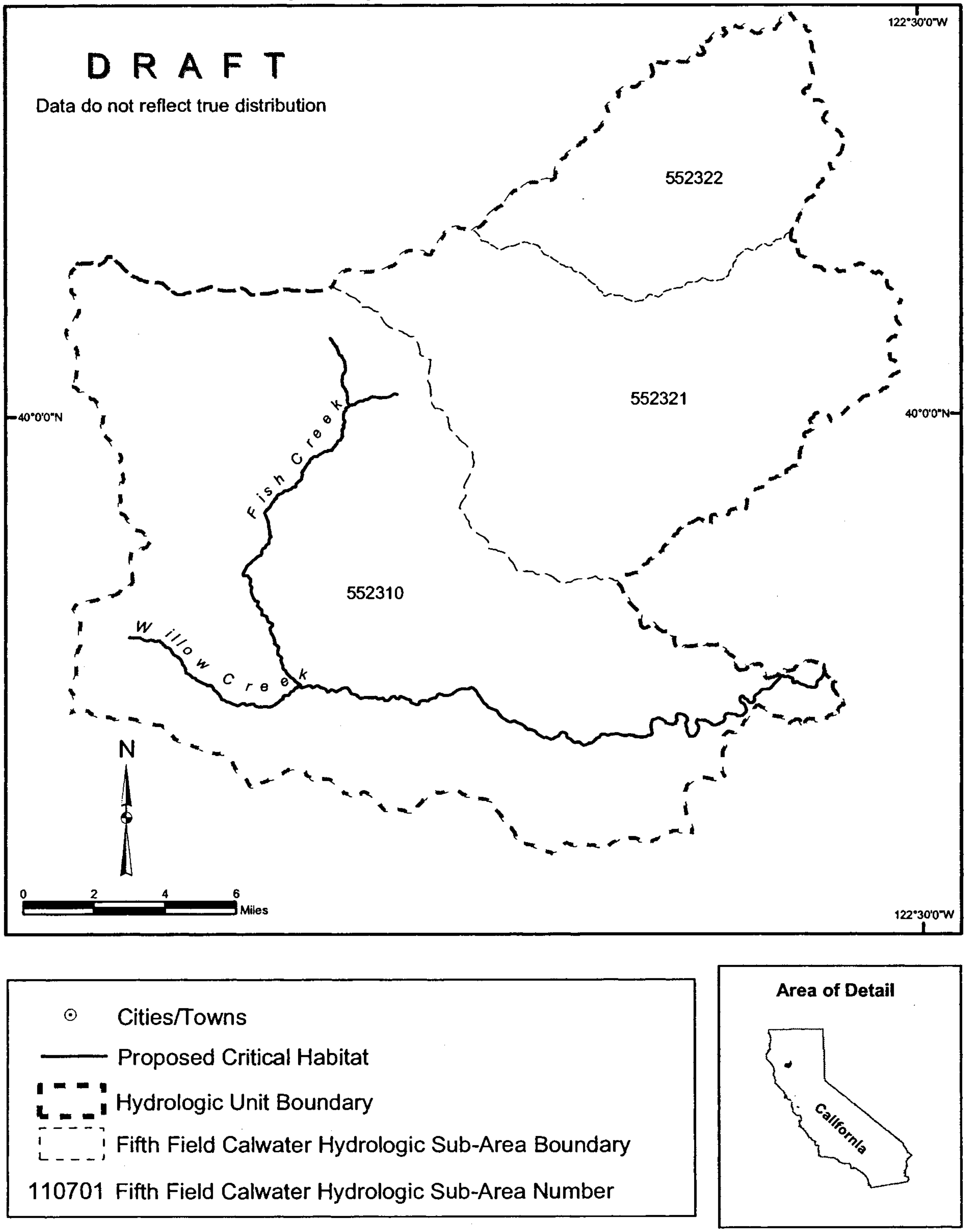
Proposed Critical Habitat for the
California Central Valley O. Mykiss
Valley-American Hydrologic Unit
5519
DRAFT
Data do not reflect true distribution
121°30'0"W
121°0'0"W
39°0'0"N
38°30'0"N
Olivehurst
551922
Auburn Ravine (lower)
Secret Ravine
Miner's Ravine
Dry Creek
Rio Linda
551921
American River
Rancho Cordova
551912
551911
Elk Grove
Cosumnes River
N
0 4 8 12
Miles
Cities/Towns
Proposed Critical Habitat
Hydrologic Unit Boundary
Fifth Field Calwater Hydrologic Sub-Area Boundary
110701 Fifth Field Calwater Hydrologic Sub-Area Number
Area of Detail
California

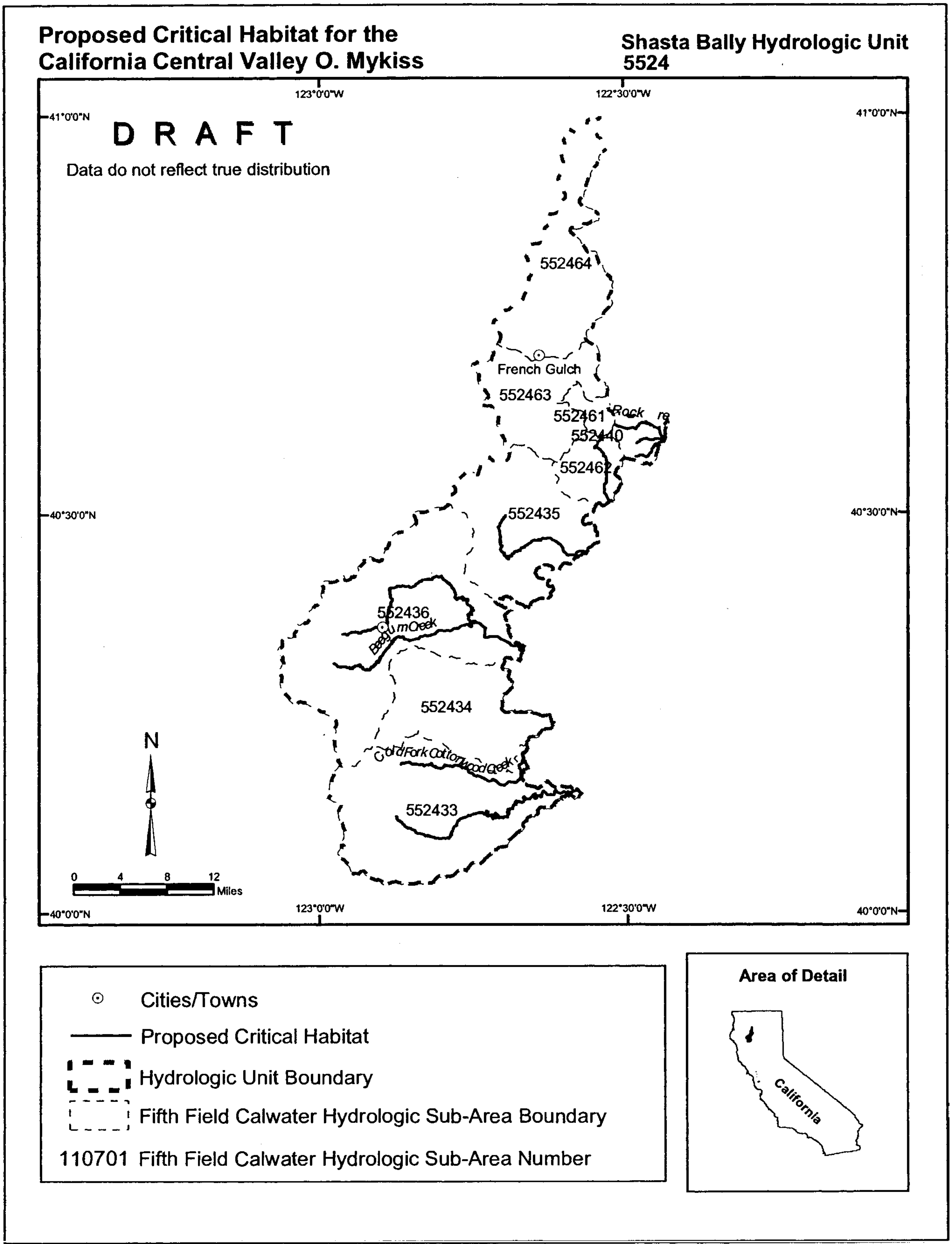

Proposed Critical Habitat for the
California Central Valley O. Mykiss
Colusa Basin Hydrologic Unit
5520
DRAFT
Data do not reflect true distribution
122°30'0"W
122°0'0"W
121°30'0"W
39°30'0"N
39°0'0"N
552022
552021
552040
552030
552010
Colusa Bypass
Butte Creek (lower)
Little Dry Creek
Butte Creek Sutter Bypass
N
0 5 10 15 Miles
Cities/Towns
Proposed Critical Habitat
Hydrologic Unit Boundary
Fifth Field Calwater Hydrologic Sub-Area Boundary
110701 Fifth Field Calwater Hydrologic Sub-Area Number
Area of Detail
California


Proposed Critical Habitat for the
California Central Valley O. Mykiss
Butte Creek Hydrologic Unit
5521
DRAFT
Data do not reflect true distribution
121°30'0"W
40°0'0"N
552130
552120
Butte Creek
Paradise
552110
N
0 3 6 9
Miles
Cities/Towns
Proposed Critical Habitat
Occupied but excluded streams / areas
Hydrologic Unit Boundary
Fifth Field Calwater Hydrologic Sub-Area Boundary
110701 Fifth Field Calwater Hydrologic Sub-Area Number
Area of Detail
California

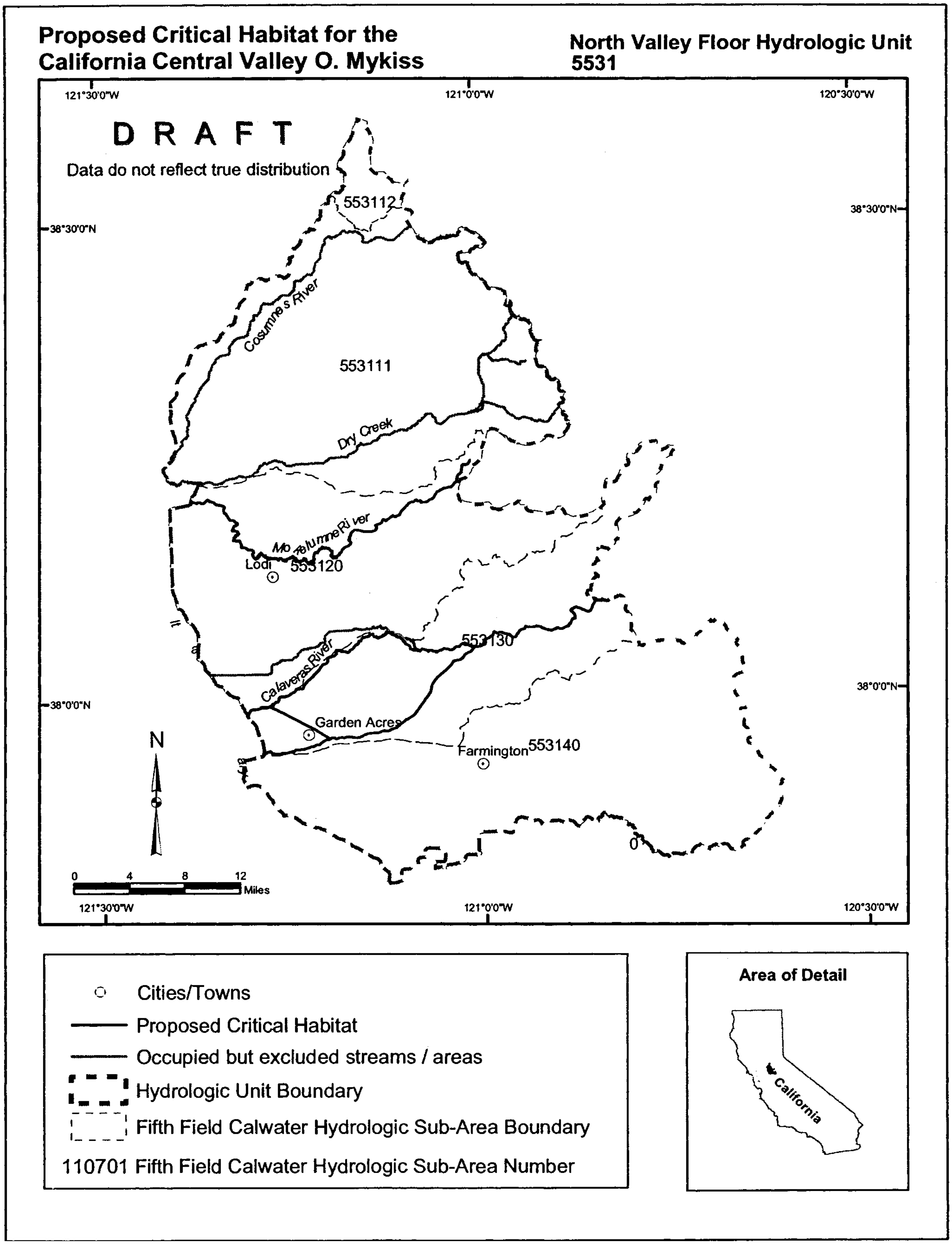
Proposed Critical Habitat for the California Central Valley O. Mykiss

Ball Mountain Hydrologic Unit 5523

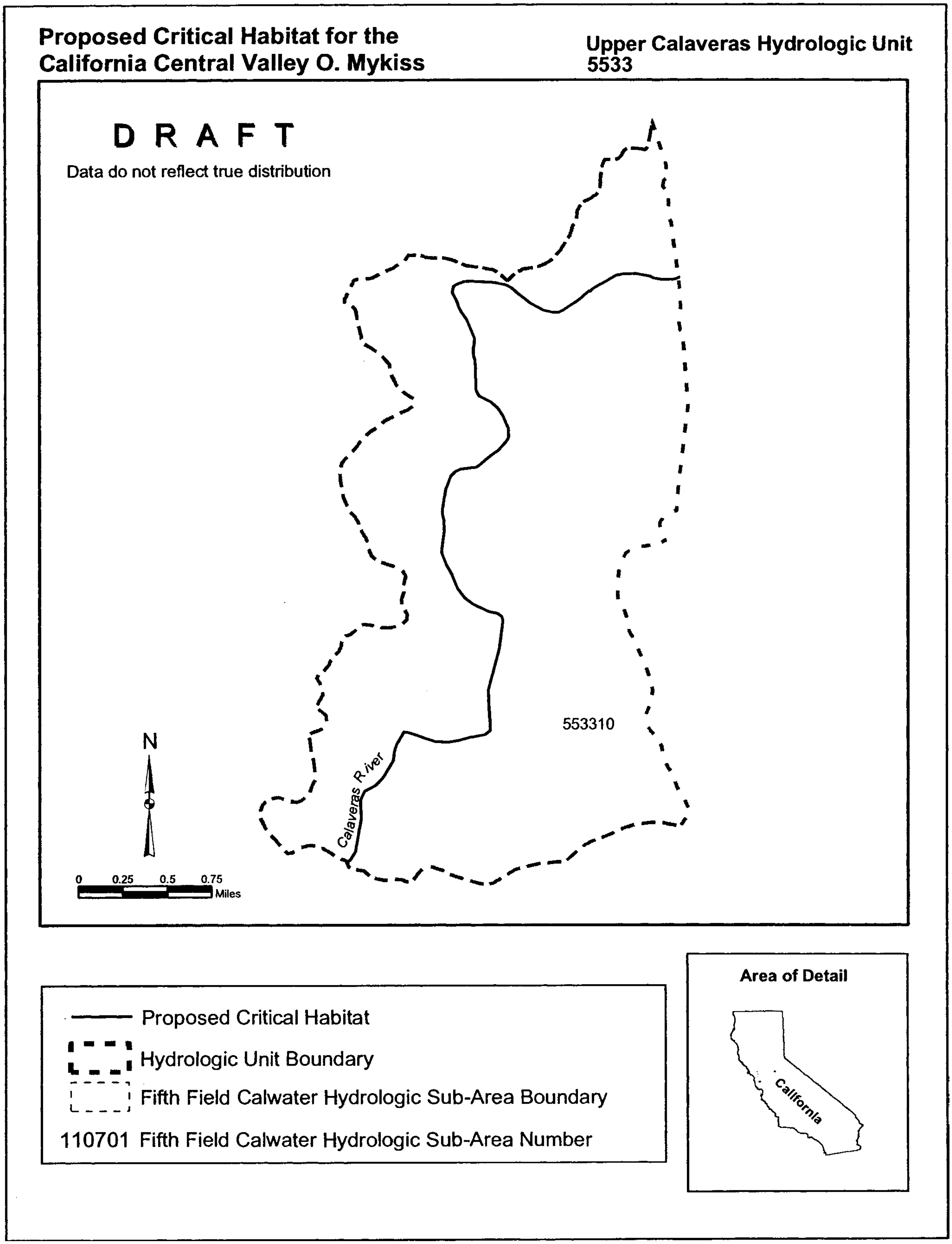


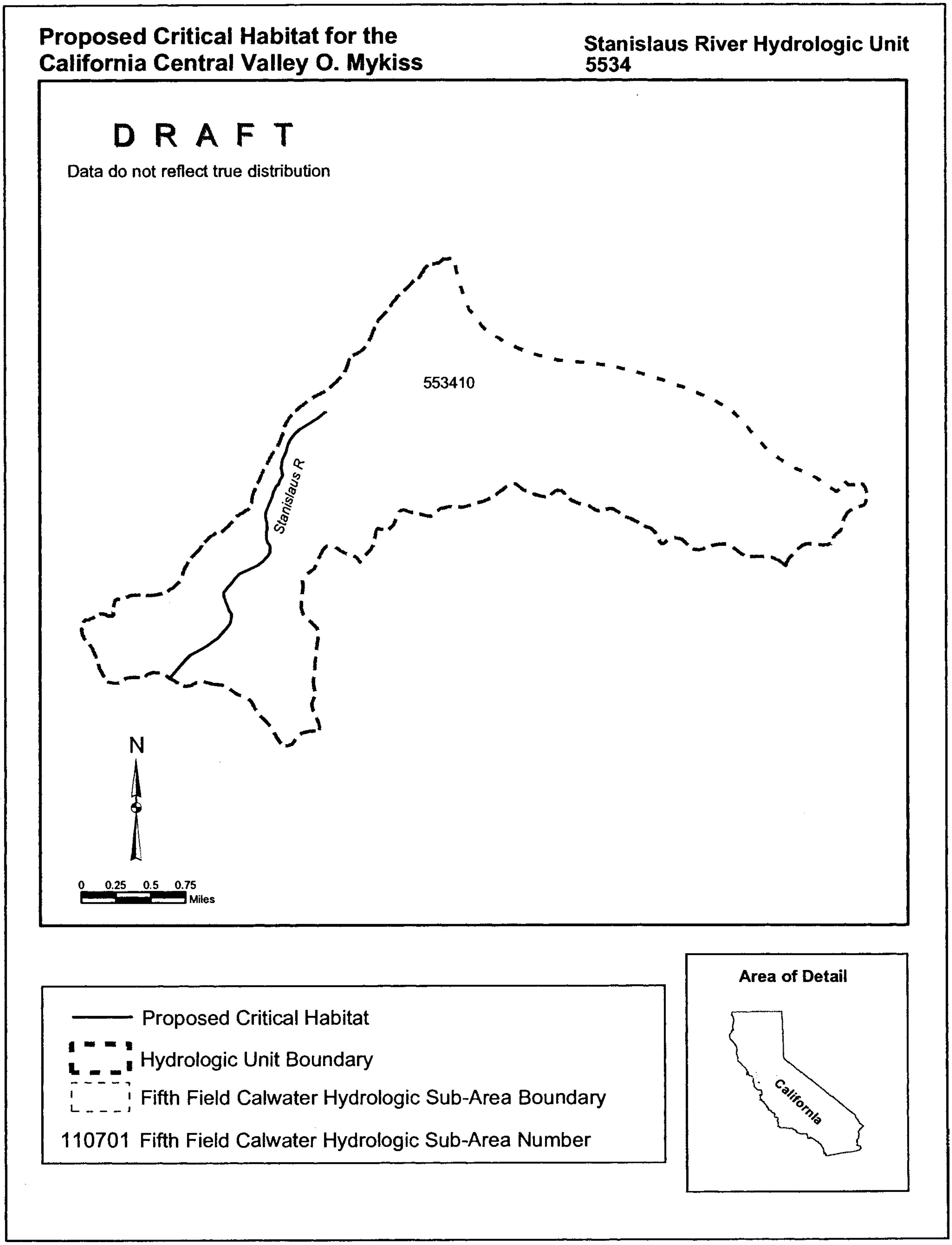


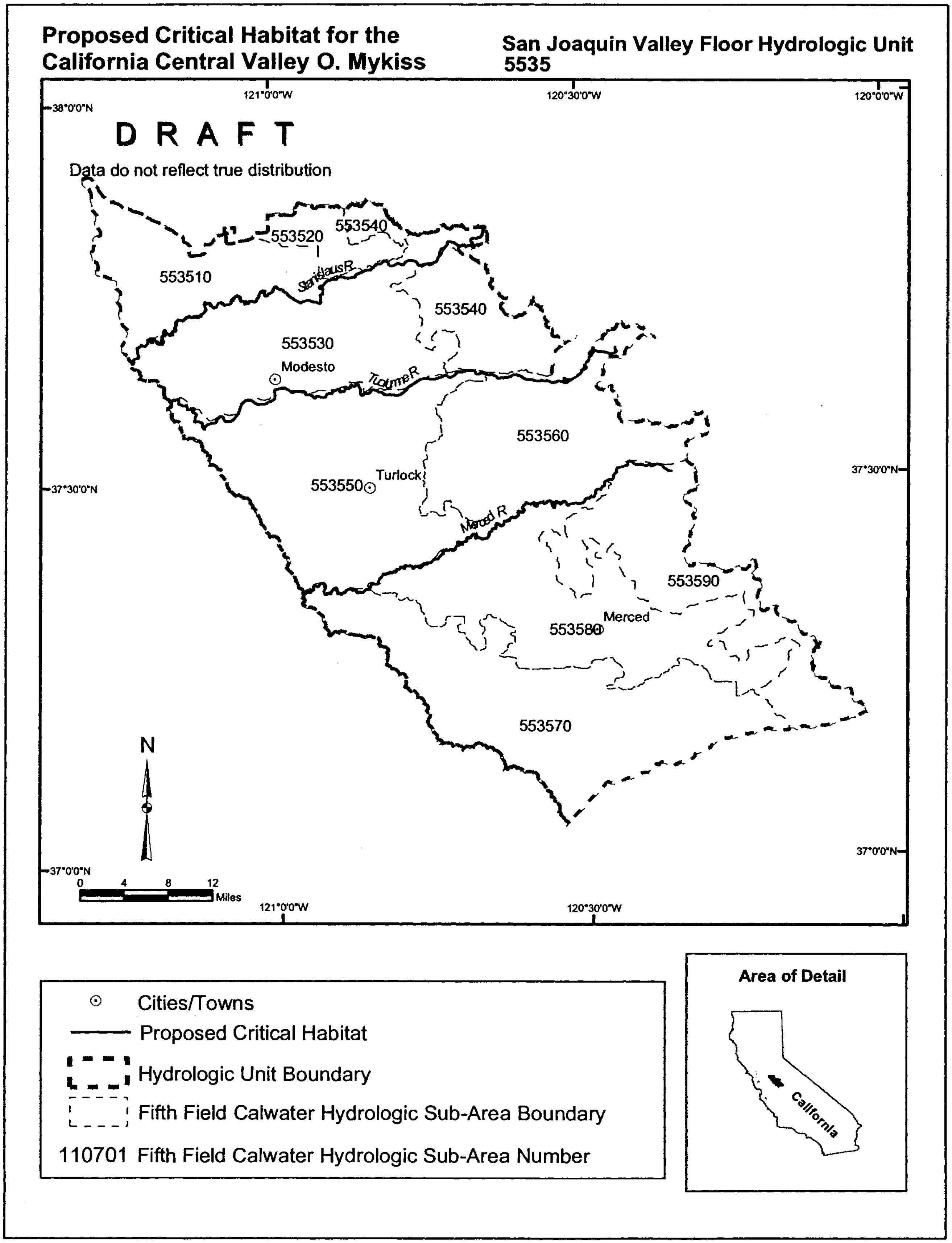
Proposed Critical Habitat for the California Central Valley O. Mykiss
Shasta Bally Hydrologic Unit 5524
DRAFT
Data do not reflect true distribution
123°0'0"W
122°30'0"W
41°0'0"N
40°30'0"N
40°0'0"N
552464
French Gulch
552463
552461
552440
552462
552435
552436
552434
552433
N
0 4 8 12 Miles
Cities/Towns
Proposed Critical Habitat
Hydrologic Unit Boundary
Fifth Field Calwater Hydrologic Sub-Area Boundary
110701 Fifth Field Calwater Hydrologic Sub-Area Number
Area of Detail
California

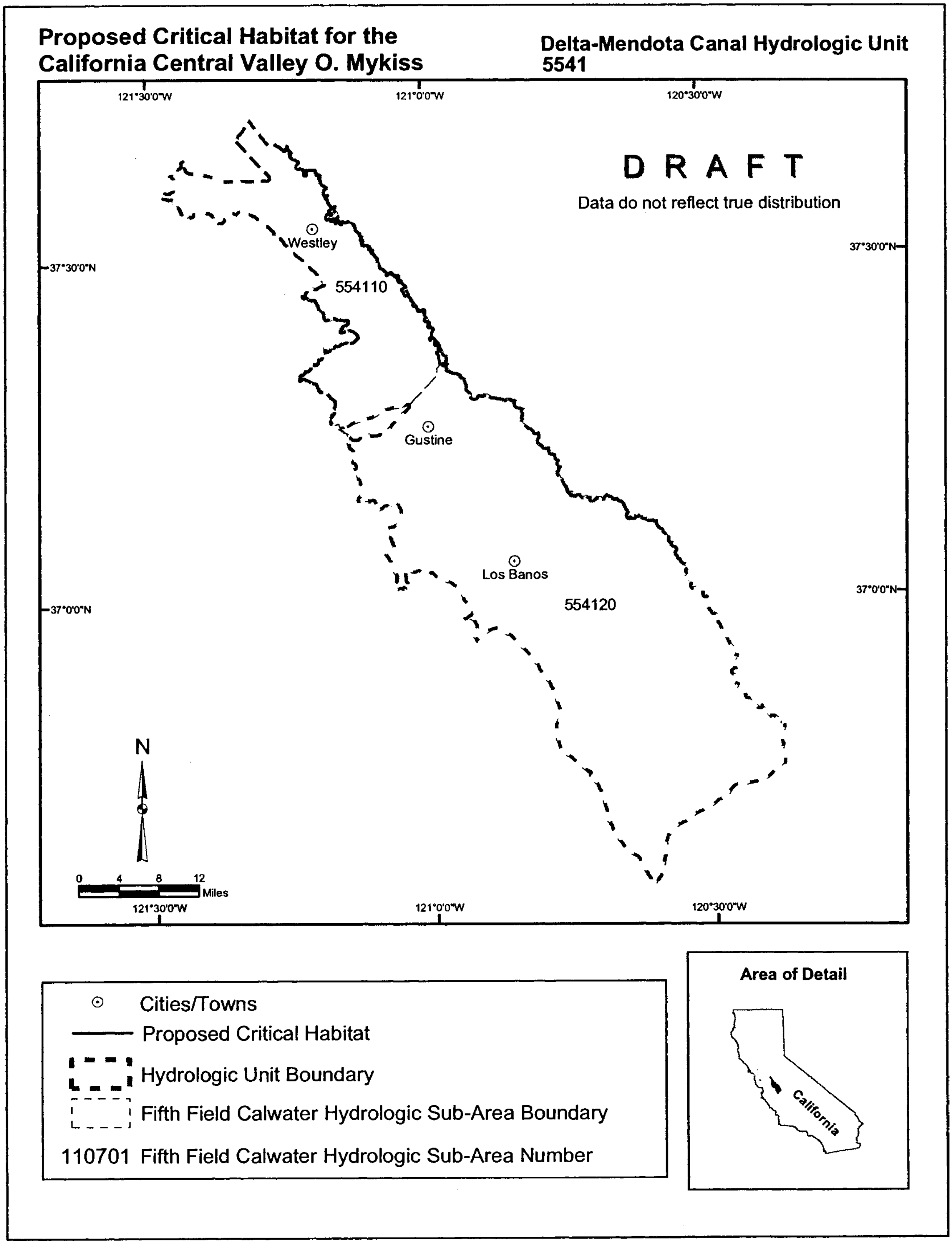


Proposed Critical Habitat for the
California Central Valley O. Mykiss
North Valley Floor Hydrologic Unit
5531
DRAFT
Data do not reflect true distribution
121°30'0"W
121°0'0"W
120°30'0"W
38°30'0"N
38°0'0"N
553112
553111
Cosumne s River
Dry Creek
Mokelumne River
Lodi
553120
553130
Calaveras River
Garden Acres
Farmington
553140
N
0
4
8
12
Miles
Cities/Towns
Proposed Critical Habitat
Occupied but excluded streams / areas
Hydrologic Unit Boundary
Fifth Field Calwater Hydrologic Sub-Area Boundary
110701 Fifth Field Calwater Hydrologic Sub-Area Number
Area of Detail
California

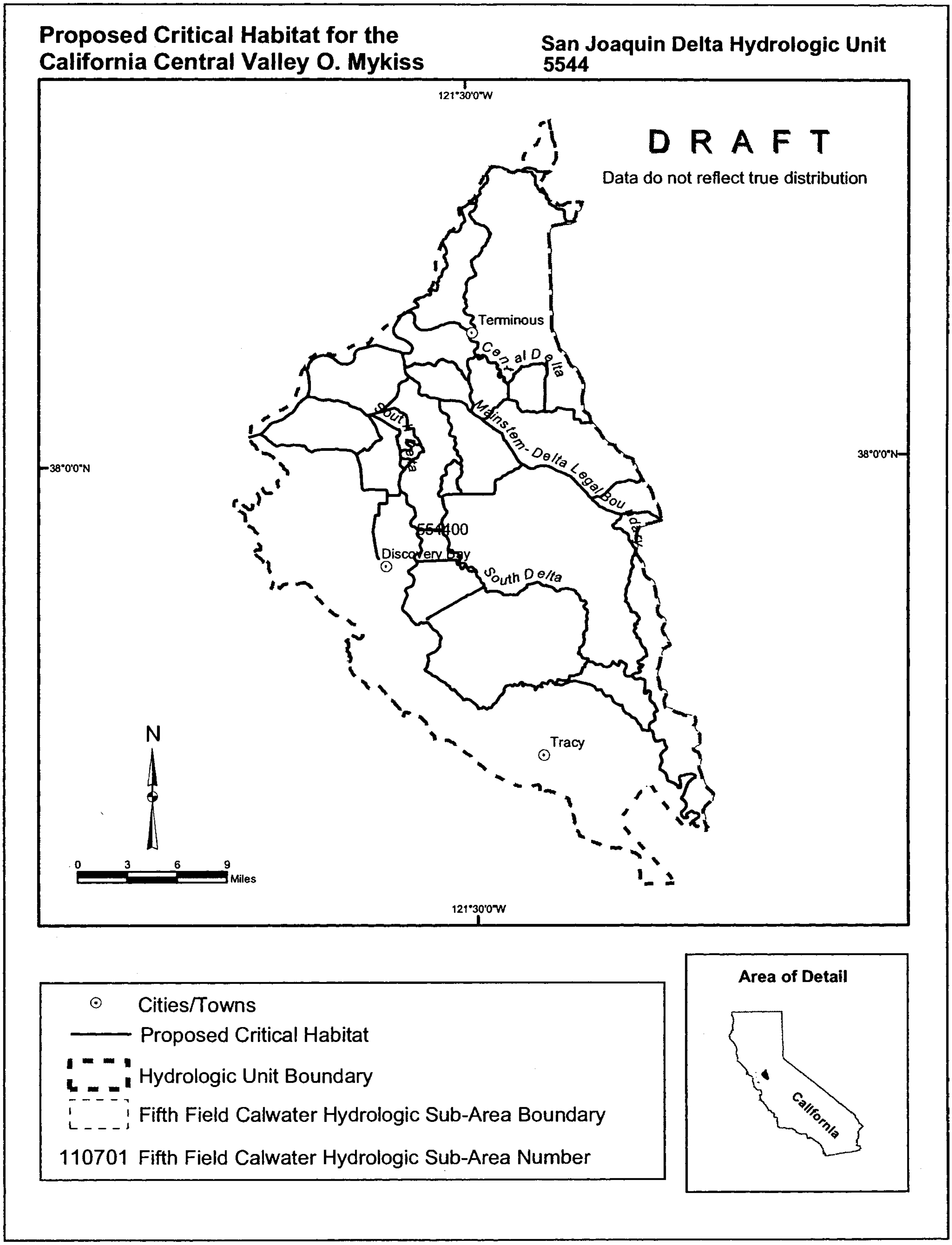

Proposed Critical Habitat for the
California Central Valley O. Mykiss
Upper Calaveras Hydrologic Unit
5533
D R A F T
Data do not reflect true distribution
553310
Calaveras River
N
0 0.25 0.5 0.75
Miles
Proposed Critical Habitat
Hydrologic Unit Boundary
Fifth Field Calwater Hydrologic Sub-Area Boundary
110701 Fifth Field Calwater Hydrologic Sub-Area Number
Area of Detail
California


Proposed Critical Habitat for the
California Central Valley O. Mykiss
Stanislaus River Hydrologic Unit
5534
D R A F T
Data do not reflect true distribution
553410
Stanislaus R
N
0 0.25 0.5 0.75
Miles
Proposed Critical Habitat
Hydrologic Unit Boundary
Fifth Field Calwater Hydrologic Sub-Area Boundary
110701 Fifth Field Calwater Hydrologic Sub-Area Number
Area of Detail
California


Proposed Critical Habitat for the
California Central Valley O. Mykiss
San Joaquin Valley Floor Hydrologic Unit
5535
121°0'0"W
120°30'0"W
120°0'0"W
38°0'0"N
DRAFT
Data do not reflect true distribution
553520
553540
553510
Stanislaus R.
553540
553530
Modesto
Tuolumne R
553560
37°30'0"N
553550
Turlock
Merced R
553590
Merced
553580
553570
N
37°0'0"N
0 4 8 12
Miles
Cities/Towns
Proposed Critical Habitat
Hydrologic Unit Boundary
Fifth Field Calwater Hydrologic Sub-Area Boundary
110701 Fifth Field Calwater Hydrologic Sub-Area Number
Area of Detail
California



Proposed Critical Habitat for the California Central Valley O. Mykiss
Delta-Mendota Canal Hydrologic Unit 5541
121°30'0"W
121°0'0"W
120°30'0"W
DRAFT
Data do not reflect true distribution
37°30'0"N
37°0'0"N
Westley
554110
Gustine
Los Banos
554120
N
0 4 8 12
Miles
Cities/Towns
Proposed Critical Habitat
Hydrologic Unit Boundary
Fifth Field Calwater Hydrologic Sub-Area Boundary
110701 Fifth Field Calwater Hydrologic Sub-Area Number
Area of Detail
California



[FR Doc. 04–26681 Filed 12–9–04; 8:45 am]

BILLING CODE 3510–22–C

EXHIBIT 6

Federal Register

Friday,
September 2, 2005

Part II

Department of Commerce

National Oceanic and Atmospheric Administration

50 CFR Part 226
Endangered and Threatened Species; Designation of Critical Habitat for Seven Evolutionarily Significant Units of Pacific Salmon and Steelhead in California; Final Rule

DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

50 CFR Part 226

[Docket No. 041123329–5202–02; I.D. No.110904F]

RIN 0648–AO04

Endangered and Threatened Species; Designation of Critical Habitat for Seven Evolutionarily Significant Units of Pacific Salmon and Steelhead in California

AGENCY: National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration, Commerce.

ACTION: Final rule.

SUMMARY: We, the National Marine Fisheries Service (NMFS), are issuing a final rule designating critical habitat for two Evolutionarily Significant Units (ESUs) of chinook salmon (*Oncorhynchus tshawytscha*) and five ESUs of steelhead (*O. mykiss*) listed as of the date of this designation under the Endangered Species Act of 1973, as amended (ESA). The specific areas designated in the rule text set out below include approximately 8,935 net mi (14,269 km) of riverine habitat and 470 mi^2 (1,212 km^2) of estuarine habitat (primarily in San Francisco-San Pablo-Suisun Bays) in California. Some of the areas designated are occupied by two or more ESUs. The annual net economic impacts of changes to Federal activities as a result of the critical habitat designations (regardless of whether those activities would also change as a result of the ESA's jeopardy requirement) are estimated to be approximately $81,647,439. We solicited information and comments from the public in an Advanced Notice of Proposed Rulemaking and on all aspects of the proposed rule. This rule is being issued to meet the timeline established in litigation between NMFS and Pacific Coast Federation of Fishermen's Associations (*PCFFA et. al* v. *NMFS* (Civ.No. 03–1883)). In the proposed rule, we identified a number of potential exclusions we were considering including exclusions for federal lands subject to the Pacific Northwest Forest Plan, PACFISH and INFISH. We are continuing to analyze whether exclusion of those federal lands is appropriate.

DATES: This rule becomes effective January 2, 2006.

ADDRESSES: Comments and materials received, as well as supporting documentation used in the preparation of this final rule, are available for public inspection by appointment, during normal business hours, at the National Marine Fisheries Service, NMFS, Protected Resources Division, 501 W. Ocean Blvd., Suite 4200, Long Beach, CA 90802–4213. The final rule, maps, and other materials relating to these designations can be found on our Web site at *http://swr.nmfs.noaa.gov.*

FOR FURTHER INFORMATION CONTACT: Craig Wingert at the above address, at 562/980–4021, or Marta Nammack at 301/713–1401 ext. 180.

SUPPLEMENTARY INFORMATION:

Organization of the Final Rule

This **Federal Register** notice describes the final critical habitat designations for seven ESUs of West Coast salmon and steelhead listed under the ESA. The pages that follow summarize the comments and information received in response to proposed designations published on December 10, 2004 (69 FR 71880), describe any changes from the proposed designations, and detail the final designations for seven ESUs. To assist the reader, the content of this notice is organized as follows:

I. Background and Previous Federal Action

We are responsible for determining whether species, subspecies, or distinct population segments of Pacific salmon and steelhead (*Oncorhynchus* spp.) are threatened or endangered, and for designating critical habitat for them under the ESA (16 U.S.C. 1531 *et seq*). To qualify as a distinct population segment, a Pacific salmon or steelhead population must be substantially reproductively isolated from other conspecific populations and represent an important component in the evolutionary legacy of the biological species. According to agency policy, a population meeting these criteria is considered to be an Evolutionarily Significant Unit (ESU) (56 FR 58612, November 20, 1991).

We are also responsible for designating critical habitat for species listed under our jurisdiction. Section 3 of the ESA defines critical habitat as (1) specific areas within the geographical area occupied by the species at the time of listing, on which are found those physical or biological features that are essential to the conservation of the listed species and that may require special management considerations or protection, and (2) specific areas outside the geographical area occupied by the species at the time of listing that are essential for the conservation of a listed species. Our regulations direct us to focus on ''primary constituent elements,'' or PCEs, in identifying these physical or biological features. Section 7(a)(2) of the ESA requires that each Federal agency shall, in consultation with and with the assistance of NMFS, ensure that any action authorized, funded or carried out by such agency is not likely to jeopardize the continued existence of an endangered or threatened salmon or steelhead ESU or result in the destruction or adverse modification of critical habitat. Section 4 of the ESA requires us to consider the economic impacts, impacts on national security, and other relevant impacts of specifying any particular area as critical habitat.

The timeline for completing the critical habitat designations described in this **Federal Register** notice was established pursuant to litigation between NMFS and the Pacific Coast Federation of Fishermen's Associations, Institute for Fisheries Resources, the Center for Biological Diversity, the Oregon Natural Resources Council, the Pacific Rivers Council, and the Environmental Protection Information Center (PCFFA, *et al.*) and is subject to a Consent Decree and Stipulated Order of Dismissal (Consent Decree) approved by the D.C. District Court. A complete summary of previous court action regarding these designations can be found in the proposed rule (69 FR 71880; December 10, 2004).

In keeping with the Consent Decree, on December 10, 2004 (69 FR 71880), we published proposed critical habitat designations for two ESUs of Chinook salmon and five ESUs of *O. mykiss.* (For the latter ESUs we used the species' scientific name rather than ''steelhead'' because at the time they were being proposed for revision to include both anadromous (steelhead) and resident (rainbow/redband) forms of the species—*see* 69 FR 33101, June 14, 2004). The seven ESUs addressed in the proposed rule were: (1) California Coastal Chinook salmon; (2) Northern California *O. mykiss;* (3) Central California Coast *O. mykiss;* (4) South-Central Coast *O. mykiss;* (5) Southern California *O. mykiss;* (6) Central Valley spring run Chinook salmon; and (7) Central Valley *O. mykiss.* The comment period for the proposed critical habitat designations was originally opened until February 8, 2005. On February 7, 2005 (70 FR 6394), we announced a court-approved Amendment to the Consent Decree which revised the schedule for completing the designations and extended the comment period until March 14, 2005, and the date to submit final rules to the **Federal Register** as August 15, 2005.

In the critical habitat proposed rule we stated that ''the final critical habitat designations will be based on the final listing decisions for these seven ESUs due by June 2005 and thus will reflect occupancy ''at the time of listing'' as the ESA requires.'' All of these ESUs had been listed as threatened or endangered between 1997–2000, but in 2002 we announced that we would reassess the listing status of these and other ESUs (67 FR 6215; February 11, 2002). We recently published final listing decisions for the two Chinook salmon, but not for the five ESUs of *O. mykiss* (70 FR 37160; June 28, 2005). Final listing determinations for these five ESUs are expected by December 2005 (70 FR 37219; June 28, 2005). However, the Consent Decree governing the schedule for our final critical habitat designations requires that we complete final designations for those of the seven ESUs identified above that are listed as of August 15, 2005. Because anadromous forms (*i.e.*, ''steelhead'') of the five *O. mykiss* ESUs have been listed since 1997–2000 (*see* summary in June 14, 2004 **Federal Register** notice, 69 FR 33103), we are now issuing final critical habitat designations for them in this notice in accordance with the Consent Decree. We are able to do so because in developing critical habitat designations for this species we have focused on the co-occurring range of both the anadromous and resident forms. Therefore, both the proposed and final designations were restricted to the species' anadromous range, although we did consider and propose to designate some areas occupied solely by resident fish in upper Alameda Creek in the San Francisco Bay area. We focused on the co-occurring range due to uncertainties about: (1) The distribution of resident fish outside the range of co-occurrence, (2) the location of natural barriers impassable to steelhead and upstream of habitat areas proposed for designation, and (3) the final listing status of the resident form. Section 4(a)(3)(B) of the ESA provides for the revision of critical habitat designations as appropriate, and we will do so (if necessary) after making final listing determinations for these five *O. mykiss* ESUs. Moreover, we intend to actively revise critical habitat as needed for all seven ESUs to keep them as up-to-date as possible.

In an Advance Notice of Proposed Rulemaking (ANPR) (68 FR 55926; September 29, 2003), we noted that the ESA and its supporting regulations require the agency to address a number of issues before designating critical habitat: ''What areas were occupied by the species at the time of listing? What physical and biological features are essential to the species' conservation? Are those essential features ones that may require special management considerations or protection? Are areas outside those currently occupied 'essential for conservation'? What are the benefits to the species of critical habitat designation? What economic and other relevant impacts would result from a critical habitat designation, even if coextensive with other causes such as listing? What is the appropriate geographic scale for weighing the benefits of exclusion and benefits of designation? What is the best way to determine if the failure to designate an area as critical habitat will result in the extinction of the species concerned?'' We recognized that ''[a]nswering these questions involves a variety of biological and economic considerations'' and therefore were seeking public input before issuing a proposed rule. As we stated in the proposed rule that followed: ''We received numerous comments in response to the ANPR and considered them during development of this proposed rulemaking. Where applicable, we have referenced these comments in this **Federal Register** notice as well as in other documents supporting this proposed rule.'' In the proposed rule, we described the methods and criteria we applied to address these questions, relying upon the unique life history traits and habitat requirements of salmon and steelhead.

In issuing the final rule, we considered the comments we received to determine whether a change in our proposed approach to designating critical habitat for salmon and steelhead was warranted. In some instances, we concluded based on comments received that a change was warranted. For example, in this final rule we have revised our approach to allow us to consider excluding areas covered by habitat conservation plans in those cases where the benefits of exclusion outweigh the benefits of designation.

In other instances, we believe the approach taken is supported by the best available scientific information, and that given the time and additional analyses required, changes to the methods and criteria we applied in the proposed rule were not feasible. We recognize there are other equally valid approaches to designating critical habitat and for answering the myriad questions described above. Nevertheless, issuance of the final rule for designating critical habitat for these ESUs is subject to a Court Order that requires us to submit the final regulation to the **Federal Register** no later than August 15, 2005, less than 5 months after the close of the public comment period. Taking alternative approaches to designating critical habitat would have required a retooling of multiple interrelated analyses and undertaking additional new analyses in support of the final rule, and was not possible given the time available to us. We will continue to study alternative methods and criteria and may apply them in future rulemakings designating critical habitat for these or other species.

II. Summary of Comments and Recommendations

As described in agency regulations at 50 CFR 424.16(c)(1), in the critical habitat proposed rule we requested that all interested parties submit written comments on the proposals. We also contacted the appropriate Federal, state, and local agencies, scientific organizations, and other interested parties and invited them to comment on the proposed rule. To facilitate public participation we made the proposed rule available via the internet as soon as it was signed (approximately 2 weeks prior to actual publication) and accepted comments by standard mail and fax as well as via e-mail and the internet (*e.g.*, *www.regulations.gov*). In addition, we held four public hearings between January 13, 2005, and February 1, 2005, in the following locations: Arcata, Rohnert Park, Sacramento, and Santa Barbara, CA. We received 3,762 written comments (3,627 of which were form letters or in the form of e-mails with nearly identical verbiage) during the comment period on the proposed rule.

In December 2004, the Office of Management and Budget (OMB) issued a Final Information Quality Bulletin for Peer Review establishing minimum peer review standards, a transparent process for public disclosure, and opportunities for public input (70 FR 2664; January 14, 2005). The OMB Peer Review Bulletin, implemented under the Information Quality Act (Pub. L. 106–554), is intended to provide public oversight on the quality of agency information, analyses, and regulatory activities, and applies to information disseminated on or after June 16, 2005. Prior to publishing the proposed rule we submitted the initial biological assessments of our Critical Habitat Analytical Review Teams (hereafter referred to as CHART) to state co-managers and asked them to review those findings. These co-manager reviews resulted in some changes to the CHARTs' preliminary assessments (*e.g.*, revised fish distribution as well as conservation value ratings) and helped to ensure that the CHARTs' revised findings (NMFS, 2004b) incorporated the best available scientific data. We later solicited technical review of the entire critical habitat proposal (biological, economic, and policy bases) from several independent experts selected from the academic and scientific community, Native American tribal groups, Federal and state agencies, and the private sector. We also solicited opinions from three individuals with economics expertise to review the draft economics analysis supporting the proposed rule. All three of the economics reviewers and one of the biological reviewers submitted written opinions on our proposal. We have determined that the independent expert review and comments received regarding the science involved in this rulemaking constitute adequate prior review under section II.2 of the OMB Peer Review Bulletin (NMFS, 2005b).

We reviewed all comments received from the peer reviewers and the public for substantive issues and new information regarding critical habitat for the various ESUs, and we address them in the following summary. Peer reviewer comments were sufficiently similar to public comments that we have responded to them through our general responses below. For readers'convenience we have assigned comments to major issue categories and where possible have combined similar comments into single comments and responses.

Notification and General Comments

Comment 1: Some commenters raised concerns or complained about the adequacy of public notification and time to comment.

Response: We made all reasonable attempts to communicate our rulemaking process and the critical habitat proposal to the affected public. Prior to the proposed rule we published an ANPR in which we identified issues for consideration and evaluation, and solicited comments regarding these issues and information regarding the areas and species under consideration (68 FR 55926; September 29, 2003). We considered comments on the ANPR during our development of the proposed rule. As soon as the proposed rule was signed on November 29, 2004 (2 weeks before actual publication in the **Federal Register**), we posted it and supporting information on the agency's internet site to facilitate public review, and we have provided periodic updates to that site (see **ADDRESSES**). In response to numerous requests—in particular from plaintiffs as well as private citizens, counties, farm bureaus, and state legislators in Washington—the original 60-day public comment period was extended by 30 days (70 FR 6394; February 7, 2005) to allow additional time for the public to submit comments on the critical habitat proposals.

Additionally, we realize that the statute provides a short time frame for designating critical habitat. Congress amended the ESA in 1982 to establish the current time frame for designation. In doing so, Congress struck a balance between the recognition that critical habitat designations are based upon information that may not be determinable at the time of listing and the desire to ensure that designations occur in a timely fashion. Additionally, the ESA and supporting regulations provide that designations may be revised as new data become available to the Secretary. We recognize that where the designation covers a large geographic area, as is the case here, the short statutory time frame requires a short period for the public to consider a great deal of factual information. We also recognize that this designation takes a new approach by considering relative conservation value of different areas and applying a cost-effectiveness framework. In this notice we are announcing our intention to consider revising the designations as new habitat conservation plans and other management plans are developed, and as other new information becomes available. Through that process we anticipate continuing to engage the interested public and affected landowners in an ongoing dialogue regarding critical habitat designations.

Comment 2: Some commenters disagreed with our decision to vacate the February 2000 critical habitat designations for these ESUs.

Response: We believe that the issues identified in a legal challenge to our February 2000 designations warranted withdrawing that rule. Developing a cost-effectiveness approach, designed to achieve the greatest conservation at the least cost, is in keeping with long-standing Executive direction on rulemaking and is a responsible and conservation-oriented approach to implementing section 4(b)(2) of the ESA. In addition, we had new and better information in 2004 than we had in 2000, such as the information of fish distribution and habitat use that was generated by agency fishery biologists. The ESA requires that we use the best available information, and the distribution data is the best information currently available. Finally, the litigation challenging our 2000 designation also challenged the lack of specificity in our designation of the riparian area, leading us to consider whether there was a better approach that was more consistent with our regulations and with the best available information.

Comment 3: Some commenters stated that we should wait to publish final critical habitat designations until after final listing determinations have been made and the final hatchery listing policy is published.

Response: The ESA states that the Secretary *shall* designate critical habitat, defined as areas within or outside the geographical area occupied by the species *at the time of listing* and using the best *available* information (emphasis added). These designations follow that statutory mandate and have been completed on a schedule established under a Consent Decree. Also, the final hatchery listing policy and final listing determinations for several salmon ESUs were published on June 28, 2005 (70 FR 37160 and 37204) in advance of the completion of this final critical habitat designation. For reasons described above in the ''Background and Previous Federal Action'' section, we are now making final designations for those listed salmon and steelhead ESUs in the

Southwest Region that are subject to the Consent Decree and listed as of the date of this designation.

Identification of Critical Habitat Areas

Comment 4: Several commenters contended that we can only designate areas that are essential for species conservation.

Response: Section 3(5)(A) of the ESA has a two-pronged definition of critical habitat: ''(i) the specific areas *within the geographical area occupied by the species*, at the time it is listed * * * on which are found those physical or biological features (I) essential to the conservation of the species and (II) which may require special management considerations or protection; and (ii) *specific areas outside the geographical area occupied by the species*, at the time it is listed * * * upon a determination by the Secretary that such areas are essential for the conservation of the species' (emphasis added). As described in this rule and documented in the reports supporting it, we have strictly applied this definition and made the requisite findings. We requested and received comments on various aspects of our identification of areas meeting this definition and address those here. Only those areas meeting the definition were considered in the designation process. Comments regarding the section 4(b)(2) process, in which we considered the impacts of designation and whether areas should be excluded, are addressed in a subsequent section.

Comment 5: In the proposed rule we considered occupied streams within a CALWATER Hydrologic Subarea (HSA) as the ''specific area'' in which the physical or biological features essential to conservation of the ESUs were found. We also used these watershed delineations as the ''particular areas''—the analytical unit—for purposes of the section 4(b)(2) analysis. In the proposed rule we requested public comment on whether considering exclusions on a stream-by-stream approach would be more appropriate. Some commenters believed that the watershed scale was too broad for making critical habitat designations and suggested that a smaller watershed or a stream-by-stream approach was more appropriate. Some commenters believed that we should conduct a reach-by-reach assessment in their watersheds.

Response: Our ESA section 4(b)(2) report (NMFS, 2005c) acknowledges that the delineation of both specific areas and particular areas should be as small as practicable, to ensure our designations are not unnecessarily broad and to carry out congressional intent that we fully consider the impacts of designation. For reasons described in the section below on ''Methods and Criteria Used to Identify Critical Habitat,'' we continue to believe that the specific facts of salmon biology and life history make CALWATER HSA watersheds in California an appropriate scale to use in delineating the ''specific'' areas in which physical or biological features are found. We also believe consideration of the impacts of designation on an HSA watershed scale results in a meaningful section 4(b)(2) balancing process. Moreover, congressional direction requires that designations be completed in a very short time frame by a specified deadline, ''based on such data as may be available at that time.'' Given that short time frame and the geographic extent of salmon critical habitat, the HSA watershed was the smallest practicable area we were able to analyze.

Comment 6: Some commenters believed we applied the definition of ''specific areas within the geographical area occupied by the species at the time it is listed'' too narrowly. In their views, this led to two errors—failure to designate all ''accessible'' stream reaches and failure to designate riparian and upstream areas. Commenters felt that the ''best scientific data available'' support a conclusion that salmon and steelhead will occupy all accessible streams in a watershed during a period of time that can be reasonably construed as ''at the time it is listed.'' One commenter stated that ''[w]hether a particular stream reach is occupied cannot be determined with certainty based on ''occupation'' data alone, especially for fragmented, declining, or depressed populations of fish.'' The commenter pointed to the rationale provided in our 2000 rule for identifying occupied areas as all areas accessible within a subbasin (a 4th field watershed, using U.S. Geological Survey (USGS) terminology): ''NMFS believes that adopting a more inclusive, watershed based description of critical habitat is appropriate because it (1) recognizes the species' use of diverse habitats and underscores the need to account for all of the habitat types supporting the species' freshwater and estuarine life stages, from small headwater streams to migration corridors and estuarine rearing areas; (2) takes into account the natural variability in habitat use that makes precise mapping problematic (*e.g.*, some streams may have fish present only in years with abundant rainfall) (65 FR 7764; February 16, 2000).''

Some commenters believe that in delineating ''specific areas within the geographical area occupied by the species,'' we need not confine ourselves to areas that are literally ''occupiable'' by the species in that we should designate riparian and upstream areas. If there are physical or biological features essential to conservation to be found within a broadly defined ''geographical area occupied by the species,'' we have the duty to delineate specific areas in a way that encompasses them. Some argued that limiting the designation to the stream channel fails to recognize the biological and hydrological connections between streams and riparian areas and would lead to further degradation of the latter. Some commenters suggested that we use a fixed distance (*e.g.*, 300 feet (91.4 m) if a functional description is not used. Some requested that we adopt the ''functional zone'' description for lateral extent used in the 2000 designations (65 FR 7764; February 16, 2000), while other commenters felt that our reference to habitat linkages with upslope and upstream areas was vague and wondered whether we were actually using the old approach anyway. Other commenters believed that using the line of ordinary high water or bankfull width was appropriate and noted that this would remove prior ambiguities about which areas were designated. Other commenters supported the approach taken in this designation, to identify specific areas occupied by the species and not broadly designate ''all areas accessible,'' some commenting that this was a more rigorous assessment and more in keeping with the ESA.

Response: The approach we took in the proposed designation is different from the approach we took in the vacated 2000 designation for a variety of reasons. The ESA directs that we will use the best scientific data available in designating critical habitat. Our regulations also provide direction: ''[e]ach critical habitat will be defined by specific limits using reference points and lines as found on standard topographic maps of the area * * * Ephemeral reference points (*e.g.*, trees, sand bars) shall not be used in defining critical habitat.'' (50 CFR 424.12(c)). With respect to our approach for identifying ''the geographical area occupied by the species,'' we recognize that the available fish and habitat use distribution data are limited to areas that have been surveyed or where professional judgment has been applied to infer distribution, and that large areas of watersheds containing fish may not have been observed or considered. We also recognize there have been many instances in which previously unobserved areas are found to be occupied once they are surveyed. Nevertheless, we believe the extensive data compiled by agency biologists, which was not available when we completed the 2000 designations, represents the best scientific information currently available regarding the geographical area occupied by the species. Moreover, the CHARTs had an opportunity to interact with the state fish biologists with the California Department of Fish and Game (CDFG) to confirm the accuracy of the data. We also believe the approach we have taken in this designation better conforms to the regulatory direction to use ''specific limits'' for the designation. The approach we used in 2000 used subbasin boundaries to delineate ''specific areas,'' which arguably met the requirement to use ''specific limits,'' but we believe using latitude-longitude endpoints in stream reaches, as we have done here, better adheres to the letter and spirit of our regulations.

With respect to our approach of limiting the designation to the occupied stream itself, not extending the designation into the riparian zone or upstream areas, we acknowledge that our regulations contemplate situations in which areas that are not literally occupiable may nevertheless be designated. Paragraph (d) of 50 CFR 424.12 gives as an example a situation in which areas upland of a pond or lake may be designated if it is determined that ''the upland areas were essential to the conservation of an aquatic species located in the ponds and lakes.'' For this designation, however, given the vast amount of habitat under consideration and the short statutory time frames in which to complete the designation, we could not determine ''specific limits'' that would allow us to map with accuracy what part of the riparian zone or upstream area could be considered to contain PCEs. As an alternative, we considered the approach we used in 2000, which was to designate riparian areas that provide function, but concluded that approach may not have been entirely consistent with the regulatory requirement to use ''specific limits.'' We believe limiting the designation to streams will not compromise the ability of an ESA section 7 consultation to provide for conservation of the species. Section 7 requires Federal agencies to ensure their actions are not likely to destroy or adversely modify critical habitat. Actions occurring in the riparian zone, upstream areas, or upland areas all have the potential to destroy or adversely modify the critical habitat in the stream. Although these areas are not themselves designated, Federal agencies must nevertheless meet their section 7 obligations if they are taking actions in these areas that ''may affect'' the designated critical habitat in the stream. Even though these designations are restricted to the stream itself, we will continue to be concerned about the same activities we have addressed in past consultations.

Comment 7: Several commenters believed we incorrectly applied the definition of ''specific areas outside the geographical area occupied by the species.'' In the view of some, we failed our duty under the ESA by not making a determination that we had identified as critical habitat enough areas (occupied and unoccupied) to support conservation. In the view of others, it was this failure that led to one of the errors described in the previous comment—the failure to designate all ''accessible stream reaches.'' Many commenters expressed concern about statements made in the press that the change from ''all areas accessible'' to areas documented as occupied led to a 90-percent reduction in critical habitat. Other commenters supported the approach taken in this designation, to identify specific areas occupied by the species and not broadly designate ''all areas accessible,'' some commenting that this was a more rigorous assessment and more in keeping with the ESA.

Response: Section 3(5)(A)(I) of the ESA requires us to identify specific areas within the geographical area occupied by the species that contain physical or biological features that may require special management considerations or protection. Section 3(5)(A)(ii) requires that specific areas outside the geographical area occupied by the species only fall within the definition of critical habitat if the Secretary determines that the area is essential for conservation. Our regulations further provide that we will designate unoccupied areas ''only when a designation limited to [the species'] present range would be inadequate to ensure the conservation of the species (50 CFR 424.12(e)).'' The ESA requires the Secretary to designate critical habitat at the time of listing. If critical habitat is not then determinable, the Secretary may extend the period by 1 year, ''but not later than the close of such additional year the Secretary must publish a final regulation, based on such data as may be available at that time, designating, to the maximum extent prudent, such habitat.''

At the present time, we do not have information allowing us to determine that the specific areas within the geographical area occupied by the species are inadequate for conservation, such that unoccupied areas are essential for conservation. We anticipate revising our critical habitat designations in the future as additional information becomes available through recovery planning processes.

Comment 8: Some commenters questioned the adequacy of our identification of PCEs, in particular the lack of specificity.

Response: To determine the physical or biological features essential to conservation of these ESUs, we first considered their complex life cycle. As described in the ANPR and proposed rule, ''[t]his complex life cycle gives rise to complex habitat needs, particularly during the freshwater phase (see review by Spence *et al.*, 1996).'' We considered these habitat needs in light of our regulations regarding criteria for designating critical habitat. Those criteria state that the requirements essential to species' conservation include such things as ''space * * * [f]ood, water, air, light, minerals, or other nutritional or physiological requirements * * * cover or shelter.'' They further state that we are to focus on the ''primary constituent elements'' such as ''spawning sites, feeding sites, * * * water quality or quantity,'' etc. In the ANPR and proposed rule we identified the features of the habitat that are essential for the species to complete each life stage and are therefore essential to its conservation. We described the features in terms of sites (spawning, rearing, migration) that contain certain elements.

Comment 9: In the proposed rule we requested comments on the extent to which specific areas may require special management considerations or protection in light of existing management plans. Several commenters stated that lands covered by habitat conservation plans or other management or regulatory schemes do not require special management considerations or protection. Others commented that even where management plans are present, there still may be ''methods or procedures useful'' for protecting the habitat features.

Response: The statutory definition and our regulations (50 CFR 424.02 and 424.12) require that specific areas within the geographical area occupied by the species must contain ''physical or biological features'' that are ''essential to the conservation of the species,'' and that ''may require special management considerations or protection.'' As described in the proposed rule, and documented in the reports supporting it, we first identified the physical or biological features essential to conservation (described in our regulations at 50 CFR 424.12(b)(5) as ''primary constituent elements'' or PCEs). We next determined the ''specific areas'' in which those PCEs are found based on the occupied stream reaches within a CALWATER HSA watershed. We used this watershed-scale approach to delineating specific areas because it is relevant to the spatial distribution of salmon and steelhead, whose innate homing behavior brings them back to spawn in the watersheds where they were born (Washington Department of Fisheries *et al.*, 1992; Kostow, 1995; McElhany *et al.*, 2000). We then considered whether the PCEs in each specific area (watershed) ''may require special management considerations or protection.''

We recognize there are many ways in which ''specific areas'' may be delineated, depending upon the biology of the species, the features of its habitat and other considerations. In addressing these comments, we considered whether to change the approach described in our proposed rule and instead delineate specific areas based on ownership. The myriad ownerships and state and local regulatory regimes present in any watershed, as well as the timing issues discussed previously, made such an approach impractical for this rulemaking, as noted in section I, ''Background and Previous Federal Action,'' above. While there are other equally valid methods for identifying areas as critical habitat, we believe that the watershed scale is an appropriate scale for identifying specific areas for salmon and steelhead, and for then determining whether the PCEs in these areas may require special management considerations or protections. We will continue to study this issue and alternative approaches in future rulemakings designating critical habitat.

Comment 10: One commenter stated that we could not designate any unoccupied areas if we had excluded any occupied areas, relying on the regulatory provision cited in a previous comment and response.

Response: The comment assumes that all habitat areas are equivalent and exchangeable, which they are not. An area may be essential for conservation because it was historically the most productive spawning area for an ESU and unless access to it is restored, the ESU will not fully recover to the point that the protections of the ESA are no longer necessary. This area will be essential regardless of whether some other specific area has been excluded.

Comment 11: Several commenters supported the designation of unoccupied areas above dams and some believed that by not designating these areas we will make it more difficult to achieve fish passage in the future. They further noted that excluding these presently blocked areas now may promote habitat degradation that will hinder conservation efforts should passage be provided in the future. Several commenters identified areas above specified dams as being essential for conservation.

Response: At the present time, we do not have information allowing us to determine that the specific areas within the geographical area occupied by the species are inadequate for conservation nor that currently unoccupied areas above dams are essential for conservation. The Southwest Region is actively involved in a multi-year, large-scale recovery planning effort in California that involves scientific teams (called technical recovery teams or TRTs) which are in the process of identifying ESU population structure, population viability criteria, and ESU level biological viability or recovery goals. These recovery planning efforts are developing information which will inform our decisions about whether unoccupied habitat will be needed to facilitate conservation beyond what is currently occupied by the ESUs addressed in this rulemaking. Until these efforts are more fully developed, we cannot make the specific determinations required under the ESA to designate critical habitat in ''unoccupied'' areas. We use our authorities under the ESA and other statutes to advocate for salmon passage above impassible dams where there is evidence such passage would promote conservation. This is not the same, however, as making the determinations required by the statute and our regulations to support designation.

Comment 12: In the proposed rule we requested comments regarding the use of professional judgment as a basis for identifying areas occupied by the species. Some commenters indicated that it was appropriate to accept the professional judgment of fish biologists who are most familiar with fish habitat within a watershed. Others believed that limiting the definition of occupied stream reaches to only those where fish presence has been observed and documented is overly narrow and fails to consider a number of conditions that affect species distribution, including natural population fluctuations and habitat alterations that affect accessibility or condition (*e.g.*, de-watering stream reaches). These commenters also argued that defining occupied reaches should be based on a broad time scale that takes into account metapopulation processes such as local extinction and recolonization, adding along with other commenters that many streams have not been adequately surveyed and species may frequent stream reaches but not actually be observed by a biologist at the time that critical habitat is being assessed.

Response: We relied on distribution and habitat use information developed by our agency fishery biologists from a wide range of sources, including the CDFG, to determine which specific stream reaches were occupied by each ESU. The data sets we developed defined occupancy based on field observations from stream surveys, and, in some cases, professional judgment based on the expert opinion of area biologists. In all cases the exercise of professional judgment included the consideration of habitat suitability for the particular species. We received several comments on our proposed rule regarding the accuracy of the distribution data in specific locations, and, where we could confirm that the information provided by the commenter was accurate, we accepted it as the best available information and adjusted our designation. We view designation of critical habitat as an ongoing process and expect to adjust the designations as necessary as new information or improved methods become available.

Comment 13: Some commenters addressed the CHART process although few recommended changes to the CHARTs' ratings of watershed conservation values. Some supported the process used, in particular the recognition that not all habitats have the same conservation value for an ESU and that this in turn allows for a more meaningful exclusion assessment under section 4(b)(2) of the ESA. One commenter contended that the CHART assessments were compromised by restricting them to consider only the stream channel rather than upslope areas as well.

Response: The CHART process was an important part of our analytical framework in that it allowed us to improve our analysis of the best available scientific data and to provide watershed-specific conservation ratings useful for the Secretary's exercise of discretion in balancing whether the benefits of exclusion outweigh the benefits of designation under section 4(b)(2) of the ESA. We do not believe that designating only the stream channel compromised the CHARTs' ability to assess watershed conservation values. As noted in the CHART report, the CHARTs employed a scoring system to assess (among other area characteristics) the quality, quantity, and distribution of

PCEs within a watershed. The PCEs we have defined for these ESUs are found within occupied stream channels, and therefore, it is appropriate to focus our assessment on those areas. The CHART scoring did include a factor related to the potential improvement of existing PCEs and thereby allowed the CHARTs to consider the ability of a watershed to contribute PCEs via natural processes such as recruitment of large wood and substrate, flow regulation, floodplain connectivity, *etc.* We recognize that salmon habitat is dynamic and that our present understanding of areas important for conservation will likely change as recovery planning sheds light on areas that can and should be protected and restored. We intend to actively update these designations as needed so that they reflect the best available scientific data and understanding.

Comment 14: Some commenters questioned whether the CHARTs considered the work of the various Technical Recovery Teams (TRTs) and suggested that the CHART assessments should be reviewed by the TRTs.

Response: Where information had been developed by the TRTs, the CHARTs did consider that information in their assessments. The CHARTs also solicited input and comments from the TRTs on their distribution and habitat use information as well as their watershed conservation assessments. We believe, therefore, that we have been able to integrate much of the TRT findings to date into our final critical habitat designations. Given their priorities (*i.e.,* providing crucial recovery planning criteria and guidance) and the time constraints under which we needed to complete the critical habitat assessments, TRT members could not participate on the CHARTs directly. We recognize that recovery planning is an ongoing process and that new information from the TRTs and recovery planning stakeholders may result in changes to our critical habitat assessments in the future.

Economics Methodology

Comment 15: Several commenters stated that the economic analysis overestimated the actual costs of critical habitat designation by including costs that should be attributed to the baseline. For example, commenters asserted that costs associated with listing and application of the jeopardy requirement should not be included in the analysis. Commenters also asserted that costs that would have occurred under Pacific Fisheries (PACFISH) or the Northwest Forest Plan should be excluded from the analysis. One commenter also stated that costs associated with existing critical habitat designations for salmon or other endangered species should be considered baseline impacts.

Response: Regarding costs associated with listing and application of ESA section 7's jeopardy requirement, the economic analysis follows the direction of the *New Mexico Cattlegrowers* decision, in which the Court of Appeals for the Tenth Circuit called for ''a full analysis of all of the economic impacts of a critical habitat designation, regardless of whether those impacts are attributable coextensively to other causes (*New Mexico Cattle Growers' Association* v. *U.S. Fish and Wildlife Service,* 248 F.3d 1277, 10th Cir. 2001). Consistent with this decision, the economic analysis includes incremental impacts, those that are solely attributable to critical habitat designation and would not occur without the designation, as well as coextensive impacts, or those that are associated with habitat-modifying actions covered by both the jeopardy and adverse modification standards under section 7 of the ESA. We do not think this overestimate of costs creates a bias in our 4(b)(2) balancing, however, for two reasons. On the ''benefit of designation'' side of the balance, we consider the benefit of designation to be the entire benefit that results from application of section 7's requirements regarding adverse modification of critical habitat, regardless of whether application of the jeopardy requirement would result in the same impact. Moreover, the cost-effectiveness approach we have adopted allows us to consider relative benefits of designation or exclusion and prioritize for exclusion areas with a relatively low conservation value and a relatively high economic cost. With such an approach it is most important that we are confident our analysis has accurately captured the relative economic impacts, and we believe it has.

In many cases, the protections afforded by PACFISH, the Northwest Forest Plan and other regulations are intertwined with those of ESA section 7. In cases where the specific regulation or initiative driving the salmon and steelhead conservation efforts is uncertain, we considered it as an ESA section 7 impact and examined the record of consultations with the affected agencies and based our analysis on the habitat protection measures routinely incorporated into the consultations. The economic analysis therefore assumes that the impacts of these types of habitat protection measures are attributable to the implementation of section 7. In these instances, to the extent that conservation burdens on economic activity are not, in fact, resulting from section 7 consultation, the economic analysis may overstate costs of the designation. We took this possibility into account in conducting the 4(b)(2) balancing of benefits. Conservation efforts clearly engendered by other regulations are included in the regulatory baseline. For example, Federal lands management activities in the Northwest Forest Plan planning area are affected by PACFISH. As a result, some projects that would have affected salmon habitat will not be proposed, and therefore will not be subject to section 7 consultation. These changes in projects are considered baseline and are not included as a cost of section 7 in the economic analysis.

Commenters correctly note that there are designations currently in place protecting critical habitat for salmon (*e.g.,* Sacramento River winter run chinook salmon, Central California Coastal coho salmon). We acknowledged this in our proposed rule, but also noted that the presence of those existing designations weighs equally on both sides of the 4(b)(2) balance—that is, the existing designations also could be considered as part of the baseline for determining the benefit of designation for the ESUs addressed in the present rule. This concern is also addressed by the cost-effectiveness approach we have adopted since it relies on relative benefits of designation and exclusion rather than absolute benefits.

Comment 16: One commenter and one peer reviewer noted that the economic analysis assigns costs to all activities within the geographic boundary of the HSA watersheds, though not all activities in this area will lead to an ESA section 7 consultation or are equally likely to have economic impacts. By doing this, the agency assumed that if the stream reaches currently occupied by salmon were designated as critical habitat, then activities throughout the watershed would be affected, whether or not they are adjacent to critical habitat stream reaches.

Response: It is possible for activities not directly adjacent to the proposed stream reaches to affect salmon and steelhead or their habitat (for example, by increasing risk of erosion or decreased water quality), and, therefore, such activities may be subject to consultation and modification. Thus, we believe the HSA watersheds represent a reasonable proxy for the potential boundary of consultation activities. In some cases the revised economic analysis applies costs less broadly by refining the geographic scale for certain activities. For example, the analysis of pesticide impacts has been refined and are now calculated based on occupied stream mile estimates within a watershed.

Comment 17: One commenter asserted that the draft report inflates its cost estimates by repeatedly choosing the high-end of a range of costs, while a peer reviewer suggested using the mid-range as a representative cost estimate was problematic.

Response: In determining likely costs associated with modifications to activities that would benefit salmon and steelhead, the economic analysis identifies a range of costs using available data from, for example, agency budgets, documented conversations with stakeholders, and published literature. The full range of costs of these activities is presented in the economic analysis, and individual watersheds are generally ranked in terms of cost impact by the midpoint of the cost range, as opposed to the high end. While we recognize that a formal sample of projects costs based on the consultation record or other sources is a better approach in theory, available data did not allow such an approach. In gathering the cost information that was available, we avoided using outliers and sought to construct a typical range of costs.

Comment 18: Some commenters asserted that the economic analysis fails to account for regional economic interactions between watersheds. One commenter stated that this would result in an overstatement of the costs, while other commenters state that this would underestimate the costs. One peer reviewer suggested using regional economic models to address these interactions.

Response: We acknowledge that modifications to economic activities within one watershed may affect economic activities in other watersheds. The economic analysis discusses the potential for regional economic impacts associated with each of the potentially affected activities. Impacts are assigned to particular areas (watersheds) based on where they are generated as opposed to felt. That is, if the designation of a watershed causes impacts in multiple nearby watersheds, and exclusion of the impact-causing watershed would remove those economic impacts from the region, the economic analysis appropriately assigns the total cost impact to the impact-causing watershed. This method of assigning impacts is most useful to us in deciding the relative cost-effectiveness of excluding particular areas from critical habitat designation. As we acknowledge in NMFS (NMFS 2005b), the economic analysis does not explicitly analyze the potential for these regional interactions to introduce cumulative economic impacts. Data are not available to support such an effort, nor would the results necessarily be applicable at the level of a particular watershed. If these impacts in fact exist, our results are likely to be biased downward, in that we have likely underestimated the costs of critical habitat designation at the level of the ESU. At the level of a watershed, however, the potential error is smaller. For this reason, we do not believe the lack of a regional modeling framework introduces a significant bias into the results for particular watersheds.

Comment 19: Several commenters stated that the economic analysis underestimates the actual costs of the rule by excluding several categories of costs from the estimates. One commenter stated that the *New Mexico Cattlegrowers* decision specifically requires a full analysis of all impacts, including those resulting from the species' listing. One comment argued that assessment of impacts stemming from activities occurring outside the designated area should be included, including indirect and regional impacts. Another commenter stated that the analysis should consider direct, indirect, and induced economic impacts including: changes in property values, property takings, water rights impacts, business activity and potential economic growth, commercial values, county and state tax base, public works project impacts, disproportionate economic burdens on society sections, impacts to custom and culture, impacts to other endangered species, environmental impacts to other types of wildlife, and any other relevant impact.

Response: As noted in a previous response, the Court in the *New Mexico Cattlegrowers* decision called for ''a full analysis of all of the economic impacts of a critical habitat designation, regardless of whether those impacts are attributable coextensively to other causes.'' (emphasis added) The economic analysis conducted for this rule evaluated direct costs associated with the designation of critical habitat and includes: (1) Direct coextensive impacts, or those that are associated with habitat-modifying actions covered by both the jeopardy (listing) and adverse modification (critical habitat) standards; and (2) direct incremental impacts, or those that are solely attributable to critical habitat designation.

We acknowledge that designation of critical habitat may also trigger economic impacts outside of the direct effects of ESA section 7 or outside of the watersheds subject to the economic analysis. For example, state or local environmental laws may contain provisions that are triggered if a state- or locally regulated activity occurs in Federally-designated critical habitat. Another possibility is that critical habitat designation could have ''stigma'' effects, or impacts on the economic value of private land not attributable to any direct restrictions on the use of the land. Our economic analysis did not reveal significant economic impacts from stigma effects for the designation of salmon and steelhead. Further, significant impacts of critical habitat on an industry may lead to broader regional economic impacts. All of these types of impacts are considered in the analysis, although it was not possible to estimate quantitative impacts in every case. We took these considerations into account in balancing benefits under section 4(b)(2).

We acknowledge that designation of critical habitat may also trigger impacts on customs, culture, or other wildlife species. We concluded that data were not presently available that would allow us to quantify these impacts, at the scale of this designation, for the economic analysis. Our analysis was further circumscribed by the short time frames available, and our primary focus on conservation benefits to the listed species that are the subject of this designation. We took this limitation into account in the balancing of benefits under section 4(b)(2).

Comment 20: Several commenters indicated that the economic analysis should include a discussion of the impact of changes in flow regimes on water users, specifically in the timing of water flow through dams and water withdrawal or diversion constraints. Among potentially affected water users are crop irrigators and other agricultural water users, regulators and consumers of public water supply in the region, and in particular, water users of the Central Valley Project and State Water Project, among others. Similarly, several commenters stated that the analysis should include an analysis of impacts of changes to operations that result in increased spill at hydropower dams on the cost of power in the region. These commenters are concerned that excluding these costs underestimates total economic impact. One commenter pointed out that low flow years and drought years are not considered in the economic impacts, and consideration of varying water year types is especially relevant to estimating impacts of instream flow augmentation. Another commenter pointed out that existing, economically feasible alternate sources of water may not be available to water users, and thus economic costs could be large. One commenter estimated the potential loss of agricultural income that would result from a reduction in water availability to a specific region. One commenter stated that if requisite minimum instream flows are developed that correspond to the proposed critical habitat designation, they could be analyzed using the CALVIN model developed by the University of California.

Response: While economic impacts would clearly result from future changes to water supply availability, the amount of water within particular areas that may be diverted from activities such as irrigation, flood control, municipal water supply, and hydropower, for the purposes of Pacific salmon and steelhead conservation, and thus the requisite timing and volume of minimum instream flows, has not been determined for most facilities. Many biological and hydrologic factors are considered in determining flow requirements through dams for Pacific salmon and steelhead, and the impacts of altering flow regimes to meet these requirements are highly site-specific. For example, the impact of increasing spill at a hydropower project depends on the level and timing of the spill, and on the method by which any lost power generation is replaced. Similarly, at a water supply facility, the impact of increasing spill depends on the size and timing of the spill, but also depends on the specific water rights held at the facility and by downstream users, including the priority, volume, timing, and particular use of those water rights.

The extent to which any future changes in flow may be attributable to the designation of critical habitat, as opposed to the listing or other wildlife-related regulations, is also unclear. The interrelated nature of dam and diversion projects with hydrology across river systems makes it very difficult to attribute flow-related impacts for salmon and steelhead conservation to specific watersheds. As a result, a comprehensive prospective analysis of the economic impacts of potential restrictions on water use by these activities would be highly speculative. We acknowledge this limitation of the economic analysis. However, the revised economic analysis does include an expanded discussion of what is known about the potential impacts of changes in flow regimes on hydropower production and prices and water diversions on irrigation based on historical examples.

Comment 21: Some commenters expressed concern that the economic analysis does not address cumulative costs of multiple layers of regulation on economic activities.

Response: Our economic analysis estimates costs associated with conducting ESA section 7 consultation to ensure Federal agency actions are not likely to destroy or adversely modify critical habitat. We did not have information available at the scale of this designation to determine the marginal cost or benefit of such a consultation, in addition to any state or local review that may occur, nor did the commenters provide data that would allow us to make such a determination.

Comment 22: One commenter stated that the economic analysis fails to factor in subsidies given to industries such as livestock grazing, hydropower operations, and irrigation activities, which minimizes true costs to the public. Another commenter further stated that the analysis does not distinguish between several countervailing cost elements, including ''socialized costs'' (costs Congress has decided that the public should bear, such as costs to Federal activities), actual costs to private entities, incentive costs, subsidies, and offsetting costs. As a result, for Federal programs, the analysis miscategorizes activities that benefit a small but favored sector of society, but that cause costs to the larger society. The analysis assumes that costs to these activities are costs to society in general.

Response: The analysis attempts to measure true social costs associated with implementing the final critical habitat rule. To accomplish this, the analysis uses the measurement of the direct costs associated with meeting the regulatory burden imposed by the rule as the best available proxy for the measurement of true social costs. We agree that it is relevant to consider appropriate countervailing or net cost impacts, where possible, in determining the benefit of exclusion. Where data are available, our analysis attempts to capture the net economic impact (*i.e.*, the increased regulatory burden less any discernable offsetting market gains), of ESA section 7 efforts imposed on regulated entities and the regional economy. For example, in the economic analysis, the revised impact estimates for pesticide use restrictions explicitly net out agriculture subsidy payments in the estimation of lost agricultural profits.

Comment 23: Several commenters indicated that the designation of critical habitat will impose an administrative burden on affected parties, including private, Federal, state and local entities. One commenter stated that the increase in paperwork as a result of re-initiating consultation on potential impacts to critical habitat for projects that have already been through ESA section 7 consultation is a major concern.

Response: We do consider that all activities may be subject to future consultation, regardless of whether past consultation occurred on these activities. Designation of critical habitat may result in reinitiating consultation on activities that were subject to previous consultation to ensure that the adverse modification requirement is addressed in addition to the jeopardy requirement. The economic analysis estimates the level of administrative effort associated with ESA section 7 consultations, whether those consultations concern a new activity or readdress the impacts of a previously reviewed activity. The revised economic analysis includes a refined estimate of administrative costs associated with consultations on West Coast salmon and steelhead.

Comment 24: Some commenters stated that the economic analysis estimates impacts using a constant per-capita income basis and that doing so is likely to underestimate the impacts on rural communities.

Response: Per-capita income is not explicitly factored into the watershed specific quantitative impact estimates in the economic analysis. The commenter is highlighting that equal costs in any given watersheds will not likely result in the same relative economic burden to residents of those watersheds. This is because the ratio of costs of the designation to income may vary across watersheds. In lower income areas, the cost of implementing modifications to projects for the benefit of salmon and steelhead may be more burdensome relative to higher income areas. We did consider the extent to which costs of designation within a watershed are likely to be borne locally. In addition, information on distribution of wealth across the designation is provided contextually in the economic analysis and this information is weighed in considering the benefits of exclusion of particular areas.

Comment 25: One commenter stated that the analysis does not attempt to explain or quantify with any level of precision what additional costs are required by ESA section 7 consultation for design and/or operational modifications or mitigation measures.

Response: The economic analysis focused on the impacts of section 7 consultation on economic activities by first identifying the types of activities occurring that may be subject to section 7 consultation. The analysis then estimated the regulatory burden placed upon these activities as a result of section 7 consultation. The burden estimate is based upon a review of past modifications to those activities undertaken for the benefit of salmon and steelhead, interviews with NMFS' consulting biologists, affected parties, and available documents and literature. This research on the potential costs of these modifications then determined a typical range of costs for potential project modifications that may be associated with section 7 consultation in the future.

Comment 26: One commenter stated that the economic analysis relied extensively on the agency's consultation history for economic impact estimates. Similarly, another commenter asserted that past costs are not good indicators of future costs due to streamlining of the consultation process (for example, for fire management) on Federal lands. One commenter stated that the economic analysis assumes that the population growth and economy of the impact areas are stagnant. The analysis should evaluate population and economic growth on a regional, State, and county basis, and evaluate the degree to which the listing of salmon and steelhead may have contributed to any population and economic decline.

Response: The economic analysis does not solely rely on the consultation history to estimate economic impacts. The analysis includes estimated costs associated with compliance with salmon conservation activities produced by regulated entities, including private, state, and Federal agencies, as well as published literature, where information was available. The economic analysis does not uniformly assume that all activities and associated consultations will occur at the same rate in future years as in past years. Instead, the economic analysis projects the most likely level of future activity using a broad spectrum of planning documents, geographical data, and interviews with planners and other stakeholders. Further, the economic analysis does not quantify retrospective impacts of salmon and steelhead conservation because the focus of the analysis is on future impacts associated with the critical habitat areas identified in this rulemaking. It should also be noted that consultations conducted by NMFS do not include cost estimates of implementing recommended actions. The analysis also presents detailed information on the current estimated population and population density within each of the particular areas in the proposed critical habitat designation.

Comment 27: One comment letter questioned whether there exists an acceptable or unacceptable level of negative economic impact to communities, landowners, or local governments and whether the government must consider the impacts that their decisions will have on local economies.

Response: The economic analysis provides information regarding the impact to potentially affected economic activities of the proposed critical habitat designation. This information was used to identify the particular areas according to their relative cost burden. We then weighed this information against the relative conservation value of the particular areas considering the economic and any other relevant impact of designating critical habitat. Further, concurrent with the economic analysis, we prepared an analysis of potential impacts to small entities, including small businesses and government. This analysis identified the number of small businesses and governments likely impacted by the proposed critical habitat using county-specific data on the ratio of small businesses to total businesses in each potentially affected economic sector.

Comment 28: Some commenters stated that the economic analysis used data that are overly broad or made assumptions across geographic areas that are too far reaching. For example, one commenter stated that the economic analysis assumes that the necessity and scope of modifications will be constant across ESUs for most activities, when in reality, these are likely to vary substantially.

Response: For each activity, the economic analysis examines the probability of consultation and the likelihood of modification. A variety of activity-specific information sources were used to forecast the frequency and geographic distribution of potentially affected activities. That is, frequency of consultation was not always assumed to be uniform across ESUs. The economic analysis does not, however, assume that costs increase in areas of overlapping ESUs. In other words, the presence of critical habitat for multiple ESUs is not expected to generate a greater impact than if the particular area is critical habitat for only a single ESU. Examination of the consultation history did not reveal differences in requests for modification to projects (reasonable and prudent alternatives) among the ESUs. We recognize, however, that the broad scope and scale of the analysis required us to make simplifying assumptions in order to complete the designations in a timely fashion.

Comment 29: Several commenters and a peer reviewer expressed concern that the economic analysis failed to consider the full range of economic benefits of salmon habitat conservation, and therefore, provided a distorted picture of the economic consequences of designating versus excluding habitat areas. Similarly, commenters expressed concerns that the economic impact of not designating particular areas to fishers and investors in recovery efforts should be considered in the economic analysis. Commenters specifically cited the lack of consideration in the economic analysis of the potential benefits of critical habitat designation on: (1) Decreased risk of extinction; (2) benefits to other aquatic and riparian species; (3) water quality; (4) flood control values; (5) recreation; (6) commercial fishing; (7) fish harvest for tribal uses; and (8) increased public education.

Response: As described in the economic analysis and ESA section 4(b)(2) report, we did not have information available at the scale of this designation that would allow us to quantify the benefits of designation in terms of increased fisheries. Such an estimate would have required us to determine the additional number of fish likely to be produced as a result of the designation, and would have required us to determine how to allocate the economic benefit from those additional fish to a particular watershed. Instead, we considered the ''benefits of designation'' in terms of conservation value ratings for each particular area (see ''Methods and Criteria Used to Designate Critical Habitat'' section). We also lacked information to quantify and include in the economic analysis the economic benefit that might result from such things as improved water quality or flood control, or improved condition of other species.

Moreover, we did not have information at the scale of this designation that would allow us to consider the relative ranking of these types of benefits on the ''benefits of designation'' side of the 4(b)(2) balance. Our primary focus was to determine, consider, and balance the benefits of designating these areas to conservation of the listed species. Given the uncertainties involved in quantifying or even ranking these ancillary types of benefits, we were concerned that their consideration would interject an element of uncertainty into our primary task.

Comment 30: One commenter asserted that the economic analysis did not consider the importance of agriculture in California and how many communities rely upon the agriculture industry to survive. A number of commenters further stated that the analysis should address impacts on agriculture of a judicially imposed moratorium on pesticide use near salmon-bearing streams. The inability to use pesticides on farmland could result directly in decreases in crop yields. More specifically, the commenters believed that the economic analysis underestimates the impacts of the Washington Toxics litigation (*Washington Toxics Coalition, et al.* v. *EPA*, No. 04–35138) limiting pesticide use around salmon-supporting waters and suggests that the economic analysis should analyze the impact of this injunction.

Response: Regarding impacts to agricultural communities, we considered impacts to small businesses in our Regulatory Flexibility Act analysis. We did not otherwise separately consider economic impacts to various economically or culturally defined communities in the economic analysis or in the ESA section 4(b)(2) balancing process. For example, we also did not separately consider impacts of designation or exclusion on coastal fishing communities. As with the consideration of ancillary unquantifiable benefits of designation described above, we were concerned that including a consideration of these ancillary benefits of exclusion would inject an unacceptable level of uncertainty into our analysis.

We agree that the draft economic analysis did not adequately consider the impact of pesticide restrictions on the agricultural industry. The revised economic analysis therefore includes refined estimates of potential lost profits associated with reduced crop yields as a result of implementing pesticide restrictions across the critical habitat designation. The analysis assumes that the agricultural net revenue generated by land within certain distances of salmon-supporting waters would be completely lost. That is, the analysis assumes that no changes in behavior are undertaken to mitigate the impact of pesticide restrictions. This assumption may lead to overestimated impacts of restricting pesticide use. On the other hand, the analysis may underestimate the impact of pesticide restrictions by assuming that farmers outside the designated areas (*e.g.*, upstream) will not be restricted in their activities.

Comment 31: Several commenters stated that impacts associated with changes in the operations of the hydropower projects should be included, including impacts from projects such as Englebright Dam, Oroville Dam, and Santa Felicia Dam.

Response: The historical record shows evidence that modifications to hydropower projects in consideration of listed salmon and steelhead can affect the level of hydropower generation and generating capacity, thus affecting power prices. Flow regimes for purposes of salmon and steelhead conservation have been implemented at various projects associated with a number of regulations, including the listing of salmon and steelhead. As mentioned previously, however, the level of increased flow or spill over the dams within particular areas that may be requested associated with critical habitat for all hydropower projects is uncertain at this time, and a prospective analysis of the impacts of such efforts would be highly speculative. Many biological and hydrologic factors are considered in determining flow requirements through dams for salmon and steelhead, and the impacts of altering flow regimes to meet these requirements are highly site-specific. For example, the impact of increasing spill at a hydropower project depends on the level and timing of the spill, and on the method by which any lost power generation is replaced.

The extent to which any future changes in flow may be attributable to the designation of critical habitat, as opposed to the listing or other wildlife-related regulations, is also unclear. The interrelated nature of dam and diversion projects with hydrology across river systems makes it very difficult to attribute flow-related impacts from salmon and steelhead conservation to specific watersheds. We acknowledge this limitation of the economic analysis. The revised economic analysis includes an expanded discussion of the potential impacts of changes in flow regimes on hydropower operations.

Comment 32: One commenter stated that the Initial Regulatory Flexibility Analysis needs more citations regarding the applied sources of information.

Response: We have provided appropriate citations in the Final Regulatory Flexibility Analysis.

Comment 33: One commenter stated that the Small Business Regulatory Enforcement Fairness Act (SBREFA) analysis assumes that most compliance costs would be borne by third parties when, in fact, a significant portion of all ESA section 7 related costs are not borne by those entities, but rather are borne by the Bureau of Reclamation (BOR).

Response: In many cases it is uncertain who will bear the costs of modification. The potentially burdened parties associated with modifications to activities are identified in the economic analysis. The BOR may, in fact, bear the cost of modifications to BOR dams, Federal land management activities, and so forth. Where information is not available on a per-project basis regarding the potentially affected party, the analysis takes a conservative approach, assuming that impacts may be borne by private entities, a portion of which may be small entities.

Weighing the Benefits of Designation Versus Exclusion

Comment 34: Several commenters supported the use of a cost-effectiveness framework, one commenter explicitly objected to it, and some commenters had concerns with the way we applied it. One commenter asserted that the economic analysis ''would have been very different'' if we had evaluated the absolute conservation value of an area ''with or without [section] 7 requirements,'' rather than relative conservation values. One commenter asserted that ''[w]ithout any target level of conservation for designation, the framework does not guarantee that areas necessary for conservation will be designated.'' Another commenter asserted that weighing quantitative economic costs against qualitative habitat ratings prejudiced the ESA section 4(b)(2) analysis in favor of excluding areas lacking a high conservation value. Several commenters suggested that the 4(b)(2) process could benefit from more explanation regarding how the process was applied.

Response: We believe the comparison of benefits provides the Secretary useful information as to the benefits of any particular inclusion or exclusion. The Secretary has discretion in balancing the statutory factors, including what weight to give those factors. The ESA provides the Secretary with the discretion to exclude areas based on the economic impact, or any other relevant impact, so long as a determination is made that the benefits of exclusion outweigh the benefits of designation, and so long as the exclusion will not result in extinction of the species concerned.

Subsequent to publication of this rule, we will undertake a review of the methods and criteria applied in this rule. If the Secretary determines the critical habitat designations should be modified as a result of that review, we will propose a revised designation with appropriate opportunity for notice and comment.

Comment 35: In the proposed rule we identified a number of potential exclusions that we were considering but were not at that time proposing, including Federal lands subject to the Northwest Forest Plan and PACFISH. Many commenters opposed these potential exclusions. Some disagreed that designation of critical habitat is unnecessary or of diminished importance in light of existing management constraints, contending that such a position is contrary to the ESA's conservation purpose and our implementing regulations and citing recent court decisions bearing on this issue. Several commenters indicated that because these ESUs are still listed, existing regulatory and voluntary mechanisms are inadequate and also noted that we concluded as such in our 2000 designations. Some commenters believed that the assumptions underlying such exclusions were unjustifiable and potentially disastrous for salmon recovery. Some commenters noted that the lack of specificity regarding which areas might be excluded as well as the lack of clear exclusion standards seriously hindered the public's ability to comment on the proposed exclusions. In contrast, several commenters supported the potential exclusions mentioned in the proposed rule. Some commenters contended that designating critical habitat on these Federal lands was duplicative with existing ESA section 7 consultation processes, inefficient (*e.g.*, citing costs of re-initiating consultation), and offers no additional conservation benefit to the listed ESUs. One commenter believed that excluding Federal lands would be consistent with our exclusion of lands subject to Integrated Natural Resource Management Plans (INRMPs) since existing land management plans provide similar protections. This commenter also cited the USFWS'' exclusion of Federal lands for bull trout (69 FR 59996; October 6, 2004) and provided information supporting the belief that we should make the same determination for salmon and steelhead ESUs.

Response: Section 4(b)(2) provides the Secretary with discretion to exclude areas from the designation of critical habitat if the Secretary determines that the benefits of exclusion outweigh the benefits of designation, and the Secretary finds that exclusion of the area will not result in extinction of the species. In the proposed rule, and the reports supporting it, we explained the policies that guided us and provided supporting analysis for a number of proposed exclusions. We also noted a number of additional potential exclusions, explaining that we were considering them because the Secretary of the Interior had recently made similar exclusions in designating critical habitat for the bull trout: ''On October 6, 2004, the FWS issued a final rule designating critical habitat for the bull trout * * *. The Secretary of the Interior found that a number of conservation measures designed to protect salmon and steelhead on Federal, state, tribal and private lands would also have significant beneficial impacts to bull trout. Therefore, the Secretary of the Interior determined that the benefits of excluding those areas exceeded the benefits of including those areas as critical habitat. The Secretary of Commerce has reviewed the bull trout rule and has recognized the merits of the approach taken by the Secretary of the Interior to these emerging issues.'' We acknowledged, in the proposed rule, however, that we lacked the analysis to propose these potential exclusions for West Coast salmon and steelhead: At this time, the Secretary of Commerce still ''has not had an opportunity to fully evaluate all of the potential exclusions, the geographical extent of such exclusions, or compare the benefits of these exclusions to the benefits of inclusion.'' Our regulations require that our proposed and final rules provide the data upon which the rule is based (50 CFR 424.16; 50 CFR 424.18).

Recently, in response to the Department of Interior's request, a District Court has remanded the bull trout rule to the Department of Interior for further rulemaking. *Alliance for the Wild Rockies and Friends of the Wild Swan* v. *David Allen and United States Fish and Wildlife* (CV 04–1812). In seeking the remand the Department of Interior noted that it intends to reconsider the 4(b)(2) exclusions in the proposed rule and that it recently issued a **Federal Register** notice seeking comment on those exclusions (70 FR 29998; May 25, 2005). In response, we received extensive comment from those supporting and opposing these potential exclusions. Based on our review of the information received and the short time between the close of the comment period and the court-ordered deadline for completing this rulemaking, we are unable to conclude at this time that the benefits of excluding these areas outweigh the benefits of designation, with the exception of areas covered by two habitat conservation plans, discussed below.

Nevertheless, we will continue to study this issue and alternative approaches in future rulemakings designating critical habitat. In particular, we intend to analyze the planning and management framework for each of the ownership categories proposed for consideration for exclusion. In each case, we envision that the planning and management framework would be evaluated against a set of criteria, which could include at least some or all of the following:

1. Whether the land manager has specific written policies that create a commitment to protection or appropriate management of the physical or biological features essential to long-term conservation of ESA-listed salmon and steelhead.

2. Whether the land manager has geographically specific goals for protection or appropriate management of the physical or biological features essential to long-term conservation of ESA-listed salmon and steelhead.

3. Whether the land manager has guidance for land management activities designed to achieve goals for protection or appropriate management of the physical or biological features essential to long-term conservation of ESA-listed salmon and steelhead.

4. Whether the land manager has an effective monitoring system to evaluate progress toward goals for protection or appropriate management of the physical or biological features essential to long-term conservation of ESA-listed salmon and steelhead.

5. Whether the land manager has a management framework that will adjust ongoing management to respond to monitoring results and/or external review and validation of progress toward goals for protection or appropriate management of the physical or biological features essential to long-term conservation of ESA-listed salmon and steelhead.

6. Whether the land manager has effective arrangements in place for periodic and timely communications with NOAA on the effectiveness of the planning and management framework in reaching mutually agreed goals for protection or appropriate management of the physical or biological features essential to long-term conservation of ESA-listed salmon and steelhead.

Comment 36: In the proposed rule we requested comments on the potential exclusion of lands subject to conservation commitments by state and private landowners reflected in habitat conservation plans (HCPs) approved by NMFS. Some commenters (none however with NMFS-approved HCPs) concurred with the potential exclusion of lands covered by an HCP, believing that we would not likely secure additional conservation benefits by designating these areas as critical habitat. Some commenters acknowledged the potential educational benefits of designation but asserted that designating HCP lands could have an unintended consequence of damaging existing and future cooperative relationships. These commenters additionally noted that HCPs have already undergone extensive environmental review and ESA section 7 consultation and been found to not likely jeopardize the species.

Several commenters disagreed with the potential exclusion of lands covered by HCPs, believing it would be contrary to the ESA, and some cited recent litigation bearing on this issue (*e.g.*, *Center for Biological Diversity* v. *Norton*, 240 F. Supp. 2d 1090 (D. Ariz. 2003); *Gifford Pinchot Task Force* v. *FWS*, 378 F. 3d 1059 (9th Cir. 2004). One commenter did not support such exclusions because of the belief that there are no guarantees the plans will remain in place when, for example, ownership changes or landowners change their minds. Some commenters believed that we failed to adequately describe the benefits of designation as they pertain to these potential exclusions.

Response: The analysis required for these types of exclusions, as with all others, first requires careful consideration of the benefits of designation versus the benefits of exclusion to determine whether benefits of exclusion outweigh benefits of designation. The benefit of designating critical habitat on non-Federal areas covered by an approved HCP or another type of conservation agreement depends upon the type and extent of Federal activities expected to occur in that area in the future. Activities may be initiated by the landowner, such as when the landowner seeks a permit for bank stabilization, water withdrawal, or dredging. Where the area is covered by an HCP, the activity for which a permit is sought may or may not be covered by the HCP. For example, an HCP covering forestry activities may include provisions governing construction of roads, but may not include provisions governing bank stabilization or pesticide application. The activity may be initiated by the Federal agency without any landowner involvement, such as when a Federal agency is involved in building a road or bridge, dredging a navigation channel, or applying a pesticide on Federal land upstream of the HCP-covered area. In analyzing the benefits of designation for these HCP-covered areas, we must consider which Federal activities are covered by the HCP and which are not. Where activities are covered by the HCP, we must consider whether an ESA section 7 consultation on that particular activity would result in beneficial changes to the proposed action over and above what is achieved under the HCP. Designation may also benefit the species by notifying the landowner and the public of the importance of an area to species' conservation.

On the other side of the balance are the benefits of exclusion. We believe the primary benefits of exclusion are related to the conservation benefits to the species that come from conservation agreements on non-Federal land. If a landowner considers exclusion from critical habitat as a benefit, exclusion may enhance the partnership between NMFS and the landowner and thus enhance the implementation of the HCP or other agreement. If other landowners also consider exclusion from critical habitat as a benefit, our willingness to exclude such areas may provide an incentive for them to seek conservation agreements with us. Improved implementation of existing partnerships, and the creation of new conservation partnerships, would ultimately benefit conservation of the species.

Conservation agreements with non-Federal landowners enhance species conservation by extending species' protections beyond those available through other ESA provisions. ESA section 7 applies only to Federal agency actions. Section 7 consultation requirements protect listed salmon and steelhead on Federal lands and whenever a Federal permit or funding is involved in non-Federal actions, but its reach is limited. The vast majority of activities occurring in riparian and upland areas on non-Federal lands do not require a Federal permit or funding and are not addressed by section 7. In contrast, instream activities generally do require a Federal permit, and therefore, are subject to the requirements of section 7. The ability of the ESA to induce landowners to adopt conservation measures lies instead in the take prohibitions of sections 9(a) and 4(d). Many landowners have chosen to put conservation plans in place to avoid any uncertainty regarding whether their actions constitute 'take'.

Beginning in 1994, when we released our draft HCP Handbook for public review and comment, we have pursued policies that provide incentives for non-Federal landowners to enter into cooperative partnerships, based on a view that we can achieve greater species' conservation on non-Federal land through HCPs than we can through coercive methods (61 FR 63854; December 2, 1996). Before we approve an HCP and grant an incidental take permit, we must conduct a rigorous analysis under ESA section 10. The HCP must specify the impact likely to result from take, what steps the applicant will take to minimize and mitigate such impacts, and the funding available to implement such steps. The applicant must have considered alternative actions and explained why other alternatives are not being pursued, and we may require additional actions necessary or appropriate for the purposes of the plan. Before an HCP can be finalized, we must conclude that any take associated with implementing the plan will be incidental, that the impact of such take will be minimized and mitigated, that the plan is adequately funded, and that the take will not appreciably reduce the likelihood of the survival and recovery of the species in the wild. The HCP undergoes environmental analysis under the National Environmental Policy Act (NEPA), and we conduct a section 7 consultation with ourselves to ensure granting the permit is not likely to jeopardize the continued existence of the species or destroy or adversely modify designated critical habitat.

Based on comments received, we could not conclude that all landowners view designation of critical habitat as imposing a burden on the land, and exclusion from designation as removing that burden and thereby strengthening the ongoing relationship. Where an HCP partner affirmatively requests designation, exclusion is likely to harm rather than benefit the relationship. We anticipate further rulemaking in the near future to refine these designations, for example, in response to developments in recovery planning. In order to aide in future revisions, we will affirmatively request information from those with approved HCPs regarding the effect of designation on our ongoing partnership. We did not consider pending HCPs for exclusion, both because we do not want to prejudge the outcome of the ongoing HCP process, and because we expect to have future opportunities to refine the designation and consider whether exclusion will outweigh the benefit of designation in a particular case.

Comment 37: We received a request from the Sonoma County Grape Growers Association and the United Winegrowers for Sonoma County to consider a determination to exclude all occupied areas in Sonoma County from critical habitat for California coastal chinook and central California coast *O. mykiss* based on the conservation value of a suite of cooperative and voluntary conservation efforts being implemented and developed by local government and the private sector, primarily the viticultural industry, in Sonoma County.

Response: These efforts may currently provide a significant conservation benefit to the listed species, and offer the promise of even greater benefits in the future. The measures include the Vineyard Erosion and Sedimentation Control Ordinance adopted by the Sonoma County Board of Supervisors; the Fish Friendly Farming Program; the North Sonoma County Agricultural Reuse Project; the planned Russian River Property Owners Association Fisheries Management Plan; the Integrated Pest Management/Organic Grape Production initiatives; and the Code of Sustainable Winegrowing Practices. The submission can be found electronically at *http://swr.nmfs.noaa.gov/.*

The request suggests the benefits of excluding the area covered by these measures from critical habitat may outweigh the benefits of including it as critical habitat because it provides conservation measures on private land in an area dominated by private ownership, which is generally beyond the reach of ESA section 7, and may therefore provide a greater benefit for the species than a critical habitat designation. Private landowners would be encouraged to participate in these voluntary programs if their lands were excluded from critical habitat.

We received this request on July 21, 2005, so we did not have time to evaluate this request as part of this rulemaking process, and could not defer the rule to accommodate a review because we are under court order to submit this final rule to the **Federal Register** by August 15, 2005. However, we are committed to working with local governments and private landowners in cooperative conservation efforts under Executive Order (E.O.) 13352 (August 26, 2004). As stated above, we anticipate further rulemaking in the near future to refine these designations. Accordingly, we expect to complete an evaluation of the conservation benefits of the measures described by the Sonoma County Grape Growers Association and the United Wine growers for Sonoma County by the end of 2005. If we find that in light of the conservation value of these measures, the benefit of excluding these private lands outweighs the benefits of including them as critical habitat, we will act promptly to propose a revision to this designation.

Comment 38: Some commenters addressed the exclusion of Indian Lands. All of the commenting Tribes and the Bureau of Indian Affairs (BIA) reiterated their support for the exclusions.

Response: This final rule maintains the exclusion of Indian lands for the reasons described in the ''*Exclusions Based on Impacts to Tribes*'' section below.

Comment 39: A few commenters addressed our assessment of INRMPs and the exclusion of Department of Defense (DOD) areas due to impacts on national security. DOD agencies supported the exclusion of military lands based on both the development of INRMPs as well as national security impacts, while other commenters did not support such exclusions. One commenter argued that we should not use the general ''national security'' language in ESA section 4(b)(2) to remove our obligation to comply with the demand for adequate INRMPs.

Response: Pursuant to section 4(a)(3)(B)(i) of the ESA (16 U.S.C. 1533(a)(3)(B)(i)), we contacted the DOD, and, after evaluating the relevant INRMPs, we concluded that, as implemented, they provide conservation benefits greater than or equal to what would be expected to result from an ESA section 7 consultation. We also determined that two of these INRMP sites (Camp Pendleton and Vandenberg Air Force Base) should be excluded from designation due to potential impacts on national security. See the ''Military Lands'' and the ''Exclusions Based on National Security Impacts'' sections below.

Effects of Designating Critical Habitat

Comment 40: Some commenters noted that the success of watershed management and restoration efforts is dependent on critical habitat protections, noting that designations assist local recovery planning efforts and provide leverage in obtaining funding and cooperation. Several commenters expressed concern that excluding areas from designation, particularly areas identified in existing recovery efforts as important for salmon, would undermine ongoing regional and local recovery planning efforts by signaling that these areas are not important for recovery.

Response: We acknowledge that critical habitat designations can serve an important educational role and that they can assist local recovery planning and implementation efforts. The ESA requires that we use the best available scientific data to evaluate which areas warrant designation and that we balance the benefits of designation against the benefits of excluding particular areas. In so doing, it is possible that some areas subject to ongoing restoration activities may have been excluded from designation. However, such exclusions do not indicate that the areas are unimportant to salmon or steelhead, but instead reflects the practical result of following the ESA's balancing of benefits as required under section 4(b)(2). We are hopeful that the information gathered and the analyses conducted to support these final designations (such as species distribution, watershed conservation value, and economic impacts from section 7 consultations) will be viewed as valuable resources for local recovery planners. As recovery planning proceeds and we determine that additional or different areas warrant designation or exclusion, we can and will make needed revisions using the same rulemaking process.

Comment 41: Several commenters asked for clarification regarding how we will make adverse modification determinations in ESA consultations. One commenter also suggested that a finding of adverse modification would need to be contingent on the habitat conditions existing at the time of designation. They noted that, where such conditions are the result of past and present management actions, and where those existing conditions would not be altered through proposed future actions, it is their belief that consultation on such future actions would result in a ''no adverse modification'' determination.

Response: In *Gifford Pinchot Task Force* v. *United States Fish and Wildlife Service,* 378 F. 3d 1059 (9th Cir. 2004), the Court of Appeals for the Ninth Circuit Court ruled that the USFWS' regulatory definition of ''destruction or adverse modification'' of critical habitat, which is also NMFS' regulatory definition (50 CFR 402.02), is contrary to law. Pending issuance of a new regulatory definition, we are relying on the statutory standard, which relates critical habitat to conservation of the species. The related point raised by one commenter regarding the relevance of habitat conditions at the time of listing when making an adverse modification determination cannot be answered in a generic way and would depend on the facts associated with a specific consultation.

Comment 42: Some commenters objected to the potential land use regulations that critical habitat designation would prompt, citing specific cases where local agencies have imposed buffers and/or other restrictions to protect ESA-listed fish.

Response: The ESA requires that we designate critical habitat and these designations follow that statutory mandate and have been completed on a schedule established under a Consent Decree. Whether and if local jurisdictions will implement their authorities to issue land use regulations is a separate matter and is not under our control.

Comment 43: Several commenters believed that we fail to (or inadequately) address required determinations related to a number of laws, regulations, and executive orders, including the NEPA, Regulatory Flexibility Act, and Data Quality Act.

Response: Our response to each of these issues are described below, and we also direct the reader to the ''Required Determinations'' section to review our response to each of the determinations relevant to this rulemaking.

(a) *NEPA*—We believe that in *Douglas County* v. *Babbitt,* 48 F.3d 1495 (9th Cir. 1995), cert. denied, 116 S. Ct. 698 (1996) the court correctly interpreted the relationship between NEPA and critical habitat designation under the ESA. The Court of Appeals for the Ninth Circuit rejected the suggestion that irreconcilable statutory conflict or duplicative statutory procedures are the only exceptions to application of NEPA to Federal actions. The court held that the legislative history of the ESA demonstrated that Congress intended to displace NEPA procedures with carefully crafted procedures specific to critical habitat designation. Further, the Douglas County Court held that the critical habitat mandate of the ESA conflicts with NEPA in that, although the Secretary may exclude areas from critical habitat designation if such exclusion would be more beneficial than harmful, the Secretary has no discretion to exclude areas from designation if such exclusion would result in extinction. The court noted that the ESA also conflicts with NEPA's demand for impact analysis, in that the ESA dictates that the Secretary ''shall'' designate critical habitat for listed species based upon an evaluation of economic and other ''relevant'' impacts, which the court interpreted as narrower than NEPA's directive. Finally, the court, based upon a review of precedent from several circuits including the Fifth Circuit, held that an environmental impact statement is not required for actions that do not change the physical environment.

(b) *Regulatory Flexibility Act*—We have prepared a final regulatory flexibility analysis that estimates the number of regulated small entities potentially affected by this rulemaking and the estimated coextensive costs of section 7 consultation incurred by small entities. As described in the analysis, we considered various alternatives for designating critical habitat for these seven ESUs. After considering these alternatives in the context of the ESA section 4(b)(2) process of weighing the benefits of exclusion against the benefits of designation, we determined that our current approach to designation provides an appropriate balance of conservation and economic mitigation and that excluding the areas identified in this rulemaking would not result in extinction of the ESUs. Our final regulatory flexibility analysis estimates how much small entities will save in compliance costs due to the exclusions made in these final designations.

(c) *Data Quality Act*—One commenter asked if we had complied with the Data Quality Act. We have reviewed this rule for compliance with that Act and found that it complies with NOAA and OMB guidance.

(d) *Negotiated Rulemaking Act (5 U.S.C. 561 et seq.)*—One commenter asserted that we should have engaged in negotiated rulemaking to issue this final critical habitat designation. This is an interesting idea and could be pursued in future critical habitat rulemaking. However, because a court approved consent decree governs the time frame for completion of this final rule, we do not feel that there was ample time to comply with the numerous processes defined in the Negotiated Rulemaking Act for this rulemaking. For example, the Negotiated Rulemaking Act provides that if the agency decides to use this tool it must follow Federal Advisory Committee Act procedures for selection of a committee, conduct of committee activities, as well as specific documentation processes (See *Negotiated Rulemaking Source Book,* 1990).

(e) *Intergovernmental Cooperation Act*—One commenter asserted that we did not properly and fully coordinate with local governments and did not comply with the Intergovernmental Cooperation Act. First, the commenter did not provide a statutory citation for the Intergovernmental Cooperation Act. Although we are reluctant to speculate on that Act, we believe the comment is in reference to the Intergovernmental Cooperative Act, Public Law 90–577, 82 Stat. 1098 (1968) as amended by Public Law 97–258 (1982) (codified at 31 U.S.C. 6501–08 and 40 U.S.C. 531–35 (1988)). This Act addresses Federal grants and development assistance. Accordingly, we do not find it relevant to the mandatory designation of critical habitat under the ESA. To the extent that the commenter's concern is assuring that state, local and regional viewpoints be solicited during the designation process, the ESA and our implementing regulations provides for public outreach (16 U.S.C. 1533 (b)(3)(A); 50 CFR 424.16). As noted in response to Comment 1, we actively sought input from all sectors beginning with an ANPR (68 FR 55926; September 29, 2003) and culminating in four public hearings to facilitate comment from the interested public in response to the proposed rule. In addition we met with several local governments and made ourselves available to meet with others.

(f) *National Historic Preservation Act (NHPA)*—One commenter asserted that we failed to comply with the NHPA (16 U.S.C. 470–470x–6). The NHPA does not apply to this designation. The NHPA applies to ''undertakings.'' ''Undertakings'' are defined under the implementing regulations as ''a *project, activity* or *program* funded in whole or in part under the direct or indirect jurisdiction of a Federal agency, including those carried out by or on behalf of a Federal agency; those carried out with Federal financial assistance; those requiring a Federal permit, license or approval; and those subject to State or local regulation administered pursuant to a delegation or approval by a Federal agency.'' (emphasis added) (36 CFR 800.16). The mandatory designation of specific areas pursuant to the criteria defined in the ESA does not constitute an ''undertaking'' under the NHPA.

(g) *Farmland Protection Policy Act (FPPA)*—One commenter asserted that we failed to comply with FPPA (7 U.S.C. 4201). The FFPA does not apply to this designation. The FPPA applies to Federal programs. Federal programs under the Act are defined as ''those activities or responsibilities of a department, agency, independent commission, or other unit of the Federal Government that involve: (A) Undertaking, financing, or assisting construction or improvement projects; or (B) acquiring, managing or disposing of Federal lands and facilities. The designation of critical habitat does not constitute a ''Federal program'' under the FFPA.

(h) *Unfunded Mandates Reform Act*—One commenter asserted that we failed to properly conduct and provide an unfunded mandates analysis because, the commenter contended, we based our decision solely on public awareness of the salmon listings. This is not the case. In the proposed rule, we found that the designation of critical habitat is not subject to the Unfunded Mandates Reform Act (2 U.S.C. 1501 *et seq.*) and explained in detail why this is the case.

(i) *Federalism*—One commenter asserted that we failed to properly comply with E.O. 13132. In the proposed rule, we found that the designation of critical habitat does not have significant Federalism effects as defined under that order, and, therefore, a Federalism assessment is not required. We find nothing in the commenter's assertions to warrant changing our original determination.

(j) *Takings*—One commenter disputed our conclusion in the proposed rule that the designations would not result in a taking. The commenter offered no information or analysis that would provide a basis for a different conclusion.

(k) *Civil Justice Reform*—One commenter asserted that we failed to properly conduct and provide a Civil Justice Reform analysis pursuant to E.O. 12988, the Department of Commerce has determined that this final rule does not unduly burden the judicial system and meets the requirements of sections 3(a) and 3(b)(2) of the E.O. We are designating critical habitat in accordance with the provisions of the ESA. This final rule uses standard property descriptions and identifies the PCEs within the designated areas to assist the public in understanding the habitat needs of the 12 salmon and steelhead ESUs.

ESU-Specific Issues

ESU Specific Comments—California Coastal Chinook Salmon

Comment 44: One private timberland owner commented that the freshwater distribution of Chinook salmon that we developed and used for their land ownership had errors in occupancy and/or upstream distribution limits. The landowner provided us with distribution information they had developed for their ownership so that the distribution information and resulting final critical habitat designation for this ESU would be more accurate.

Response: Following a review of this new information by the CHART, we incorporated it into our database and made changes in the mapped distribution of this ESU for the commenter's land ownership. The new information changed the distribution of Chinook in the following streams and Calwater HSAs: Maple Creek (110810), Little River (110820), and the Mad River (110920 and 110930). Overall, these changes in distribution were minor and increased the total occupied stream miles for this ESU by only 0.6 mi (1.0 km). Based on a reassessment by the CHART, these changes in distribution did not change the occupancy status (i.e. occupied to unoccupied or vice versa) or conservation value of any of the affected HSAs, and therefore, the economic analysis did not require revision.

Comment 45: A few commenters questioned why there was no proposed critical habitat connecting those portions of the mainstem Eel River in HSA 111142 with the high value habitat areas in the upper tributaries of the middle Fork Eel River in HSA 111172.

Response: In the proposed rule, HSA watershed 111171 was proposed for exclusion based on high economic cost (high benefit of exclusion) and relatively low benefit of designation. However, because the upper tributaries of the middle Fork Eel in HSA 111172 were rated as having high conservation value, the mainstem middle Fork Eel in HSA 111171 should have been designated as a migratory corridor to provide connectivity between critical habitat farther downstream in the mainstem Eel River and the high value tributaries that were proposed for designation. This was an error that has been corrected in the final rule. The final designation excludes HSA 111171 as was the case in the proposed rule, but designates the mainstem of the middle Fork Eel River, which serves as a migratory corridor for the high value upstream tributaries, as critical habitat.

Comment 46: A commenter questioned the conservation ratings and proposed designations for five of the seven occupied HSAs comprising the Mendocino Coast Subbasin (HU 1113). The commenter specifically questioned the historic and current presence of Chinook in these watersheds and thought any Chinook that did occur in these watersheds were likely strays from other watersheds.

Response: The CHART considered these comments and reviewed its original assessments. It concluded that its original conservation value ratings were appropriate based on the ranking criteria that were used and the information that was available, and that these areas met the definition of critical habitat under the ESA. Accordingly, the conservation value ratings for these HSA watersheds were not changed. Based on the ESA section 4(b)(2) analysis conducted for the final rule, however, HSA watershed 111350 (Navarro River) in this Subbasin was excluded from the final designation for this ESU.

Comment 47: One commenter questioned the proposed designation of critical habitat for this ESU in the Austin Creek HSA (111412) and Mark West HSA (111423), based on the view that neither watershed supported a historically self sustaining run and that Chinook in both streams were most likely strays from other watersheds.

Response: The CHART considered this comment and reviewed its original assessments. It concluded that its original conservation value ratings were appropriate based on the ranking criteria that were used and the information that was available, and that these areas met the definition of critical habitat under the ESA. Accordingly, the conservation value ratings for these HSA watersheds were not changed. Based on the ESA section 4(b)(2) analysis conducted for the final rule, however, HSA 111423 (Mark West Creek) in this Subbasin was excluded from the final designation for this ESU.

Comment 48: A property owners' association on the Russian River that controls land adjacent to portions of the Russian River in HSAs 111425 and 111424 requested that its lands be excluded from the final designations for California Coastal Chinook (and Central California Coast steelhead) because it has developed a Watershed Management Plan to manage its lands and because the benefits of excluding its lands outweigh the benefits of including them in the designation.

Response: We are very supportive of the development and implementation of this plan and have in fact participated in its development. However, we do not think this plan qualifies as the basis for excluding these lands from the final designation for either ESU at present, since it is not completed. Once the plan is completed, we will evaluate it to determine whether the benefits of excluding the habitat areas in question will outweigh the benefits of designation. In making this assessment we will evaluate the plan in the same manner as we would evaluate an approved habitat conservation plan (see *Impacts to Landowners with Contractual Commitments to Conservation* section). If we determine that the benefits of exclusion outweigh the benefits of designation, then we will initiate the appropriate rulemaking to refine the critical habitat designations.

ESU Specific Comments—Northern California Steelhead

Comment 49: Two private timberland owners commented that the freshwater distribution of steelhead that we developed and used for their land ownership had errors in occupancy and/or upstream distribution limits. Both landowners provided us with distribution information they had developed for their ownership so that the fish distribution information we used for the final critical habitat designation for this ESU would be more accurate.

Response: Following a review of this new information by the CHART, we incorporated it into our database and made changes in the mapped distribution of this ESU for the commenters' land ownership. The new information from one of the landowners changed the distribution of steelhead in the following streams and Calwater HSAs: Maple Creek (110810), Redwood Creek (110720), Little River (110820), Mad River (110920 and 110930), and several small streams including Rocky Gulch, Washington Gulch, Jacoby Creek, Freshwater Creek, and Salmon Creek (111000). Overall, these changes in distribution were minor and increased the total occupied stream miles for this ESU by only 1.1 mi (1.8 km). The changes in distribution did not affect the occupancy or conservation value rating for any of these HSAs. The new information from the other landowner changed the distribution of steelhead in the following streams and HSAs: SF Eel (111132, 111133), Usal Creek (111311), Wages Creek (111312), Ten Mile River (111313), Mill Creek, Pudding Creek and the Noyo River (111320), Big River (111330) and Salmon Creek (111340). Overall, this new information decreased the occupied stream miles for the ESU by approximately 17 miles and affected 8 HSAs. Based on a re-assessment by the CHART, these changes in distribution did not change the occupancy status (i.e. occupied to unoccupied or vice versa) or conservation value of any of the affected HSAs, and therefore, the economic analysis did not require revision.

ESU Specific Comments—Central California Coast Steelhead

Comment 50: One commenter requested that San Francisquito Creek and Los Trancos Creek in HSA 220550 be excluded from the critical habitat designation for this ESU because of the economic impact of designation and because neither creek requires special management considerations. A second commenter requested that San Francisquito Creek not be designated because of the regulatory burden and because the economic impacts on water supply were not included in the economic analysis. The second commenter also identified a labeling error concerning West Union Creek.

Response: We disagree with the first commenter and believe that these streams do require special management considerations. Both streams have extensive zones of healthy riparian vegetation and habitat and support significant steelhead populations in the San Francisco Bay area. These relatively healthy habitats and populations are unique to the San Francisco Bay area, and therefore, the CHART believes they require special management considerations. The commenter has many programs in place that benefit both creeks, but there are also many unresolved habitat issues that remain to be addressed. For example, on Los Trancos Creek a poorly designed fish ladder needs to be replaced, and several other fish passage issues remain. In addition, NMFS and CDFG have discussed the inadequate bypass flows on Los Trancos Creek below the commenter's water diversion for the past several years, but have yet to resolve the issue. Special management considerations are also necessary to address ongoing and expanding impacts of urbanization on the San Francisco Peninsula. We considered the impacts of designating the HSA watershed containing these creeks in the proposed rule and again using a revised procedure for the final rule. Based on the ESA section 4(b)(2) analysis used for the final rule, we concluded that the benefits of including this HSA watershed in the designation (medium conservation value to the ESU) outweighed the benefits of excluding it from the designation. On the basis of this analysis, therefore, we do not think there will be an unwarranted regulatory burden placed on these commenters or any other entities that may need to obtain Federal permits and consult with NMFS in this HSA watershed. We acknowledge the comment that water supply impacts were not considered in the proposed rule or in the revised 4(b)(2) process for the final rule, but we have addressed water supply impacts as a general issue in greater detail in the final economic analysis for this rule.

Comment 51: One commenter argued that Suisun and Wooden Valley Creeks in HSA 220722 do not provide suitable habitat for steelhead and that designation is not justified because surrounding HSAs were not proposed for designation.

Response: We disagree with the commenter and believe that Suisun and Wooden Valley Creeks currently support a population of steelhead and do provide suitable habitat for rearing, spawning and migration (and thus, the PCEs that support these habitat uses). The reports cited by the commenter include a discussion of limiting factors in Suisun Creek, but also include several favorable findings regarding steelhead habitat conditions in the watershed. These findings suggest that there is suitable habitat for steelhead in the watershed and that steelhead spawned in Suisun Creek in 2000–2001. Based on the information available, therefore, we believe that the medium conservation rating originally made by the CHART for this HSA watershed is appropriate. The revised ESA section 4(b)(2) exclusion analysis conducted for the final rule, however, considered section 7 opportunities within HSA watersheds and adjusted the benefits of inclusion in critical habitat accordingly. In the case of this HSA, this re-consideration resulted in a reduced assessment of the benefits of designating this watershed. Based on this revised benefit of designation in the final 4(b)(2) analysis, we have concluded that the benefits of excluding this HSA from the designation outweigh the benefits of designating it. Accordingly, this HSA watershed and the streams in question have been excluded from the final critical habitat designation.

Comment 52: Several commenters raised issues concerning our proposal to include the upper Alameda Creek watershed (which supports resident *O. mykiss* considered to be part of this ESU; see 69 FR 33101; June 14, 2004) in the critical habitat designation for this ESU. Comments ranged from support for designation of this watershed to requests that it not be designated. Issues were raised about the adequacy of the economic analysis supporting the ESA section 4(b)(2) analysis, the mapped distribution of proposed critical habitat in the watershed, the suitability of the habitat in upper Alameda Creek for steelhead, and the lack of access for steelhead.

Response: We recognize that the upper Alameda Creek watershed (HSA 220430) is not accessible to anadromous steelhead; however, the CHART treated this watershed as occupied in the analysis supporting the proposed rule because there are resident *O. mykiss* populations in the upper watershed that we had previously proposed for inclusion in this ESU (69 FR 33101). In its original analysis, the CHART concluded that this watershed had high conservation value to the ESU, contained the requisite PCEs to support the ESU, and that special management considerations were required to protect these PCEs. Based on this assessment and the original 4(b)(2) analysis which considered the benefits of including this watershed against the benefits of excluding it, we proposed to include it in the designation, as well as a migratory corridor to San Francisco Bay through a portion of the adjacent watershed (HSA 220420) that was proposed for exclusion. We recently invoked a statutory 6-month extension on our final listing determination for this ESU (70 FR 37219) based on concerns raised by the USFWS, and, therefore, at the time of publication of this final critical habitat rule, these resident populations of *O. mykiss* will not be included in this ESU and listed. Because our original proposal was premised on the upper Alameda Creek watershed being occupied by resident fish that were part of this ESU and a final listing determination concerning these populations will not be made before December 2005, we have not included this watershed in the final critical habitat designation for this ESU. A decision about whether to designate this watershed as critical habitat for this ESU will be made concurrently with the final listing determination for this ESU in December 2005.

Comment 53: One commenter opposed inclusion of the Guadelupe River/Los Gatos Creek watershed in the proposed critical habitat designation for this ESU.

Response: The watershed (HSA 220540) containing the upper portion of Guadelupe River and Los Gatos Creek was not included in the proposed designation. Occupied habitat in this watershed was excluded from the proposed rule based on the ESA section 4(b)(2) analysis which concluded that the economic benefits of exclusion outweighed the biological benefits of inclusion. The watershed unit (HSA 220550) which contains the lower portion of the Guadelupe River, however, was included in the proposed designation. It is also included in the final critical habitat designation for this ESU because the biological benefits of including the occupied stream habitat in this watershed outweigh the economic benefits of its exclusion.

Comment 54: One commenter argued that Arroyo Corte Madera del Presidio Stream in HSA watershed 220320 should be designated as critical habitat for this ESU because it is occupied by this ESU. The same commenter also questioned the exclusion of HSA 220330 from the proposed designation.

Response: Exclusion of this stream from proposed critical habitat in HSA 220320 was the result of a technical mapping error in the proposed rule. The CHART evaluated this stream for the proposed rule and concluded it was occupied and met the definition of critical habitat. Accordingly, it has been included in the final designation for this ESU. Occupied habitat in HSA 220330 was excluded from the proposed rule and in this final rule based on the results of the 4(b)(2) analysis, which indicated the economic benefits of exclusion outweighed the biological benefits of including these stream reaches in the designation for this ESU.

Comment 55: One commenter argued that occupied habitat in HSA 220330 in the east Bay of San Francisco should be designated as critical habitat for this ESU.

Response: Occupied habitat (Codornices Creek) in this HSA was excluded from the proposed designation because the conservation value of this habitat was judged by the CHART to be low (low habitat quantity and quality, low restoration potential, no unique attributes, and small population size), and the economic benefits of excluding this habitat outweighed the biological benefits of designation. The CHART did not receive any new information to change its previous determination, and, therefore, reaffirmed that it has low conservation value and that its exclusion would not impede the conservation of this ESU.

Comment 56: One commenter recommended that several additional, but small, stream reaches in the San Francisquito watershed, as well as an unoccupied habitat above an impassable dam (Searsville Dam), be designated as critical habitat for this ESU.

Response: Based on a review of the information provided by the commenter, the CHART concluded that some additional stream reaches in this watershed should be considered occupied, meet the definition of critical habitat, and should be designated as critical habitat. Because this watershed was not excluded from the designation as a result of the final ESA 4(b)(2) analysis, additional stream reaches qualifying as critical habitat have been added to the final designation. These include: a short reach of Corte Madera Creek to the base of Searsville Dam, approximately 2.5 mi (4 km) of West Union Creek above the confluence with Bear Creek, a short reach of Bear Gulch Creek up to the California Water Service Upper Diversion Dam, a small portion of Squealer Gulch above the confluence with West Union Creek, and a small portion of McGarvey Gulch above the confluence with West Union Creek.

Comment 57: One commenter requested the exclusion of several streams in Hydrologic Unit 3304 from the critical habitat designation, including Laguna Creek, Liddell Creek, Majors Creek, Arana Gulch, San Lorenzo River, Branciforte Creek, Newell Creek, and Zayante Creek because the commenter believes the benefits of excluding these areas outweigh the benefits of designating them. The rationale is that: (1) The commenter is developing an HCP that will address these streams and a designation could hinder its completion; and (2) a designation would increase the regulatory costs and burdens on the city beyond those already in place. The commenter also raised concerns about the regulatory uncertainty associated with critical habitat because of the 2004 Gifford Pinchot case.

Response: We disagree with the commenter and continue to believe that the benefits of including these streams in the critical habitat designation outweigh the benefits of excluding them. For the proposed critical habitat designation, the CHART evaluated the HSA watersheds containing the streams identified by the commenter (HSAs 330411 and 330412) and concluded that the occupied streams in both HSAs had high conservation value for this ESU and that there was a need for special management consideration or protections. Based on this assessment and the results of the ESA section 4(b)(2) analysis conducted for the proposed designation, including the consideration of potential economic impacts, we concluded that the benefits of designating the occupied streams in both watersheds were higher than the benefits of excluding them. The commenter did not provide any new scientific information to change our assessment of the benefits of designating these streams, and thus we continue to believe they have a high biological value to the ESU. As part of the 4(b)(2) analysis conducted for the final rule, however, we did reduce our assessment of the benefit of designating occupied habitat in these two HSA watersheds because they both met a ''low section 7 leverage'' profile, which we believed reduced the benefits of section 7 consultation (see discussion in *Critical Habitat Analytical Review Teams* section).

We continue to be supportive of the commenter's efforts to develop an HCP and believe completion of an HCP that meets the requirements of section 10 of the ESA will provide substantial benefits to steelhead and its habitat in these streams. However, negotiations are still ongoing, and an HCP has not been completed. Until an HCP is completed and an incidental take permit is issued, the potential conservation benefits to steelhead and its habitat are uncertain. For this reason, we believe it is premature to consider the potential benefits of such a conservation plan in the 4(b)(2) analysis for this final designation. Whether or not the commenter would experience an increased regulatory burden or higher costs with a critical habitat designation in place is uncertain. Even without critical habitat in place, the commenter is likely to incur costs associated with ESA section 7 consultations, development of an HCP, and/or efforts to avoid take. We did consider the economic impacts of critical habitat designation in both the proposed and final rules and in doing so analyzed the full costs of section 7 implementation, not just the costs associated with critical habitat implementation. In approaching the economic analysis this way, we believe that we have likely overstated the economic impacts of critical habitat designation. The final 4(b)(2) analysis for this designation considered both the reduced benefit of including HSA watersheds 330411 and 330412 and the final economic impacts for these watersheds. Based on our consideration of this information, we concluded that the benefits of designating the occupied stream reaches in HSAs 330411 and 330412, including the streams of concern to the commenter, outweighed the benefits of excluding them from the final designation.

ESU Specific Comments—South-Central Coast Steelhead

Comment 58: One commenter questioned the conservation value of the San Benito watershed (HSA 330550) and also argued that unoccupied habitat areas above Uvas Creek Dam were not essential for the conservation of this ESU.

Response: The San Benito watershed unit (HSA 330550) was rated as having medium conservation value to this ESU by the CHART based on factors used to conduct the conservation value rating and ranking effort. For the proposed critical habitat ESA section 4(b)(2) analysis, therefore, we attributed a medium benefit of designation to this watershed unit. For the final designation, we conducted a revised 4(b)2 analysis that modified the biologically based conservation value scores if they met a ''low section 7 leverage'' profile which we believe reduce the benefits of section 7 consultation (see discussion in *Critical Habitat Analytical Review Teams* section). In the case of HSA 330550, we determined that there was relatively low section 7 leverage which reduced the benefits of section 7 consultation, and therefore, reduced the benefit of inclusion from medium to low. Based on this low benefit level and comparatively high economic costs associated with section 7 consultations in this watershed unit, this watershed was considered for possible exclusion. However, the CHART reviewed the available biological and other information for this watershed unit and concluded that its exclusion would impede the conservation of this ESU. This determination was based on the size of the San Benito River and its contribution of habitat to the Pajaro River Basin, the level of section 7 activity occurring in the watershed, and the San Benito River's potential contribution to the recovery of this ESU. Accordingly, we have included the San Benito watershed unit HSA 330550 in the final critical habitat designation.

In the proposed critical habitat designation, the CHART did conclude that the unoccupied habitat above the Uvas Creek Dam ''may'' be essential for conservation of this ESU. We recognize, however, that there are several issues related to providing fish passage over this dam and also believe it is premature to include this unoccupied habitat area in the critical habitat designation until ongoing recovery planning efforts have progressed to the point where they support a determination that these areas are essential to the conservation of this ESU.

Comment 59: One commenter questioned whether the apparent exclusion of a portion of the drainage into Morro Bay was based on a consideration of land ownership.

Response: The identification and conservation rating of occupied habitat that was eligible for designation used only biological and ecological criteria, including information regarding presence of steelhead and habitat condition. Land ownership was not a consideration in the conservation rating process nor in the section 4(b)(2) analysis that identified areas for exclusion based on a balancing of the benefits of designation against the economic costs of designation. In reviewing the proposed critical habitat designation maps in response to this comment, however, we discovered a technical mapping error in Los Osos Creek. An upstream portion of Los Osos Creek was proposed for designation in HSA 331023, but the lower portion of the creek which enters into Morro Bay was inadvertently excluded from the designation. We have corrected this error in the final designation.

Comment 60: One commenter recommended exclusion of San Luis Obispo Creek from the designation for this ESU based on the management plans and existing agreements already in place which provide protection for the creek and steelhead. The commenter also raised questions about the validity of the economic impact analysis used for the proposed critical habitat designation process in light of costs incurred as a result of ESA section 7 consultation on a water reuse project.

Response: The commenter and other local agencies have undertaken numerous efforts to conserve and improve existing habitats within the San Luis Obispo Creek watershed, though some efforts were a result of regulatory requirements to compensate for the adverse effects of proposed actions. However, these conservation efforts have been confined to localized areas and provide no reliable ability to effectively protect existing suitable habitat for steelhead and improve currently degraded habitats. We have not conducted a review to determine whether the existing local conservation and management efforts (e.g., conservation easements, creek set-back ordinance, sewer ordinance) contain measures that would be expected to protect existing suitable habitat for steelhead, and, therefore, the possible benefits that existing management plans may have for the conservation of steelhead and their habitat is unknown. We have, however, reviewed the draft Creeks and Waterway Management Plan (i.e., the Environmental Impact Statement), which describes management and protection of streams within the San Luis Obispo Creek watershed, and concluded that many of the ''management'' activities (e.g., use of rock riprap, removal of woody debris, creation or modification of channels, and in-channel detention enhancements) in the plan would create conditions unfavorable for long-term survival and reproduction of steelhead within the San Luis Obispo Creek watershed and, in turn, the entire ESU. Based on these considerations and other information regarding activities potentially affecting steelhead habitat in the San Luis Obispo Creek watershed, we disagree with the commenter and continue to believe there is a need for special management considerations or protections of occupied stream habitat in the San Luis Obispo Creek watershed. Accordingly, the final designation for this ESU includes all occupied stream reaches in HSA 331024, including San Luis Obispo Creek.

We acknowledge that the economic analysis used in the ESA section 4(b)(2) analysis for the proposed designation did not address water supply and flow modification related projects adequately. The final economic analysis prepared for this designation addresses these issues more completely, though it does not specifically address the water reuse project. Rather than understate the costs of critical habitat designation, we believe that the economic analyses prepared for the proposed and final designations actually overestimate the incremental economic costs associated with critical habitat designation. In our economic analyses, we estimated the total cost of ESA section 7 consultation for specific project types anticipated to occur in the foreseeable future based on information from Federal agencies and other sources. We believe that much of the estimated costs can be attributable to the presence of listed fish and the jeopardy analysis in section 7 consultation. Indeed, the costs cited by the commenter for its water reuse project were associated with a section 7 consultation that addressed the presence of listed steelhead in the watershed, not critical habitat. Although consideration of critical habitat adverse modification in the consultation on the water reuse project may have resulted in additional project changes, we do not think they are likely to be significant.

Comment 61: Several commenters were confused about whether West Corral de Piedra Creek, an upstream tributary to Pismo Creek (HSA 331026), was included in the proposed designation, and whether areas above a local dam (the Righetti Dam) on this creek were included in the designation. Some commenters also argued that habitat above the Righetti Dam was of high quality for steelhead and should be included in the critical habitat designation. One commenter also requested that an unnamed tributary of West Corral de Piedra Creek be designated, while a second commenter requested that it not be designated.

Response: West Corral de Piedra Creek was included in the proposed designation and has also been included in the final designation for this ESU. The maps used to depict occupied stream habitat and the proposed critical habitat, however, did not properly label West Corral de Piedra Creek, hence the confusion of the commenters. We have corrected this problem in the maps depicting the final designation. The designated critical habitat in West Corral de Piedra Creek, however, does not include habitat above the Righetti Dam. Although the habitat appears to be of high quality and would likely support steelhead spawning, we are uncertain whether adult fish can pass over the dam. Accordingly, we treated the area above the Rhighetti Dam as unoccupied habitat and, since a determination that it is essential to the conservation of the ESU had not been made, we have not included it in the final designation for this ESU. In evaluating the areas of occupancy, habitat conditions, and conservation value of this HSA watershed, the CHART reviewed the available information about the unnamed tributary to West Corral de Piedra Creek. The CHART concluded it was unoccupied and had poor habitat conditions, and, since, a determination that it is essential to the conservation of the ESU has not been made, it has likewise not been included in the final designation.

Comment 62: Another commenter argued that West Corral de Piedra Creek is likely unoccupied by steelhead because of an impassable barrier on Pismo Creek downstream of West Corral de Piedra Creek (and the Righetti Dam), and, therefore, should not be designated as critical habitat. The commenter also criticized the economic analysis for not addressing impacts on irrigation and instream flow resulting from critical habitat designation. Lastly, the commenter argued that habitat area above the Righetti Dam should not be designated.

Response: The potential barrier in question is an existing fish ladder on Pismo Creek downstream of West Corral de Piedra Creek. The extent to which the ladder precludes adult steelhead is unclear, but we do not think it is a complete barrier. There is existing information indicating the presence of juvenile steelhead in West Corral de Piedra Creek downstream of Righetti Dam and above the Pismo Creek ladder which suggests steelhead can pass the existing fish ladder. In addition, direct observations of the fish ladder suggest it is capable of passing adult steelhead even though the design is not ideal and ladder operation may become impaired by inorganic and organic debris. Based on the available information, therefore, the CHART considered West Corral de Piedra to be occupied habitat for steelhead up to, but not above, the Rhigetti Dam. Accordingly, this reach of West Corral de Piedra is included in the final critical habitat designation for this ESU. We acknowledge that the economic analysis prepared for the proposed critical habitat designation did not adequately address economic impacts related to changes in instream flow or agricultural flows. The final economic analysis made additional efforts to address this issue, though potential flow changes at the Righetti Dam was not a part of that analysis. As noted in the previous response, the habitat area above the Righetti Dam is not considered occupied by steelhead though habitat conditions are considered favorable for steelhead spawning. For this reason, the habitat area above Righetti Dam is not included in the final designation of this ESU.

Comment 63: One commenter argued that Arroyo Grande Creek should not be included in the designation because it is not essential for conservation, numerous dams on the creek have altered habitat conditions for steelhead, existing protections are in place and thus there is no need for special management considerations, and previous determinations by Federal and State agencies have concluded that activities at Oceano SVRA do not adversely impact steelhead or their habitat. The commenter cited the final draft HCP for Arroyo Grande Creek as an existing mechanism for managing the creek, and suggested designation of critical habitat was unnecessary because it would cause confusion among stakeholders and agencies regarding the management of the area for steelhead. Another commenter argued that designation of the mouth of Arroyo Grande Creek may impact recreational uses in that area, and thereby result in significant economic impacts to local governments and businesses.

Response: The CHART determined that Arroyo Grande Creek met the definition of critical habitat, and was therefore eligible for designation, based on an extensive review of information, including observations and information obtained from site visits and field studies. This information allowed the CHART to identify the geographic areas occupied by steelhead and confirm that the creek contains physical and biological features essential to conservation. A draft HCP prepared by the San Luis Obispo County Flood Control and Water Conservation District Zone 3 (District) provides information regarding the quality and quantity of habitats in Arroyo Grande Creek for steelhead and discusses the abundance of steelhead. Although this ESU has a broad geographic distribution, there are relatively few representative streams in the southern portion of the ESU where steelhead actively spawn and rear. Arroyo Grande Creek is one of the few streams at the southern portion of the subject ESU where age-0 and older juvenile steelhead occur during summer and fall, and sexually ripe adults occur in winter and early spring. There are numerous streams in San Luis Obispo County, but a disproportionate number in the southern portion of the subject ESU currently do not appear suitable for steelhead owing in part to improper land-use activities. Arroyo Grande Creek is one of the notable exceptions. On the basis of this information, the CHART determined that the HSA watershed containing Arroyo Grande Creek had medium conservation value and that it was essential for the conservation of the ESU.

Based on information available to us, the only dam which is a full barrier to steelhead in Arroyo Grande Creek is Lopez Dam. Its presence and operation have certainly contributed to declines in the quality and quantity of habitat for steelhead, but evidence indicates that steelhead still use Arroyo Grande Creek for spawning and rearing. More importantly, the effects of Lopez Dam on steelhead and its habitat in Arroyo Grande Creek underscore the need for special management considerations or protections in this watershed.

The purpose of the HCP in question is essentially to address the ''take'' of steelhead and other federally listed species associated with operation of Lopez Dam, not to manage the Arroyo Grande Creek as a whole. More importantly, the current draft HCP does not ensure that essential habitat functions necessary for long-term species survival would be attained through the proposed conservation program. For instance, the flow regime proposed in the draft HCP is conditioned upon reservoir-operation constraints, and, therefore, is not ecologically meaningful. The HCP requires considerable revision before being suitable for adoption in the application phase, and years may pass before it is ultimately approved and an incidental take permit issued.

The commenter is correct that we have determined through informal ESA section 7 consultations with the U.S. Army Corps of Engineers (COE) that off-road vehicle crossings of the creek at the mouth (a sandy tidally influenced area) are not likely to adversely affect steelhead. However, the decision to include Arroyo Grande Creek in the designation was not predicated on whether previous activities, such as off-road vehicle use, did or did not adversely affect the species. Rather, NMFS performed an extensive review and analysis to identify those habitats that are essential for conservation of the species and determined that Arroyo Grande Creek (including the creek mouth) is one such habitat area for this ESU. Inclusion of the creek mouth in the critical habitat designation is necessary because the mouth is an essential migratory habitat linking upstream spawning and rearing areas with the ocean.

Based on our past consultation experience in this area, we do not think that designation of the Arroyo Grande Creek, including the creek mouth, is likely to result in restricted recreational crossings of the creek mouth or cause significant economic impacts to local governments and businesses. Although not definitive on the outcome of future consultations, previous consultations involving such crossings have determined that steelhead were not likely to be adversely affected and that the value of the creek mouth as a migration corridor for steelhead was not likely to be diminished.

Comment 64: One commenter (CDFG) recommended that the conservation value of the HSA watersheds containing Arroyo de la Cruz (HSA 331012) and San Carpoforo (HSA 331011) creeks should be high because of the quality and quantity of steelhead habitat and the potential risks to these resources in the future.

Response: We agree with CDFG that the quality of steelhead habitat is high for both of these streams. However, the CHART considered a range of factors in assessing the conservation value of the HSA watersheds containing these streams, and on the basis of that analysis, concluded that a medium conservation value was appropriate for both watersheds. Based on the available information, we continue to believe that these two HSA watersheds have a medium conservation value to this ESU relative to other HSA occupied watersheds in the range of the ESU. Both HSA watersheds had a relatively low economic benefit of exclusion, and therefore, all occupied habitat in both watersheds, including the two streams in question, are included in the final critical habitat designation for this ESU.

ESU Specific Comments—Southern California Steelhead

Comment 65: Several commenters raised questions about whether or not the Sisquoc River and some of its tributaries are occupied by steelhead, and whether there are PCEs to support steelhead in this watershed. At least one commenter argued that any *O. mykiss* in this watershed were hatchery plants. One commenter criticized the economic analysis for the HSA containing the Sisquoc River watershed, and another was concerned that recreational fishing in one tributary would be adversely affected by a critical habitat designation.

Response: The CHART reconsidered whether the Sisquoc River and its tributaries should be considered occupied based on the issues raised by these commenters. Based on a reassessment of the available information (primarily the Stoecker and Stoecker 2003 barrier assessment for the Sisquoc River), the CHART concluded that the Sisquoc River and its tributaries (HSA 331220) should be considered occupied, and that this watershed contains PCEs supporting migration, spawning and rearing habitat. We recognize that flows in the Santa Maria River watershed are constrained by the operation of Twitchell Dam and that migration opportunities into the Sisquoc River are limited. For this reason, steelhead access to this watershed is not available in all years, and occupancy of the watershed will be on a more infrequent, rather than annual, basis. Nevertheless, migration opportunities do occur in wet years when high flows breach the sand bar at the mouth of the Santa Maria River, and steelhead can and do migrate into the middle and upper reaches of the Sisquoc River watershed where over-summering/rearing habitat and spawning habitat occurs. Although rainbow trout may well have been planted in some areas historically, we are not aware of any current planting of fish except in Manzana Creek. Accordingly, we do not believe the vast majority of steelhead in the watershed are of hatchery origin. A revised economic impact analysis was prepared for the final critical habitat designation. Although it may not address all site specific potential economic impacts within each HSA watershed, we believe this analysis does consider the vast majority of projected activities which are subject to ESA section 7 consultation in each watershed and that it provides a reasonable basis for conducting an ESA section 4(b)(2) analysis. More detailed responses to comments on the economic analysis were presented earlier in this final rule. Lastly, the designation of critical habitat for this ESU is not expected to affect recreational fishing activities in this watershed because such activities are not subject to section 7 of the ESA and are unlikely to affect critical habitat. Nevertheless, such activities do need to ensure that they do not result in the ''take'' of listed steelhead.

Comment 66: One commenter questioned whether specific streams (Santa Agueda and Alamo Pintado, both tributaries to the lower Santa Ynez River in HSA 331440, and Santa Monica Creek in HSA 331534) should be designated as critical habitat.

Response: We have re-examined the available information supporting the inclusion of these tributaries in the proposed designation and concluded that although these streams may occasionally support steelhead, there is not sufficient information to consider them occupied for the purposes of this designation process. Accordingly, these tributaries were not considered occupied in the final critical habitat designation and a determination that they were essential to the conservation of the ESU was not made, so they have been removed from the final critical habitat designation and associated maps.

Comment 67: Many commenters responded to our request for comments regarding the designation of unoccupied habitat above Bradbury, Matilija, Casitas, Santa Felicia and Rindge Dams. Several commenters recommended that these areas be designated because they are essential for the conservation of this ESU, while several other commenters were opposed to designating these unoccupied habitats. Some commenters were confused or misunderstood that we were only requesting information and thought we had proposed to designate these areas as critical habitat.

Response: As part of the proposed rule development process, the CHART was asked to identify unoccupied areas above dams within the range of this ESU that ''may'' be essential for its conservation. Based on its assessment, the CHART identified the unoccupied habitat found above the five dams listed above. The proposed rule did not include these unoccupied areas in the proposed designation for this ESU, but rather solicited public comment on our determination that these unoccupied areas ''may'' be essential for conservation of this ESU. As stated elsewhere in this rule, we believe that it is premature to designate such areas at this time, and that any designation of unoccupied areas above dams or in other areas must await the completion of technical recovery planning efforts that are currently underway. Our expectation is that the technical recovery planning process will provide the scientific foundation to support the inclusion of unoccupied habitat areas in any critical habitat designation. Once the technical recovery planning is completed, we intend to revisit the designation of unoccupied habitat and will use information provided by commenters to inform any subsequent proposal.

Comment 68: A large number of commenters were opposed to the inclusion of any portion of Rincon Creek in the critical habitat designation. They argued that steelhead did not occupy the stream, the habitat was unsuitable, and the economic impacts of designation would be significant. Some commenters were confused and thought that Rincon Creek upstream from the Highway 101 culvert had been proposed.

Response: The proposed designation of Rincon Creek only included that portion of the creek that is seaward of the Highway 101 culvert. The culvert is considered a complete barrier to steelhead migration, and therefore, areas upstream of the culvert are considered unoccupied. We continue to believe that the lagoon and that portion of Rincon Creek seaward of the culvert is periodically occupied and meets the definition of critical habitat. Accordingly, this habitat reach was considered in the final ESA section 4(b)(2) analysis and has been retained in the final critical habitat designation for this ESU. Efforts are underway to improve fish passage at this culvert, and the designation of critical habitat downstream may support those efforts. If fish passage is successfully implemented at this location and steelhead reoccupy Rincon Creek upstream from the Highway 101 culvert, we will reconsider the possibility of designating critical habitat in the newly occupied habitat area.

Comment 69: Camp Pendleton Marine Corps Base and Vandenberg Air Force Base both provided supplementary comments and information to support the exclusion of their facilities from the final critical habitat designation for this ESU, based on the conservation benefits provided by their respective INRMPs. Both DOD facilities also provided information supporting the national security related impacts of a critical habitat designation on their activities and operations.

Response: As discussed elsewhere in this final rule, we have concluded that the INRMPs for both of these facilities provide conservation benefits to this steelhead ESU, and, therefore, the areas subject to these INRMPs are not eligible for designation pusuant to section 4(a)(3)(B)(i) of the ESA. Information provided by both DOD facilities concerning the impacts of critical habitat designation on their activities and operations support the view that designation of habitat will likely reduce the readiness capability of both the Marine Corps and Air Force, both of which are actively engaged in training, maintaining, and deploying forces in the current war on terrorism. On this basis, we also concluded that the benefits of excluding these facilities from the critical habitat designation for this ESU outweighed the benefits of designation.

Comment 70: Several commenters raised questions about steelhead access to, and occupancy in, upper San Antonio Creek (a tributary to the Ventura River) and its tributaries (*e.g.*, Reeves, Thatcher, Gridley, Ladera, and Senior Canyon Creeks). These commenters argued that a migration impediment at the Soule Park golf course blocks steelhead access upstream and that the only occupied habitat in the San Antonio Creek watershed is downstream from that location.

Response: We agree with the commenters that steelhead access to some portions of upper San Antonio Creek watershed are in fact blocked and should not be considered occupied habitat for the purposes of this critical habitat designation. For example, most of Thatcher Creek and Reeves Creek are presently inaccessible because of a passage impediment at Boardman Road on Thatcher Creek, and, therefore, these habitat reaches are clearly unoccupied by steelhead at present. Similarly, steelhead access into Gridley Canyon Creek, Senior Canyon Creek, and the lower portion of Thatcher Creek was blocked until this past winter when storms washed out a passage impediment at the Soule Park golf course. Although the passage impediment at the Soule Park golf course is no longer present, we have no information at present indicating that steelhead occur in the habitat reaches upstream of the former impediment to migration. Based on this information, we concluded it is appropriate to consider all stream reaches in the upper San Antonio Creek watershed above the Soule Park golf course to be unoccupied for the purposes of this critical habitat designation. We have revised our fish distribution maps accordingly and also removed these areas from the final critical habitat designation. It should be noted, however, that steelhead may now begin to occupy areas above the Soule Park golf course, and that efforts are underway to provide fish passage for steelhead at the Boardman Road location. If steelhead do access these currently unoccupied habitat areas, we will reconsider the exclusion of these areas from critical habitat for this ESU.

Comment 71: Some commenters questioned the distribution of occupied habitat and the proposed designation of occupied habitat in Hydrologic Unit 4901, particularly with regard to the upstream endpoints in San Juan Creek, Trabuco Creek (a tributary of San Juan Creek), and Devil's Canyon (a tributary of San Mateo Creek). Other commenters supported the proposed designation of habitat in the San Juan Creek and Trabuco Creek watersheds.

Response: We have reviewed the information provided by the commenters, re-evaluated the information used in developing the proposed designation, and also consulted with CDFG regarding the upstream limit of the distribution of steelhead in San Juan Creek and Trabuco Creek. After considering this information, we have substantially modified the upstream distribution limits of steelhead occupancy in Trabuco and San Juan Creeks. According to CDFG, the Trabuco Creek crossing under I–5 in San Juan Capistrano is a complete barrier to steelhead. Therefore, the occupied habitat reach in Trabuco Creek is now considered to end at the I–5 crossing which is in HSA 490127. As a result of this distributional change, three HSA watershed units in upper Trabuco Creek that were previously considered occupied and proposed for designation (HSAs 490121, 490123, and 490122) are no longer considered occupied. Because these watersheds are not occupied and a determination that they are essential to the conservation of the species had not been made, they are not included in the final critical habitat designation. The I–5 does not serve as a barrier to steelhead migration in San Juan Creek. However, the upstream distributional limit of steelhead according to CDFG is basically at the I–5 bridge based on the available anecdotal information. As a result of this distributional change, three HSA watersheds upstream from this location that were previously considered occupied and proposed for designation (HSAs 491028, 490126, and 490125) are no longer considered occupied; and, because a determination that they are essential to the conservation of the ESU has not been made, they are not included in the final designation for this ESU. Those portions of Trabuco and San Juan Creeks that are occupied and occur in HSA 490127 as described above were considered eligible for designation and were considered in the final ESA section 4(b)(2) analysis. Based on this analysis, we concluded that the benefits of including the occupied habitat reaches in HSA 490127 outweighed the benefits of their exclusion, and, therefore, we have included these habitat areas in the final designation.

Comment 72: One commenter questioned why Pole Creek, a tributary to the Santa Clara River, was included in the proposed critical habitat designation when the habitat conditions were poor and there was little information indicating it was occupied.

Response: Based on information from the commenter and observations by agency biologists, we have reassessed the appropriateness of including Pole Creek in the final designation. We recognize that habitat conditions in Pole Creek are poor and upstream passage through the existing concrete channel in the lower portion of the creek is highly unlikely. Accordingly, we have concluded that Pole Creek should be considered unoccupied. Because it is considered unoccupied and we have not made a determination that it is essential for conservation, it is not included in the final critical habitat designation.

Comment 73: One commenter questioned why critical habitat was not proposed in the Santa Clara River upstream from its confluence with Piru Creek.

Response: The CHART did not consider that portion of the Santa Clara to be occupied, and we did not make a determination that it was essential for the conservation of the ESU; thus it was not considered further in the critical habitat analysis.

ESU Specific Comments—Central Valley Spring Run Chinook

Comment 74: Two commenters provided information regarding the distribution of occupied spring run Chinook habitat and habitat use, and recommended that additional critical habitat be designated in the upper Sacramento River Basin for this ESU. One commenter indicated that we should designate several west-side tributaries to the upper Sacramento River in the vicinity of Redding (HSA 550810) as critical habitat because these streams provide significant non-natal rearing and refugia habitat, especially since Shasta and Keswick Dams block access to hundreds of miles of historic rearing and refugia habitat. Another commenter recommended that small intermittent tributaries used for natal rearing in the Sacramento River, as well as lower Butte Creek, should be designated as critical habitat.

Response: The CHART reviewed the information provided by these commenters for the upper Sacramento River tributaries and concluded that it did not change the previously determined distribution of occupied habitat for this ESU. The CHART reassessed the conservation value of occupied habitat in HSA 550810 based on the new information and concluded that the conservation value of some reach specific tributaries was less than previously thought to be the case, but that the overall conservation value for the HSA remained high. All occupied spring run Chinook habitat in HSA 550810 was proposed for designation, and, as a result of the final ESA section 4(b)(2) analysis, this habitat has been included in the final designation for this ESU. The CHART agreed with the commenter that intermittent tributaries to the Sacramento River are used for non-natal rearing and that lower Butte Creek is important for the conservation of this ESU. In fact, the CHART previously analyzed these occupied habitat areas and rated them as having high conservation value. These areas were proposed for designation and are also included in the final designation for this ESU.

Comment 75: One commenter recommended that the lower American River from the outfall of the Natomas Main Drainage Canal downstream to the confluence with the Sacramento River be designated because it is used for non-natal rearing (HSA 551921). The argument was that this habitat provides spawning, rearing and migration values for spring run Chinook that may require special management considerations.

Response: The HSA watershed (551921) containing the lower American River was originally rated by the CHART as having medium conservation value and was excluded from the proposed designation because of relatively high economic costs. In response to these comments, the CHART reassessed the conservation value of this HSA and determined that it should be rated as having a high conservation value to the ESU. Information provided by the commenter demonstrated the importance of the lower American River for non-natal rearing and the high improvement potential of the habitat conditions from ongoing restoration projects. In addition, the lower American River may be used during high winter flows for rearing and refugia by multiple populations of spring Chinook in the central valley (*e.g.*, Feather and Yuba Rivers). Additionally, the commenter suggested that special management considerations may be required to maintain and improve habitat conditions and the conservation value of this HSA for spring run Chinook. In particular, special management considerations may be necessary to address flood control, residential and commercial development, agricultural management, and habitat restoration. Based on the change in conservation value and the final ESA section 4(b)(2) analysis, we concluded that all occupied habitat in HSA 551921, including the lower American River, should be designated as critical habitat for this ESU.

Comment 76: A commenter also recommended that the lower Bear River (HSA 551510) from the mouth of Dry Creek downstream to its confluence with the Feather River be designated as critical habitat because it is used for non-natal rearing and will require special management to maintain habitat value for this ESU.

Response: The HSA watershed (551510) containing the lower Bear River was originally considered unoccupied by the CHART, and its conservation value was not rated. Based on the information provided by the commenter, the CHART has reclassified the lower Bear River as occupied habitat for spring run Chinook. Information provided by the commenter indicates that the lower Bear River is used for non-natal rearing and that habitat values are likely to increase in the near future as a result of planned restoration projects that will improve the condition of several PCEs. The CHART applied the PCE factor ranking criteria and rated the lower Bear River as having high conservation value to this ESU, primarily because: (1) the habitat area is likely to be used by at least two populations (*i.e.*, Feather and Yuba River); (2) non-natal rearing represents a unique life-history strategy that is essential for the conservation of the species (contributing to improved growth conditions); (3) the habitat serves as a refugia from high water conditions and catastrophic events; and (4) there is high improvement potential for this habitat from ongoing restoration efforts. Based on information from the commenter, the lower Bear River will require special management efforts to protect and maintain habitat values for this ESU. Special management considerations are likely to include flood control, residential and commercial development, agricultural management, and habitat restoration. Because this HSA is now considered occupied, contains the necessary PCEs, and has a need for special management considerations, it was considered eligible for designation in the final ESA section 4(b)(2) analysis conducted for this designation. Based on the results of the final 4(b)(2) analysis, we concluded that the benefits of including this area in the designation outweighed the benefits of its exclusion. Accordingly, occupied habitat in HSA 551510 is now included in the final critical habitat designation for this ESU.

Comment 77: Several commenters recommended that portions of the San Joaquin River and its major tributaries below impassable mainstem dams be designated as critical habitat for this ESU either because of future efforts to restore habitat or because of unpublished information from CDFG indicating specific habitat areas were occasionally occupied by spring run Chinook. These areas include the San Joaquin River from its confluence with the Merced River upstream to Friant Dam, the Tuolumne River downstream of La Grange Dam, the Merced River downstream of Crocker Huffman Dam, and the Stanislaus River downstream of Goodwin Dam.

Response: The recommendation to designate the San Joaquin River above the confluence with the Merced River confluence was primarily based on the historical occupancy of this habitat reach by spring Chinook and the expectation that future efforts will be undertaken to restore habitat in this reach. We recognize that this habitat in the San Joaquin River was historically used by spring Chinook; however, it has been unoccupied for more than half a century. Moreover, plans to restore flows and habitat conditions downstream of Friant Dam are uncertain, and significant passage impediments and flow alterations in the San Joaquin above the Merced River confluence present potentially significant obstacles to future restoration success. Because this habitat is currently unoccupied and no determination has been made that it is essential for the conservation of this ESU, we have not included it in the final critical habitat designation.

The CHART reviewed information provided by the commenters regarding occupancy of the Tuolumne, Merced, and Stanislaus Rivers by spring Chinook and concluded there was insufficient data to consider them occupied. Although the CHART did evaluate these as unoccupied areas for the proposed critical habitat designation and concluded that they ''may'' be essential for the conservation of spring run Chinook ESU, we believe it is premature to include these unoccupied areas in the critical habitat designation for this ESU until ongoing recovery planning efforts provide information sufficient to make a determination that these areas are essential to the conservation of this ESU. Because these tributary rivers to the San Joaquin River are currently unoccupied and recovery planning efforts do not yet support a determination that these areas are essential for the conservation of this ESU, we have not included them in the final critical habitat designation.

Comment 78: One commenter argued that the lower Feather River below Oroville Dam should not be designated because of the introgression of fall run Chinook and spring run Chinook by the Feather River hatchery.

Response: We disagree with the commenter and believe that the lower Feather River below Oroville Dam should be designated as critical habitat. The extant Feather River population of spring-run Chinook salmon represents a legacy population of the fish that historically used the upper Feather River prior to construction of Oroville Dam, and it is an important population to conserve and protect because of its potential contribution to ESU recovery. This habitat area was proposed for critical habitat because the CHART considered it occupied by spring run Chinook, it contains PCEs, and it requires special management considerations for activities such as flood control, flow and temperature management, residential and commercial development, agricultural management, and habitat restoration. HSA 551540, which contains much of the lower Feather River below Oroville Dam, was rated as having high conservation value by the CHART for the proposed designation, and that determination was not changed as a result of these comments. Based on the results the final ESA section 4(b)(2) analysis, occupied habitat in HSA 551540, including the lower Feather River below Oroville Dam, is included in the final critical habitat designation for this ESU.

Comment 79: Some commenters contended that NMFS should not designate any critical habitat for spring run Chinook in the Sacramento River, its major tributaries (*i.e.* Feather River), the Sacramento-San Joaquin Delta, or the Suisun-San Francisco Bay complex because existing protective efforts and mechanisms are sufficient to protect the ESU.

Response: We disagree with these commenters. These habitat areas comprise the entire freshwater and estuarine range of this ESU, contain one or more PCEs that are essential to the conservation of the ESU, including migration, holding, spawning, rearing, and refugia habitat, and require special management considerations or protections beyond those protective efforts that are already in place or available. For these reasons, they were considered for designation through this rulemaking process. In the course of the analysis supporting this rulemaking, we evaluated the quantity, quality and diversity of PCEs within the occupied portions of these waterbodies by watershed unit, assessed the benefits of designating these watershed units, and finally weighed the benefits of designation against the benefits of exclusion by watershed unit. The resultant critical habitat designation in this final rule, therefore, meets the definition of critical habitat and also represents that habitat which contains PCEs that we believe are essential for the conservation of this ESU.

Comment 80: One commenter recommended that several areas proposed for designation in the Sacramento River basin below impassable barriers not be designated in the final rule. These areas include: (1) the South Fork Cow Creek watershed because it is not occupied; (2) specific streams in the Tehama Hydrologic Unit (5504) including HSAs 550410 and 550420 because they do not support populations of spring run Chinook and also lack cool, deep pools for summer holding habitat; (3) specific streams in the Whitmore Hydrologic Unit (5507) including HSAs 550711 and 550722 because they do not support populations of spring run Chinook and also lack cool, deep pools for summer holding habitat; and (4) specific streams in the Redding Hydrologic Unit (5508) and HSA 550810 because they do not support a population of spring run Chinook and lack cool, deep pools for summer holding habitat.

Response: The CHART re-evaluated the South Fork Cow Creek based on these comments and agreed that it is unoccupied and therefore reclassified its occupancy status accordingly. Because the HSA containing South Fork Cow Creek (HSA 550731) is now considered unoccupied and we have not made a determination that it is essential to the conservation of the ESU, it was excluded from further consideration in the analysis and has not been included as critical habitat in the final designation for this ESU.

The CHART, however, disagreed with the commenter's recommendation to exclude the identified streams and HSAs in the Tehama (5504), Whitmore (5507), and Redding (5008) Hydrologic Units. The recommendation was based on the lack of cool, deep pools for summer holding habitat that is essential for adult holding, spawning, and summer rearing. The CHART's previous assessment of the conservation value of these streams and watershed units, however, was based on their use during winter and early-spring months for non-natal rearing by juvenile spring-run Chinook. Though current use is likely low, it is expected to increase in the near future as a result of habitat restoration and range expansion in Battle and Clear Creeks. The CHART concluded these streams provide several PCEs that are important for juvenile non-natal rearing, which represents a unique life-history strategy that is essential for the conservation of this ESU because of its contribution to improved growth conditions and refugia from high water and catastrophic events. In addition, the CHART concluded that these streams will require special management efforts for flood control, residential and commercial development, agricultural management, and habitat restoration to protect and maintain the conservation value of these habitats for spring-run Chinook. Based on these factors, the CHART rated most of the occupied HSAs in these three Hydrologic Units as having high conservation value to the ESU. After consideration of these comments, the CHART concluded there was no reason to change its previous assessment of spring Chinook distribution, habitat use, or conservation value for these streams and Hydrologic Units. Accordingly, the occupied streams in these Hydrologic Units and associated HSAs were considered in the final 4(b)(2) analysis for this final designation.

Comment 81: Two commenters questioned the historical and current habitat use and occupancy of Putah, Alamo, and Ulatis Creeks by spring run Chinook and thus whether they should be designated as critical habitat.

Response: The proposed critical habitat designation for spring run Chinook did not include any of these three creeks, because the CHART considered all of them to be unoccupied in its original assessment and we had not made a determination that they were essential to the conservation of the ESU. The commenters likely were confused because these creeks all occur in the Valley Putah-Cache Hydrologic Unit (HSAs 551100 and 551120), and some portions of this Hydrologic unit were included in the proposed designation because they are occupied, have the requisite PCEs, may need special management considerations, and were not excluded as a result of the original ESA section 4(b)(2) exclusion process that led to the proposed rule. The CHART did not receive any new information indicating these creeks are occupied, so they were not reconsidered and are not included in the final critical habitat designation for this ESU.

Comment 82: Several commenters indicated that habitat above major impassable rim dams on tributaries to the San Joaquin River (Stanislaus, Tuolumne, and Merced Rivers) do not contain habitat that would support spring run Chinook and/or that the feasibility of providing fish passage for spring run Chinook has not been adequately evaluated.

Response: Although the CHART did evaluate these as unoccupied areas for the proposed critical habitat designation and concluded that some of the reaches above the rim dams ''may'' be essential for the conservation of spring run Chinook, we believe it is premature to include these unoccupied areas in the critical habitat designation for this ESU until ongoing recovery planning efforts provide technical information supporting a determination that one or more of these areas are essential to its conservation and recovery. Because these tributary rivers to the San Joaquin River are currently unoccupied and recovery planning efforts do not yet support a determination that these areas are essential for the conservation of this ESU, we have not included them in the final critical habitat designation.

ESU-Specific Comments—Central Valley Steelhead

Comment 83: One commenter recommended that we designate several west-side tributaries to the Sacramento River in the vicinity of Redding (HSA 550810) as critical habitat for this ESU because they are used as spawning and/or rearing habitat.

Response: The CHART reviewed the new information provided by the commenter and concluded that several of these streams are seasonally occupied and most likely used by steelhead as non-natal rearing habitat with occasional use as spawning habitat, and that they contain PCEs supporting non-natal habitat use. The CHART considered these additional occupied habitat areas important for steelhead because they are likely to be used by several populations (e.g., upper Sacramento River, Clear Creek, and Cow Creek), and because non-natal rearing represents a unique life-history strategy that is essential for the conservation since it contributes to improved growth conditions and serves as a refugia from high water and catastrophic events. The CHART concluded that these streams may require special management considerations to address activities such as flood control, residential and commercial development, agricultural management, and habitat restoration, and, therefore, evaluated the conservation value of these occupied habitat stream reaches and the overall HSA. This reassessment concluded that the conservation value of the additional occupied stream reaches ranged from low to high, but that the overall conservation value of HSA watershed 550810 remained high to the ESU. Based on the results of the final ESA section 4(b)(2) analysis, all occupied habitat in HSA 550810, including several stream reaches recommended by the commenter, is designated as critical habitat in the final rule.

Comment 84: One commenter recommended that we should designate upper little Dry Creek, a tributary to Butte Creek, as critical habitat for this ESU.

Response: The CHART originally evaluated the conservation value of upper Dry Creek (HSA 552110) as being low, and it was proposed for exclusion in the proposed rule based on the results of the ESA section 4(b)(2) analysis. In response to these comments, the CHART re-assessed the conservation value of this HSA and concluded it should be changed from low to medium. The original low rating was strongly influenced by the low number of stream miles in the HSA. The remainder of little Dry Creek is located downstream in HSA 552040, which was rated as having a high conservation value by the CHART because of the number of occupied stream miles, its high restoration potential, and its use by multiple populations of steelhead. In its reassessment of the conservation value of HSA 552110, the CHART placed more emphasis on the restoration potential of this reach of upper little Dry Creek and the potential for the stream reach to support life history stages of high importance (i.e., spawning adults and over summering juveniles) for this ESU. Based on the increased conservation value of this HSA 552110 (increased from low to medium) and the results of the final ESA section 4(b)(2) analysis, the upper little Dry Creek has been included in the final critical habitat designation for this ESU.

Comment 85: One commenter recommended that we designate the lower Bear River as critical habitat for Central Valley steelhead from its confluence with Dry Creek downstream to its confluence with the Feather River because it is used for non-natal rearing and will require special management considerations to maintain habitat value for the ESU.

Response: The CHART originally evaluated the conservation value of HSA 551510, which contains the lower Bear River, as being low, and it was proposed for exclusion in the proposed critical habitat rule based on the results of the ESA section 4(b)(2) analysis conducted for that rulemaking. In response to the information provided by the commenter, the CHART re-assessed the conservation value and concluded that the overall conservation value for this HSA is medium rather than low. As a result of the revised 4(b)(2) analysis conducted for the final rule, however, this HSA watershed was considered to have a medium benefit of designation and a relatively high benefit of exclusion (ie., high cost relative to benefit), making it potentially subject to exclusion from the final designation. However, the CHART felt the lower portion of the Bear River within this HSA was important because the habitat is likely to be used for non-natal rearing by several populations (i.e., Feather and Yuba River populations) and because non-natal rearing represents a unique life-history strategy that is essential for conservation since it contributes to improved growth conditions and serves as a refugia from high water and catastrophic events. Therefore the CHART concluded the benefit of including this area out weighed the benefit of excluding this area and we have included HSA 551510, which includes the lower Bear River, in the final critical habitat designation for this ESU.

Comment 86: One commenter recommended that the Cosumnes River should be designated as critical habitat for this ESU based on unpublished documentation of steelhead presence.

Response: The original analysis conducted by the CHART for the proposed rule considered the Cosumnes River to be occupied, but its assessment concluded that the HSA watersheds (553111, 553221, 553223 and 553224) containing this river system were of low conservation value. Based on this assessment and the results of the ESA section 4(b)(2) analysis conducted for the proposed rule, the Cosumnes River and all other occupied habitat in these four watersheds were excluded from the proposed designation. The commenter did not provide any new information warranting a change in our proposed rule, and, therefore, the Cosumnes River and these four watersheds have been excluded from the final designation for this ESU.

Comment 87: Several commenters recommended that we designate the San Joaquin River from its confluence with the Merced River to Friant Dam as critical habitat for this ESU.

Response: The recommendations to designate the San Joaquin River above the confluence with the Merced River were primarily based on the historical occupancy of this habitat reach by steelhead and the expectation that future efforts will be undertaken to restore habitat in this reach. We recognize that this habitat in the San Joaquin River was historically used by steelhead, but we consider it presently unoccupied. Moreover, plans to restore flows and habitat conditions downstream of Friant Dam are uncertain, and significant passage impediments and flow alterations in the San Joaquin River above the Merced confluence present significant obstacles to future restoration success. Because this habitat is currently unoccupied, and ongoing recovery planning efforts have not identified areas in this reach of the San Joaquin River as being essential for the conservation of this ESU, we have not included it in the final critical habitat designation.

Comment 88: Two commenters recommended that we designate Dry Creek, a tributary to the Yuba River, as critical habitat for Central Valley steelhead.

Response: The commenters incorrectly interpreted the proposed designation. Dry Creek, a tributary to the Yuba River, occurs in two HSA watersheds (551712 and 551713). However, the vast majority of this creek occurs within HSA 551712. The CHART originally concluded that watershed 551712 had a high conservation value and that watershed 551713 had a low conservation value. Based on this assessment and the original ESA section 4(b)(2) analysis, the proposed designation for this ESU included all occupied habitat in HSA 55172, including Dry Creek, but did exclude a small portion of Dry Creek occurring in HSA 551713 because of high economic costs. We did not receive any new information warranting a change in the proposed critical habitat with respect to Dry Creek, and, therefore, the final critical habitat designation for this ESU only includes that portion of Dry Creek contained in HSA 551712.

Comment 89: Some commenters contended that we should not designate any critical habitat for steelhead in the Sacramento River, San Joaquin River or its major tributaries, the Sacramento-San Joaquin Delta, or the Suisun-San Francisco Bay complex because existing protective efforts and mechanisms are sufficient to protect the ESU.

Response: We disagree with these commenters. These waterbodies comprise the entire freshwater and estuarine range of this ESU, contain one or more PCEs that are essential to the conservation of the ESU, including migration, holding, spawning, rearing, and refugia habitat, and may require special management beyond those protective efforts that are already in place or available. For these reasons, they were considered for designation through this rulemaking process. In the course of this rulemaking, we evaluated the quantity, quality, and diversity of PCEs within the occupied portions of these waterbodies by watershed unit, assessed the benefits of designating these watershed units, and finally weighed the benefits of designation against the benefits of exclusion by watershed unit. The resultant critical habitat designation in this final rule, therefore, meets the definition of critical habitat and also contains PCEs that we believe are essential for the conservation of this ESU.

Comment 90: One commenter recommended that we should not designate several streams in the upper Sacramento River (Red Bluff [550420 and Spring Creek [550440] HSAs) as critical habitat for Central Valley steelhead because they are low elevation streams without sufficient flow duration or suitable habitat to support the species.

Response: We disagree with the commenter's recommendation to exclude specific streams in these two

HSAs. The CHART has evaluated these streams and recognizes that they have limited flow duration. However, the team also concluded the streams in question support important winter and early spring non-natal rearing habitat for steelhead and thus contain PCEs that are important for juvenile rearing. The CHART previously rated both HSAs as having an overall high conservation value for this ESU and does not believe the comments warrant a revision in any of its previous conclusions regarding these two HSAs. Based on the CHART's previous conclusions and the results of the final ESA section 4(b)(2) analysis conducted for this rule, all occupied habitat in these two HSAs is included in the final designation for this ESU.

Comment 91: Some commenters argued that there was no basis for proposing to designate critical habitat for Central Valley steelhead in the Calaveras, Stanislaus, Tuolumne, or Merced Rivers.

Response: We disagree with the commenters. The CHART concluded that the HSA watersheds containing these rivers were occupied by steelhead, contained PCEs supporting the species for spawning, rearing and/or migration, and that there may be a need for special management considerations. On this basis, these rivers met the definition of occupied critical habitat, and, therefore, were eligible for designation. We weighed the benefits of including these areas in the designation against the benefits of their exclusion in the original ESA section 4(b)(2) analysis for the proposed rule, and again in a revised analysis for the final rule. In both instances, the benefits of designating the HSA watersheds containing these rivers outweighed the benefits of their exclusion. Accordingly, the HSA watershed containing these rivers were included in the proposed critical habitat designation and are also included in the final designation for this ESU.

Comment 92: One commenter argued that the Old River and Paradise Cut channels in the San Joaquin Delta Subbasin or Hydrologic Unit (5544) do not meet the definition of critical habitat for Central Valley steelhead.

Response: We disagree with the commenter. The CHART concluded that all of the estuarine habitat in this Hydrologic Unit, including the Old River and Paradise Cut channels, is used by steelhead smolts for rearing and migration from upstream freshwater rivers. On this basis the CHART considered the entire Hydrologic Unit to be occupied and to contain PCEs for rearing and migration that are essential to the conservation of this ESU. The CHART also concluded that agricultural water and municipal water withdrawals, entrainment associated with water diversions, invasive/non-invasive species management, and point and non-point source water pollution could affect these PCEs and that there was a need for special management considerations. Based on all of the available information, the CHART rated this Hydrologic Unit as having high conservation value for the ESU. Based on the CHART's assessment and the original ESA section 4(b)(2) analysis conducted for the proposed rule, this Hydrologic Unit was proposed for designation. We have received no new information warranting a change in this proposal, and, therefore, all occupied habitat in this Hydrologic Unit including the Old River and Paradise Cut channels are included in the final critical habitat designation for this ESU.

Comment 93: One commenter recommended designating critical habitat above major dams in the central valley to ensure these habitats were protected and to encourage implementation of fish passage above these dams.

Response: As part of the proposed critical habitat designation process, the CHART did evaluate many unoccupied areas above dams in the central valley as potential critical habitat, and concluded that some of the reaches above the rim dams ''may'' be essential for the conservation of steelhead. Although the CHART believes these areas may be essential for conservation, and we recognize the historical importance of many of these areas to steelhead, we believe it is premature to include these unoccupied areas in the final designation for this ESU until ongoing recovery planning efforts provide technical information to support a determination that any such areas are essential to its conservation and recovery. Because these above-dam habitat areas are currently unoccupied and recovery planning efforts do not yet support a determination that any specific areas are essential for the conservation of this ESU, we have not included them in the final critical habitat designation. As recovery planning efforts mature and sufficient information is available to make a determination about whether any of these areas are essential for conservation of this ESU, we will conduct additional rulemaking as appropriate.

Comment 94: Two commenters addressed the issue of designating critical habitat above the Solano Irrigation District Dam on Putah Creek. One commenter argued that habitat between the Solano Irrigation Dam and Monticello Dam on Putah Creek should be designated as critical habitat for steelhead even though it is unoccupied because: Suitable spawning and rearing habitat exists for steelhead above the dam; providing fish passage is likely to be economically and logistically feasible; and Central Valley steelhead populations are constrained by the lack of accessible habitat. The other commenter argued that this habitat should not be designated because of problems associated with providing passage.

Response: The CHART considered the information provided by these commenters and concluded that the unoccupied area above Solano Irrigation Dam may contain PCEs that would support steelhead and that providing passage would likely be feasible. However, the CHART did not make a determination about whether this above dam area may be essential for the conservation of this ESU. As noted previously, we believe it is premature to include any unoccupied areas above dams in the final critical habitat designation for this ESU until ongoing recovery planning efforts identify those specific unoccupied areas that are essential to its conservation and recovery. Because the habitat above the Solano Irrigation Dam is currently unoccupied and recovery planning efforts do not yet support a determination that this area is essential for the conservation of this ESU, we have not included this area in the final critical habitat designation.

ESU-Specific Comments—Central Valley Spring Run Chinook and Central Valley Steelhead

Comment 95: One commenter argued that west-side tributaries in Glenn County, and in particular Stony Creek, should not be designated as critical habitat for either spring-run Chinook salmon or steelhead because these habitats are unoccupied and water temperatures are too warm to support salmonids.

Response: We disagree with the commenter. The CHART has evaluated the available information, particularly with regard to Stony Creek (HSA 550410), and concluded that this stream is occupied by both spring run Chinook and steelhead. Juvenile spring run Chinook have been consistently documented using Stony Creek as rearing habitat since 2001 (Corwin and Grant, 2004), as well as in previous years (Maslin and McKinney, 1994). Similarly, juvenile steelhead have been periodically documented rearing in Stony Creek (Corwin and Grant, 2004; Maslin and McKinney, 1994). The

CHART also concluded that Stony Creek has PCEs that support both species. Water temperature monitoring from 2001 through 2004 has shown that temperatures in Stony Creek under current operations are generally suitable for adult and juvenile salmonids (below 65 °F) from mid-October through late May. Water temperatures have been found to be suitable for salmonid spawning and incubation (below 56 °F) from mid-November through early May (Corwin and Grant, 2004). Though successful steelhead spawning has not been documented recently in Stony Creek, habitat conditions under current operations are considered marginally suitable to support steelhead reproduction. Because of ongoing restoration actions and ESA section 7 consultations, progress is being made toward improving these habitat conditions, and we expect conditions to continue to improve into the future.

Comment 96: Numerous commenters raised issues concerning the designation of unoccupied and inaccessible habitat in the Yuba River. Several commenters recommended we designate unoccupied stream reaches above major impassable barriers in the Middle, North, and South Fork Yuba Rivers as critical habitat for both ESUs. In contrast, several other commenters recommended we delay any decision to designate unoccupied and inaccessible habitat for both ESUs in the Yuba River above Englebright Dam until the Upper Yuba River Studies Program is completed.

Response: The CHART reviewed information regarding unoccupied habitat above Englebright Dam for the proposed rule and concluded that unoccupied and inaccessible areas above the dam ''may'' be essential for the conservation of these ESUs. However, we have not made a final determination that these areas are essential to conservation. As noted previously for other unoccupied and inaccessible areas, we believe that it is premature to designate unoccupied areas in the Yuba River above Englebright Dam as critical habitat until ongoing recovery planning efforts identify those specific unoccupied habitat areas in the central valley that are essential to the conservation and recovery of these ESUs. The Upper Yuba River Studies Program is expected to provide relevant information for the recovery planning process of both ESUs, and we intend to await the findings of this program as well as recovery planning efforts before making a determination about whether or not the unoccupied habitat areas in question are essential to the conservation of either ESU. If such a determination is made, we will undertake the appropriate rulemaking to propose the designation of these areas as critical habitat.

Comment 97: One commenter recommended designating the entire Butte Creek watershed, upstream from the Centerville Diversion Dam, as critical habitat for both the spring run Chinook and steelhead ESUs. Conversely, another commenter argued that we should not designate this unoccuped habitat in Butte Creek because there is no historical information that suggests this habitat was historically occupied by anadromous salmonids, and recent CDFG barrier assessments have concluded that barrier modifications are not desirable because of the high stream gradient and the presence of multiple natural barriers immediately above the Dam.

Response: The CHART reviewed information regarding unoccupied habitat above the Centerville Diversion Dam on Butte Creek for the proposed rule and concluded that this unoccupied and inaccessible habitat ''may'' be essential for the conservation of both the spring run Chinook and steelhead ESUs. As noted previously for other unoccupied and inaccessible areas above dams, however, we believe that it is premature to designate unoccupied areas in Butte Creek above the Centerville Diversion Dam as critical habitat until ongoing recovery planning efforts identify those specific unoccupied habitat areas in the central valley that are essential to the conservation and recovery of these ESUs. Because the habitat areas above the Centerville Diversion Dam are unoccupied and no final determination has been made that they are essential for conservation of the ESU, they are not included in the final critical habitat designation for these ESUs. If the agency makes such a determination in the future, we will undertake the appropriate rulemaking to designate these areas as critical habitat.

Comment 98: One commenter (CDFG) argued that it is premature to designate unoccupied habitat above Oroville Dam in the upper Feather River as critical habitat for either spring run Chinook or steelhead.

Response: As discussed in other responses, we agree with CDFG. Although the CHART concluded as part of the proposed critical habitat rule that specific unoccupied areas above Oroville Dam ''may'' be essential for the conservation of spring run Chinook and steelhead, we believe it is premature to make such a determination until ongoing recovery planning efforts in the central valley identify above-dam unoccupied areas that are essential for conservation of these ESUs. For this reason, unoccupied areas above Oroville Dam are not included in the final designation.

Comment 99: Some commenters indicated that habitat above rim dams on tributaries (Tuolumne, Stanislaus, and Merced) to the San Joaquin River did not contain suitable habitat for either ESU and that the feasibility of passage had not been adequately studied.

Response: The CHART evaluated specific unoccupied and inaccessible stream reaches above rim dams on these San Joaquin River tributaries and concluded that they ''may'' be essential for the conservation of spring run Chinook and steelhead. However, as discussed previously, we believe it is premature to make such a determination until ongoing recovery planning efforts in the central valley identify above-dam unoccupied areas that are essential for conservation of these ESUs. For this reason, unoccupied areas above these rim dams on the San Joaquin River tributaries are not included in the final designation.

III. Summary of Revisions

We evaluated the comments and new information received on the proposed rule to ensure that they represented the best scientific data available and made a number of general types of changes to the critical habitat designations, including:

(1) We revised distribution maps and related biological assessments based on a final CHART assessment (NMFS, 2005a) of information provided by commenters, peer reviewers, and agency biologists. We also evaluated watersheds that may be low leverage (*i.e.*, unlikely to have an ESA section 7 consultation or where a section 7 consultation, if it did occur, would yield few conservation benefits) and identified several for possible exclusion in the final ESA section 4(b)(2) analysis.

(2) We revised our economic analysis based on information provided by commenters and peer reviewers as well as our own efforts as referenced in the proposed rule. Major changes included assessing new impacts associated with pesticide consultations, revising Federal land consultation costs to take into account wilderness areas, and modifying grazing impacts to more accurately reflect likely project modifications.

(3) We conducted a new ESA section 4(b)(2) analysis based on economic impacts to take into account the above revisions. This resulted in the final exclusion of many of the same

watersheds proposed for exclusion. It also resulted in some areas originally proposed for exclusion not being excluded and some areas proposed for designation now being excluded. The analysis is described further in the 4(b)(2) report (NMFS, 2005c).

(4) We did not conduct an ESA section 4(b)(2) analysis of lands covered by approved HCPs because existing HCP holders did not request exclusion from the critical habitat designation. We did not have sufficient information to conduct this analysis for the vast areas covered by Federal land management plans, but may do so in the future.

The following sections summarize the ESU-specific changes to the proposed critical habitat rule. These changes are also reflected in final agency reports pertaining to the biological, economic, and policy assessments supporting these designations (NMFS, 2005a; NMFS, 2005b; NMFS, 2005c). We conclude that these changes are warranted based on new information and analyses that constitute the best scientific data available.

ESU Specific Changes—California Coastal Chinook Salmon

The CHART did not change conservation value ratings for any watershed within the geographical area occupied by this ESU. However, based on public comments and new information reviewed by the CHART, we have identified minor changes to the extent of occupied habitat areas in some watersheds. Also, based on public comments we have added a migratory corridor in one watershed (HSA 111171) that was proposed to be fully excluded in order to provide connectivity between the ocean and an upstream watershed of high conservation value. Additionally, as a result of revised economic data for this ESU and our final ESA section 4(b)(2) analysis, we are excluding all occupied habitat in two watersheds that were previously proposed for designation (HSAs 111350 and 111423). Table 1 summarizes the specific changes made for this ESU.

TABLE 1.—ESU SPECIFIC CHANGES—CALIFORNIA COASTAL CHINOOK SALMON

Hydrologic unit	HSA watershed code	HSA watershed name	Changes from proposed rule
Trinidad	110810	Big Lagoon	Removed 0.7 mi (1.1 km) of occupied habitat area.
Trinidad	110820	Little River—Albion—Big Salmon	Added 1.2 miles (1.9 km) of occupied habitat area.
Mad River	110920	NF Mad River	Removed 0.8 miles (1.3 km) of occupied habitat area.
Mad River	110930	Butler Valley	Added 1.0 mile (1.6 km) of occupied habitat area.
Eel River	111171	Eden Valley	Excluded tributaries from final designation and retained migratory corridor.
Mendocino Coast	111350	Navarro River	Excluded all occupied habitat from final designation
Russian River	111423	Mark West	Excluded all occupied habitat from final designation.

ESU Specific Changes—Northern California Steelhead

The CHART did not change conservation value ratings for any watershed within the geographical area occupied by this ESU. However, based on public comments and new information reviewed by the CHART, we have identified changes to the extent of occupied habitat areas in 13 watersheds. As a result of revised economic data for this ESU and our final ESA section 4(b)(2) analysis, we did not make any changes to the areas that were previously proposed for designation or identify any new areas for exclusion in the final designation. Table 2 summarizes the specific changes made for this ESU.

TABLE 2.—ESU SPECIFIC CHANGES—NORTHERN CALIFORNIA STEELHEAD

Hydrologic unit	HSA watershed code	HSA watershed name	Changes from proposed rule
Redwood Creek	110720	Beaver	Removed 0.7 mi (1.1 km) of occupied habitat area.
Trinidad	110810	Big Lagoon	Added 0.3 mi (0.5 km) of occupied habitat area.
Trinidad	110820	Little River	Added 2.9 mi (4.7 km) of occupied habitat areas.
Mad River	110930	Butler Valley	Removed 0.4 mi (0.6 km) of occupied habitat area.
Eureka Plain	111000	Eureka Plain	Removed 0.8 mi (1.3 km) of occupied habitat area.
Eel River	111132	Benbow	Removed 0.7 mi (1.1 km) of occupied habitat area.
Eel River	111133	Laytonville	Removed 0.8 mi (1.3 km) of occupied habitat area.
Mendocino Coast	111311	Usal Creek	Removed 5.6 mi (9.0 km) of Coast occupied habitat areas.
Mendocino Coast	111312	Wages Creek	Removed 0.5 mi (0.8 km) of occupied habitat area.
Mendocino Coast	111313	Ten Mile Creek	Removed 7.6 mi (12.2 km) of occupied habitat area.
Mendocino Coast	111320	Noyo River	Removed 0.9 mi (1.4 km) of occupied habitat area
Mendocino Coast	111330	Big River	Removed 0.3 mi (0.5 km) of occupied habitat area.
Mendocino Coast	111340	Albion River	Removed 1.2 mi (1.9 km) of occupied habitat area.

ESU Specific Changes—Central California Coast Steelhead

The CHART did not change the conservation value of any occupied watersheds within the geographical area occupied by this ESU. Occupied habitat was added to one watershed (220320) because of a mapping error in the proposed rule and to another watershed (220550) based on public comments and new information received by the CHART. The Upper Alameda Creek watershed (220430) was removed from the final designation because it is occupied only by resident *O. mykiss*, and a final listing determination for this life form will not be made until December 2005 (70 FR 37219; June 28, 2005). As a result of this change, portions of the migratory corridor to upper Alameda Creek were also removed from two watersheds (220420 and 220520) in the final designation. As a result of revised economic data for this ESU and our final ESA section 4(b)(2) analysis, we are excluding all occupied habitat areas in two watersheds that were not previously proposed for designation (111421 and 220722). Table 3 summarizes the specific changes made for this ESU.

TABLE 3.—ESU SPECIFIC CHANGES—CENTRAL CALIFORNIA COAST STEELHEAD

Hydrologic unit	HSA watershed code	HSA watershed name	Changes from proposed rule
Russian River	111421	Laguna De Santa Rosa	Excluded all occupied habitat from final designation.
Bay Bridges	220320	San Rafael	Added 6.4 mi (10.3 km) of occupied habitat area (Arroyo Core Madera del Presidio).
South Bay	220420	Eastbay Cities	Removed 8.6 mi (13.8 km) migratory corridor to Upper Alameda Creek watershed (220430).
South Bay	220430	Upper Alameda Creek	Removed all occupied habitat (99.0 mi, or 159 km) from final designation.
Santa Clara	220520	Fremont Bayside	Removed portion of migratory corridor (1.0 mi, or 1.6 km) to Upper Alameda Creek watershed (220430).
Santa Clara	220550	Palo Alto	Added 1.9 mi (3.0 km) of occupied habitat area (San Francisquito Creek tributaries).
Suisun	220722	Suisun Creek	Excluded all occupied habitat area from final designation.

ESU Specific Changes—South-Central California Steelhead

The CHART did not change the conservation value rating for any watershed within the geographical area occupied by this ESU, nor were there any changes to the extent of occupied habitat areas. As a result of revised economic data for this ESU and our final ESA section 4(b)(2) analysis, we did not make any changes to the areas that were previously proposed for designation or identify any new areas for exclusion.

ESU Specific Changes—Southern California Steelhead

The CHART did not change the conservation value ratings for any of the occupied watersheds within the geographical area occupied by this ESU. However, based on information from the public comments and agency biologists and reviewed by the CHART, several watershed units (490121, 490122, 490125, 490126, and 490128) were determined to be unoccupied and, because we had not made a determination that they were essential to the conservation of the ESU, were not considered eligible for designation or considered in the final ESA section 4(b)(2) analysis for this final designation. These watershed units were located in the San Juan Creek/ Trabuco Creek watershed in the southern portion of the range of the ESU. Also, based on public comments and other information reviewed by the CHART, we have identified several changes to the extent of occupied habitat in a number of watersheds. Based on the revised economic data for this ESU and our final ESA section 4(b)(2) analysis, we did not make any changes to the watershed areas that were previously proposed for designation. Table 4 summarizes the specific changes made for this ESU.

TABLE 4.—ESU SPECIFIC CHANGES—SOUTHERN CALIFORNIA STEELHEAD

Hydrologic unit	HSA watershed code	HSA watershed/area name	Changes from proposed rule
Santa Ynez	331440	Santa Ynez to Bradbury	Removed 24.0 mi (38.6 km) of occupied tributary habitat area to the Santa Ynez River (Alamo Pintado and Santa Aguedo Creeks).
South Coast	331534	Carpenteria	Removed 0.8 mi (1.3 km) of occupied habitat (Santa Monica estuary).
Ventura River	440232	Thatcher	Removed 20.9 mi (33.6 km) of occupied tributary habitat area (San Antonio Creek and tributaries).
Santa Clara—Calleguas	440331	Sespe—Santa Clara	Removed 5.4 mi (8.7 km) of occupied habitat area (Pole Creek).
San Juan	490121	Trabuco	Changed to unoccupied. Removed small amount of occupied habitat area (Trabuco Creek).
San Juan	490122	Upper Trabuco	Changed to unoccupied. Removed 7.7 mi (12.4 km) of occupied habitat area (Trabuco Creek).
San Juan	490123	Middle Trabuco	Removed 12.4 mi (20.0 km) of occupied habitat area (Trabuco Creek).
San Juan	490125	Upper San Juan	Changed to unoccupied. Removed 12.5 mi (20.1 km) of occupied habitat area (San Juan Creek).
San Juan	490126	Mid upper San Juan	Changed to unoccupied. Removed 3.8 mi (6.1 km) of occupied habitat area (San Juan Creek).
San Juan	490128	Middle San Juan	Changed to unoccupied. Removed 3.4 mi (5.5 km) of occupied habitat area (San Juan Creek).

TABLE 4.—ESU SPECIFIC CHANGES—SOUTHERN CALIFORNIA STEELHEAD—Continued

Hydrologic unit	HSA watershed code	HSA watershed/area name	Changes from proposed rule
San Juan	490140	San Mateo	Removed 4.9 mi (7.9 km) of occupied habitat (Devil Creek).

ESU Specific Changes—Central Valley Spring Run Chinook Salmon

Based on information provided in the public comments and new information reviewed by the CHART, one watershed was changed from occupied to unoccupied (550731), one was changed from unoccupied to occupied and rated as having a high conservation value to the ESU (551510), and one watershed was changed from a medium to a high conservation value (551921). Also, based on public comments and new information reviewed by the CHART, we have identified relatively minor changes to the extent of occupied habitat in some watersheds. Based on the results of the revised economic data for this ESU and our final ESA section 4(b)(2) analysis, we are excluding all occupied habitat areas in one watershed (551720) that were previously proposed for designation, and designating all occupied habitat areas in a second watershed (551921) that were previously proposed for exclusion. Table 5 summarizes the specific changes made for this ESU.

TABLE 5.—ESU SPECIFIC CHANGES—CENTRAL VALLEY SPRING RUN CHINOOK

Hydrologic unit	HSA watershed code	HSA Watershed name	Changes from proposed rule
Whitmore	550731	South Cow Creek	Changed from occupied to unoccupied. Removed 10.3 mi (16.6 km) of occupied habitat area.
Redding	550810	Enterprise Flat	Minor changes in distribution. No net change in occupied mi of habitat area.
Marysville	551510	Lower Bear River	Changed from unoccupied to occupied. Added 5.1 mi (8.2 km) of occupied habitat area. Rated as high in conservation value and included all occupied habitat in the final designation.
Yuba River	551720	Nevada City	Excluded all occupied habitat from final designation.
Valley-American	551921	Lower American	Changed conservation value from medium to high and included all occupied habitat in the final designation.

ESU Specific Changes—Central Valley Steelhead

Based on information provided in the public comments and new information reviewed by the CHART, the conservation value of two watersheds (551510 and 552110) within the geographical range of this ESU was changed from low to medium. Additionally, based on public comments and new information reviewed by the CHART, we have identified changes to the extent of occupied habitat areas in two watersheds. As a result of the revised economic data for this ESU and our final ESA section 4(b)(2) analysis, we are excluding all occupied habitat areas in two watersheds (550964 and 552435) proposed for designation and designating all occupied areas in two other watersheds (551510 and 552110) that were previously proposed for exclusion. Table 6 summarizes the specific changes made for this ESU.

TABLE 6.—ESU SPECIFIC CHANGES—CENTRAL VALLEY STEELHEAD

Hydrologic unit	HSA watershed code	HSA Watershed name	Changes from proposed rule
Redding	550810	Enterprise Flat	Added 5.7 mi (9.2 km) of occupied habitat area (several tributaries).
Eastern Tehama	550964	Paynes Creek	Excluded all occupied habitat Tehama from the final designation.
Marysville	551510	Lower Bear River	Changed conservation value from low to medium. Included all occupied habitat in the final designation.
Butte Creek	552110	Upper Dry Creek	Changed conservation value from low to medium. Included all occupied habitat in the final designation.
Shasta Bally	552435	Ono	Excluded all occupied habitat from the final designation.
Shasta Bally	552440	Spring Creek	Removed 3.1 mi (5.0 km) of occupied habitat area.

IV. Methods and Criteria Used To Designate Critical Habitat

The following sections describe the relevant definitions and guidance found in the ESA and our implementing regulations, and the key methods and criteria we used to make these final critical habitat designations after incorporating, as appropriate, comments and information received on the proposed rule. Section 4 of the ESA (16 U.S.C. 1533(b)(2)) and our regulations at 50 CFR 424.12(a) require that we designate critical habitat, and make revisions thereto, ''on the basis of the best scientific data available.''

Section 3 of the ESA (16 U.S.C. 1532(5)) defines critical habitat as ''(i) the specific areas within the geographical area occupied by the species, at the time it is listed * * * on which are found those physical or biological features (I) essential to the conservation of the species and (II) which may require special management considerations or protection; and (ii) specific areas outside the geographical area occupied by the species at the time it is listed upon a determination by the Secretary that such areas are essential for the conservation of the species.'' Section 3 of the ESA (16 U.S.C. 1532(3)) also defines the terms ''conserve,'' ''conserving,'' and ''conservation'' to mean ''to use, and the use of, all methods and procedures which are necessary to bring any endangered species or threatened species to the point at which the measures provided pursuant to this chapter are no longer necessary.''

Pursuant to our regulations, when designating critical habitat we consider the following requirements of the species: (1) Space for individual and population growth, and for normal behavior; (2) food, water, air, light, minerals, or other nutritional or physiological requirements; (3) cover or shelter; (4) sites for breeding, reproduction, or rearing of offspring; and, generally, (5) habitats that are protected from disturbance or are representative of the historical geographical and ecological distributions of the species (see 50 CFR 424.12(b)). In addition to these factors, we also focus on the known physical and biological features (primary constituent elements or PCEs) within the occupied areas that are essential to the conservation of the species and that may require special management considerations or protection. Both the ESA and our regulations, in recognition of the divergent biological needs of species, establish criteria that are fact specific rather than ''one size fits all.''

Our regulations state that, ''The Secretary shall designate as critical habitat areas outside the geographic area presently occupied by the species only when a designation limited to its present range would be inadequate to ensure the conservation of the species'' (50 CFR 424.12(e)). Accordingly, when the best available scientific and commercial data do not demonstrate that the conservation needs of the species so require, we will not designate critical habitat in areas outside the geographic area occupied by the species.

Section 4 of the ESA requires that before designating critical habitat we must consider the economic impacts, impacts on national security, and other relevant impacts of specifying any particular area as critical habitat, and the Secretary may exclude any area from critical habitat if the benefits of exclusion outweigh the benefits of inclusion, unless excluding an area from critical habitat will result in the extinction of the species concerned. Once critical habitat for a salmon or steelhead ESU is designated, section 7(a)(2) of the ESA requires that each Federal agency shall, in consultation with and with the assistance of NMFS, ensure that any action authorized, funded or carried out by such agency is not likely to result in the destruction or adverse modification of critical habitat.

Salmon Life History

Pacific salmon are anadromous fish, meaning adults migrate from the ocean to spawn in freshwater lakes and streams where their offspring hatch and rear prior to migrating back to the ocean to forage until maturity. The migration and spawning times vary considerably across and within species and populations (Groot and Margolis, 1991). At spawning, adults pair to lay and fertilize thousands of eggs in freshwater gravel nests or ''redds'' excavated by females. Depending on lake/stream temperatures, eggs incubate for several weeks to months before hatching as ''alevins'' (a larval life stage dependent on food stored in a yolk sac). Following yolk sac absorption, alevins emerge from the gravel as young juveniles called ''fry'' and begin actively feeding. Depending on the species and location, juveniles may spend from a few hours to several years in freshwater areas before migrating to the ocean. The physiological and behavioral changes required for the transition to salt water result in a distinct ''smolt'' stage in most species. On their journey juveniles must migrate downstream through every riverine and estuarine corridor between their natal lake or stream and the ocean. For example, smolts from Idaho will travel as far as 900 miles (1,448 km) from the inland spawning grounds. En route to the ocean the juveniles may spend from a few days to several weeks in the estuary, depending on the species. The highly productive estuarine environment is an important feeding and acclimation area for juveniles preparing to enter marine waters.

Juveniles and subadults typically spend from 1 to 5 years foraging over thousands of miles in the North Pacific Ocean before returning to spawn. Some species, such as coho and Chinook salmon, have precocious life history types (primarily male fish known as ''jacks'') that mature and spawn after only several months in the ocean. Spawning migrations known as ''runs'' occur throughout the year, varying by species and location. Most adult fish return or ''home'' with great fidelity to spawn in their natal stream, although some do stray to non-natal streams. Salmon species die after spawning, except anadromous *O. mykiss* (steelhead), which may return to the ocean and make one or more repeat spawning migrations. This complex life cycle gives rise to complex habitat needs, particularly during the freshwater phase (see review by Spence *et al.*, 1996). Spawning gravels must be of a certain size and free of sediment to allow successful incubation of the eggs. Eggs also require cool, clean, and well-oxygenated waters for proper development. Juveniles need abundant food sources, including insects, crustaceans, and other small fish. They need places to hide from predators (mostly birds and bigger fish), such as under logs, root wads and boulders in the stream, and beneath overhanging vegetation. They also need places to seek refuge from periodic high flows (side channels and off channel areas) and from warm summer water temperatures (coldwater springs and deep pools). Returning adults generally do not feed in fresh water but instead rely on limited energy stores to migrate, mature, and spawn. Like juveniles, they also require cool water and places to rest and hide from predators. During all life stages salmon require cool water that is free of contaminants. They also require rearing and migration corridors with adequate passage conditions (water quality and quantity available at specific times) to allow access to the various habitats required to complete their life cycle.

The homing fidelity of salmon has created a metapopulation structure with distinct populations distributed among watersheds (McElhany *et al.*, 2000). Low levels of straying result in regular genetic exchange among populations, creating genetic similarities among populations in adjacent watersheds. Maintenance of the metapopulation structure requires a distribution of populations among watersheds where environmental risks (*e.g.*, from landslides or floods) are likely to vary. It also requires migratory connections among the watersheds to allow for periodic genetic exchange and alternate spawning sites in the case that natal streams are inaccessible due to natural events such as a drought or landslide. More detailed information describing habitat and life history characteristics of the ESUs is contained in the proposed rule (69 FR 71880; December 10, 2004), agency status reviews for each ESU, technical recovery team products, and in a biological report supporting these designations (NMFS, 2005a).

Identifying the Geographical Area Occupied by the Species and Specific Areas Within the Geographical Area

In past critical habitat designations, we had concluded that the limited availability of species distribution data prevented mapping salmonid critical habitat at a scale finer than occupied river basins (65 FR 7764; February 16, 2000). Therefore, the 2000 designations defined the ''geographical area occupied by the species, at the time of listing'' as all accessible river reaches within the current range of the listed species.

In the proposed rule we described in greater detail that since the previous designations in 2000, we can now be somewhat more precise about the ''geographical area occupied by the species'' because of efforts by agency biologists, in coordination with Federal and state co-managers, to compile information and map actual species distribution at the level of stream reaches. Moreover, much of the available data can now be accessed and analyzed using geographic information systems (GIS) to produce consistent and fine-scale maps. The current mapping effort for these ESUs documents fish presence and identifies occupied stream reaches where the species has been observed. It also identifies stream reaches where the species is presumed to occur based on the professional judgment of biologists familiar with the watershed. We made use of these finer-scale data for the current critical habitat designations, and we now believe that they enable a more accurate delineation of the ''geographical area occupied by the species'' referred to in the ESA definition of critical habitat.

We are now also able to identify ''specific areas'' (ESA section 3(5)(a)) and ''particular areas'' (ESA section 4(b)(2)) at a finer scale than in 2000. As described in the proposed rule, we have used the State of California's CALWATER watershed classification system, which is similar to the USGS watershed classification system that was used for salmonid critical habitat designations in the Northwest. This information is now generally available via the internet, and we have expanded our GIS resources to use these data. We used the CALWATER Hydrologic Subarea (HSA) unit (which is generally similar in size to USGS HUC5s) to organize critical habitat information systematically and at a scale that, while somewhat broad geographically, is applicable to the spatial distribution of salmon. Organizing information at this scale is especially relevant to salmonids, since their innate homing ability allows them to return to the watersheds where they were born. Such site fidelity results in spatial aggregations of salmonid populations that generally correspond to the area encompassed by HSA watersheds or aggregations of these watersheds.

The CALWATER system maps watershed units as polygons, bounding a drainage area from ridge-top to ridge-top, encompassing streams, riparian areas and uplands. Within the boundaries of any HSA watershed, there are stream reaches not occupied by the species. Land areas within the CALWATER HSA boundaries are also generally not ''occupied'' by the species (though certain areas such as flood plains or side channels may be occupied at some times of some years). We used the watershed boundaries as a basis for aggregating occupied stream reaches, for purposes of delineating ''specific'' areas at a scale that often corresponds well to salmonid population structure and ecological processes. This designation refers to the occupied stream reaches within the watershed boundary as the ''habitat area'' to distinguish it from the entire area encompassed by the watershed boundary. Each habitat area was reviewed by the CHARTs to verify occupation, PCEs, and special management considerations (see ''Critical Habitat Analytical Review Teams'' section below).

The watershed-scale aggregation of stream reaches also allowed us to analyze the impacts of designating a ''particular area,'' as required by ESA section 4(b)(2). As a result of watershed processes, many activities occurring in riparian or upland areas and in non-fish-bearing streams may affect the physical or biological features essential to conservation in the occupied stream reaches. The watershed boundary thus describes an area in which Federal activities have the potential to affect critical habitat (Spence *et al.*, 1996). Using watershed boundaries for the economic analysis ensured that all potential economic impacts were considered. Section 3(5) defines critical habitat in terms of ''specific areas,'' and section 4(b)(2) requires the agency to consider certain factors before designating ''particular areas.'' In the case of Pacific salmonids, the biology of the species, the characteristics of its habitat, the nature of the impacts and the limited information currently available at finer geographic scales made it appropriate to consider ''specific areas'' and ''particular areas'' as the same unit.

Occupied estuarine areas were also considered in the context of defining ''specific areas.'' In our proposed rule we noted that estuarine areas are crucial for juvenile salmonids, given their multiple functions as areas for rearing/feeding, freshwater-saltwater acclimation, and migration (Simenstad *et al.*, 1982; Marriott *et al.*, 2002). The San Francisco Bay estuary complex consists of five CALWATER HSA watershed units that are separate from upstream freshwater habitats that drain into the estuarine complex, and these units were analyzed separately. Some other small estuaries did not correspond to HSA watershed units nor were they part of defined HSA watershed units, and so we defined specific polygons which were analyzed separately. In all occupied estuarine areas we were able to identify physical or biological features essential to the conservation of the species, and that may require special management considerations or protection. For those estuarine areas designated as critical habitat we are again delineating them in similar terms to our past designations, as being defined by a line connecting the furthest land points at the estuary mouth.

In previous designations of salmonid critical habitat we did not designate offshore marine areas. In the Pacific Ocean, we concluded that there may be essential habitat features, but we could not identify any special management considerations or protection associated with them as required under section 3(5)(A)(i) of the ESA (65 FR 7776; February 16, 2000). Since that time we have carefully considered the best available scientific information, and related agency actions, such as the designation of Essential Fish Habitat under the Magnuson-Stevens Fishery Conservation and Management Act. In contrast to estuarine areas, we conclude that it is not possible to identify ''specific areas'' in the Pacific Ocean that contain essential features for salmonids. Also, links between human activity, habitat conditions and impacts to listed salmonids are less direct in offshore marine areas. Perhaps the closest linkage exists for salmon prey species that are harvested commercially (*e.g.*, Pacific herring) and, therefore, may require special management considerations or protection. However, because salmonids are opportunistic feeders we could not identify ''specific areas'' where these or other essential features are found within this vast geographic area occupied by salmon and steelhead. Moreover, prey species move or drift great distances throughout the ocean and would be difficult to link to any ''specific'' areas. Therefore, we are not designating critical habitat in offshore marine areas. We requested comment on this issue in our proposed rule but did not receive comments or information that would change our conclusion.

Primary Constituent Elements

In determining what areas are critical habitat, agency regulations at 50 CFR 424.12(b) require that we must ''consider those physical or biological features that are essential to the conservation of a given species * * *, including space for individual and population growth and for normal behavior; food, water, air, light, minerals, or other nutritional or physiological requirements; cover or shelter; sites for breeding, reproduction, and rearing of offspring; and habitats that are protected from disturbance or are representative of the historical geographical and ecological distribution of a species.'' The regulations further direct us to ''focus on the principal biological or physical constituent elements * * * that are essential to the conservation of the species,'' and specify that the ''known primary constituent elements shall be listed with the critical habitat description.'' The regulations identify primary constituent elements (PCEs) as including, but not limited to: ''roost sites, nesting grounds, spawning sites, feeding sites, seasonal wetland or dryland, water quality or quantity, host species or plant pollinator, geological formation, vegetation type, tide, and specific soil types.''

NMFS biologists developed a list of PCEs that are essential to the species' conservation and based on the unique life history of salmon and steelhead and their biological needs (Hart, 1973; Beauchamp *et al.*, 1983; Laufle *et al.*, 1986; Pauley *et al.*, 1986, 1988, and 1989; Groot and Margolis, 1991; Spence *et al.*, 1996). Guiding the identification of PCEs was a decision matrix we developed for use in ESA section 7 consultations (NMFS, 1996) which describes general parameters and characteristics of most of the essential features under consideration in this critical habitat designation. We identified these PCEs and requested comment on them in the ANPR (68 FR 55931; September 29, 2003) and proposed rule (69 FR 74636; December 14, 2005) but did not receive information to support changing them. The ESUs addressed in this final rule share many of the same rivers and estuaries and have similar life history characteristics and, therefore, many of the same PCEs. These PCEs include sites essential to support one or more life stages of the ESU (sites for spawning, rearing, migration and foraging). These sites in turn contain physical or biological features essential to the conservation of the ESU (for example, spawning gravels, water quality and quantity, side channels, forage species). The specific PCEs include:

1. Freshwater spawning sites with water quantity and quality conditions and substrate supporting spawning, incubation and larval development. These features are essential to conservation because without them the species cannot successfully spawn and produce offspring.

2. Freshwater rearing sites with water quantity and floodplain connectivity to form and maintain physical habitat conditions and support juvenile growth and mobility; water quality and forage supporting juvenile development; and natural cover such as shade, submerged and overhanging large wood, log jams and beaver dams, aquatic vegetation, large rocks and boulders, side channels, and undercut banks. These features are essential to conservation because without them juveniles cannot access and use the areas needed to forage, grow, and develop behaviors (*e.g.,* predator avoidance, competition) that help ensure their survival.

3. Freshwater migration corridors free of obstruction with water quantity and quality conditions and natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, side channels, and undercut banks supporting juvenile and adult mobility and survival. These features are essential to conservation because without them juveniles cannot use the variety of habitats that allow them to avoid high flows, avoid predators, successfully compete, begin the behavioral and physiological changes needed for life in the ocean, and reach the ocean in a timely manner. Similarly, these features are essential for adults because they allow fish in a non-feeding condition to successfully swim upstream, avoid predators, and reach spawning areas on limited energy stores.

4. Estuarine areas free of obstruction with water quality, water quantity, and salinity conditions supporting juvenile and adult physiological transitions between fresh- and saltwater; natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, and side channels; and juvenile and adult forage, including aquatic invertebrates and fishes, supporting growth and maturation. These features are essential to conservation because without them juveniles cannot reach the ocean in a timely manner and use the variety of habitats that allow them to avoid predators, compete successfully, and complete the behavioral and physiological changes needed for life in the ocean. Similarly, these features are essential to the conservation of adults because they provide a final source of abundant forage that will provide the energy stores needed to make the physiological transition to fresh water, migrate upstream, avoid predators, and develop to maturity upon reaching spawning areas.

5. Nearshore marine areas free of obstruction with water quality and quantity conditions and forage, including aquatic invertebrates and fishes, supporting growth and maturation; and natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, and side channels. As in the case with freshwater migration corridors and estuarine areas, nearshore marine features are essential to conservation because without them juveniles cannot successfully transition from natal streams to offshore marine areas.

6. Offshore marine areas with water quality conditions and forage, including aquatic invertebrates and fishes, supporting growth and maturation. These features are essential for conservation because without them juveniles cannot forage and grow to adulthood. However, for the reasons stated previously in this document, it is difficult to identify specific areas containing this PCE as well as human activities that may affect the PCE condition in those areas. Therefore, we have not designated any specific areas based on this PCE but instead have identified it because it is essential to the species' conservation and specific offshore areas may be identified in the future (in which case any designation would be subject to separate rulemaking).

The occupied habitat areas designated in this final rule contain PCEs required to support the biological processes for which the species use the habitat. The CHARTs verified this for each watershed/nearshore zone by relying on the best available scientific data (including species distribution maps, watershed analyses, and habitat surveys) during their review of occupied areas and resultant assessment of area conservation values (NMFS, 2005a). The contribution of the PCEs varies by site and biological function such that the quality of the elements may vary within a range of acceptable conditions. The CHARTs took this variation into account when they assessed the conservation value of an area.

Special Management Considerations or Protections

An occupied area cannot be designated as critical habitat unless it contains physical and biological features that ''may require special management considerations or protection.'' Agency regulations at 424.02(j) define ''special management considerations or protection'' to mean ''any methods or procedures useful in protecting physical and biological features of the environment for the conservation of listed species.''

As part of the biological assessment described below under ''Critical Habitat Analytical Review Teams,'' teams of biologists examined each habitat area to determine whether the physical or biological features may require special management consideration. These determinations are identified for each area in the CHART report (NMFS, 2005a). In the case of salmon and steelhead, the CHARTs identified a variety of activities that threaten the physical and biological features essential to listed salmon and steelhead (see review by Spence *et al.*, 1996), including: (1) Forestry; (2) grazing and other associated rangeland activities; (3) agriculture; (4) road building/maintenance; (5) channel modifications/diking/stream bank stabilization; (6) urbanization; (7) sand and gravel mining; (8) mineral mining; (9) dams; (10) irrigation impoundments and withdrawals; (11) wetland loss/removal; (12) exotic/invasive species introductions; and (13) impediments to migration. In addition to these, the harvest of salmonid prey species (*e.g.,* forage fishes such as herring, anchovy, and sardines) may present another potential habitat-related management activity (Pacific Fishery Management Council, 1999).

Unoccupied Areas

ESA section 3(5)(A)(ii) defines critical habitat to include ''specific areas outside the geographical area occupied'' if the areas are determined by the Secretary to be ''essential for the conservation of the species.'' NMFS regulations at 50 CFR 424.12(e) emphasize that we ''shall designate as critical habitat areas outside the geographical area presently occupied by a species only when a designation limited to its present range would be inadequate to ensure the conservation of the species.'' The CHARTs did identify several unoccupied areas above dams that may be essential for the conservation of specific ESUs, primarily within the historical range of the Central Valley spring run Chinook, Central Valley steelhead, and Southern California steelhead ESUs (see proposed rule; 69 FR 71880; December 10, 2004); however, we are not designating unoccupied areas at this time. Though it is not possible to conclude at this time that any of these historically occupied areas warrant designation, we believe it is useful to signal to the public that these specific areas may be considered for possible designation in the future. However, any designation of unoccupied areas would be based on the required determination that such area is essential for the conservation of an ESU and would be subject to separate rulemaking with the opportunity for notice and comment.

Lateral Extent of Critical Habitat

In past designations we have described the lateral extent of critical habitat in various ways ranging from fixed distances to ''functional'' zones defined by important riparian functions (65 FR 7764; February 16, 2000). Both approaches presented difficulties, and this was highlighted in several comments (most of which requested that we focus on aquatic areas only) received in response to the ANPR (68 FR 55926; September 29, 2003). Designating a set riparian zone width will (in some places) accurately reflect the distance from the stream on which PCEs might be found, but in other cases may over- or understate the distance. Designating a functional buffer avoids that problem, but makes it difficult for Federal agencies to know in advance what areas are critical habitat. To address these issues we are proposing to define the lateral extent of designated critical habitat as the width of the stream channel defined by the ordinary high-water line as defined by the COE in 33 CFR 329.11. This approach is consistent with the specific mapping requirements described in agency regulations at 50 CFR 424.12(c). In areas for which ordinary high-water has not been defined pursuant to 33 CFR 329.11, the width of the stream channel shall be defined by its bankfull elevation. Bankfull elevation is the level at which water begins to leave the channel and move into the floodplain (Rosgen, 1996) and is reached at a discharge which generally has a recurrence interval of 1 to 2 years on the annual flood series (Leopold *et al.*, 1992). Such an interval is commensurate with nearly all of the juvenile freshwater life phases of most salmon and steelhead ESUs. Therefore, it is reasonable to assert that for an occupied stream reach this lateral extent is regularly ''occupied''. Moreover, the bankfull elevation can be readily discerned for a variety of stream reaches and stream types using recognizable water lines (*e.g.,* marks on rocks) or vegetation boundaries (Rosgen, 1996).

As underscored in previous critical habitat designations, the quality of aquatic habitat within stream channels is intrinsically related to the adjacent riparian zones and floodplain, to surrounding wetlands and uplands, and to non-fish-bearing streams above occupied stream reaches. Human activities that occur outside the stream can modify or destroy physical and biological features of the stream. In addition, human activities that occur within and adjacent to reaches upstream (*e.g.,* road failures) or downstream (*e.g.*, dams) of designated stream reaches can also have demonstrable effects on physical and biological features of designated reaches.

In estuarine areas we believe that extreme high water is the best descriptor of lateral extent. We are designating the area inundated by extreme high tide because it encompasses habitat areas typically inundated and regularly occupied during the spring and summer when juvenile salmon are migrating in the nearshore zone and relying heavily on forage, cover, and refuge qualities provided by these occupied habitats. As noted above for stream habitat areas, human activities that occur outside the area inundated by extreme or ordinary high water can modify or destroy physical and biological features of the nearshore habitat areas, and Federal agencies must be aware of these important habitat linkages as well.

Military Lands

The Sikes Act of 1997 (Sikes Act) (16 U.S.C. 670a) required each military installation that includes land and water suitable for the conservation and management of natural resources to complete, by November 17, 2001, an INRMP. An INRMP integrates implementation of the military mission of the installation with stewardship of the natural resources found there. Each INRMP includes: an assessment of the ecological needs on the installation, including the need to provide for the conservation of listed species; a statement of goals and priorities; a detailed description of management actions to be implemented to provide for these ecological needs; and a monitoring and adaptive management plan. Among other things, each INRMP must, to the extent appropriate and applicable, provide for fish and wildlife management, fish and wildlife habitat enhancement or modification, wetland protection, enhancement, and restoration where necessary to support fish and wildlife and enforcement of applicable natural resource laws.

The National Defense Authorization Act for Fiscal Year 2004 (Pub. L. No. 108–136) amended the ESA to address designation of military lands as critical habitat. Specifically, section 4(a)(3)(B)(i) of the ESA (16 U.S.C. 1533(a)(3)(B)(i)) now provides: ''The Secretary shall not designate as critical habitat any lands or other geographical areas owned or controlled by the Department of Defense, or designated for its use, that are subject to an integrated natural resources management plan prepared under section 101 of the Sikes Act (16 U.S.C. 670a), if the Secretary determines in writing that such plan provides a benefit to the species for which critical habitat is proposed for designation.''

To address this new provision we contacted the DOD and requested information on all INRMPs that might benefit Pacific salmon. In response to the ANPR (68 FR 55926; September 29, 2003) we had already received a letter from the U.S. Marine Corps regarding this and other issues associated with a possible critical habitat designation on its facilities in the range of the Southern California Steelhead ESU. In response to our request, the military services identified 25 installations in California with INRMPs in place or under development. Based on information provided by the military, as well as GIS analysis of fish distributional information compiled by NMFS'' Southwest Region (NMFS, 2004b; NMFS, 2005a) and land use data, we determined that the following facilities with INRMPs overlap with habitat areas under consideration for critical habitat designation in California: (1) Camp Pendleton Marine Corps Base; (2) Vandenberg Air Force Base; (3) Camp San Luis Obispo; (4) Camp Roberts; and (5) Mare Island Army Reserve Center. Two additional facilities are adjacent to, but do not overlap with, habitat areas under consideration for critical habitat in California: (1) Naval Weapons Station, Seal Beach/Concord Detachment; and (2) Point Mugu Naval Air Station. None of the remaining facilities with INRMPs in place overlapped with or were adjacent to habitat under consideration for critical habitat based on the information available to us. All of these INRMPs are final except for the Vandenberg Air Force Base INRMP, which is expected to be finalized in the near term.

We identified habitat of value to listed salmonids in each INRMP and reviewed these plans, as well as other information available regarding the management of these military lands. Our review indicates that each of these INRMPs addresses habitat for salmonids, and all contain measures that provide benefits to ESA-listed salmon and steelhead. Examples of the types of benefits include actions that control erosion, protect riparian zones, minimize stormwater and construction impacts, reduce contaminants, and monitor listed species and their habitats. As a result of our review, we have determined that the final INRMPs and the draft INRMP for Vandenberg Air Force Base provide a benefit to the species for which critical habitat is proposed for designation, and, therefore, we are not designating critical habitat in those areas. Also, we have received information from the Vandenberg Air Force Base and Camp Pendleton Marine Corps Base identifying national security impacts to their operations from critical habitat designation. Our consideration of such impacts is separate from our assessment of INRMPs, but serves as an independent and sufficient basis for our determination not to designate those areas as critical habitat.

Critical Habitat Analytical Review Teams

To assist in the designation of critical habitat, we convened several CHARTs organized by major geographic domains that roughly correspond to salmon recovery planning domains in California. The CHARTs consisted of NMFS fishery biologists from the Southwest Region with demonstrated expertise regarding salmonid habitat and related protective efforts within the domain. The CHARTs were tasked with compiling and assessing biological information pertaining to areas under consideration for designation as critical habitat. Each CHART worked closely with GIS specialists to develop maps depicting the spatial distribution of habitat occupied by each ESU and the use of occupied habitat on stream hydrography at a scale of 1:100,000. The CHARTs also reconvened to review the public comments and any new information regarding the ESUs and habitat in their domain.

The CHARTs examined each habitat area within the watershed to determine whether the stream reaches or lakes occupied by the species contain the physical or biological features essential to conservation. As noted previously, the CHARTs also relied on their experience conducting ESA section 7 consultations and existing management plans and protective measures to determine whether these features may require special management considerations or protection.

In addition to occupied areas, the definition of critical habitat also includes unoccupied areas if we determine that area is essential for conservation of a species. Accordingly the CHARTs were also asked whether there were any unoccupied areas within the historical range of the ESUs that may be essential for conservation. For the seven ESUs addressed in this rulemaking, the CHARTs did not have sufficient information that would allow them to conclude that specific unoccupied areas were essential for conservation; however, in many cases they were able to identify areas they believed may be determined essential through future recovery planning efforts. These were described in the proposed critical habitat designation rule (69 FR 71880).

The CHARTs were next asked to determine the relative conservation value of each occupied HSA watershed area for each ESU. The CHARTs scored each habitat area based on several factors related to the quantity and quality of the physical and biological features. They next considered each area in relation to other areas and with respect to the population occupying that area. Based on a consideration of the raw scores for each area, and a consideration of that area's contribution in relation to other areas and in relation to the overall population structure of the ESU, the CHARTs rated each habitat area as having a ''high,'' ''medium,'' or ''low'' conservation value. The preliminary CHART ratings were reviewed by several state and tribal co-managers in advance of the proposed rule and the CHARTs made needed changes prior to that rule. State co-managers also evaluated our proposed rule and provided comments and new information which were also reviewed and incorporated as needed by the CHARTs in the preparation of the final designations.

The rating of habitat areas as having a high, medium, or low conservation value provided information useful to inform the Secretary's exercise of discretion in balancing whether the benefits of exclusion outweigh the benefits of designation in ESA section 4(b)(2). The higher the conservation value for an area, the greater may be the likely benefit of the ESA section 7 protections. We recognized that the ''benefit of designation'' would also depend on the likelihood of a consultation occurring and the improvements in species' conservation that may result from changes to proposed Federal actions. To address this concern, we developed a profile for a ''low leverage'' watershed—that is, a watershed where it was unlikely there would be a section 7 consultation, or where a section 7 consultation, if it did occur, would yield few conservation benefits. For watersheds not meeting the ''low leverage'' profile, we considered their conservation rating to be a fair assessment of the benefit of designation, for purposes of our cost-effectiveness framework (NMFS 2005c). For watersheds meeting the ''low leverage'' profile, we considered the benefit of designation to be an increment lower than the conservation rating. For example, therefore, a watershed with a ''high'' conservation value but ''low leverage'' was considered to have a ''medium'' benefit of designation, and so forth. We then applied the dollar thresholds for exclusion appropriate to the adjusted ''benefit of designation.''

As discussed earlier, the scale chosen for the ''specific area'' referred to in section 3(5)(a) was an HSA watershed as delineated by the CALWATER watershed classification system. This delineation required us to adapt the approach for some areas. For example, a large stream or river might serve as a rearing and migration corridor to and from many watersheds, yet be embedded itself in a watershed. In any given watershed through which it passes, the stream may have a few or several tributaries. For rearing/migration corridors embedded in a watershed, the CHARTs were asked to rate the conservation value of the watershed based on the tributary habitat. We assigned the rearing/migration corridor the rating of the highest-rated watershed for which it served as a rearing/migration corridor. The reason for this treatment of migration corridors is the role they play in the salmon's life cycle. Salmon are anadromous—born in fresh water, migrating to salt water to feed and grow, and returning to fresh water to spawn. Without a rearing/migration corridor to and from the sea, salmon cannot complete their life cycle. It would be illogical to consider a spawning and rearing area as having a particular conservation value and not consider the associated rearing/migration corridor as having a similar conservation value.

V. Application of ESA Section 4(b)(2)

The foregoing discussion describes those areas that are eligible for designation as critical habitat—the specific areas that fall within the ESA section 3(5)(A) definition of critical habitat, minus those lands owned or controlled by the DOD, or designated for its use, that are covered by an INRMP that we have determined provides a benefit to the species.

Specific areas eligible for designation are not automatically designated as critical habitat. Section 4(b)(2) of the ESA requires that the Secretary first considers the economic impact, impact on national security, and any other relevant impact. The Secretary has the discretion to exclude an area from designation if he determines the benefits of exclusion (that is, avoiding the impact that would result from designation) outweigh the benefits of designation. The Secretary may not exclude an area from designation if exclusion will result in the extinction of the species. Because the authority to exclude is discretionary, exclusion is not required for any areas. In this rulemaking, the Secretary has applied his statutory discretion to exclude areas from critical habitat for several different reasons.

In this exercise of discretion, the first issue we must address is the scope of impacts relevant to the 4(b)(2) evaluation. As discussed in the Background and Previous Federal Action section, we are re-designating critical habitat for these seven ESUs because the previous designations were vacated (*National Association of Homebuilders* v. *Evans*, 2002 WL 1205743 No. 00–CV–2799 (D.D.C.) (*NAHB*)). The *NAHB* court had agreed with the reasoning of the Court of Appeals for the Tenth Circuit in *New Mexico Cattle Growers Association* v. *U.S. Fish and Wildlife Service*, 248 F.3d 1277 (10th Cir. 2001). In that decision, the Tenth Circuit stated ''[t]he statutory language is plain in requiring some kind of consideration of economic impact in the critical habitat designation phase.'' The Tenth Circuit concluded that, given the USFWS'' failure to distinguish between ''adverse modification'' and ''jeopardy'' in its 4(b)(2) analysis, the USFWS must analyze the full impacts of critical habitat designation, regardless of whether those impacts are coextensive with other impacts (such as the impact of the jeopardy requirement).

In re-designating critical habitat for these salmon ESUs, we have followed the Tenth Circuit Court's directive regarding the statutory requirement to consider the economic impact of designation. Areas designated as critical habitat are subject to ESA section 7 requirements, which provide that Federal agencies ensure that their actions are not likely to destroy or adversely modify critical habitat. To evaluate the economic impact of critical habitat we first examined our voluminous section 7 consultation record for these as well as other ESUs of salmon. (For thoroughness, we examined the consultation record for other ESUs to see if it shed light on the issues.) That record includes consultations on habitat-modifying Federal actions both where critical habitat has been designated and where it has not. We could not discern a distinction between the impacts of applying the jeopardy provision versus the adverse modification provision in occupied critical habitat. Given our inability to detect a measurable difference between the impacts of applying these two provisions, the only reasonable alternative seemed to be to follow the recommendation of the Tenth Circuit, approved by the *NAHB* court—to measure the coextensive impacts; that is, measure the entire impact of applying the adverse modification provision of section 7, regardless of whether the jeopardy provision alone would result in the identical impact.

The Tenth Circuit's opinion only addressed ESA section 4(b)(2)'s requirement that economic impacts be considered. The court did not address how ''other relevant impacts'' were to be considered, nor did it address the benefits of designation. Because section 4(b)(2) requires a consideration of other relevant impacts of designation, and the benefits of designation, and because our record did not support a distinction between impacts resulting from application of the adverse modification provision versus the jeopardy provision, we are uniformly considering coextensive impacts and coextensive benefits, without attempting to distinguish the benefit of a critical habitat consultation from the benefit that would otherwise result from a jeopardy consultation that would occur even if critical habitat were not designated. To do otherwise would distort the balancing test contemplated by section 4(b)(2).

The principal benefit of designating critical habitat is that Federal activities that may affect such habitat are subject to consultation pursuant to section 7 of the ESA. Such consultation requires every Federal agency to ensure that any action it authorizes, funds or carries out is not likely to result in the destruction or adverse modification of critical habitat. This complements the section 7 provision that Federal agencies ensure that their actions are not likely to jeopardize the continued existence of a listed species. Another benefit is that the designation of critical habitat can serve to educate the public regarding the potential conservation value of an area and thereby focus and contribute to conservation efforts by clearly delineating areas of high conservation value for certain species. It is unknown to what extent this process actually occurs, and what the actual benefit is, as there are also concerns, noted above, that a critical habitat designation may discourage such conservation efforts.

The balancing test in ESA section 4(b)(2) contemplates weighing benefits that are not directly comparable—the benefit associated with species conservation balanced against the economic benefit, benefit to national security, or other relevant benefit that results if an area is excluded from designation. Section 4(b)(2) does not specify a method for the weighing process. Agencies are frequently required to balance benefits of regulations against impacts; E.O. 12866 established this requirement for Federal agency regulation. Ideally such a balancing would involve first translating the benefits and impacts into a common metric. Executive branch guidance from the OMB suggests that benefits should first be monetized (*i.e.*, converted into dollars). Benefits that cannot be monetized should be quantified (for example, numbers of fish saved). Where benefits can neither be monetized nor quantified, agencies are to describe the expected benefits (OMB, 2003).

It may be possible to monetize benefits of critical habitat designation for a threatened or endangered species in terms of willingness-to-pay (OMB, 2003). However, we are not aware of any available data that would support such an analysis for salmon. In addition, ESA section 4(b)(2) requires analysis of impacts other than economic impacts that are equally difficult to monetize, such as benefits to national security of excluding areas from critical habitat. In the case of salmon designations, impacts to Northwest tribes are an ''other relevant impact'' that also may be difficult to monetize.

An alternative approach, approved by OMB (OMB, 2003), is to conduct a cost-effectiveness analysis. A cost-effectiveness analysis ideally first involves quantifying benefits, for example, percent reduction in extinction risk, percent increase in productivity, or increase in numbers of fish. Given the state of the science, it would be difficult to quantify reliably the benefits of including particular areas in the critical habitat designation. Although it is difficult to monetize or quantify benefits of critical habitat designation, it is possible to differentiate among habitat areas based on their relative contribution to conservation. For example, habitat areas can be rated as having a high, medium, or low conservation value. The qualitative ordinal evaluations can then be combined with estimates of the economic costs of critical habitat designation in a framework that essentially adopts that of cost-effectiveness. Individual habitat areas can then be assessed using both their biological evaluation and economic cost, so that areas with high conservation value and lower economic cost might be considered to have a higher priority for designation, while areas with a low conservation value and higher economic cost might have a higher priority for exclusion. While this approach can provide useful information to the decision-maker, there is no rigid formula through which this information translates into exclusion decisions. Every geographical area containing habitat eligible for designation is different, with a unique set of ''relevant impacts'' that may be considered in the exclusion process. Regardless of the analytical approach, section 4(b)(2) makes clear that what weight the agency gives various impacts and benefits, and whether the agency excludes areas from the designation, is discretionary.

Exclusions Based on Impacts to Tribes

The principal benefit of designating critical habitat is that Federal activities that may affect such habitat are subject to consultation pursuant to section 7 of the ESA. We believe there is very little benefit to designating critical habitat on Indian lands for these seven ESUs. Although there are potentially a number of activities on Indian lands that may trigger section 7 consultation, Indian lands comprise only a very minor portion (substantially less than 1 percent) of the total habitat under consideration for these seven California ESUs. Specifically, occupied stream reaches on Indian lands only occur within the range of the California Coastal Chinook, Northern California steelhead, and Central California Coast steelhead ESUs, and these areas represent less than 0.1 percent of the total occupied habitat under consideration for these three ESUs. Based on our analysis, the remaining four ESUs did not contain any Indian lands that overlapped with occupied stream habitat. These percentages are likely overestimates as they include all habitat area within reservation boundaries.

There are several benefits to excluding Indian lands. The longstanding and distinctive relationship between the Federal and tribal governments is defined by treaties, statutes, executive orders, judicial decisions, and agreements, which differentiate tribal governments from the other entities that deal with, or are affected by, the Federal government. This relationship has given rise to a special Federal trust responsibility involving the legal responsibilities and obligations of the United States toward Indian Tribes and the application of fiduciary standards of due care with respect to Indian lands, tribal trust resources, and the exercise of tribal rights. Pursuant to these authorities lands have been retained by Indian Tribes or have been set aside for tribal use. These lands are managed by Indian Tribes in accordance with tribal goals and objectives within the framework of applicable treaties and laws.

In addition to the distinctive trust relationship for Pacific salmon and steelhead in California and in the Northwest, there is a unique partnership between the Federal government and Indian tribes regarding salmon management. Indian tribes in California and the Northwest are regarded as ''co-managers'' of the salmon resource, along with Federal and State managers. This co-management relationship evolved as a result of numerous court decisions clarifying the tribes' treaty right to take fish in their usual and accustomed places.

The benefits of excluding Indian lands from designation include: (1) The furtherance of established national policies, our Federal trust obligations and our deference to the tribes in management of natural resources on their lands; (2) the maintenance of effective long-term working relationships to promote the conservation of salmonids on an ecosystem-wide basis; (3) the allowance for continued meaningful collaboration and cooperation in scientific work to learn more about the conservation needs of the species on an ecosystem-wide basis; and (4) continued respect for tribal sovereignty over management of natural resources on Indian lands through established tribal natural resource programs.

We believe that the current co-manager process addressing activities on an ecosystem-wide basis across the State is currently beneficial for the conservation of the salmonids. Because the co-manager process provides for coordinated ongoing focused action through a variety of forums, we find the benefits of this process to be greater than the benefits of applying ESA section 7 to Federal activities on Indian lands, which comprise much less than one percent of the total area under consideration for these ESUs. Additionally, we have determined that the exclusion of tribal lands will not result in the extinction of the species concerned. We also believe that maintenance of our current co-manager relationship consistent with existing policies is an important benefit to continuance of our tribal trust responsibilities and relationship. Based upon our consultation with the Round Valley Indian Tribes and the BIA, we believe that designation of Indian lands as critical habitat would adversely impact our working relationship and the benefits resulting from this relationship.

Based upon these considerations, we have decided to exercise agency discretion under ESA section 4(b)(2) and exclude Indian lands from the critical habitat designation for these ESUs of salmonids. The Indian lands specifically excluded from critical habitat are those defined in the Secretarial Order, including: (1) Lands held in trust by the United States for the benefit of any Indian tribe; (2) land held in trust by the United States for any Indian Tribe or individual subject to restrictions by the United States against alienation; (3) fee lands, either within or outside the reservation boundaries, owned by the tribal government; and (4) fee lands within the reservation boundaries owned by individual Indians. The Indian tribes for which these exclusions apply in California include: Big Lagoon Reservation, Blue Lake Rancheria, Round Valley Indian Tribes, Laytonville Rancheria, Redwood Valley Rancheria, Coyote Valley Reservation, and Manchester-Point Arena Rancheria. We have determined that these exclusions, together with the other exclusions described in this rule, will not result in the extinction of any of the seven ESUs in this designation.

Impacts to Landowners With Contractual Commitments to Conservation

Conservation agreements with non-Federal landowners (*e.g.*, HCPs) enhance species conservation by extending species' protections beyond those available through section 7 consultations. In the past decade we have encouraged non-Federal landowners to enter into conservation agreements, based on a view that we can achieve greater species' conservation on non-Federal land through such partnerships than we can through coercive methods (61 FR 63854; December 2, 1996).

Section 10(a)(1)(B) of the ESA authorizes us to issue to non-Federal entities a permit for the incidental take of endangered and threatened species. This permit allows a non-Federal landowner to proceed with an activity that is legal in all other respects, but that results in the incidental taking of a listed species (*i.e.*, take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity). The ESA specifies that an application for an incidental take permit must be accompanied by a conservation plan, and specifies the content of such a plan. The purpose of such an HCP is to describe and ensure that the effects of the permitted action on covered species are adequately minimized and mitigated, and that the action does not appreciably reduce the survival and recovery of the species.

To date we have not excluded critical habitat on lands covered by an HCP, but we acknowledged in our proposed rule that this was an emerging issue and that the benefits of such exclusions may outweigh the benefits of designation (69 FR 74623; December 14, 2004). As described in greater detail above (see Comment 42) and in our assessment of HCPs associated with this final rulemaking (NMFS, 2005e), the analysis required for these types of exclusions requires careful consideration of the benefits of designation versus the benefits of exclusion to determine whether benefits of exclusion outweigh benefits of designation. The benefits of designation typically arise from additional section 7 protections as well as enhanced public awareness once specific areas are identified as critical habitat. The benefits of exclusion generally relate to relieving regulatory burdens on existing conservation partners, maintaining good working relationships with them, and encouraging the development of new partnerships.

Based on comments received on our proposed rule, we could not conclude that all landowners view designation of critical habitat as imposing a burden, and exclusion from designation as removing that burden and thereby strengthening the ongoing relationship. Where an HCP partner affirmatively requests designation, exclusion is likely to harm rather than benefit the relationship. Where an HCP partner has remained silent on the benefit of exclusion of its land, we do not believe the record supports a presumption that exclusion will enhance the relationship. Similarly, we do not believe it provides an incentive to other landowners to seek an HCP if our exclusions are not in response to an expressed landowner preference. We anticipate further rulemaking in the near future to refine these designations, for example, in response to developments in recovery planning. As part of future revisions, we will consider information we receive from those with approved HCPs regarding the effect of designation on our ongoing partnership. We did not consider pending HCPs for exclusion, both because we do not want to prejudge the outcome of the ongoing HCP process, and because we expect to have future opportunities to refine the designation and consider whether exclusion will outweigh the benefit of designation in a particular case.

Exclusions Based on National Security Impacts

As previously noted (see *Military Lands* section), we evaluated several DOD sites with draft or final INRMPs and determined that each INRMP provides a benefit to the listed salmon or steelhead ESUs under consideration at the site. Therefore, we conclude that those areas subject to final INRMPs are not eligible for designation pursuant to section 4(a)(3)(B)(I) of the ESA (16 U.S.C. 1533(A)(3)). At the request of the DOD (and in the case that an INRMP might not provide a benefit to the species), we also assessed the impacts on national security that may result from designating these and other DOD sites as critical habitat.

The U.S. Marine Corps provided comments in response to the ANPR (68 FR 55926; September 29, 2003) regarding its INRMP for Camp Pendleton Marine Corps Base and potential impacts to national security for this facility, which is within the range of the Southern California *O. mykiss* ESU. By letter, NMFS subsequently provided the DOD with information about the areas we were considering to designate as critical habitat for the seven ESUs in California (as well as the 13 ESUs in the Pacific Northwest), and, in addition to a request for information about DOD's INRMPs, requested information about potential impacts to national security as a result of any critical habitat designation. In response to that request and also in comments on the proposed critical habitat designation (69 FR 71880), the Camp Pendleton Marine Corps Base and Vandenberg Air Force Base provided detailed information on such impacts to their operations. Both military agencies concluded that critical habitat designation at either of these sites would likely impact national security by diminishing military readiness, with possible impacts including: (1) The prevention, restriction, or delay in training or testing exercises or access to such sites; (2) the restriction or delay in activities associated with space launches; (3) a delay in response times for troop deployments and overall operations; and (4) the creation of uncertainties regarding ESA consultation (*e.g.*, reinitiation requirements) or imposition of compliance conditions that would divert military resources. Also, both military agencies cited their ongoing and positive consultation history with NMFS and underscored cases where they are implementing best management practices to reduce impacts on listed salmonids. The occupied fish habitat occurring on Camp Pendleton and Vandenberg AFB have important conservation value, but they are primarily migratory corridors and represent only a small percentage of the total occupied habitat area for the Southern California steelhead ESU. Designating habitat on these two installations will likely reduce the readiness capability of the Marine Corps and the Air Force, both of which are actively engaged in training, maintaining, and deploying forces in the current war on terrorism. Therefore, we conclude that the benefits of exclusion outweigh the benefits of designation, and we are not proposing to designate these DOD sites as critical habitat.

Exclusions Based on Economic Impacts

Our assessment of economic impact generated considerable interest from commenters on the ANPR (68 FR 55926; September 29, 2003) and the proposed rule (69 FR 71880; December 10, 2004). Based on new information and comments received on the proposed rule, we have updated the economics report wherein we document our conclusions regarding the economic impacts of designating each of the particular areas found to meet the definition of critical habitat (NMFS, 2005b). This report is available from NMFS (see **ADDRESSES**).

The first step in the overall economic analysis was to identify existing legal and regulatory constraints on economic activity that are independent of critical habitat designation, such as Clean Water Act (CWA) requirements. Coextensive impacts of the ESA section 7 requirement to avoid jeopardy were not considered part of the baseline. Also, we have stated our intention to revisit the existing critical habitat designations for Sacramento River winter run Chinook salmon and two California coastal coho salmon ESUs, if appropriate, following completion of related rulemaking (67 FR 6215; February 11, 2002). Given the uncertainty that these designations will remain in place in their current configuration, we decided not to consider them as part of the baseline for the ESA section 4(b)(2) analysis.

From the consultation record, we identified Federal activities that might affect habitat and that might result in an ESA section 7 consultation. (We did not consider Federal actions, such as the approval of a fishery, that might affect the species directly but not affect its habitat.) We identified ten types of activities including: Hydropower dams; non-hydropower dams and other water supply structures; federal lands management, including grazing (considered separately); transportation projects; utility line projects; instream activities, including dredging (considered separately); activities permitted under EPA's National Pollution Discharge Elimination System; sand & gravel mining; residential and commercial development; and agricultural pesticide applications. Based on our consultation record and other available information, we determined the modifications each type of activity was likely to undergo as a result of section 7 consultation (regardless of whether the modification might be required by the jeopardy or the adverse modification provision). We developed an expected direct cost for each type of action and projected the likely occurrence of each type of project in each watershed, using existing spatial databases (*e.g.*, the COE 404(d) permit database). Finally, we aggregated the costs from the various types of actions and estimated an annual impact, taking into account the probability of consultation occurring and the likely rate of occurrence of that project type.

This analysis allowed us to estimate the coextensive economic impact of designating each ''particular area'' (that is, each habitat area, or aggregated occupied stream reaches in an HSA watershed). Expected economic impacts ranged from zero to in excess of 1 million dollars per habitat area. Where a watershed included both tributaries and a migration corridor that served other watersheds, we attempted to estimate the separate impacts of designating the tributaries and the migration corridor. We did this by identifying those categories of activities most likely to affect tributaries and those most likely to affect larger migration corridors.

Because of the methods we selected and the data limitations, portions of our analysis both under- and over-estimate the coextensive economic impact of ESA section 7 requirements. For example, we lacked data on the likely impact on flows at non-Federal hydropower projects, which would increase economic impacts. In addition, we did not have information about potential changes in irrigation flows associated with section 7 consultation which would likely increase the estimate of coextensive costs. On the other hand, we estimated an impact on all activities occurring within the geographic boundaries of a watershed, even though in some cases activities would be far removed from occupied stream reaches and so might not require modification. In addition, we were unable to document significant costs of critical habitat designation that occur outside the section 7 consultation process, including costs resulting from state or local regulatory burdens imposed on developers and landowners as a result of a Federal critical habitat designation.

In determining whether the economic benefit of excluding a habitat area might outweigh the benefit of designation to the species, we took into consideration the many data limitations described above. The ESA requires that we make critical habitat designations within a short time frame ''with such data as may be available'' at the time. Moreover the cost-effectiveness approach we adopted accommodated many of these data limitations by considering the relative benefits of designation and exclusion, giving priority to excluding habitat areas with a relatively lower benefit of designation and a relatively higher economic impact.

The circumstances of most of the listed ESUs can make a cost-effectiveness approach useful. Pacific salmon are wide-ranging species and occupy numerous habitat areas with thousands of stream miles. Not all occupied areas, however, are of equal importance to conserving an ESU. Within the currently occupied range there are areas that support highly productive populations, areas that support less productive populations, and areas that support production in only some years. Some populations within an ESU may be more important to long-term conservation of the ESU than other populations. Therefore, in many cases it may be possible to construct different scenarios for achieving conservation. Scenarios might have more or less certainty of achieving conservation, and more or less economic impact.

Our first step in constructing an exclusion scenario was to identify all watershed areas we would consider for an economic exclusion based on dollar thresholds. The next step was to examine those areas potentially eligible for exclusion based on dollar thresholds to determine whether or not any of them would make an important contribution to conservation for the ESU. Based on the rating process used by the CHARTs, we judged that all of the high conservation value habitat areas make an important contribution to conservation, and therefore, we did not consider them for exclusion.

In developing criteria for the first step, we chose dollar thresholds that we anticipated would lead most directly to a cost effective scenario. We considered for exclusion, low value habitat areas with an economic impact greater than $70,000–85,000, and medium value areas with an economic impact greater than $300,000.

The criteria we selected for identifying habitat areas eligible for exclusion do not represent an objective judgment that, for example, a low value habitat area is worth a certain dollar amount and no more. The ESA directs us to balance dissimilar values with a limited amount of time and therefore information. It emphasizes the discretionary nature of the balancing task. Moreover, while our approach follows the Tenth Circuit's direction to consider coextensive economic impacts, we nevertheless must acknowledge that not all of the costs will be avoided by exclusion from designation. Finally, the cost estimates developed by our economic analysis do not have obvious break points that would lead to a logical division between high, medium and low costs.

Given these factors, a judgment that any particular dollar threshold is objectively correct would be neither necessary or possible. Rather, what economic impact is high, and therefore, might outweigh the benefit of designating a medium or low value habitat area is a matter of discretion and depends on the policy context. The policy context in which we carry out this task led us to select dollar thresholds that would likely lead to a cost effective designation in a limited amount of time with a relatively simple process.

In the second step of the process, we asked the CHARTs whether any of the habitat areas (*i.e.*, watersheds) eligible for exclusion make an important contribution to conservation of the ESU in question. The CHARTs considered this question in the context of all of the areas eligible for exclusion as well as the information they had developed in providing the initial conservation ratings. The following section describes the results of applying the two-step process to each ESU. The results are discussed in more detail in a separate report that is available for public review (NMFS, 2005c). We have determined that these exclusions, together with the other exclusions described in this rule, will not result in the extinction of any of the seven ESUs.

VI. Critical Habitat Designation

We are designating approximately 8,935 net mi (14,296 km) of riverine habitat and 470 mi^2 (1,212 km^2) of estuarine habitat in California within the geographical areas presently occupied by the seven ESUs. This designation excludes approximately 771 net mi (1,233 km) of occupied riverine habitat as a result of economic considerations, 32 mi (51 km) of occupied riverine habitat on Tribal lands, and 44 mi (70 km) of occupied riverine habitat on DOD lands. Some of these areas in the final designation overlap substantially for two ESUs. The net economic impacts (coextensive with ESA section 7) associated with the areas designated for all ESUs are estimated to be approximately $81,647,439.

TABLE 7.—APPROXIMATE QUANTITY OF HABITAT * AND OWNERSHIP WITHIN WATERSHEDS CONTAINING HABITAT AREAS DESIGNATED AS CRITICAL HABITAT.

ESU	Streams (mi) (km)	Estuary Habitat (Sq mi) (Sq km)	Ownership (percent)			
			Federal	Tribal	State	Private
California Coastal Chinook Salmon	1,475 2,360	25 65	16.4	0.4	3.4	79.8
Northern California Steelhead	3,028 4,844	25 65	18.8	0.5	3.7	77.1
Central California Coast Steelhead	1,465 2,344	386 996	4.5	0.0	7.2	88.3
South-Central California Coast Steelhead	1,249 2,000	3 8	16.3	0.0	2.2	81.6
Southern California Steelhead	708 1,132	....	25.0	1.0	2.4	71.6
Central Valley Spring Run Chinook Salmon	1,158 1,853	254 655	12.1	0.0	3.3	84.5
Central Valley Steelhead	2,308 3,693	254 655	8.6	0.0	3.1	88.3

* These estimates are the total amount for each ESU. They do not account for overlapping areas designated for multiple ESUs.

These areas designated, summarized below by ESU, are considered occupied and contain physical and biological features essential to the conservation of the species and that may require special management considerations or protection.

California Coastal Chinook Salmon

There are 45 occupied HSA watersheds within the freshwater and estuarine range of this ESU. Eight watersheds received a low rating, 10 received a medium rating, and 27 received a high rating of conservation value to the ESU (NMFS, 2005a). Two estuarine habitat areas used for rearing and migration (Humboldt Bay and the Eel River Estuary) also received a high conservation value rating.

HSA watershed habitat areas for this ESU include approximately 1,634 mi (2,614 km) of stream habitat and approximately 25 mi^2 (65 km^2) of estuarine habitat (principally Humboldt Bay). Of these, 10.3 stream miles (16.5 km) are being excluded because they overlap with Indian lands (see *Government-to-Government Relationship With Tribes*). No lands controlled by the DOD or covered by HCPs are being excluded from the final designation. As a result of the balancing process for economic impacts described above, the Secretary is excluding from the designation the habitat areas shown in Table 8. Of the habitat areas eligible for designation, approximately 158 stream miles (253 km) are being excluded because the economic benefits of exclusion outweigh the benefits of designation. The total potential estimated economic impact, with no exclusions, would be $10,993,337. The exclusions identified in Table 8 would reduce the total estimated economic impact by 33 percent to $7,333,751.

TABLE 8.—HSA WATERSHEDS WITHIN THE GEOGRAPHICAL RANGE OF THE CALIFORNIA COASTAL CHINOOK SALMON ESU AND EXCLUDED FROM CRITICAL HABITAT

Watershed code	Watershed name	Area excluded
111122	Bridgeville	Entire watershed.
111142	Spy Rock	Indian lands.
111150	North Fork Eel River	Indian lands.
111171	Eden Valley	Tributaries only; Indian lands.
111172	Round Valley	Indian lands.
111173	Black Butte River	Entire watershed.
111174	Wilderness	Entire watershed.
111350	Navarro River	Entire watershed.
111422	Santa Rosa	Entire watershed.
111423	Mark West	Entire watershed.

Northern California Steelhead

There are 50 occupied HSA watersheds within the freshwater and estuarine range of this ESU. Nine watersheds received a low rating, 14 received a medium rating, and 27 received a high rating of conservation value to the ESU (NMFS, 2005a). Two estuarine habitat areas used for rearing and migration (Humboldt Bay and the Eel River Estuary) also received a high conservation value rating.

HSA watershed habitat areas for this ESU include approximately 3,148 mi (5,037 km) of stream habitat and approximately 25 mi^2 (65 km^2) of estuarine habitat (principally Humboldt Bay). Of these, approximately 21 stream miles (33.5 km) are being excluded because they overlap with Indian lands (see *Government-to-Government Relationship With Tribes*). No lands controlled by the DOD or covered by HCPs are being excluded from the final designation. As a result of the balancing process for economic impacts described above, the Secretary is excluding from the designation the habitat areas shown in Table 9. Of the habitat areas eligible for designation, approximately 120 stream miles (192 km) are being excluded because the economic benefits of exclusion outweigh the benefits of designation. Total potential estimated economic impact, with no exclusions, would be $8,773,432. The exclusions identified in Table 9 would reduce the total estimated economic impact by 31 percent to $6,063,568.

TABLE 9.—HSA WATERSHEDS WITHIN THE GEOGRAPHICAL RANGE OF THE NORTHERN CALIFORNIA STEELHEAD ESU AND EXCLUDED FROM CRITICAL HABITAT

Watershed code	Watershed name	Area excluded
110940	Ruth	Entire watershed.
111142	Spy Rock	Tribal land.
111150	North Fork Eel	Entire watershed; Indian lands.
111163	Lake Pilsbury	Entire watershed.
111171	Eden Valley	Indian lands.
111172	Round Valley	Indian lands.

Central California Coast Steelhead

There are 46 occupied HSA watersheds within the freshwater and estuarine range of this ESU. Fourteen watersheds received a low rating, 13 received a medium rating, and 19 received a high rating of conservation value to the ESU (NMFS, 2005a). Five of these HSA watersheds comprise portions of the San Francisco-San Pablo-Suisun Bay estuarine complex which provides rearing and migratory habitat for this ESU.

HSA watershed habitat areas for this ESU include approximately 1,832 mi (2,931 km) of stream habitat and approximately 442 mi^2 (1,140 km^2) of estuarine habitat (principally San Francisco Bay-San Pablo Bay). Of these, approximately 0.6 stream miles (1.0 km) are being excluded because they overlap with Indian lands (Coyote Valley and Redwood Valley Rancherias) (see *Government-to-Government Relationship With Tribes*). No lands controlled by the DOD are excluded.

As a result of the balancing process for economic impacts described above, the Secretary is excluding from the designation the habitat areas shown in Table 10. Of the habitat areas eligible for designation, approximately 367 stream miles (587 km) and 56 mi2 of estuarine habitat are being excluded because the economic benefits of exclusion outweigh the benefits of designation. Total potential estimated economic impact, with no exclusions, would be $18,577,246. The exclusions identified in Table 10 would reduce the total estimated economic impact by 31 percent to $12,917,247.

TABLE 10.—HSA WATERSHEDS WITHIN THE GEOGRAPHICAL RANGE OF THE CENTRAL CALIFORNIA COASTAL STEELHEAD ESU AND EXCLUDED FROM CRITICAL HABITAT

Watershed code	Watershed name	Area excluded
111421	Laguna de Santa Rosa	Entire watershed.
111422	Santa Rosa	Entire watershed.
111431	Ukiah	Tributaries only.
111433	Forsythe Creek	Indian lands.
220330	Berkeley	Entire watershed.
220440	San Mateo Bayside	Entire watershed.
220420	Eastbay Cities	Entire watershed.
220540	Guadelupe River	Entire watershed.
220620	Novato	Entire watershed.
220660	Pinole	Entire watershed.
220710	Suisun Bay	Entire unit.
220722	Suisun Creek	Entire watershed.
220721	Benecia	Entire watershed.
220731	Pittsburg	Entire watershed.
220733	Martinez	Entire watershed.

South-Central California Coast Steelhead

There are 30 occupied HSA watersheds within the freshwater and estuarine range of this ESU. Six watersheds received a low rating, 11 received a medium rating, and 13 received a high rating of conservation value to the ESU (NMFS, 2005a). One of these occupied watershed units is Morro Bay, which is used as rearing and migratory habitat for steelhead populations that spawn and rear in tributaries to the Bay.

HSA watershed habitat areas for this ESU include approximately 1,251 mi (2,000 km) of stream habitat and approximately 3 mi^2 (8 km^2) of estuarine habitat (*e.g.*, Morro Bay). Approximately 22 stream miles (35 km) are not eligible for designation because they are within lands controlled by the DOD (Camp San Luis Obispo and Camp Roberts) that have qualifying INRMPs (Table 11). The reduction in economic impacts resulting from these exclusions could not be estimated.

As a result of the balancing process for economic impacts described above, the Secretary is excluding from the designation the habitat areas shown in Table 11. Of the habitat eligible for designation, approximately 2 stream miles (3.2 km) are being excluding because the economic benefits of exclusion outweigh the benefits of designation. The total potential estimated economic impact, with no exclusions, would be $16,857,365. It was not possible to estimate the reduced economic impacts associated with the habitat exclusions in Table 11, therefore, the total potential economic impact is the same as if there were no exclusions.

TABLE 11.—HSA WATERSHEDS WITHIN THE GEOGRAPHICAL RANGE OF THE SOUTH-CENTRAL CALIFORNIA COAST STEELHEAD ESU AND EXCLUDED FROM CRITICAL HABITAT

Watershed code	Watershed name	Area excluded
330911	Neponset	Tributaries only.
330930	Soledad	Tributaries only.
330940	Upper Salinas Valley	Tributaries only.
330981	Paso Robles	DOD lands.
331022	Chorro	DOD lands.

Southern California Steelhead ESU

There are 32 occupied HSA watersheds within the freshwater and estuarine range of this ESU. Five watersheds received a low rating, 6 received a medium rating, and 21 received a high rating of conservation value to the ESU (NMFS, 2005a).

HSA watershed habitat areas for this ESU include approximately 741 mi (1,186 km) of stream habitat. Of these, approximately 22 mi (35 km) of occupied stream miles are excluded because they are within lands controlled by the DOD (Vandenberg AFB and Camp Pendleton Marine Corps Base) that have qualifying INRMPs and for which the benefits of exclusion outweigh the benefits of designation. The reduction in economic impacts resulting from these exclusions could not be estimated.

As a result of the balancing process for economic impacts described above, the Secretary is excluding from the designation the habitat areas shown in Table 12. Of the habitat areas eligible for designation, approximately 33 stream miles (53 km) are being excluded because the economic benefits of exclusion outweigh the benefits of designation. Total potential estimated economic impact, with no exclusions, would be $19,443,413. The exclusions identified in Table 12 would reduce the total estimated economic impact by 40 percent to $11,586,752.

TABLE 12.—HSA WATERSHEDS WITHIN THE GEOGRAPHICAL RANGE OF THE SOUTHERN CALIFORNIA STEELHEAD ESU AND EXCLUDED FROM CRITICAL HABITAT

Watershed code	Watershed name	Area excluded
331210	Guadelupe	Tributaries only.
331230	Cuyama Valley	Entire watershed.
331410	Lompoc	DOD lands.
331430	Buelton	Tributaries only.
331451	Santa Cruz Creek	Entire watershed.
440811	East of Oxnard	Entire watershed.
490140	San Mateo Canyon	DOD lands.

Central Valley Spring Run Chinook Salmon ESU

There are 37 occupied HSA watersheds within the freshwater and estuarine range of this ESU. Seven watersheds received a low rating, 3 received a medium rating, and 27 received a high rating of conservation value to the ESU (NMFS, 2005a). Four of these HSA watersheds comprise portions of the San Francisco-San Pablo-Suisun Bay estuarine complex which provides rearing and migratory habitat for this ESU.

HSA watershed habitat areas for this ESU include approximately 1,373 mi (2,197 km) of occupied stream habitat and approximately 427 mi^2 (1,102 km^2) of estuarine habitat in the San Francisco-San Pablo-Suisun Bay complex. There are no DOD, tribal or HCP managed lands excluded from the designation. As a result of the balancing process for economic impacts described above, the Secretary is excluding from the designation the habitat areas shown in Table 13. Of the habitat areas eligible for designation, approximately 215 stream miles (344 km) and 173 mi^2 of estuarine habitat are being excluded because the economic benefits of exclusion outweigh the benefits of designation. The total potential estimated economic impact, with no exclusions, would be $29,223,186. The exclusions identified in Table 13 would reduce the total estimated economic impact by 25 percent to $22,066,974.

TABLE 13.—HSA WATERSHEDS WITHIN THE GEOGRAPHICAL RANGE OF THE CENTRAL VALLEY SPRING RUN CHINOOK SALMON ESU AND EXCLUDED FROM CRITICAL HABITAT

Watershed code	Watershed name	Area excluded
551000	Sacramento Delta	Deep Water Ship Channel.
551713	Mildred Lake	Entire watershed.
551720	Nevada City	Entire watershed.
552310	Thomes Creek	Entire watershed.
552433	South Fork	Entire watershed.
554300	No. Diablo Range	Entire watershed.
554400	San Joaquin Delta	Entire watershed.
220410	South SF Bay	Entire unit.

Central Valley Steelhead ESU

There are 67 occupied HSA watersheds within the freshwater and estuarine range of this ESU. Twelve watersheds received a low rating, 18 received a medium rating, and 37 received a high rating of conservation value to the ESU (NMFS, 2005a). Four of these HSA watersheds comprise portions of the San Francisco-San Pablo-Suisun Bay estuarine complex which provides rearing and migratory habitat for this ESU.

HSA watershed habitat areas for this ESU include approximately 2,604 mi (4,168 km) of stream habitat and approximately 427 mi^2 (1,102 km^2) of estuarine habitat. There are no DOD, tribal or HCP managed lands excluded from the designation. As a result of the balancing process for economic impacts described above, the Secretary is excluding from the designation the habitat areas shown in Table 14. Of the habitat areas eligible for designation, approximately 296 stream miles (473 km) and 173 mi^2 of estuarine habitat are being excluded because the economic benefits of exclusion outweigh the benefits of designation. Total potential estimated economic impact, with no exclusions, would be $38,235,233. The exclusions identified in Table 14 would reduce the total estimated economic impact by 11 percent to $34,389,278.

TABLE 14.—HSA WATERSHEDS WITHIN THE GEOGRAPHICAL RANGE OF THE CENTRAL VALLEY STEELHEAD ESU AND EXCLUDED FROM CRITICAL HABITAT

Watershed code	Watershed name	Area excluded
550964	Paynes Creek	Entire watershed.
551000	Sacramento Delta	Deep Water Ship Channel.
551110	Elmira	Entire watershed.
551713	Mildred Lake	Entire watershed.
551720	Nevada City	Entire watershed.
552435	Ono	Entire watershed.
553111	Herald	Entire watershed.
553120	Lower Mokelumne	Partial watershed.
553221	Big Canyon Creek	Entire watershed.
553223	NF Cosumnes	Entire watershed.

TABLE 14.—HSA WATERSHEDS WITHIN THE GEOGRAPHICAL RANGE OF THE CENTRAL VALLEY STEELHEAD ESU AND EXCLUDED FROM CRITICAL HABITAT—Continued

Watershed code	Watershed name	Area excluded
553224	Omo Ranch	Entire watershed.
553240	Sutter Creek	Entire watershed.
554300	No. Diablo Range	Entire watershed.
220410	So. SF Bay	Entire unit.

VII. Effects of Critical Habitat Designation

Section 7 Consultation

Section 7(a) of the ESA requires Federal agencies, including NMFS, to evaluate their actions with respect to any species that is proposed or listed as endangered or threatened and with respect to its critical habitat, if any is proposed or designated. Regulations implementing this provision of the ESA are codified at 50 CFR 402. Section 7(a)(4) of the ESA requires Federal agencies to confer with us on any action that is likely to jeopardize the continued existence of a proposed species or result in the destruction or adverse modification of proposed critical habitat. Conference reports provide conservation recommendations to assist the agency in eliminating conflicts that may be caused by the proposed action. The conservation recommendations in a conference report are advisory.

We may issue a formal conference report if requested by a Federal agency. Formal conference reports include an opinion that is prepared according to 50 CFR 402.14, as if the species were listed or critical habitat designated. We may adopt the formal conference report as the biological opinion when the species is listed or critical habitat designated, if no substantial new information or changes in the action alter the content of the opinion (see 50 CFR 402.10(d)).

If a species is listed or critical habitat is designated, ESA section 7(a)(2) requires Federal agencies to ensure that activities they authorize, fund, or carry out are not likely to jeopardize the continued existence of such a species or to destroy or adversely modify its critical habitat. If a Federal action may affect a listed species or its critical habitat, the responsible Federal agency (action agency) must enter into consultation with us. Through this consultation, we would review actions to determine if they would destroy or adversely modify critical habitat.

If we issue a biological opinion concluding that a project is likely to result in the destruction or adverse modification of critical habitat, we will also provide reasonable and prudent alternatives to the project, if any are identifiable. Reasonable and prudent alternatives are defined at 50 CFR 402.02 as alternative actions identified during consultation that can be implemented in a manner consistent with the intended purpose of the action, that are consistent with the scope of the Federal agency's legal authority and jurisdiction, that are economically and technologically feasible, and that we believe would avoid destruction or adverse modification of critical habitat. Reasonable and prudent alternatives can vary from slight project modifications to extensive redesign or relocation of the project. Costs associated with implementing a reasonable and prudent alternative are similarly variable.

Regulations at 50 CFR 402.16 require Federal agencies to reinitiate consultation on previously reviewed actions in instances where critical habitat is subsequently designated and the Federal agency has retained discretionary involvement or control over the action or such discretionary involvement or control is authorized by law. Consequently, some Federal agencies may request reinitiation of consultation or conference with us on actions for which formal consultation has been completed, if those actions may affect designated critical habitat or adversely modify or destroy proposed critical habitat.

Activities on Federal lands that may affect these ESUs or their critical habitat will require ESA section 7 consultation. Activities on private or state lands requiring a permit from a Federal agency, such as a permit from the COE under section 404 of the CWA, a section 10(a)(1)(B) permit from NMFS, or some other Federal action, including funding (*e.g.,* Federal Highway Administration (FHA) or Federal Emergency Management Agency (FEMA) funding), will also be subject to the section 7 consultation process. Federal actions not affecting listed species or critical habitat and actions on non-Federal and private lands that are not Federally funded, authorized, or permitted do not require section 7 consultation.

Activities Affected by Critical Habitat Designation

Section 4(b)(8) of the ESA requires that we evaluate briefly and describe, in any proposed or final regulation that designates critical habitat, those activities (whether public or private) that may adversely modify such habitat or that may be affected by such designation. A wide variety of activities may affect critical habitat and, when carried out, funded, or authorized by a Federal agency, require that an ESA section 7 consultation be conducted. Generally these include water and land management actions of Federal agencies (e.g., USFS, Bureau of Land Management (BLM), COE, BOR, the FHA, NRCS, National Park Service (NPS), BIA, and the Federal Energy Regulatory Commission (FERC)) and related or similar actions of other Federally regulated projects and lands, including livestock grazing allotments by the USFS and BLM; hydropower sites licensed by the FERC; dams built or operated by the COE or BOR; timber sales and other vegetation management activities conducted by the USFS, BLM, and BIA; irrigation diversions authorized by the USFS and BLM; and road building and maintenance activities authorized by the FHA, USFS, BLM, NPS, and BIA. Other actions of concern include dredge and fill, mining, diking, and bank stabilization activities authorized or conducted by the COE, habitat modifications authorized by the FEMA, and approval of water quality standards and pesticide labeling and use restrictions administered by the EPA.

The Federal agencies that will most likely be affected by this critical habitat designation include the USFS, BLM, BOR, COE, FHA, NRCS, NPS, BIA, FEMA, EPA, and the FERC. This designation will provide these agencies, private entities, and the public with clear notification of critical habitat designated for listed salmonids and the boundaries of the habitat. This designation will also assist these agencies and others in evaluating the potential effects of their activities on listed salmon and their critical habitat and in determining if section 7 consultation with NMFS is needed.

As noted above, numerous private entities also may be affected by this critical habitat designation because of the direct and indirect linkages to an array of Federal actions, including Federal projects, permits, and funding. For example, private entities may harvest timber or graze livestock on Federal land or have special use permits to convey water or build access roads across Federal land; they may require Federal permits to armor stream banks, construct irrigation withdrawal facilities, or build or repair docks; they may obtain water from Federally funded and operated irrigation projects; or they may apply pesticides that are only available with Federal agency approval. These activities will need to be analyzed with respect to their potential to destroy or adversely modify critical habitat. In some cases, proposed activities may require modifications that may result in decreases in activities such as timber harvest and livestock and crop production. The transportation and utilities sectors may need to modify the placement of culverts, bridges, and utility conveyances (e.g., water, sewer and power lines) to avoid barriers to fish migration. Developments occurring in or near salmon streams (e.g., marinas, residential, or industrial facilities) that require Federal authorization or funding may need to be altered or built in a manner that ensures that critical habitat is not destroyed or adversely modified as a result of the construction, or subsequent operation, of the facility. These are just a few examples of potential impacts, but it is clear that the effects will encompass numerous sectors of private and public activities. If you have questions regarding whether specific activities will constitute destruction or adverse modification of critical habitat, contact NMFS (see **ADDRESSES** and **FOR FURTHER INFORMATION CONTACT**).

VIII. Required Determinations

Administrative Procedure Act

This rulemaking covers over 8,900 miles of streams and 470 square miles of estuarine habitat. Unlike the previous critical habitat designations it contains over a thousand geographic points identifying the extent of the designations. The proposed rule generated substantial public interest. In addition to comments received during four public hearings we received a total of 3,762 written comments (3,627 of these in the form of email with nearly identical language). Many commenters expressed concerns about how the rule would be implemented. Additionally, our experience in implementing the 2000 critical habitat designations suggests that the Administrative Procedure Act's (APA) and critical habitat regulations' minimum 30-day delay in effective date nor the 60-day delay required by the Congressional Review Act for a ''major rule'' such as this are sufficient for this rule. In view of the geographic scope of this rule, our prior experience with a rule of this scope, the current level of public interest in this rule, and in order to provide for efficient administration of the rule once effective, we are providing a 120-day delay in effective date. As a result this rule will be effective on January 2, 2006. This will allow us the necessary time to provide for outreach to and interaction with the public, to minimize confusion and educate the public about activities that may be affected by the rule, and to work with Federal agencies and applicants to provide for an orderly transition in implementing the rule.

Regulatory Planning and Review

In accordance with E.O. 12866, this document is a significant rule and has been reviewed by OMB. As noted above, we have prepared several reports to support the exclusion process under section 4(b)(2) of the ESA. The economic costs of the critical habitat designations are described in our economic report (NMFS, 2005b). The benefits of the designations are described in the CHART report (NMFS, 2005a) and the 4(b)(2) report (NMFS, 2005c). The CHART report uses a biologically-based ranking system for gauging the benefits of applying section 7 of the ESA to particular watersheds. Because data are not available to express these benefits in monetary terms, we have adopted a cost-effectiveness framework, as outlined in a 4(b)(2) report (NMFS, 2005c). This approach is in accord with OMB's guidance on regulatory analysis (U.S. Office of Management and Budget. Circular A–4, Regulatory Analysis, September 17, 2003). By taking this approach, we seek to designate sufficient critical habitat to meet the biological goal of the ESA while imposing the least burden on society, as called for by E.O. 12866.

In assessing the overall cost of critical habitat designation for the 7 Pacific salmon and steelhead ESUs addressed in this final rule, the annual total impact figures given in the draft economic analysis (NMFS, 2005b) cannot be added together to obtain an aggregate annual impact. Because some watersheds are included in more than one ESU, a simple summation would entail duplication, resulting in an overestimate. Accounting for this duplication, the aggregate annual economic impact of the 7 critical habitat designations is $81,647,439. These amounts include impacts that are coextensive with the implementation of the jeopardy standard of section 7 (NMFS, 2005b).

Within the State of California, hydropower projects currently provide approximately 15 percent of the total electricity produced. This is small compared to the Pacific Northwest where hydropower generates up to 70 percent of the total electricity produced, with approximately 60 percent of this hydroelectric power generated through the Federal Columbia River Power System. Because hydropower is a more pervasive power source in the Pacific Northwest than in California, the impacts to the energy industry in California from environmental mitigation associated with protecting listed salmon and steelhead and their critical habitat are likely to be much less than in the Northwest. There are approximately 90 hydropower projects within the area covered by the potential critical habitat for the 7 ESUs in California. Based on the economic analysis conducted for this rulemaking (NMFS 2005b), the estimated annualized capital and programmatic costs of section 7 for hydropower projects ranges from $11,000 to $9.8 million per ESU, with the estimated annualized cost for all ESUs totaling $18.8 million. The aggregate economic costs of capital modifications within the range of these 7 ESUs is approximately 10 percent of the total aggregate costs for all categories of activities evaluated in the economic analysis. This cost estimate, however, does not include costs associated with operational modifications of hydropower projects such as changes to the flow regime (level or timing) which can result in foregone power generation, require supplementary power purchases, or have other economic effects. The necessary data to estimate operational modification costs in California are not available, but they are expected to be highly variable and project-specific. The estimated impacts of operational changes at hydropower projects in the Pacific Northwest (unknown for several projects to $31 million in forgone power revenues for Baker River Dam), however, demonstrate the potential magnitude and variability of impacts on a per project basis in California. For these projects in the Northwest, the proportion of costs attributable to section 7 implementation is unknown, but the share of incremental costs associated with critical habitat designation alone is unlikely to be significant.

Regulatory Flexibility Act (5 U.S.C. 601 et seq.)

Under the Regulatory Flexibility Act (5 U.S.C. 601 *et seq.*, as amended by the Small Business Regulatory Enforcement Fairness Act (SBREFA) of 1996), whenever an agency is required to publish a notice of rulemaking for any proposed or final rule, it must prepare and make available for public comment a regulatory flexibility analysis that describes the effects of the rule on small entities (*i.e.*, small businesses, small organizations, and small government jurisdictions). We have prepared a final regulatory flexibility analysis and this document is available upon request (see **ADDRESSES**). This analysis estimates that the number of regulated small entities potentially affected by this rulemaking ranges from 444 to 4,893 depending on the ESU. The estimated coextensive costs of section 7 consultation incurred by small entities is estimated to range from $1.6 million to $26.5 million depending on the ESU. As described in the analysis, we considered various alternatives for designating critical habitat for these seven ESUs. We rejected the alternative of not designating critical habitat for any of the ESUs because such an approach did not meet the legal requirements of the ESA. We also examined and rejected an alternative in which all the potential critical habitat of the seven Pacific salmon and steelhead ESUs is designated (*i.e.*, no areas are excluded) because many of the areas considered to have a low conservation value also had relatively high economic impacts that might be mitigated by excluding those areas from designation. A third alternative we examined and rejected would exclude all habitat areas with a low or medium conservation value. While this alternative furthers the goal of reducing economic impacts, we could not make a determination that the benefits of excluding all habitat areas with low and medium conservation value outweighed the benefits of designation. Moreover, for some habitat areas the incremental economic benefit from excluding that area is relatively small. Therefore, after considering these alternatives in the context of the section 4(b)(2) process of weighing benefits of exclusion against benefits of designation, we determined that the current approach to designation (*i.e.*, designating some but not all areas with low or medium conservation value) provides an appropriate balance of conservation and economic mitigation and that excluding the areas identified in this rulemaking would not result in extinction of the ESUs. It is estimated that small entities will save from $39.9 thousand to $5.5 million in compliance costs, depending on the ESU, due to the exclusions made in these final designations.

As noted above, we will continue to study alternative approaches in future rulemakings designating critical habitat. As part of that assessment, we will examine alternative methods for analyzing the economic impacts of designation on small business entities, which will inform our Regulatory Flexibility Analysis as well as our analysis under section 4(b)(2) of the ESA.

E.O. 13211

On May 18, 2001, the President issued an Executive Order on regulations that significantly affect energy supply, distribution, and use. E.O. 13211 requires agencies to prepare Statements of Energy Effects when undertaking certain actions. This rule may be a significant regulatory action under E.O. 12866. We have determined, however, that the energy effects of the regulatory action are unlikely to exceed the energy impact thresholds identified in E.O.13211.

As discussed elsewhere in this final rule, there are approximately 90 hydropower projects within the range of the potential critical habitat for these 7 ESUs. The annualized capital and programmatic costs of section 7 for these projects ranges from $11,000 to $9.8 million per ESU, with the estimated annualized cost for all ESUs totaling $18.8 million. Despite these costs and operational costs which we do not have the data available to estimate, we believe the proper focus under E.O. 13211 is on the incremental impacts of critical habitat designation. The available data do not allow us to separate precisely these incremental impacts from the impacts of all conservation measures on energy production and costs. There is evidence from the California Energy Commission (California Energy Commission 2003), however, that the implementation of environmental mitigation measures associated with relicensing and selective decommissioning of hydropower projects in California has not impacted the ability of the State's electricity system to meet demand. This conclusion was based on a consideration of implementing all mitigation measures, not just those for salmon and steelhead, thus it is likely that the impact of implementing mitigations associated with salmon and steelhead protection directly or even more specifically salmon and steelhead critical habitat protection would be a subset of the impacts determined by the Commission. In addition, there is historical evidence from the Pacific Northwest, that the ESA jeopardy standard alone is capable of imposing all of the costs affecting hydropower projects and energy supply. While this information is indirect, it is sufficient to draw the conclusion that the designation of critical habitat for the 7 salmon and steelhead ESUs in California does not significantly affect energy supply, distribution, or use.

Unfunded Mandates Reform Act (2 U.S.C. 1501 et seq.)

In accordance with the Unfunded Mandates Reform Act, we make the following findings:

(a) This final rule will not produce a Federal mandate. In general, a Federal mandate is a provision in legislation, statute or regulation that would impose an enforceable duty upon State, local, tribal governments, or the private sector and includes both ''Federal intergovernmental mandates'' and ''Federal private sector mandates.'' These terms are defined in 2 U.S.C. 658(5)–(7). ''Federal intergovernmental mandate'' includes a regulation that ''would impose an enforceable duty upon State, local, or tribal governments'' with two exceptions. It excludes ''a condition of Federal assistance.'' It also excludes ''a duty arising from participation in a voluntary Federal program,'' unless the regulation ''relates to a then-existing Federal program under which $500,000,000 or more is provided annually to State, local, and tribal governments under entitlement authority,'' if the provision would ''increase the stringency of conditions of assistance'' or ''place caps upon, or otherwise decrease, the Federal Government's responsibility to provide funding'' and the State, local, or tribal governments ''lack authority'' to adjust accordingly. (At the time of enactment, these entitlement programs were: Medicaid; AFDC work programs; Child Nutrition; Food Stamps; Social Services Block Grants; Vocational Rehabilitation State Grants; Foster Care, Adoption Assistance, and Independent Living; Family Support Welfare Services; and Child Support Enforcement.) ''Federal private sector mandate'' includes a regulation that ''would impose an enforceable duty upon the private sector, except (i) a condition of Federal assistance; or (ii) a duty arising from participation in a voluntary Federal program.'' The designation of critical habitat does not impose a legally binding duty on non-Federal government entities or private parties. Under the ESA, the only regulatory effect is that Federal agencies must ensure that their actions do not destroy or adversely modify critical habitat under section 7. While non-Federal entities who receive Federal funding, assistance, permits or otherwise require approval or authorization from a Federal agency for an action may be indirectly impacted by the designation of critical habitat, the legally binding duty to avoid destruction or adverse modification of critical habitat rests squarely on the Federal agency. Furthermore, to the extent that non-Federal entities are indirectly impacted because they receive Federal assistance or participate in a voluntary Federal aid program, the Unfunded Mandates Reform Act would not apply; nor would critical habitat shift the costs of the large entitlement programs listed above to State governments.

(b) Due to current public knowledge of salmon protection and the prohibition against take of these species both within and outside of the designated areas, we do not anticipate that this final rule will significantly or uniquely affect small governments. As such, a Small Government Agency Plan is not required.

Takings

In accordance with E.O. 12630, this final rule does not have significant takings implications. A takings implication assessment is not required. The designation of critical habitat affects only Federal agency actions. This final rule will not increase or decrease the current restrictions on private property concerning take of salmon. As noted above, due to widespread public knowledge of salmon protection and the prohibition against take of the species both within and outside of the designated areas, we do not anticipate that property values will be affected by these critical habitat designations. While real estate market values may temporarily decline following designation, due to the perception that critical habitat designation may impose additional regulatory burdens on land use, we expect any such impacts to be short term (NMFS, 2005b). Additionally, critical habitat designation does not preclude development of HCPs and issuance of incidental take permits. Owners of areas that are included in the designated critical habitat will continue to have the opportunity to use their property in ways consistent with the survival of listed salmon.

Federalism

In accordance with E.O. 13132, this final rule does not have significant Federalism effects. A Federalism assessment is not required. In keeping with Department of Commerce policies, we requested information from, and coordinated development of, this critical habitat designation with appropriate state resource agencies in California. Theses designations may have some benefit to the states and local resource agencies in that the areas essential to the conservation of the species are more clearly defined, and the primary constituent elements of the habitat necessary to the survival of the species are specifically identified. While making this definition and identification does not alter where and what Federally sponsored activities may occur, it may assist local governments in long-range planning rather than waiting for case-by-case section 7 consultations to occur.

Civil Justice Reform

In accordance with E.O. 12988, the Department of the Commerce has determined that this final rule does not unduly burden the judicial system and meets the requirements of sections 3(a) and 3(b)(2) of the E.O. We are designating critical habitat in accordance with the provisions of the ESA. This final rule uses standard property descriptions and identifies the primary constituent elements within the designated areas to assist the public in understanding the habitat needs of the seven salmon and steelhead ESUs.

Paperwork Reduction Act of 1995 (44 U.S.C. 3501 et seq.)

This final rule does not contain new or revised information collection for which OMB approval is required under the Paperwork Reduction Act. This final rule will not impose record keeping or reporting requirements on State or local governments, individuals, businesses, or organizations. An agency may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid OMB control number.

National Environmental Policy Act

We have determined that we need not prepare environmental analyses as provided for under the National Environmental Policy Act of 1969 for critical habitat designations made pursuant to the ESA. See *Douglas County* v. *Babbitt,* 48 F.3d 1495 (9th Cir. 1995), cert. denied, 116 S.Ct. 698 (1996).

Government-to-Government Relationship With Tribes

The longstanding and distinctive relationship between the Federal and tribal Governments is defined by treaties, statutes, executive orders, judicial decisions, and agreements, which differentiate tribal governments from the other entities that deal with, or are affected by, the Federal Government. This relationship has given rise to a special Federal trust responsibility involving the legal responsibilities and obligations of the United States toward Indian Tribes and the application of fiduciary standards of due care with respect to Indian lands, tribal trust resources, and the exercise of tribal rights. Pursuant to these authorities lands have been retained by Indian Tribes or have been set aside for tribal use. These lands are managed by Indian Tribes in accordance with tribal goals and objectives within the framework of applicable treaties and laws.

Administration policy contained in the Secretarial Order: ''American Indian Tribal Rights, Federal-Tribal Trust Responsibilities, and the Endangered Species Act'' (June 5, 1997) (''Secretarial Order''); the President's Memorandum of April 29, 1994, ''Government-to-Government Relations with Native American Tribal Governments'' (50 FR 2291); E.O. 13175; and Department of Commerce-American Indian and Alaska Native Policy (March 30, 1995) reflects and defines this unique relationship.

These policies also recognize the unique status of Indian lands. The Presidential Memorandum of April 29, 1994, provides that, to the maximum extent possible, tribes should be the governmental entities to manage their lands and tribal trust resources. The Secretarial Order provides that, ''Indian lands are not Federal public lands or part of the public domain, and are not subject to Federal public lands laws.''

In implementing these policies the Secretarial Order specifically seeks to harmonize this unique working relationship with the Federal Government's duties pursuant to the ESA. The order clarifies our responsibilities when carrying out authorities under the ESA and requires that we consult with and seek participation of, the affected Indian Tribes to the maximum extent practicable in the designation of critical habitat. Accordingly, we recognize that we must carry out our responsibilities under the ESA in a manner that harmonizes these duties with the Federal trust responsibility to the tribes and tribal sovereignty while striving to ensure that Indian Tribes do not bear a disproportionate burden for the conservation of species. Any decision to designate Indian land as critical habitat must be informed by the Federal laws and policies establishing our responsibility concerning Indian lands, treaties and trust resources, and by Department of Commerce policy establishing our responsibility for dealing with tribes when we implement the ESA.

For West Coast salmon in California, our approach is also guided by the unique partnership between the Federal Government and Indian tribes regarding salmon management. In California, Indian tribes are regarded as ''co-managers'' of the salmon resource, along with Federal and state managers. This co-management relationship evolved as a result of numerous court decisions establishing the tribes' treaty right to take fish in their usual and accustomed places.

Pursuant to the Secretarial Order we consulted with the affected Indian Tribes when considering the designation of critical habitat in an area that may impact tribal trust resources, tribally owned fee lands or the exercise of tribal rights. Additionally some tribes and the BIA provided written comments that are a part of the administrative record for this rulemaking.

We understand from the tribes that there is general agreement that Indian lands should not be designated critical habitat. The Secretarial Order defines Indian lands as ''any lands title to which is either: (1) Held in trust by the United States for the benefit of any Indian tribe or (2) held by an Indian Tribe or individual subject to restrictions by the United States against alienation.'' In clarifying this definition with the tribes, we agree that (1) fee lands within the reservation boundaries and owned by the Tribe or individual Indian, and (2) fee lands outside the reservation boundaries and owned by the Tribe would be considered Indian lands for the purposes of this rule. (Fee lands outside the reservation owned by individual Indians are not included within the definition of Indian lands for the purposes of this rule.)

In evaluating Indian lands for designation as critical habitat we look to section 4(b)(2) of the ESA. Section 4(b)(2) requires us to base critical habitat designations on the best scientific and commercial data available, after taking into consideration the economic impact, the impact on national security and any other relevant impact of specifying any particular area as critical habitat. The Secretary may exclude areas from a critical habitat designation when the benefits of exclusion outweigh the benefits of designation, provided the exclusion will not result in the extinction of the species. We find that a relevant impact for consideration is the degree to which the Federal designation of Indian lands would impact the longstanding unique relationship between the tribes and the Federal Government and the corresponding effect on West Coast salmon protection and management. This is consistent with recent case law addressing the designation of critical habitat on tribal lands. ''It is certainly reasonable to consider a positive working relationship relevant, particularly when the relationship results in the implementation of beneficial natural resource programs, including species preservation.'' *Center for Biological Diversity et al.* v. *Norton,* 240 F. Supp. 2d 1090, 1105); *Douglas County* v. *Babbitt,* 48 F.3d 1495, 1507 (1995) (defining ''relevant'' as impacts consistent with the purposes of the ESA).

As noted above, NMFS and the tribal governments in California currently have cooperative working relationships that have enabled us to implement natural resource programs of mutual interest for the benefit of threatened and endangered salmonids. The tribes have existing natural resource programs that assist us on a regular basis in providing information relevant to salmonid protection. The tribes indicate that they view the designation of Indian lands as an unwanted intrusion into tribal self-governance, compromising the government-to-government relationship that is essential to achieving our mutual goal of conserving threatened and endangered salmonids. At this time, for the general reasons described above, we conclude that the ESA 4(b)(2) analysis leads us to exclude all Indian lands containing occupied habitat otherwise eligible for designation in our final designation for these 7 ESUs of salmon and steelhead.

IX. References Cited

A complete list of all references cited in this rulemaking can be found on our Web site at *http://swr.nmfs.noaa.gov* and is available upon request from the NMFS office in Long Beach, CA (see **ADDRESSES** section).

List of Subjects in 50 CFR Part 226

Endangered and threatened species.

Dated: August 12, 2005.

William T. Hogarth,

Assistant Administrator for Fisheries, National Marine Fisheries Service.

■ For the reasons set out in the preamble, we amend part 226, title 50 of the Code of Regulations as set forth below:

PART 226—[AMENDED]

■ 1. The authority citation of part 226 continues to read as follows:

Authority: 16 U.S.C. 1533.

■ 2. Add § 226.211 to read as follows:

§ 226.211 Critical habitat for Seven Evolutionarily Significant Units (ESUs) of Salmon (*Oncorhynchus spp.*) in California.

Critical habitat is designated in the following California counties for the following ESUs as described in paragraph (a) of this section, and as further described in paragraphs (b) through (e) of this section. The textual descriptions of critical habitat for each ESU are included in paragraphs (f) through (l) of this section, and these descriptions are the definitive source for determining the critical habitat boundaries. General location maps are provided at the end of each ESU description (paragraphs (f) through (l) of this section) and are provided for general guidance purposes only, and not as a definitive source for determining critical habitat boundaries.

(a) Critical habitat is designated for the following ESUs in the following California counties:

ESU	State—counties
(1) California Coastal Chinook	*CA*—Humboldt, Trinity, Mendocino, Sonoma, Lake, Napa, Glenn, Colusa, and Tehama.
(2) Northern California Steelhead	*CA*—Humboldt, Trinity, Mendocino, Sonoma, Lake, Glenn, Colusa, and Tehama.
(3) Central California Coast Steelhead	*CA*—Lake, Mendocino, Sonoma, Napa, Marin, San Francisco, San Mateo, Santa Clara, Santa Cruz, Alameda, Contra Costa, and San Joaquin.
(4) South-Central Coast Steelhead	*CA*—Monterey, San Benito, Santa Clara, Santa Cruz, San Luis Obispo.

ESU	State—counties
(5) Southern California Steelhead	*CA*—San Luis Obispo, Santa Barbara, Ventura, Los Angeles, Orange and San Diego.
(6) Central Valley spring-run Chinook	*CA*—Tehama, Butte, Glenn, Shasta, Yolo, Sacramento, Solano, Colusa, Yuba, Sutter, Trinity, Alameda, San Joaquin, and Contra Costa.
(7) Central Valley Steelhead	*CA*—Tehama, Butte, Glenn, Shasta, Yolo, Sacramento, Solona, Yuba, Sutter, Placer, Calaveras, San Joaquin, Stanislaus, Tuolumne, Merced, Alameda, Contra Costa.

(b) *Critical habitat boundaries.* Critical habitat includes the stream channels within the designated stream reaches, and includes a lateral extent as defined by the ordinary high-water line (33 CFR 329.11). In areas where the ordinary high-water line has not been defined, the lateral extent will be defined by the bankfull elevation. Bankfull elevation is the level at which water begins to leave the channel and move into the floodplain and is reached at a discharge which generally has a recurrence interval of 1 to 2 years on the annual flood series. Critical habitat in estuaries (*e.g.* San Francisco-San Pablo-Suisun Bay, Humboldt Bay, and Morro Bay) is defined by the perimeter of the water body as displayed on standard 1:24,000 scale topographic maps or the elevation of extreme high water, whichever is greater.

(c) *Primary constituent elements.* Within these areas, the primary constituent elements essential for the conservation of these ESUs are those sites and habitat components that support one or more life stages, including:

(1) Freshwater spawning sites with water quantity and quality conditions and substrate supporting spawning, incubation and larval development;

(2) Freshwater rearing sites with:

(i) Water quantity and floodplain connectivity to form and maintain physical habitat conditions and support juvenile growth and mobility;

(ii) Water quality and forage supporting juvenile development; and

(iii) Natural cover such as shade, submerged and overhanging large wood, log jams and beaver dams, aquatic vegetation, large rocks and boulders, side channels, and undercut banks.

(3) Freshwater migration corridors free of obstruction and excessive predation with water quantity and quality conditions and natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, side channels, and undercut banks supporting juvenile and adult mobility and survival.

(4) Estuarine areas free of obstruction and excessive predation with:

(i) Water quality, water quantity, and salinity conditions supporting juvenile and adult physiological transitions between fresh- and saltwater;

(ii) Natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, side channels; and

(iii) Juvenile and adult forage, including aquatic invertebrates and fishes, supporting growth and maturation.

(d) *Exclusion of Indian lands.* Critical habitat does not include occupied habitat areas on Indian lands. The Indian lands specifically excluded from critical habitat are those defined in the Secretarial Order, including:

(1) Lands held in trust by the United States for the benefit of any Indian tribe;

(2) Land held in trust by the United States for any Indian Tribe or individual subject to restrictions by the United States against alienation;

(3) Fee lands, either within or outside the reservation boundaries, owned by the tribal government; and

(4) Fee lands within the reservation boundaries owned by individual Indians.

(e) *Land owned or controlled by the Department of Defense.* Additionally, critical habitat does not include the following areas owned or controlled by the Department of Defense, or designated for its use, that are subject to an integrated natural resources management plan prepared under section 101 of the Sikes Act (16 U.S.C. 670a):

(1) Camp Pendleton Marine Corps Base;

(2) Vandenberg Air Force Base;

(3) Camp San Luis Obispo;

(4) Camp Roberts; and

(5) Mare Island Army Reserve Center.

(f) *California Coastal Chinook Salmon (Oncorhynchus tshawytscha).* Critical habitat is designated to include the areas defined in the following CALWATER Hydrologic units:

(1) Redwood Creek Hydrologic Unit 1107—(i) *Orick Hydrologic Sub-area 110710.* Outlet(s) = Redwood Creek (Lat –41.2923, Long –124.0917) upstream to endpoint(s) in: Boyes Creek (41.3639, –123.9845); Bridge Creek (41.137, –124.0012); Brown Creek (41.3986, –124.0012); Emerald (Harry Weir) (41.2142, –123.9812); Godwood Creek (41.3889, –124.0312); Larry Dam Creek (41.3359, –124.003); Little Lost Man Creek (41.2944, –124.0014); Lost Man Creek (41.3133, –123.9854); May Creek (41.3547, –123.999); McArthur Creek (41.2705, –124.041); North Fork Lost Man Creek (41.3374, –123.9935); Prairie Creek (41.4239, –124.0367); Tom McDonald (41.1628, –124.0419).

(ii) *Beaver Hydrologic Sub-area 110720.* Outlet(s) = Redwood Creek (Lat 41.1367, Long –123.9309) upstream to endpoint(s): Lacks Creek (41.0334, –123.8124); Minor Creek (40.9706, –123.7899).

(iii) *Lake Prairie Hydrologic Sub-area 110730.* Outlet(s) = Redwood Creek (Lat 40.9070, Long –123.8170) upstream to endpoint(s) in: Redwood Creek (40.7432, –123.7206).

(2) Trinidad Hydrologic Unit 1108—(i) *Big Lagoon Hydrologic Sub-area 110810.* Outlet(s) = Maple Creek (Lat 41.1555, Long –124.1380) upstream to endpoint(s) in: North Fork Maple Creek (41.1317, –124.0824); Maple Creek (41.1239, –124.1041).

(ii) *Little River Hydrologic Sub-area 110820.* Outlet(s) = Little River (41.0277, –124.1112) upstream to endpoint(s) in: South Fork Little River (40.9908, –124.0412); Little River (41.0529, –123.9727); Railroad Creek (41.0464, –124.0475); Lower South Fork Little River (41.0077, –124.0078); Upper South Fork Little River (41.0131, –123.9853).

(3) Mad River Hydrologic Unit 1109—(i) *Blue Lake Hydrologic Sub-area 110910.* Outlet(s) = Mad River (Lat 40.9139, Long –124.0642) upstream to endpoint(s) in: Lindsay Creek (40.983, –124.0326); Mill Creek (40.9008, –124.0086); North Fork Mad River (40.8687, –123.9649); Squaw Creek (40.9426, –124.0202); Warren Creek (40.8901, –124.0402).

(ii) *North Fork Mad River 110920.* Outlet(s) = North Fork Mad River (Lat 40.8687, Long –123.9649) upstream to endpoint(s) in: Sullivan Gulch (40.8646, –123.9553); North Fork Mad River (40.8837, –123.9436).

(iii) *Butler Valley 110930.* Outlet(s) = Mad River (Lat 40.8449, Long –123.9807) upstream to endpoint(s) in: Black Creek (40.7547, –123.9016); Black Dog Creek (40.8334, –123.9805); Canon Creek (40.8362, –123.9028); Dry Creek (40.8218, –123.9751); Mad River (40.7007, –123.8642); Maple Creek (40.7928, –123.8742); Unnamed (40.8186, –123.9769).

(4) Eureka Plain Hydrologic Unit 1110—(i) *Eureka Plain Hydrologic Sub-area 111000.* Outlet(s) = Mad River (Lat 40.9560, Long –124.1278); Jacoby Creek (40.8436, –124.0834); Freshwater Creek (40.8088, –124.1442); Elk River (40.7568, –124.1948); Salmon Creek (40.6868, –124.2194) upstream to endpoint(s) in: Bridge Creek (40.6958, –124.0795); Dunlap Gulch (40.7101, –124.1155); Freshwater Creek (40.7389, –123.9944); Gannon Slough (40.8628, –124.0818); Jacoby Creek (40.7944, –124.0093); Little Freshwater Creek (40.7485, –124.0652); North Branch of the North Fork Elk River (40.6878, –124.0131); North Fork Elk River (40.6756, –124.0153); Ryan Creek (40.7835, –124.1198); Salmon Creek (40.6438, –124.1319); South Branch of the North Fork Elk River (40.6691, –124.0244); South Fork Elk River (40.6626, –124.061); South Fork Freshwater Creek (40.7097, –124.0277).

(ii) [Reserved]

(5) Eel River Hydrologic Unit 1111—(i) *Ferndale Hydrologic Sub-area 111111.* Outlet(s) = Eel River (Lat 40.6282, Long –124.2838) upstream to endpoint(s) in: Atwell Creek (40.472, –124.1449); Howe Creek (40.4748, –124.1827); Price Creek (40.5028, –124.2035); Strongs Creek (40.5986, –124.1222); Van Duzen River (40.5337, –124.1262).

(ii) *Scotia Hydrologic Sub-area 111112.* Outlet(s) = Eel River (Lat 40.4918, Long –124.0998) upstream to endpoint(s) in: Bear Creek (40.391, –124.0156); Chadd Creek (40.3921, –123.9542); Jordan Creek (40.4324, –124.0428); Monument Creek (40.4676, –124.1133).

(iii) *Larabee Creek Hydrologic Sub-area 111113.* Outlet(s) = Larabee Creek (40.4090, Long –123.9334) upstream to endpoint(s) in: Carson Creek (40.4189, –123.8881); Larabee Creek (40.3950, –123.8138).

(iv) *Hydesville Hydrologic Sub-area 111121.* Outlet(s) = Van Duzen River (Lat 40.5337, Long –124.1262) upstream to endpoint(s) in: Cummings Creek (40.5258, –123.9896); Fielder Creek (40.5289, –124.0201); Hely Creek (40.5042, –123.9703); Yager Creek (40.5583, –124.0577).

(v) *Yager Creek Hydrologic Sub-area 111123.* Outlet(s) = Yager Creek (Lat 40.5583, Long –124.0577) upstream to endpoint(s) in: Corner Creek (40.6189, –123.9994); Fish Creek (40.6392, –124.0032); Lawrence Creek (40.6394, –123.9935); Middle Fork Yager Creek (40.5799, –123.9015); North Fork Yager Creek (40.6044, –123.9084); Owl Creek (40.5557, –123.9362); Shaw Creek (40.6245, –123.9518); Yager Creek (40.5673, –123.9403).

(vi) *Weott Hydrologic Sub-area 111131.* Outlet(s) = South Fork Eel River (Lat 40.3500, Long –213.9305) upstream to endpoint(s) in: Bridge Creek (40.2929, –123.8569); Bull Creek (40.3148, –124.0343); Canoe Creek (40.2909, –123.922); Cow Creek (40.3583, –123.9626); Cuneo Creek (40.3377, –124.0385); Elk Creek (40.2837, –123.8365); Fish Creek (40.2316, –123.7915); Harper Creek (40.354, –123.9895); Mill Creek (40.3509, –124.0236); Salmon Creek (40.2214, –123.9059); South Fork Salmon River (40.1769, –123.8929); Squaw Creek (40.3401, –123.9997); Tostin Creek (40.1722, –123.8796).

(vii) *Benbow Hydrologic Sub-area 111132.* Outlet(s) = South Fork Eel River (Lat 40.1932, Long –123.7692) upstream to endpoint(s) in: Anderson Creek (39.9337, –123.8933); Bear Pen Creek (39.9125, –123.8108); Bear Wallow Creek (39.7296, –123.7172); Bond Creek (39.7856, –123.6937); Butler Creek (39.7439, –123.692); China Creek (40.1035, –123.9493); Connick Creek (40.0911, –123.8187); Cox Creek (40.0288, –123.8542); Cummings Creek (39.8431, –123.5752); Dean Creek (40.1383, –123.7625); Dinner Creek (40.0915, –123.937); East Branch South Fork Eel River (39.9433, –123.6278); Elk Creek (39.7986, –123.5981); Fish Creek (40.0565, –123.7768); Foster Creek (39.8455, –123.6185); Grapewine Creek (39.7991, –123.5186); Hartsook Creek (40.012, –123.7888); Hollow Tree Creek (39.7316, –123.6918); Huckleberry Creek (39.7315, –123.7253); Indian Creek (39.9464, –123.8993); Jones Creek (39.9977, –123.8378); Leggett Creek (40.1374, –123.8312); Little Sproul Creel (40.0897, –123.8585); Low Gap Creek (39.993, –123.767); McCoy Creek (39.9598, –123.7542); Michael's Creek (39.7642, –123.7175); Miller Creek (40.1215, –123.916); Moody Creek (39.9531, –123.8819); Mud Creek (39.8232, –123.6107); Piercy Creek (39.9706, –123.8189); Pollock Creek (40.0822, –123.9184); Rattlesnake Creek (39.7974, –123.5426); Redwood Creek (39.7721, –123.7651); Redwood Creek (40.0974, –123.9104); Seely Creek (40.1494, –123.8825); Somerville Creek (40.0896, –123.8913); South Fork Redwood Creek (39.7663, –123.7579); Spoul Creek (40.0125, –123.8585); Standley Creek (39.9479, –123.8083); Tom Long Creek (40.0315, –123.6891); Twin Rocks Creek (39.8269, –123.5543); Warden Creek (40.0625, –123.8546); West Fork Sproul Creek (40.0386, –123.9015); Wildcat Creek (39.9049, –123.7739); Wilson Creek (39.841, –123.6452); Unnamed Tributary (40.1136, –123.9359).

(viii) *Laytonville Hydrologic Sub-area 111133.* Outlet(s) = South Fork Eel River (Lat 39.7665, Long –123.6484)) upstream to endpoint(s) in: Bear Creek (39.6413, –123.5797); Cahto Creek (39.6624, –123.5453); Dutch Charlie Creek (39.6892, –123.6818); Grub Creek (39.7777, –123.5809); Jack of Hearts Creek (39.7244, –123.6802); Kenny Creek (39.6733, –123.6082); Mud Creek (39.6561, –123.592); Redwood Creek (39.6738, –123.6631); Rock Creek (39.6931, –123.6204); South Fork Eel River (39.6271, –123.5389); Streeter Creek (39.7328, –123.5542); Ten Mile Creek (39.6651, –123.451).

(ix) *Sequoia Hydrologic Sub-area 111141.* Outlet(s) = Eel River (Lat 40.3557, Long –123.9191); South Fork Eel River (40.3558, –123.9194) upstream to endpoint(s) in: Brock Creek (40.2411, –123.7248); Dobbyn Creek (40.2216, –123.6029); Hoover Creek (40.2312, –123.5792); Line Gulch (40.1655, –123.4831); North Fork Dobbyn Creek (40.2669, –123.5467); South Fork Dobbyn Creek (40.1723, –123.5112); South Fork Eel River (40.35, –123.9305); Unnamed Tributary (40.3137, –123.8333); Unnamed Tributary (40.2715, –123.549).

(x) *Spy Rock Hydrologic Sub-area 111142.* Outlet(s) = Eel River (Lat 40.1736, Long –123.6043) upstream to endpoint(s) in: Bell Springs Creek (39.9399, –123.5144); Burger Creek (39.6943, –123.413); Chamise Creek (40.0563, –123.5479); Jewett Creek (40.1195, –123.6027); Kekawaka Creek (40.0686, –123.4087); Woodman Creek (39.7639, –123.4338).

(xi) *North Fork Eel River Hydrologic Sub-area 111150.* Outlet(s) = North Fork Eel River (Lat 39.9567, Long –123.4375) upstream to endpoint(s) in: North Fork Eel River (39.9370, –123.3758).

(xii) *Outlet Creek Hydrologic Sub-area 111161.* Outlet(s) = Outlet Creek (Lat 39.6263, Long –123.3453) upstream to endpoint(s) in: Baechtel Creek (39.3688, –123.4028); Berry Creek (39.4272, –123.2951); Bloody Run (39.5864, –123.3545); Broaddus Creek (39.3907, –123.4163); Davis Creek (39.3701, –123.3007); Dutch Henry Creek (39.5788, –123.4543); Haehl Creek (39.3795, –123.3393); Long Valley Creek (39.6091, –123.4577); Ryan Creek (39.4803, –123.3642); Upp Creek (39.4276, –123.3578); Upp Creek

(39.4276, –123.3578); Willits Creek (39.4315, –123.3794).

(xiii) *Tomki Creek Hydrologic Sub-area 111162.* Outlet(s) = Eel River (Lat 39.7138, Long –123.3531) upstream to endpoint(s) in: Cave Creek (39.3925, –123.2318); Long Branch Creek (39.4074, –123.1897); Rocktree Creek (39.4533, –123.3079); Salmon Creek (39.4461, –123.2104); Scott Creek (39.456, –123.2297); String Creek (39.4855, –123.2891); Tomki Creek (39.549, –123.3613); Wheelbarrow Creek (39.5029, –123.3287).

(xiv) *Lake Pillsbury Hydrologic Sub-area 111163.* Outlet(s) = Eel River (Lat 39.3860, Long –123.1163) upstream to endpoint(s) in: Eel River (39.4078, –122.958).

(xv) *Eden Valley Hydrologic Sub-area 111171.* Outlet(s) = Middle Fork Eel River (Lat 39.8146, Long –123.1332) upstream to endpoint(s) in: Middle Fork Eel River (39.8145, –123.1333).

(xvi) *Round Valley Hydrologic Sub-area 111172.* Outlet(s) = Mill Creek (Lat 39.7396, Long –123.1420); Williams Creek (39.8145, –123.1333) upstream to endpoint(s) in: Mill Creek (39.8456, –123.2822); Murphy Creek (39.8804, –123.1636); Poor Mans Creek (39.8179, –123.1833); Short Creek (39.8645, –123.2242); Turner Creek (39.7238, –123.2191); Williams Creek (39.8596, –123.1341).

(6) *Cape Mendocino Hydrologic Unit 1112—(i) Capetown Hydrologic Sub-area 111220.* Outlet(s) = Bear River (Lat 40.4744, Long –124.3881) upstream to endpoint(s) in: Bear River (40.3591, –124.0536); South Fork Bear River (40.4271, –124.2873).

(ii) *Mattole River Hydrologic Sub-area 111230.* Outlet(s) = Mattole River (Lat 40.2942, Long –124.3536) upstream to endpoint(s) in: Bear Creek (40.1262, –124.0631); Blue Slide Creek (40.1286, –123.9579); Bridge Creek (40.0503, –123.9885); Conklin Creek (40.3169, –124.229); Dry Creek (40.2389, –124.0621); East Fork Honeydew Creek (40.1633, –124.0916); East Fork of the North Fork Mattole River (40.3489, –124.2244); Eubanks Creek (40.0893, –123.9743); Gilham Creek (40.2162, –124.0309); Grindstone Creek (40.1875, –124.0041); Honeydew Creek (40.1942, –124.1363); Mattole Canyon (40.1833, –123.9666); Mattole River (39.9735, –123.9548); McGinnis Creek (40.3013, –124.2146); McKee Creek (40.0674, –123.9608); Mill Creek (40.0169, –123.9656); North Fork Mattole River (40.3729, –124.2461); North Fork Bear Creek (40.1422, –124.0945); Oil Creek (40.3008, –124.1253); Rattlesnake Creek (40.2919, –124.1051); South Fork Bear Creek (40.0334, –124.0232); Squaw Creek (40.219, –124.1921); Thompson Creek (39.9969, –123.9638); Unnamed (40.1522, –124.0989); Upper North Fork Mattole River (40.2907, –124.1115); Westlund Creek (40.2333, –124.0336); Woods creek (40.2235, –124.1574); Yew Creek (40.0019, –123.9743).

(7) Mendocino Coast Hydrologic Unit 1113—(i) *Wages Creek Hydrologic Sub-area 111312.* Outlet(s) = Wages Creek (Lat 39.6513, Long –123.7851) upstream to endpoint(s) in: Wages Creek (39.6393, –123.7146).

(ii) *Ten Mile River Hydrologic Sub-area 111313.* Outlet(s) = Ten Mile River (Lat 39.5529, Long –123.7658) upstream to endpoint(s) in: Middle Fork Ten Mile River (39.5397, –123.5523); Little North Fork Ten Mile River (39.6188, –123.7258); Ten Mile River (39.5721, –123.7098); South Fork Ten Mile River (39.4927, –123.6067); North Fork Ten Mile River (39.5804, –123.5735).

(iii) Noyo River Hydrologic Sub-area 111320. Outlet(s) = Noyo River (Lat 39.4274, Long –123.8096) upstream to endpoint(s) in: North Fork Noyo River (39.4541, –123.5331); Noyo River (39.431, 123.494); South Fork Noyo River (39.3549, –123.6136).

(iv) *Big River Hydrologic Sub-area 111330.* Outlet(s) = Big River (Lat 39.3030, Long –123.7957) upstream to endpoint(s) in: Big River (39.3095, –123.4454).

(v) *Albion River Hydrologic Sub-area 111340.* Outlet(s) = Albion River (Lat 39.2253, Long –123.7679) upstream to endpoint(s) in: Albion River (39.2644, –123.6072).

(vi) *Garcia River Hydrologic Sub-area 111370.* Outlet(s) = Garcia River (Lat 38.9455, Long –123.7257) upstream to endpoint(s) in: Garcia River (38.9160, –123.4900).

(8) Russian River Hydrologic Unit 1114—(i) *Guerneville Hydrologic Sub-area 111411.* Outlet(s) = Russian River (Lat 38.4507, Long –123.1289) upstream to endpoint(s) in: Austin Creek (38.5099, –123.0681); Mark West Creek (38.4961, –122.8489).

(ii) *Austin Creek Hydrologic Sub-area 111412.* Outlet(s) = Austin Creek (Lat 38.5099, Long –123.0681) upstream to endpoint(s) in: Austin Creek (38.5326, –123.0844).

(iii) *Warm Springs Hydrologic Sub-area 111424.* Outlet(s) = Dry Creek (Lat 38.5861, Long –122.8573) upstream to endpoint(s) in: Dry Creek (38.7179, –123.0075).

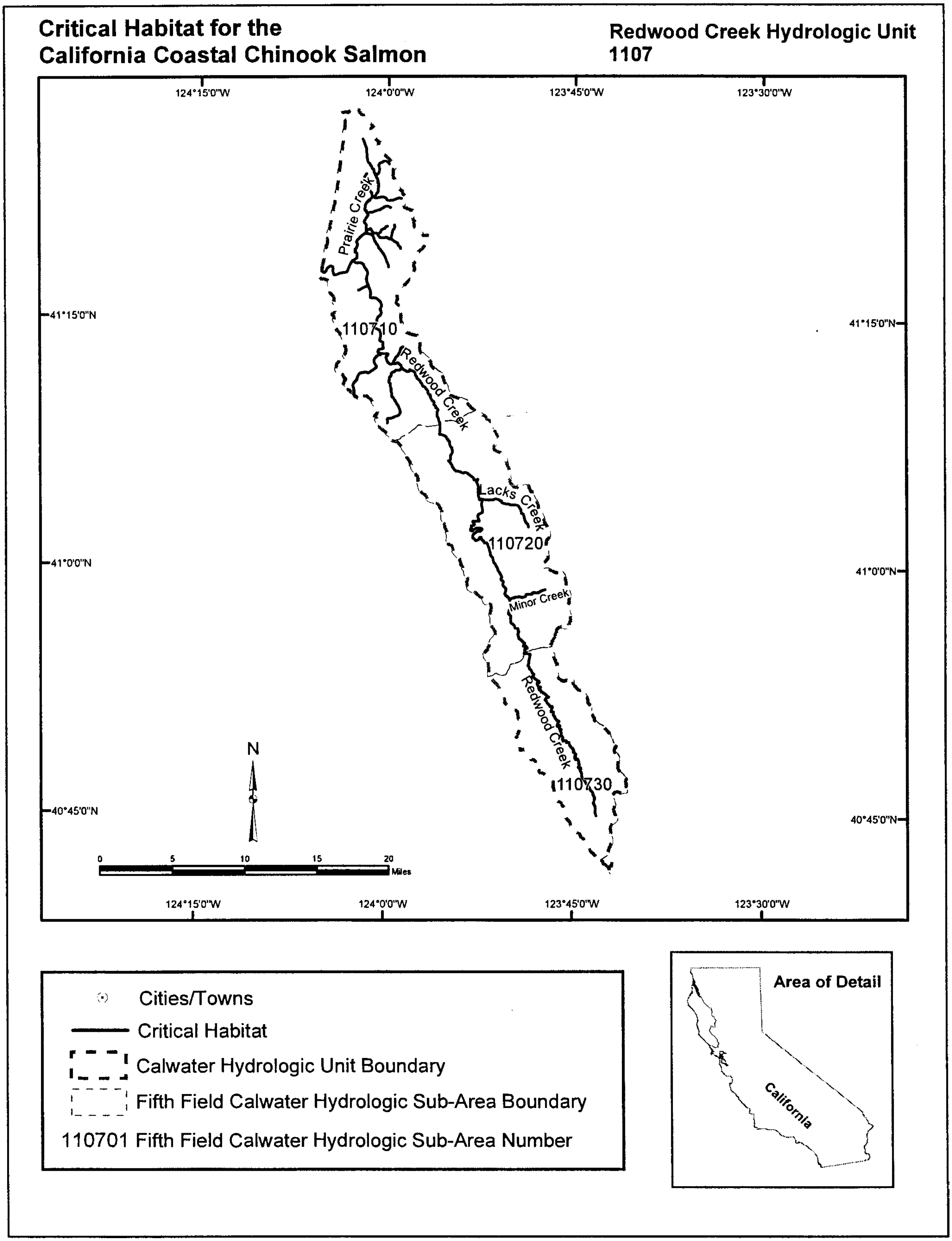
(iv) *Geyserville Hydrologic Sub-area 111425.* Outlet(s) = Russian River (Lat 38.6132, Long –122.8321) upstream.

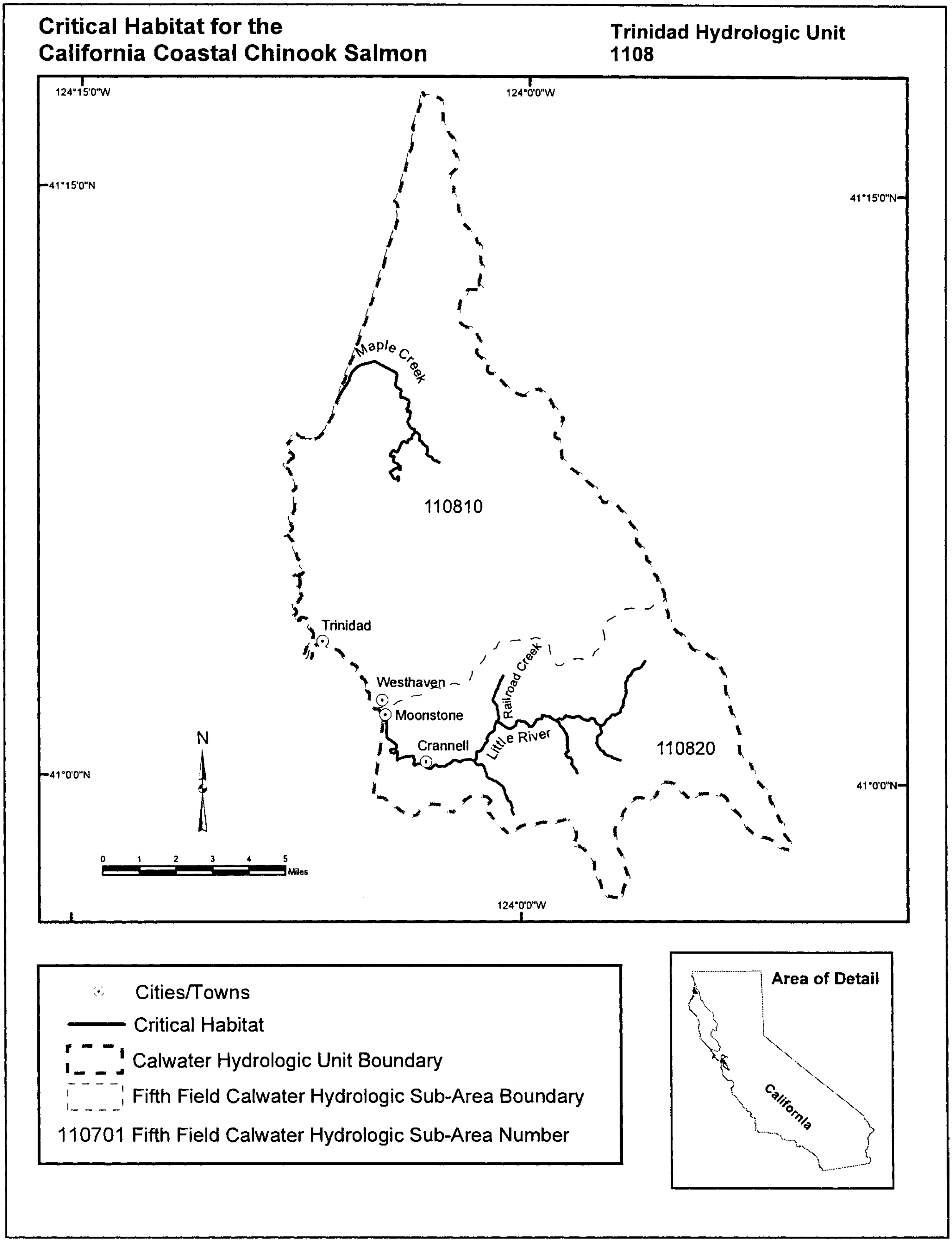
(v) *Ukiah Hydrologic Sub-area 111431.* Outlet(s) = Russian River (Lat 38.8828, Long –123.0557) upstream to endpoint(s) in: Feliz Creek (38.9941, –123.1779).

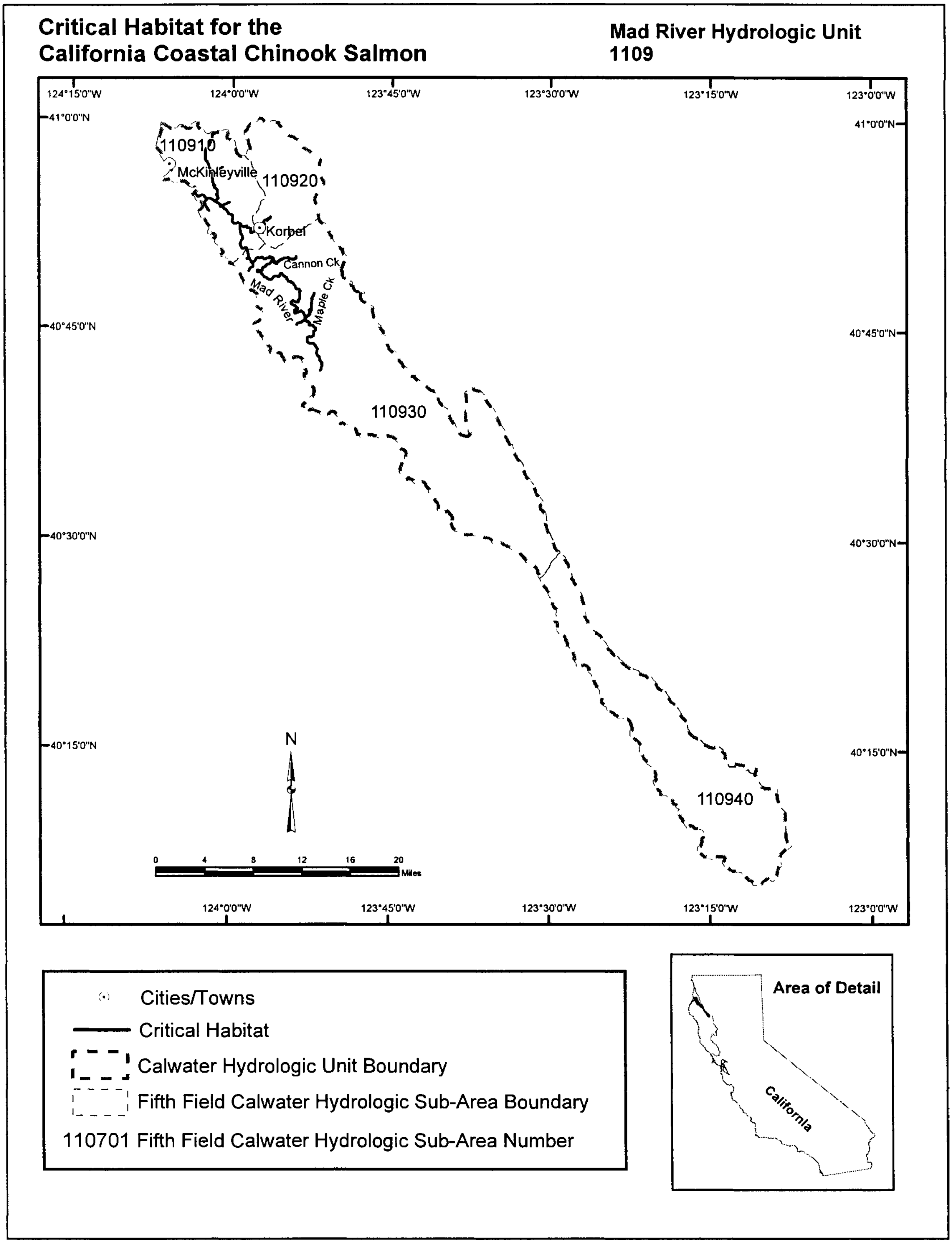
(vi) *Forsythe Creek Hydrologic Sub-area 111433.* Outlet(s) = Russian River (Lat 39.2257, Long –123.2012) upstream to endpoint(s) in: Forsythe Creek (39.2780, –123.2608); Russian River (39.3599, –123.2326).

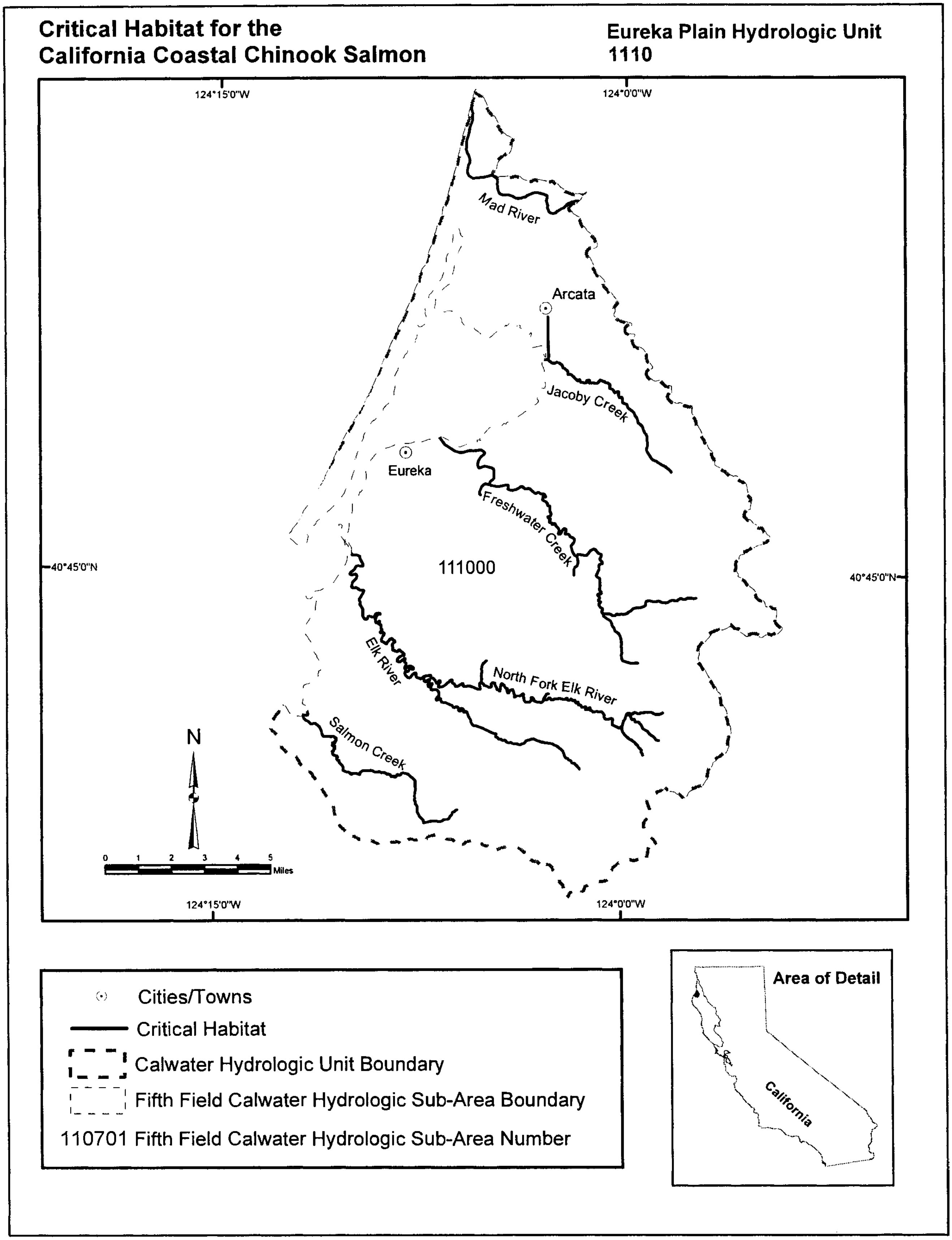
(9) Maps of critical habitat for the California Coast chinook salmon ESU follow:

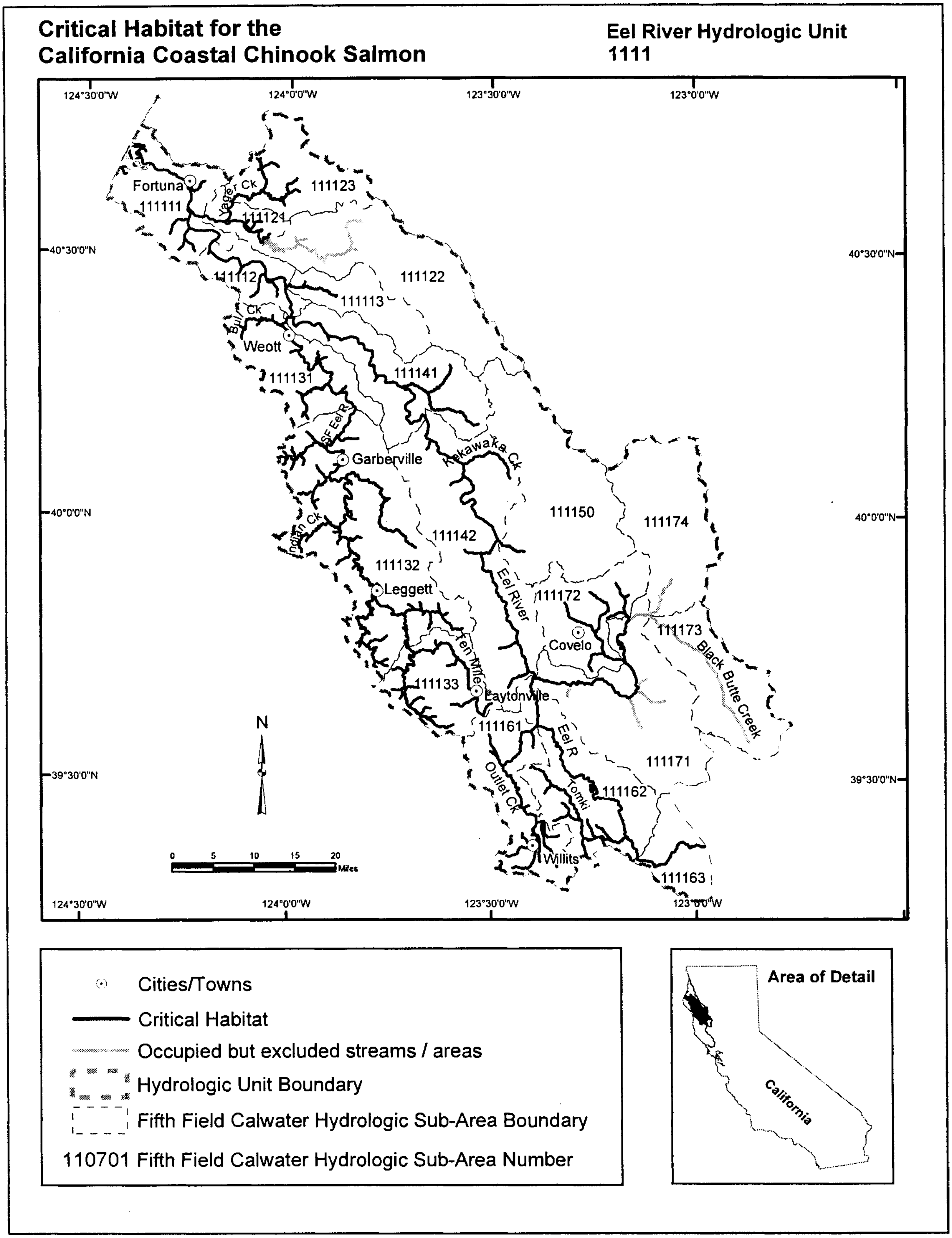
BILLING CODE 3510–22–P


Critical Habitat for the
California Coastal Chinook Salmon
Redwood Creek Hydrologic Unit
1107
124°15'0"W
124°0'0"W
123°45'0"W
123°30'0"W
41°15'0"N
41°0'0"N
40°45'0"N
Prairie Creek
Redwood Creek
Lacks Creek
Minor Creek
110710
110720
110730
N
0
5
10
15
20
Miles
Cities/Towns
Critical Habitat
Calwater Hydrologic Unit Boundary
Fifth Field Calwater Hydrologic Sub-Area Boundary
110701 Fifth Field Calwater Hydrologic Sub-Area Number
Area of Detail
California

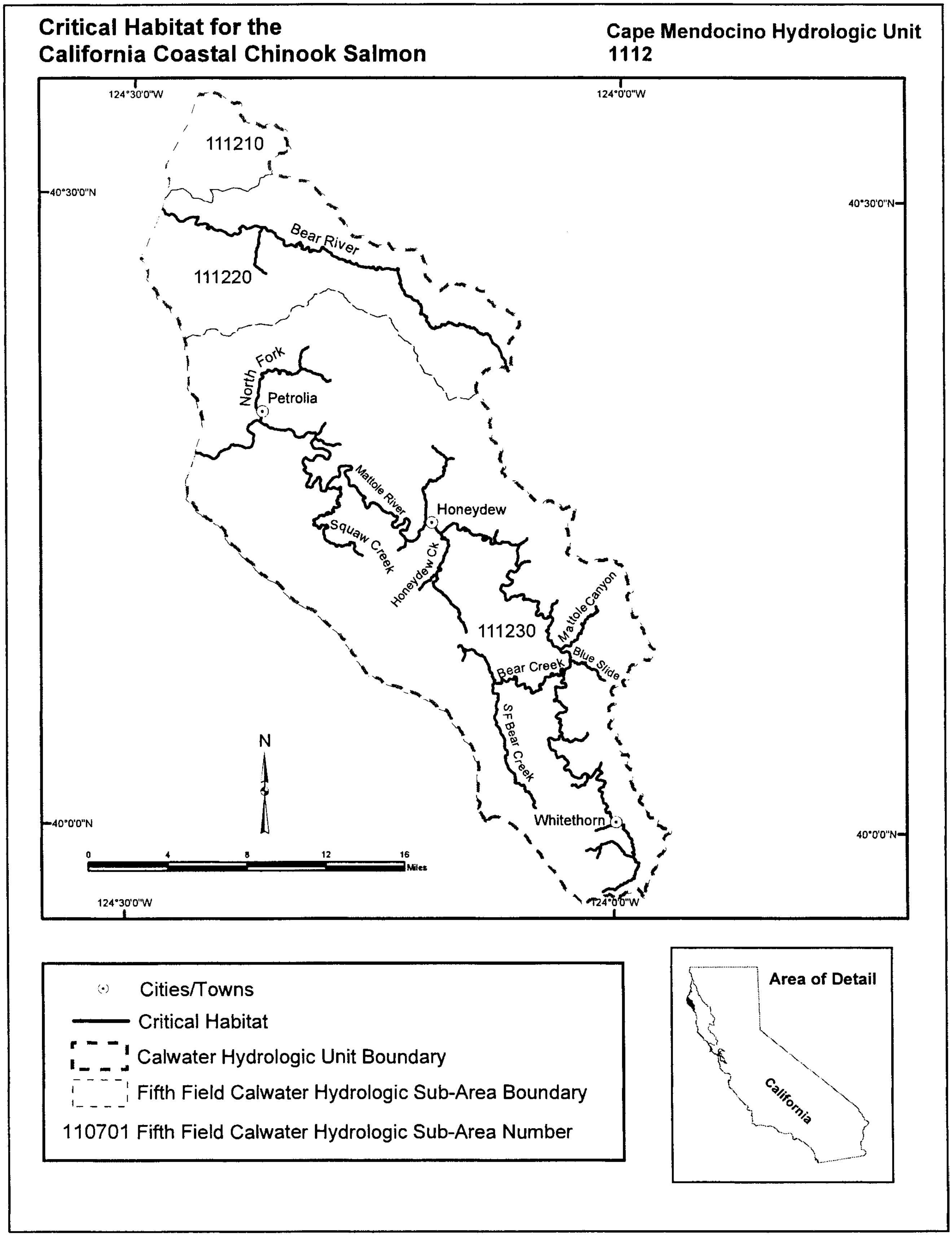

Critical Habitat for the
California Coastal Chinook Salmon
Trinidad Hydrologic Unit
1108
124°15'0"W
124°0'0"W
41°15'0"N
41°0'0"N
Maple Creek
110810
Trinidad
Westhaven
Moonstone
Crannell
Railroad Creek
Little River
110820
N
0 1 2 3 4 5 Miles
Cities/Towns
Critical Habitat
Calwater Hydrologic Unit Boundary
Fifth Field Calwater Hydrologic Sub-Area Boundary
110701 Fifth Field Calwater Hydrologic Sub-Area Number
Area of Detail
California

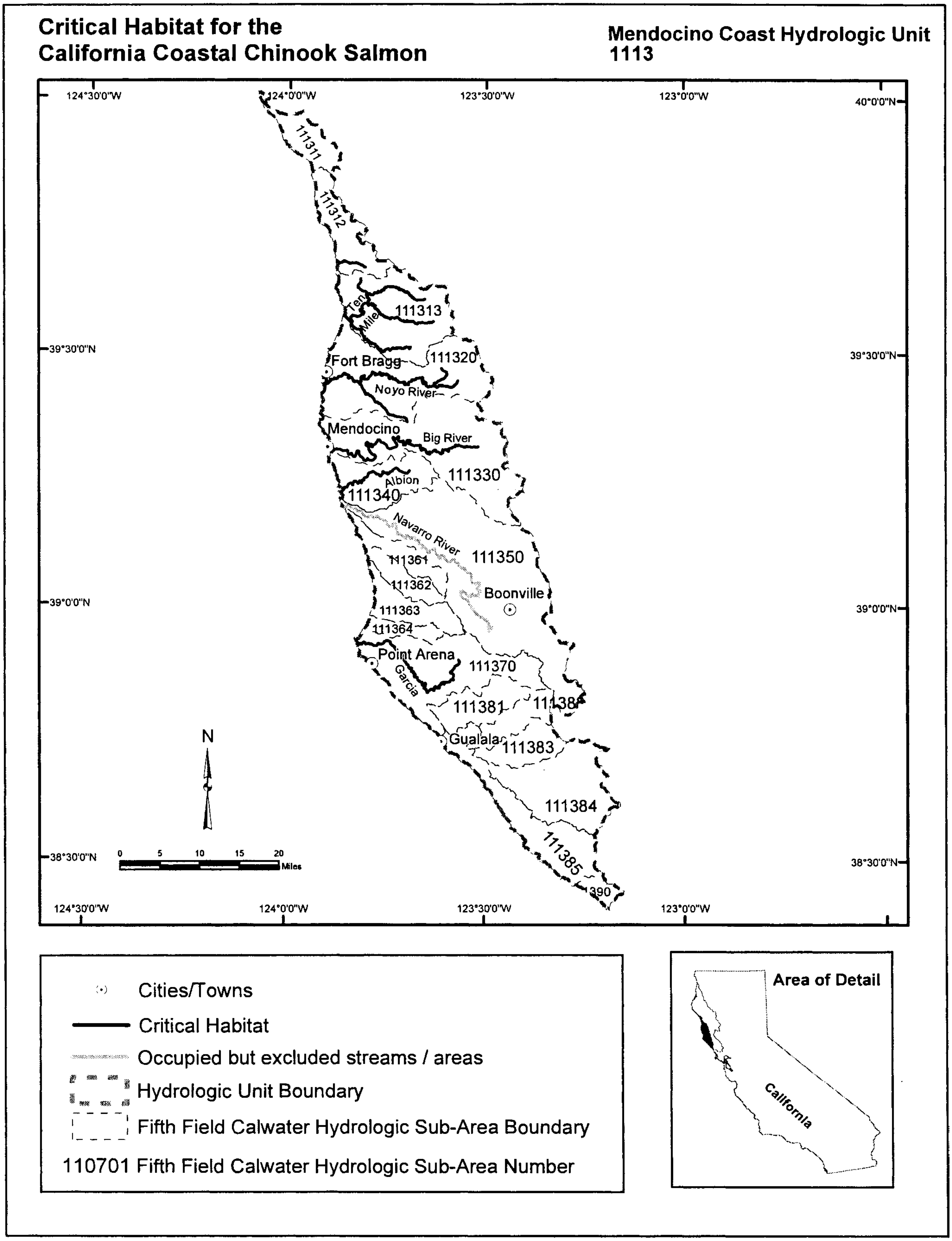

Critical Habitat for the
California Coastal Chinook Salmon
Mad River Hydrologic Unit
1109
124°15'0"W
124°0'0"W
123°45'0"W
123°30'0"W
123°15'0"W
123°0'0"W
41°0'0"N
40°45'0"N
40°30'0"N
40°15'0"N
110910
McKinleyville
110920
Korbel
Cannon Ck
Mad River
Maple Ck
110930
110940
N
0
4
8
12
16
20
Miles
Cities/Towns
Critical Habitat
Calwater Hydrologic Unit Boundary
Fifth Field Calwater Hydrologic Sub-Area Boundary
110701 Fifth Field Calwater Hydrologic Sub-Area Number
Area of Detail
California

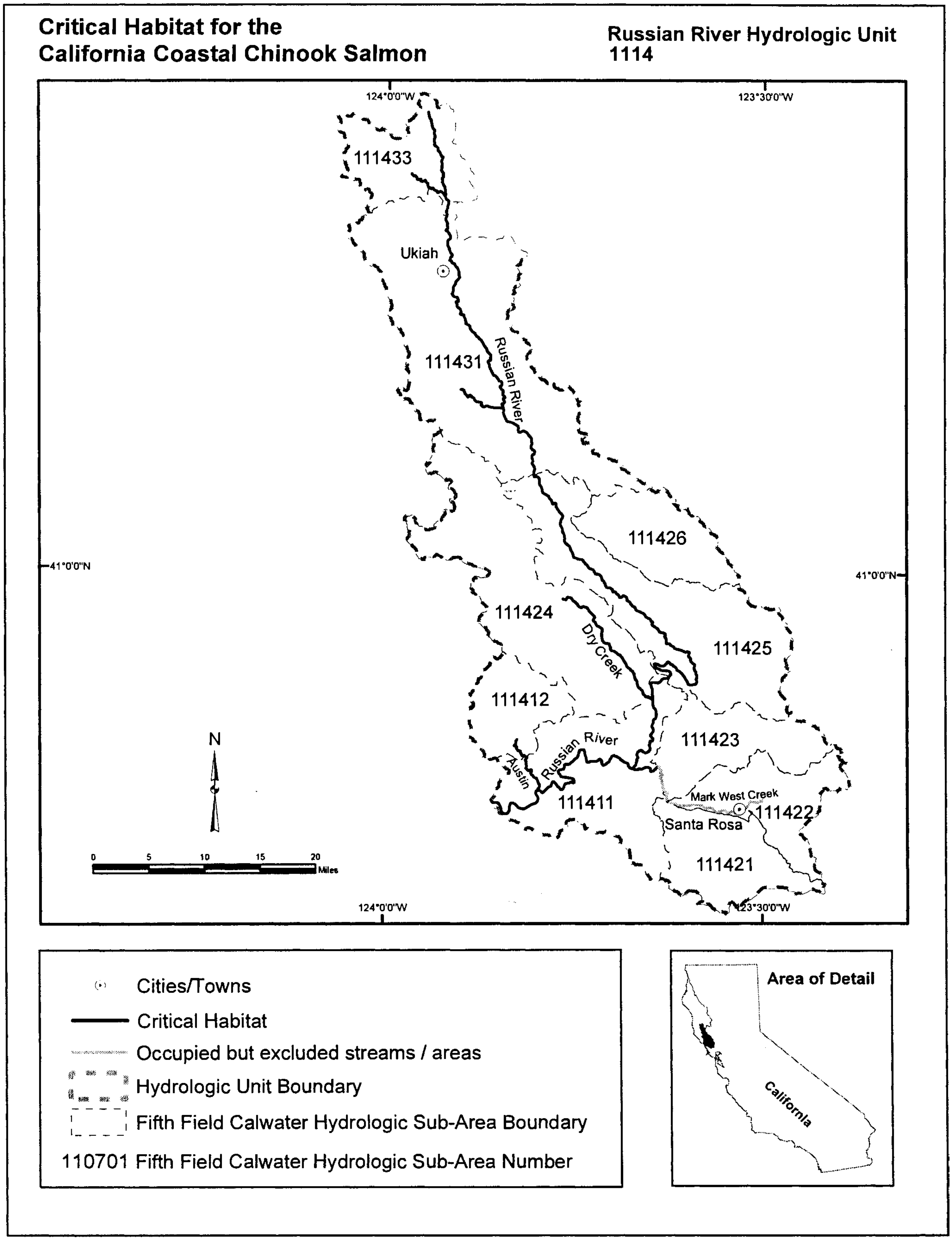

Critical Habitat for the
California Coastal Chinook Salmon
Eureka Plain Hydrologic Unit
1110
124°15'0"W
124°0'0"W
40°45'0"N
Mad River
Arcata
Jacoby Creek
Eureka
Freshwater Creek
111000
Elk River
North Fork Elk River
Salmon Creek
N
0 1 2 3 4 5
Miles
Cities/Towns
Critical Habitat
Calwater Hydrologic Unit Boundary
Fifth Field Calwater Hydrologic Sub-Area Boundary
110701 Fifth Field Calwater Hydrologic Sub-Area Number
Area of Detail
California



Critical Habitat for the
California Coastal Chinook Salmon
Eel River Hydrologic Unit
1111
124°30'0"W
124°0'0"W
123°30'0"W
123°0'0"W
40°30'0"N
40°0'0"N
39°30'0"N
Fortuna
111111
Yager Ck
111121
111123
111112
111122
111113
Bull Ck
Weott
111131
111141
SF Eel R
Garberville
Kekawaka Ck
111150
111174
Indian Ck
111142
111132
Leggett
Eel River
111172
Covelo
111173
Black Butte Creek
Ten Mile
111133
Laytonville
111161
Eel R
111171
Outlet Ck
Tomki
111162
Willits
111163
N
0 5 10 15 20
Miles
Cities/Towns
Critical Habitat
Occupied but excluded streams / areas
Hydrologic Unit Boundary
Fifth Field Calwater Hydrologic Sub-Area Boundary
110701 Fifth Field Calwater Hydrologic Sub-Area Number
Area of Detail
California


Critical Habitat for the
California Coastal Chinook Salmon
Cape Mendocino Hydrologic Unit
1112
124°30'0"W
124°0'0"W
40°30'0"N
40°0'0"N
111210
111220
111230
Bear River
North Fork
Petrolia
Mattole River
Honeydew
Squaw Creek
Honeydew Ck
Mattole Canyon
Blue Slide
Bear Creek
SF Bear Creek
Whitethorn
N
0
4
8
12
16
Miles
Cities/Towns
Critical Habitat
Calwater Hydrologic Unit Boundary
Fifth Field Calwater Hydrologic Sub-Area Boundary
110701 Fifth Field Calwater Hydrologic Sub-Area Number
Area of Detail
California


Critical Habitat for the
California Coastal Chinook Salmon
Mendocino Coast Hydrologic Unit
1113
124°30'0"W
124°0'0"W
123°30'0"W
123°0'0"W
40°0'0"N
39°30'0"N
39°0'0"N
38°30'0"N
111311
111312
Ten Mile
111313
Fort Bragg
111320
Noyo River
Mendocino
Big River
Albion
111330
111340
Navarro River
111350
111361
111362
Boonville
111363
111364
Point Arena
Garcia
111370
111381
111382
Gualala
111383
111384
111385
390
N
0 5 10 15 20
Miles
Cities/Towns
Critical Habitat
Occupied but excluded streams / areas
Hydrologic Unit Boundary
Fifth Field Calwater Hydrologic Sub-Area Boundary
110701 Fifth Field Calwater Hydrologic Sub-Area Number
Area of Detail
California



BILLING CODE 3510–22–C

(g) *Northern California Steelhead (O. mykiss).* Critical habitat is designated to include the areas defined in the following CALWATER Hydrologic units:

(1) Redwood Creek Hydrologic Unit 1107—(i) *Orick Hydrologic Sub-area 110710.* Outlet(s) = Boat Creek (Lat 41.4059, Long –124.0675); Home Creek (41.4027, –124.0683); Redwood Creek (41.2923, –124.0917); Squashan Creek (41.3889, –124.0703) upstream to endpoint(s) in: Boat Creek (41.4110, –124.0583); Bond Creek (41.2326, –124.0262); Boyes Creek (41.3701, –124.9891); Bridge Creek (41.1694, –123.9964); Brown Creek (41.3986, –124.0012); Cloquet Creek (41.2466, –123.9884); Cole Creek (41.2209, –123.9931); Copper Creek (41.1516, –123.9258); Dolason Creek (41.1969, –123.9667); Elam Creek (41.2613, –124.0321); Emerald Creek (41.2164, –123.9808); Forty Four Creek (41.2187, –124.0195); Gans South Creek (41.2678, –124.0071); Godwood Creek (41.3787, –124.0354); Hayes Creek (41.2890, –124.0164); Home Creek (41.3951, –124.0386); Larry Dam Creek (41.3441, –123.9966); Little Lost Man Creek (41.3078, –124.0084); Lost Man Creek (41.3187, –123.9892); May Creek (41.3521, –124.0164); McArthur Creek (41.2702, –124.0427); Miller Creek (41.2305, –124.0046); North Fork Lost Man Creek (41.3405, –123.9859); Oscar Larson Creek (41.2559, –123.9943); Prairie Creek (41.4440, –124.0411); Skunk Cabbage Creek (41.3211, –124.0802); Slide Creek (41.1736, –123.9450); Squashan Creek (41.3739, –124.0440); Streelow Creek (41.3622, –124.0472); Tom McDonald Creek (41.1933, –124.0164); Unnamed Tributary (41.3619, –123.9967); Unnamed Tributary (41.3424, –124.0572).

(ii) *Beaver Hydrologic Sub-area 110720.* Outlet(s) = Redwood Creek (Lat 41.1367, Long –123.9309) upstream to endpoint(s) in: Beaver Creek (41.0208, –123.8608); Captain Creek (40.9199, –123.7944); Cashmere Creek (41.0132, –123.8862); Coyote Creek (41.1251, –123.8926); Devils Creek (41.1224, –123.9384); Garcia Creek (41.0180, –123.8923); Garrett Creek (41.0904, –123.8712); Karen Court Creek (41.0368, –123.8953); Lacks Creek (41.0306, –123.8096); Loin Creek (40.9465, –123.8454); Lupton Creek (40.9058, –123.8286); Mill Creek (41.0045, –123.8525); Minor Creek (40.9706, –123.7899); Molasses Creek (40.9986, –123.8490); Moon Creek (40.9807, –123.8368); Panther Creek (41.0732, –123.9275); Pilchuck Creek (41.9986, –123.8710); Roaring Gulch (41.0319, –123.8674); Santa Fe Creek (40.9368, –123.8397); Sweathouse Creek (40.9332, –123.8131); Toss–Up Creek (40.9845, –123.8656); Unnamed Tributary (41.1270, –123.8967); Wiregrass Creek (40.9652, –123.8553).

(iii) *Lake Prairie Hydrologic Sub-area 110730.* Outlet(s) = Redwood Creek (Lat 40.9070, Long –123.8170) upstream to endpoint(s) in: Bradford Creek (40.7812, –123.7215); Cut–Off Meander (40.8507, –123.7729); Emmy Lou Creek (40.8655, –123.7771); Gunrack Creek (40.8391, –123.7650); High Prairie Creek (40.8191, –123.7723); Jena Creek (40.8742, –123.8065); Lake Prairie Creek (40.7984, –123.7558); Lupton Creek (40.9058, –123.8286); Minon Creek (40.8140, –123.7372); Noisy Creek (40.8613, –123.8044); Pardee Creek (40.7779, –123.7416); Redwood Creek (40.7432, –123.7206); Simion Creek (40.8241, –123.7560); Six Rivers Creek (40.8352, –123.7842); Smokehouse Creek (40.7405, –123.7278); Snowcamp Creek (40.7415, –123.7296); Squirrel Trail Creek (40.8692, –123.7844); Twin Lakes Creek (40.7369, –123.7214); Panther Creek (40.8019, –123.7094); Windy Creek (40.8866, –123.7956).

(2) Trinidad Hydrologic Unit 1108—(i) *Big Lagoon Hydrologic Sub-area 110810.* Outlet(s) = Maple Creek (Lat 41.1555, Long –124.1380); McDonald Creek (41.2521, –124.0919) upstream to endpoint(s) in: Beach Creek (41.0716, –124.0239); Clear Creek (41.1031, –124.0030); Diamond Creek (41.1571, –124.0926); Maple Creek (41.0836, –123.9790); McDonald Creek (41.1850, –124.0773); M-Line Creek (41.0752, –124.0787); North Fork Maple Creek (41.1254, –124.0539); North Fork McDonald Creek (41.2107, –124.0664); Pitcher Creek (41.1518, –124.0874); South Fork Maple Creek (41.1003, –124.1119); Tom Creek (41.1773, –124.0966); Unnamed Tributary (41.1004, –124.0155); Unnamed Tributary (41.0780, –124.0676); Unnamed Tributary (41.1168, –124.0886); Unnamed Tributary (41.0864, –124.0899); Unnamed Tributary (41.1132, –124.0827); Unnamed Tributary (41.0749, –124.0889); Unnamed Tributary (41.1052, –124.0675); Unnamed Tributary (41.0714, –124.0611); Unnamed Tributary (41.0948, –124.0016).

(ii) *Little River Hydrologic Sub-area 110820.* Outlet(s) = Little River (Lat 41.0277, Long –124.1112) upstream to endpoint(s) in: Freeman Creek (41.0242, –124.0582); Little River (40.9999, –123.9232); Lower South Fork Little River (41.0077, –124.0079); Railroad Creek (41.0468, –124.0466); South Fork Little River (40.9899, –124.0394); Unnamed Tributary (41.0356, –123.9958); Unnamed Tributary (41.0407, –124.0598); Unnamed Tributary (41.0068, –123.9830); Unnamed Tributary (41.0402, –124.0111); Unnamed Tributary (41.0402, –124.0189); Unnamed Tributary (41.0303, –124.0366); Unnamed Tributary (41.0575, –123.9710); Unnamed Tributary (41.0068, –123.9830); Upper South Fork Little River (41.0146, –123.9826).

(3) Mad River Hydrologic Unit 1109—(i) *Blue Lake Hydrologic Sub-area 110910.* Outlet(s) = Mad River (Lat 40.9139, Long –124.0642); Strawberry Creek (40.9964, –124.1155); Widow White Creek (40.9635, –124.1253) upstream to endpoint(s) in: Boundary Creek (40.8395, –123.9920); Grassy Creek (40.9314, –124.0188); Hall Creek (40.9162, –124.0141); Kelly Creek (40.8656, –124.0260); Leggit Creek (40.8808, –124.0269); Lindsay Creek (40.9838, –124.0283); Mather Creek (40.9796, –124.0526); Mill Creek (40.9296, –124.1037); Mill Creek (40.9162, –124.0141); Mill Creek (40.8521, –123.9617); North Fork Mad River (40.8687, –123.9649); Norton Creek (40.9572, –124.1003); Palmer Creek (40.8633, –124.0193); Puter Creek (40.8474, –123.9966); Quarry Creek (40.8526, –124.0098); Squaw Creek (40.9426, –124.0202); Strawberry Creek (40.9761, –124.0630); Unnamed Tributary (40.9624, –124.0179); Unnamed Tributary (40.9549, –124.0554); Unnamed Tributary (40.9672, –124.0218); Warren Creek (40.8860, –124.0351); Widow White Creek (40.9522, –124.0784).

(ii) *North Fork Mad River Hydrologic Sub-area 110920.* Outlet(s) = North Fork Mad River (Lat 40.8687, Long –123.9649) upstream to endpoint(s) in: Bald Mountain Creek (40.8922, –123.9097); Canyon Creek (40.9598, –123.9269); Denman Creek (40.9293, –123.9429); East Fork North Fork (40.9702, –123.9449); Gosinta Creek (40.9169, –123.9420); Hutchery Creek (40.8730, –123.9503); Jackson Creek (40.9388, –123.9462); Krueger Creek (40.9487, –123.9571); Long Prairie Creek (40.9294, –123.8842); Mule Creek (40.9416, –123.9309); North Fork Mad River (40.9918, –123.9610); Pine Creek (40.9274, –123.9096); Pollock Creek (40.9081, –123.9071); Sullivan Gulch (40.8646, –123.9553); Tyson Creek (40.9559, –123.9738); Unnamed Tributary (40.9645, –123.9338); Unnamed Tributary (40.9879, –123.9511); Unnamed Tributary (40.9906, –123.9540); Unnamed Tributary (40.9866, –123.9788); Unnamed Tributary (40.9927, –123.9736).

(iii) *Butler Valley Hydrologic Sub-area 110930.* Outlet(s) = Mad River (Lat 40.8449, Long –123.9807) upstream to endpoint(s) in: Bear Creek (40.5468, –123.6728); Black Creek (40.7521, –123.9080); Black Dog Creek (40.8334, –123.9805); Blue Slide Creek (40.7333, –123.9225); Boulder Creek (40.7634, –123.8667); Bug Creek (40.6587, –123.7356); Cannon Creek (40.8535, –123.8850); Coyote Creek (40.6147, –123.6488); Devil Creek (40.8032, –123.9175); Dry Creek (40.8218, –123.9751); East Creek (40.5403, –123.5579); Maple Creek (40.7933, –123.8353); Pilot Creek (40.5950, –123.5888); Simpson Creek (40.8138, –123.9156); Unnamed Tributary (40.7306, –123.9019); Unnamed Tributary (40.7739, –123.9255); Unnamed Tributary (40.7744, –123.9137); Unnamed Tributary (40.8029, –123.8716); Unnamed Tributary (40.8038, –123.8691); Unnamed Tributary (40.8363, –123.9025).

(4) Eureka Plain Hydrologic Unit 1110—(i) *Eureka Plain Hydrologic Sub-area 111000.*

Outlet(s) = Elk River (Lat 40.7568, Long –124.1948); Freshwater Creek (40.8088, –124.1442); Jacoby Creek (40.8436, –124.0834); Mad River (40.9560, –124.1278); Rocky Gulch (40.8309, –124.0813); Salmon Creek (40.6868, –124.2194); Washington Gulch (40.8317, –124.0805) upstream to endpoint(s) in: Bridge Creek (40.6958, –124.0805); Browns Gulch (40.7038, –124.1074); Clapp Gulch (40.6967, –124.1684); Cloney Gulch (40.7826, –124.0347); Doe Creek (40.6964, –124.0201); Dunlap Gulch (40.7076, –124.1182); Falls Gulch (40.7655, –124.0261); Fay Slough (40.8033, –124.0574); Freshwater Creek (40.7385, –124.0035); Golf Course Creek (40.8406, –124.0402); Graham Gulch (40.7540, –124.0228); Guptil Gulch (40.7530, –124.1202); Henderson Gulch (40.7357, –124.1394); Jacoby Creek (40.7949, –124.0096); Lake Creek (40.6848, –124.0831); Line Creek (40.6578, –124.0460); Little Freshwater Creek (40.7371, –124.0649); Little North Fork Elk River (40.6972, –124.0100); Little South Fork Elk River (40.6555, –124.0877); Martin Slough (40.7679, –124.1578); McCready Gulch (40.7824, –124.0441); McWinney Creek (40.6968, –124.0616); Morrison Gulch (40.8169, –124.0430); North Branch of the North Fork Elk River (40.6879, –124.0130); North Fork Elk River (40.6794–123.9834); Railroad Gulch (40.6955, –124.1545); Rocky Gulch (40.8170, –124.0613); Ryan Creek (40.7352, –124.0996); Salmon Creek (40.6399, –124.1128); South Branch of the North Fork Elk River (40.6700, –124.0251); South Fork Elk River (40.6437, –124.0388); South Fork Freshwater Creek (40.7110, –124.0367); Swain Slough (40.7524, –124.1825); Tom Gulch (40.6794, –124.1452); Unnamed Tributary (40.7850, –124.0561); Unnamed Tributary (40.7496, –124.1651); Unnamed Tributary (40.7785,—124.1081); Unnamed Tributary (40.7667, –124.1054); Unnamed Tributary (40.7559, –124.0870); Unnamed Tributary (40.7952, –124.0568); Unnamed Tributary (40.7408, –124.1118); Unnamed Tributary (40.7186, –124.1385); Unnamed Tributary (40.7224, –124.1038); Unnamed Tributary (40.8210, –124.0111); Unnamed Tributary (40.8106, –124.0083); Unnamed Tributary (40.7554, –124.1379); Unnamed Tributary (40.7457, –124.1138); Washington Gulch (40.8205, –124.0549).

(ii) [Reserved]

(5) Eel River Hydrologic Unit 1111—(i) *Ferndale Hydrologic Sub-area 111111.* Outlet(s) = Eel River (Lat 40.6275, Long –124.2520) upstream to endpoint(s) in: Atwell Creek (40.4824, –124.1498); Dean Creek (40.4847, –124.1217); Horse Creek (40.5198, –124.1702); Howe Creek (40.4654, –124.1916); Nanning Creek (40.4914, –124.0652); North Fork Strongs Creek (40.6077, –124.1047); Price Creek (40.5101, –124.2731); Rohner Creek (40.6151, –124.1408); Strongs Creek (40.5999, –124.0985); Sweet Creek (40.4900, –124.2007); Van Duzen River (40.5337, –124.1262).

(ii) *Scotia Hydrologic Sub-area 111112.* Outlet(s) = Eel River (Lat 40.4918, Long –124.0988) upstream to endpoint(s) in: Bear Creek (40.3942, –124.0262); Bridge Creek (40.4278, –123.9317); Chadd Creek (40.3919, –123.9540); Darnell Creek (40.4533, –123.9808); Dinner Creek (40.4406, –124.0855); Greenlow Creek (40.4315, –124.0231); Jordan Creek (40.4171, –124.0517); Kiler Creek (40.4465, –124.0952); Monument Creek (40.4371, –124.1165); Shively Creek (40.4454, –123.9539); South Fork Bear Creek (40.3856, –124.0182); Stitz Creek (40.4649, –124.0531); Twin Creek (40.4419, –124.0714); Unnamed Tributary (40.3933, –123.9984); Weber Creek (40.3767, –123.9094).

(iii) *Larabee Creek Hydrologic Sub-area 111113.* Outlet(s) = Larabee Creek (Lat 40.4090, Long –123.9334) upstream to endpoint(s) in: Arnold Creek (40.4006, –123.8583); Balcom Creek (40.4030, –123.8986); Bosworth Creek (40.3584, –123.7089); Boulder Flat Creek (40.3530, –123.6381); Burr Creek (40.4250, –123.7767); Carson Creek (40.4181, –123.8879); Chris Creek (40.4146, –123.9235); Cooper Creek (40.3123, –123.6463); Dauphiny Creek (40.4049, –123.8893); Frost Creek (40.3765, –123.7357); Hayfield Creek (40.3350, –123.6535); Knack Creek (40.3788, –123.7385); Larabee Creek (40.2807, –123.6445); Martin Creek (40.3730, –123.7060); Maxwell Creek (40.3959, –123.8049); McMahon Creek (40.3269, –123.6363); Mill Creek (40.3849, –123.7440); Mountain Creek (40.2955, –123.6378); Scott Creek (40.4020, –123.8738); Smith Creek (40.4194, –123.8568); Thurman Creek (40.3506, –123.6669); Unnamed Tributary (40.3842, –123.8062); Unnamed Tributary (40.3982, –123.7862); Unnamed Tributary (40.3806, –123.7564); Unnamed Tributary (40.3661, –123.7398); Unnamed Tributary (40.3524, –123.7330).

(iv) *Hydesville Hydrologic Sub-area 111121.* Outlet(s) = Van Duzen River (Lat 40.5337, Long –124.1262) upstream to endpoint(s) in: Cuddeback Creek (40.5421, –124.0263); Cummings Creek (40.5282, –123.9770); Fiedler Creek (40.5351, –124.0106); Hely Creek (40.5165, –123.9531); Yager Creek (40.5583, –124.0577); Unnamed Tributary (40.5718, –124.0946).

(v) *Bridgeville Hydrologic Sub-area 111122.* Outlet(s) = Van Duzen River (Lat 40.4942, Long –123.9720) upstream to endpoint(s) in: Bear Creek (40.3455, –123.5763); Blanket Creek (40.3635, –123.5710); Browns Creek (40.4958, –123.8103); Butte Creek (40.4119, –123.7047); Dairy Creek (40.4174, –123.5981); Fish Creek (40.4525, –123.8434); Grizzly Creek (40.5193, –123.8470); Little Larabee Creek (40.4708, –123.7395); Little Van Duzen River (40.3021, –123.5540); North Fork Van Duzen (40.4881, –123.6411); Panther Creek (40.3921, –123.5866); Root Creek (40.4490, –123.9018); Stevens Creek (40.5062, –123.9073); Thompson Creek (40.4222, –123.6084); Van Duzen River (40.4820, –123.6629); Unnamed Tributary (40.3074, –123.5834).

(vi) *Yager Creek Hydrologic Sub-area 111123.* Outlet(s) = Yager Creek (Lat 40.5583, Long –124.0577) upstream to endpoint(s) in: Bell Creek (40.6809, –123.9685); Blanten Creek (40.5839, –124.0165); Booths Run (40.6584, –123.9428); Corner Creek (40.6179, –124.0010); Fish Creek (40.6390, –124.0024); Lawrence Creek (40.6986, –123.9314); Middle Fork Yager Creek (40.5782, –123.9243); North Fork Yager Creek (40.6056, –123.9080); Shaw Creek (40.6231, –123.9509); South Fork Yager Creek (40.5451, –123.9409); Unnamed

Tributary (40.5892, –123.9663); Yager Creek (40.5673, –123.9403).

(vii) *Weott Hydrologic Sub-area 111131.* Outlet(s) = South Fork Eel River (Lat 40.3500, Long –123.9305) upstream to endpoint(s) in: Albee Creek (40.3592, –124.0088); Bull Creek (40.3587, –123.9624); Burns Creek (40.3194, –124.0420); Butte Creek (40.1982, –123.8387); Canoe Creek (40.2669, –123.9556); Coon Creek (40.2702, –123.9013); Cow Creek (40.2664, –123.9838); Cuneo Creek (40.3401, –124.0494); Decker Creek (40.3312, –123.9501); Elk Creek (40.2609, –123.7957); Fish Creek (40.2459, –123.7729); Harper Creek (40.3591, –123.9930); Mill Creek (40.3568, –124.0333); Mowry Creek (40.2937, –123.8895); North Fork Cuneo Creek (40.3443, –124.0488); Ohman Creek (40.1924, –123.7648); Panther Creek (40.2775, –124.0289); Preacher Gulch (40.2944, –124.0047); Salmon Creek (40.2145, –123.8926); Slide Creek (40.3011, –124.0390); South Fork Salmon Creek (40.1769, –123.8929); Squaw Creek (40.3167, –123.9988); Unnamed Tributary (40.3065, –124.0074); Unnamed Tributary (40.2831, –124.0359).

(viii) *Benbow Hydrologic Sub-area 111132.* Outlet(s) = South Fork Eel River (Lat 40.1929, Long –123.7692) upstream to endpoint(s) in: Anderson Creek (39.9325, –123.8928); Bear Creek (39.7885, –123.7620); Bear Pen Creek (39.9201, –123.7986); Bear Wallow Creek (39.7270, –123.7140); Big Dan Creek (39.8430, –123.6992); Bond Creek (39.7778, –123.7060); Bridges Creek (39.9087, –123.7142); Buck Mountain Creek (40.0944, –123.7423); Butler Creek (39.7423, –123.6987); Cedar Creek (39.8834, –123.6216); China Creek (40.1035, –123.9493); Connick Creek (40.0912, –123.8154); Cox Creek (40.0310, –123.8398); Cruso Cabin Creek (39.9281, –123.5842); Durphy Creek (40.0205, –123.8271); East Branch South Fork Eel River (39.9359, –123.6204); Elkhorn Creek (39.9272, –123.6279); Fish Creek (40.0390, –123.7630); Hartsook Creek (40.0081, –123.8113); Hollow Tree Creek (39.7250, –123.6924); Huckleberry Creek (39.7292, –123.7275); Indian Creek (39.9556, –123.9172); Islam John Creek (39.8062, –123.7363); Jones Creek (39.9958, –123.8374); Leggett Creek (40.1470, –123.8375); Little Sproul Creek (40.0890, –123.8577); Lost Man Creek (39.7983, –123.7287); Low Gap Creek (39.8029, –123.6803); Low Gap Creek (39.9933, –123.7601); McCoy Creek (39.9572, –123.7369); Michael's Creek (39.7665, –123.7035); Middle Creek (39.8052, –123.7691); Milk Ranch Creek (40.0102, –123.7514); Mill Creek (39.8673, –123.7605); Miller Creek (40.1319, –123.9302); Moody Creek (39.9471, –123.8827); Mule Creek (39.8169, –123.7745); North Fork Cedar Creek (39.8864, –123.6363); North Fork McCoy Creek (39.9723, –123.7496); Piercy Creek (39.9597, –123.8442); Pollock Creek (40.0802, –123.9341); Red Mountain Creek (39.9363, –123.7203); Redwood Creek (39.7723, –123.7648); Redwood Creek (40.0974, –123.9104); Rock Creek (39.8962, –123.7065); Sebbas Creek (39.9934, –123.8903); Somerville Creek (40.1006, –123.8884); South Fork Mule Creek (39.8174, –123.7788); South Fork Redwood Creek (39.7662, –123.7579); Sproul Creek (40.0226, –123.8649); Squaw Creek (40.0760, –123.7257); Standly Creek (39.9327, –123.8309); Tom Long Creek (40.0175, –123.6551); Waldron Creek (39.7469, –123.7465); Walter's Creek (39.7921, –123.7250); Warden Creek (40.0629, –123.8551); West Fork Sproul Creek (40.0587, –123.9170); Wildcat Creek (39.8956, –123.7820); Unnamed Tributary (39.9927, –123.8807).

(ix) *Laytonville Hydrologic Sub-area 111133.* Outlet(s) = South Fork Eel River (Lat 39.7665, Long –123.6484) upstream to endpoint(s) in: Bear Creek (39.6418, –123.5853); Big Rick Creek (39.7117, –123.5512); Cahto Creek (39.6527, –123.5579); Dark Canyon Creek (39.7333, –123.6614); Dutch Charlie Creek (39.6843, –123.7023); Elder Creek (39.7234, –123.6192); Fox Creek (39.7441, –123.6142); Grub Creek (39.7777, –123.5809); Jack of Hearts Creek (39.7136, –123.6896); Kenny Creek (39.6838, –123.5929); Little Case Creek (39.6892, –123.5441); Mill Creek (39.6839, –123.5118); Mud Creek (39.6713, –123.5741); Mud Springs Creek (39.6929, –123.5629); Redwood Creek (39.6545, –123.6753); Rock Creek (39.6922, –123.6090); Section Four Creek (39.6137, –123.5297); South Fork Eel River (39.6242, –123.5468); Streeter Creek (39.7340, –123.5606); Ten Mile Creek (39.6652, –123.4486); Unnamed Tributary (39.7004, –123.5678).

(x) *Sequoia Hydrologic Sub-area 111141.* Outlet(s) = Eel River (Lat 40.3557, Long –123.9191) upstream to endpoint(s) in: Beatty Creek (40.3198, –123.7500); Brock Creek (40.2410, –123.7246); Cameron Creek (40.3313, –123.7707); Dobbyn Creek (40.2216, –123.6029); Kapple Creek (40.3531, –123.8585); Line Gulch Creek (40.1640, –123.4783); Mud Creek (40.2078, –123.5143); North Fork Dobbyn Creek (40.2669, –123.5467); Sonoma Creek (40.2974, –123.7953); South Fork Dobbyn Creek (40.1723, –123.5112); South Fork Eel River (40.3500, –123.9305); South Fork Thompson Creek (40.3447, –123.8334); Thompson Creek (40.3552, –123.8417); Unnamed Tributary (40.2745, –123.5487).

(xi) *Spy Rock Hydrologic Sub-area 111142.* Outlet(s) = Eel River (Lat 40.1736, Long –123.6043) upstream to endpoint(s) in: Bear Pen Canyon (39.6943, –123.4359); Bell Springs Creek (39.9457, –123.5313); Blue Rock Creek (39.8937, –123.5018); Burger Creek (39.6693, –123.4034); Chamise Creek (40.0035, –123.5945); Gill Creek (39.7879, –123.3465); Iron Creek (39.7993, –123.4747); Jewett Creek (40.1122, –123.6171); Kekawaka Creek (40.0686, –123.4087); Rock Creek (39.9347, –123.5187); Shell Rock Creek (39.8414, –123.4614); Unnamed Tributary (39.7579, –123.4709); White Rock Creek (39.7646, –123.4684); Woodman Creek (39.7612, –123.4364).

(xii) *Outlet Creek Hydrologic Sub-area 111161.* Outlet(s) = Outlet Creek (Lat 39.6265, Long –123.3449) upstream to endpoint(s) in: Baechtel Creek (39.3623, –123.4143); Berry Creek (39.4271, –123.2777); Bloody Run Creek (39.5864, –123.3545); Broaddus Creek (39.3869, –123.4282); Cherry Creek (39.6043, –123.4073); Conklin Creek (39.3756, –123.2570); Davis Creek (39.3354, –123.2945); Haehl Creek (39.3735, –123.3172); Long Valley Creek (39.6246, –123.4651); Mill Creek (39.4196, –123.3919); Outlet Creek (39.4526, –123.3338); Ryan Creek (39.4804, –123.3644); Unnamed Tributary (39.4956, –123.3591); Unnamed Tributary (39.4322, –123.3848); Unnamed Tributary (39.5793, –123.4546); Unnamed Tributary (39.3703, –123.3419); Upp Creek (39.4479, –123.3825); Willts Creek (39.4686, –123.4299).

(xiii) *Tomki Creek Hydrologic Sub-area 111162.* Outlet(s) = Eel River (Lat 39.7138, Long –123.3532) upstream to endpoint(s) in: Cave Creek (39.3842, –123.2148); Dean Creek (39.6924, –123.3727); Garcia Creek (39.5153, –123.1512); Little Cave Creek (39.3915, –123.2462); Little Creek (39.4146, –123.2595); Long Branch Creek (39.4074, –123.1897); Rocktree Creek (39.4534, –123.3053); Salmon Creek (39.4367, –123.1939); Scott Creek (39.4492, –123.2286); String Creek (39.4658, –123.3206); Tarter Creek (39.4715, –123.2976); Thomas Creek (39.4768, –123.1230); Tomki Creek (39.5483, –123.3687); Whitney Creek (39.4399, –123.1084); Wheelbarrow Creek (39.5012, –123.3304).

(xiv) *Eden Valley Hydrologic Sub-area 111171.* Outlet(s) = Middle Fork Eel River (Lat 39.7138, Long –123.3532) upstream to endpoint(s) in: Crocker Creek (39.5559, –123.0409); Eden Creek (39.5992, –123.1746); Elk Creek (39.5371, –123.0101); Hayshed Creek

(39.7082, –123.0967); Salt Creek (39.6765, –123.2740); Sportsmans Creek (39.5373, –123.0247); Sulper Springs (39.5536, –123.0365); Thatcher Creek (39.6686, –123.0639).

(xv) *Round Valley Hydrologic Sub-area 111172.* Outlet(s) = Mill Creek (Lat 39.7396, Long –123.1420); Williams Creek (39.8145, –123.1333) upstream to endpoint(s) in: Cold Creek (39.8714, –123.2991); Grist Creek (39.7640, –123.2883); Mill Creek (39.8481, –123.2896); Murphy Creek (39.8885, –123.1612); Short Creek (39.8703, –123.2352); Town Creek (39.7991, –123.2889); Turner Creek (39.7218, –123.2175); Williams Creek (39.8903, –123.1212); Unnamed Tributary (39.7428, –123.2757); Unnamed Tributary (39.7493, –123.2584).

(xvi) *Black Butte River Hydrologic Sub-area 111173.* Outlet(s) = Black Butte River (Lat 39.8239, Long –123.0880) upstream to endpoint(s) in: Black Butte River (39.5946, –122.8579); Buckhorn Creek (39.6563, –122.9225); Cold Creek (39.6960, –122.9063); Estell Creek (39.5966, –122.8224); Spanish Creek (39.6287, –122.8331).

(xvii) *Wilderness Hydrologic Sub-area 111174.* Outlet(s) = Middle Fork Eel River (Lat 39.8240, Long –123.0877) upstream to endpoint(s) in: Beaver Creek (39.9352, –122.9943); Fossil Creek (39.9447, –123.0403); Middle Fork Eel River (40.0780, –123.0442); North Fork Middle Fork Eel River (40.0727, –123.1364); Palm of Gileade Creek (40.0229, –123.0647); Pothole Creek (39.9347, –123.0440).

(6) Cape Mendocino Hydrologic Unit 1112—(i) *Oil Creek Hydrologic Sub-area 111210.* Outlet(s) = Guthrie Creek (Lat 40.5407, Long –124.3626); Oil Creek (40.5195, –124.3767) upstream to endpoint(s) in: Guthrie Creek (40.5320, –124.3128); Oil Creek (40.5061, –124.2875); Unnamed Tributary (40.4946, –124.3091); Unnamed Tributary (40.4982, –124.3549); Unnamed Tributary (40.5141, –124.3573); Unnamed Tributary (40.4992, –124.3070).

(ii) *Capetown Hydrologic Sub-area 111220.* Outlet(s) = Bear River (Lat 40.4744, Long –124.3881); Davis Creek (40.3850, –124.3691); Singley Creek (40.4311, –124.4034) upstream to endpoint(s) in: Antone Creek (40.4281, –124.2114); Bear River (40.3591, –124.0536); Beer Bottle Gulch (40.3949, –124.1410); Bonanza Gulch (40.4777, –124.2966); Brushy Creek (40.4102, –124.1050); Davis Creek (40.3945, –124.2912); Harmonica Creek (40.3775, –124.0735); Hollister Creek (40.4109, –124.2891); Nelson Creek (40.3536, –124.1154); Peaked Creek (40.4123, –124.1897); Pullen Creek (40.4057, –124.0814); Singley Creek (40.4177, –124.3305); South Fork Bear River (40.4047, –124.2631); Unnamed Tributary (40.4271, –124.3107); Unnamed Tributary (40.4814, –124.2741); Unnamed Tributary (40.3633, –124.0651); Unnamed Tributary (40.3785, –124.0599); Unnamed Tributary (40.4179, –124.2391); Unnamed Tributary (40.4040, –124.0923); Unnamed Tributary (40.3996, –124.3175); Unnamed Tributary (40.4045, –124.0745); Unnamed Tributary (40.4668, –124.2364); Unnamed Tributary (40.4389, –124.2350); Unnamed Tributary (40.4516, –124.2238); Unnamed Tributary (40.4136, –124.1594); Unnamed Tributary (40.4350, –124.1504); Unnamed Tributary (40.4394, –124.3745); West Side Creek (40.4751, –124.2432).

(iii) *Mattole River Hydrologic Sub-area 111230.* Outlet(s) = Big Creek (Lat 40.1567, Long –124.2114); Big Flat Creek (40.1275, –124.1764); Buck Creek (40.1086, –124.1218); Cooskie Creek (40.2192, –124.3105); Fourmile Creek (40.2561, –124.3578); Gitchell Creek (40.0938, –124.1023); Horse Mountain Creek (40.0685, –124.0822); Kinsey Creek (40.1717, –124.2310); Mattole River (40.2942, –124.3536); McNutt Gulch (40.3541, –124.3619); Oat Creek (40.1785, –124.2445); Randall Creek (40.2004, –124.2831); Shipman Creek (40.1175, –124.1449); Spanish Creek (40.1835, –124.2569); Telegraph Creek (40.0473, –124.0798); Whale Gulch (39.9623, –123.9785) upstream to endpoint(s) in: Anderson Creek (40.0329, –123.9674); Baker Creek (40.0143, –123.9048); Bear Creek (40.1262, –124.0631); Bear Creek (40.2819, –124.3336); Bear Trap Creek (40.2157, –124.1422); Big Creek (40.1742, –124.1924); Big Finley Creek (40.0910, –124.0179); Big Flat Creek (40.1444, –124.1636); Blue Slide Creek (40.1562, –123.9283); Box Canyon Creek (40.1078, –123.9854); Bridge Creek (40.0447, –124.0118); Buck Creek (40.1166, –124.1142); Conklin Creek (40.3197, –124.2055); Cooskie Creek (40.2286, –124.2986); Devils Creek (40.3432, –124.1365); Dry Creek (40.2646, –124.0660); East Branch North Fork Mattole River (40.3333, –124.1490); East Fork Honeydew Creek (40.1625, –124.0929); Eubank Creek (40.0997, –123.9661); Fire Creek (40.1533, –123.9509); Fourmile Creek (40.2604, –124.3079); Fourmile Creek (40.1767, –124.0759); French Creek (40.1384, –124.0072); Gibson Creek (40.0304, –123.9279); Gilham Creek (40.2078, –124.0085); Gitchell Creek (40.1086, –124.0947); Green Ridge Creek (40.3254, –124.1258); Grindstone Creek (40.2019, –123.9890); Harris Creek (40.0381, –123.9304); Harrow Creek (40.1612, –124.0292); Helen Barnum Creek (40.0036, –123.9101); Honeydew Creek (40.1747, –124.1410); Horse Mountain Creek (40.0769, –124.0729); Indian Creek (40.2772, –124.2759); Jewett Creek (40.1465, –124.0414); Kinsey Creek (40.1765, –124.2220); Lost Man Creek (39.9754, –123.9179); Mattole Canyon (40.2021, –123.9570); Mattole River (39.9714, –123.9623); McGinnis Creek (40.3186, –124.1801); McKee Creek (40.0864, –123.9480); McNutt Gulch (40.3458, –124.3418); Middle Creek (40.2591, –124.0366); Mill Creek (40.0158, –123.9693); Mill Creek (40.3305, –124.2598); Mill Creek (40.2839, –124.2946); Nooning Creek (40.0616, –124.0050); North Fork Mattole River (40.3866, –124.1867); North Fork Bear Creek (40.1494, –124.1060); North Fork Fourmile Creek (40.2019, –124.0722); Oat Creek (40.1884, –124.2296); Oil Creek (40.3214, –124.1601); Painter Creek (40.0844, –123.9639); Prichett Creek (40.2892, –124.1704); Randall Creek (40.2092, –124.2668); Rattlesnake Creek (40.3250, –124.0981); Shipman Creek (40.1250, –124.1384); Sholes Creek (40.1603, –124.0619); South Branch West Fork Bridge Creek (40.0326, –123.9853); South Fork Bear Creek (40.0176, –124.0016); Spanish Creek (40.1965, –124.2429); Squaw Creek (40.1934, –124.2002); Stanley Creek (40.0273, –123.9166); Sulphur Creek (40.3647, –124.1586); Telegraph Creek (40.0439, –124.0640); Thompson Creek (39.9913, –123.9707); Unnamed Tributary (40.3475, –124.1606); Unnamed Tributary (40.3522, –124.1533); Unnamed Tributary (40.0891, –123.9839); Unnamed Tributary (40.2223, –124.0172); Unnamed Tributary (40.1733, –123.9515); Unnamed Tributary (40.2899, –124.0955); Unnamed Tributary (40.2853, –124.3227); Unnamed Tributary (39.9969, –123.9071); Upper East Fork Honeydew Creek (40.1759, –124.1182); Upper North Fork Mattole River (40.2907, –124.1115); Vanauken Creek (40.0674, –123.9422); West Fork Bridge Creek (40.0343, –123.9990); West Fork Honeydew Creek (40.1870, –124.1614); Westlund Creek (40.2440, –124.0036); Whale Gulch (39.9747, –123.9812); Woods Creek (40.2119, –124.1611); Yew Creek (40.0018, –123.9762).

(7) Mendocino Coast Hydrologic Unit 1113—(i) *Usal Creek Hydrologic Sub-area 111311.* Outlet(s) = Jackass Creek (Lat 39.8806, Long –123.9155); Usal

Creek (39.8316, –123.8507) upstream to endpoint(s) in: Bear Creek (39.8898, –123.8344); Jackass Creek (39.8901, –123.8928); Julias Creek (39.8542, –123.7937); Little Bear Creek (39.8629, –123.8400); North Fork Jackass Creek (39.9095, –123.9101); North Fork Julias Creek (39.8581, –123.8045); Soldier Creek (39.8679, –123.8162); South Fork Usal Creek (39.8356, –123.7865); Unnamed Tributary (39.8890, –123.8480); Usal Creek (39.8957, –123.8797); Waterfall Gulch (39.8787, –123.8680).

(ii) *Wages Creek Hydrologic Sub-area 111312.* Outlet(s) = Cottaneva Creek (Lat 39.7360, Long –123.8293); DeHaven Creek (39.6592, –123.7863); Hardy Creek (39.7107, –123.8082); Howard Creek (39.6778, –123.7915); Juan Creek (39.7028, –123.8042); Wages Creek (39.6513, –123.7851) upstream to endpoint(s) in: Cottaneva Creek (39.7825, –123.8210); DeHaven Creek (39.6687, –123.7060); Dunn Creek (39.8103, –123.8320); Hardy Creek (39.7221, –123.7822); Howard Creek (39.6808, –123.7463); Juan Creek (39.7107, –123.7472); Kimball Gulch (39.7559, –123.7828); Little Juan Creek (39.7003, –123.7609); Middle Fork Cottaneva Creek (39.7738, –123.8058); North Fork Cottaneva Creek (39.8011, –123.8047); North Fork Dehaven Creek (39.6660, –123.7382); North Fork Wages Creek (39.6457, –123.7066); Rider Gulch (39.6348, –123.7621); Rockport Creek (39.7346, –123.8021); Slaughterhouse Gulch (39.7594, –123.7914); South Fork Cottaneva Creek (39.7447, –123.7773); South Fork Wages Creek (39.6297, –123.6862); Wages Creek (39.6297, –123.6862).

(iii) *Ten Mile River Hydrologic Sub-area 111313.* Outlet(s) = Abalobadiah Creek (Lat 39.5654, Long –123.7672); Chadbourne Gulch (39.6133, –123.7822); Ten Mile River (39.5529, –123.7658); Seaside Creek (39.5592, –123.7655) upstream to endpoint(s) in: Abalobadiah Creek (39.5878, –123.7503); Bald Hill Creek (39.6278, –123.6461); Barlow Gulch (39.6046, –123.7384); Bear Pen Creek (39.5824, –123.6402); Booth Gulch (39.5567, –123.5918); Buckhorn Creek (39.6093, –123.6980); Campbell Creek (39.5053, –123.6610); Cavanough Gulch (39.6107, –123.6776); Chadbourne Gulch (39.6190, –123.7682); Clark Fork (39.5280, –123.5134); Curchman Creek (39.4789, –123.6398); Gulch 11 (39.4687, –123.5816); Gulch 19 (39.5939, –123.5781); Little Bear Haven Creek (39.5655, –123.6147); Little North Fork (39.6264, –123.7350); Mill Creek (39.5392, –123.7068); North Fork Ten Mile River (39.5870, –123.5480); O'Conner Gulch (39.6042, –123.6632); Patsy Creek (39.5714, –123.5669); Redwood Creek (39.5142, –123.5620); Seaside Creek (39.5612, –123.7501); Smith Creek (39.5251, –123.6499); South Fork Bear Haven Creek (39.5688, –123.6527); South Fork Ten Mile River (39.5083, –123.5395); Ten Mile River (39.5721, –123.7098); Unnamed Tributary (39.5180, –123.5948); Unnamed Tributary (39.5146, –123.6183); Unnamed Tributary (39.5898, –123.7657); Unnamed Tributary (39.5813, –123.7526); Unnamed Tributary (39.5936, –123.6034).

(iv) *Noyo River Hydrologic Sub-area 111320.* Outlet(s) = Digger Creek (Lat 39.4088, Long –123.8164); Hare Creek (39.4171, –123.8128); Jug Handle Creek (39.3767, –123.8176); Mill Creek (39.4894, –123.7967); Mitchell Creek (39.3923, –123.8165); Noyo River (39.4274, –123.8096); Pudding Creek (39.4588, –123.8089); Virgin Creek (39.4714, –123.8045) upstream to endpoint(s) in: Bear Gulch (39.3881, –123.6614); Brandon Gulch (39.4191, –123.6645); Bunker Gulch (39.3969, –123.7153); Burbeck Creek (39.4354, –123.4235); Covington Gulch (39.4099, –123.7546); Dewarren Creek (39.4974, –123.5535); Digger Creek (39.3932, –123.7820); Duffy Gulch (39.4469, –123.6023); Gulch Creek (39.4441, –123.4684); Gulch Seven (39.4523, –123.5183); Hare Creek (39.3781, –123.6922); Hayworth Creek (39.4857, –123.4769); Hayshed Creek (39.4200, –123.7391); Jug Handle Creek (39.3647, –123.7523); Kass Creek (39.4262, –123.6807); Little North Fork (39.4532, –123.6636); Little Valley Creek (39.5026, –123.7277); Marble Gulch (39.4423, –123.5479); McMullen Creek (39.4383, –123.4488); Middle Fork North Fork (39.4924, –123.5231); Mill Creek (39.4813, –123.7600); Mitchell Creek (39.3813, –123.7734); North Fork Hayworth Creek (39.4891, –123.5026); North Fork Noyo River (39.4765, –123.5535); North Fork Noyo (39.4765, –123.5535); North Fork South Fork Noyo River (39.3971, –123.6108); Noyo River (39.4242, –123.4356); Olds Creek (39.3964, –123.4448); Parlin Creek (39.3700, –123.6111); Pudding Creek (39.4591, –123.6516); Redwood Creek (39.4660, –123.4571); South Fork Hare Creek (39.3785, –123.7384); South Fork Noyo River (39.3620, –123.6188); Unnamed Tributary (39.4113, –123.5621); Unnamed Tributary (39.3918, –123.6425); Unnamed Tributary (39.4168, –123.4578); Unnamed Tributary (39.4656, –123.7467); Unnamed Tributary (39.4931, –123.7371); Unnamed Tributary (39.4922, –123.7381); Unnamed Tributary (39.4939, –123.7184); Unnamed Tributary (39.4158, –123.6428); Unnamed Tributary (39.4002, –123.7347); Unnamed Tributary (39.3831, –123.6177); Unnamed Tributary (39.4926, –123.4764); Virgin Creek (39.4621, –123.7855); Unnamed Tributary (39.4650, –123.7463).

(v) *Big River Hydrologic Sub-area 111330.* Outlet(s) = Big River (Lat 39.3030, Long –123.7957); Casper Creek (39.3617, –123.8169); Doyle Creek (39.3603, –123.8187); Jack Peters Creek (39.3193, –123.8006); Russian Gulch (39.3288, –123.8050) upstream to endpoint(s) in: Berry Gulch (39.3585, –123.6930); Big River (39.3166, –123.3733); Casper Creek (39.3462, –123.7556); Chamberlain Creek (39.4007, –123.5317); Daugherty Creek (39.1700, –123.3699); Doyle Creek (39.3517, –123.8007); East Branch Little North Fork Big River (39.3372, –123.6410); East Branch North Fork Big River (39.3354, –123.4652); Gates Creek (39.2083, –123.3944); Jack Peters Gulch (39.3225, –123.7850); James Creek (39.3922, –123.4747); Johnson Creek (39.1963, –123.3927); Johnson Creek (39.2556, –123.4485); Laguna Creek (39.2910, –123.6334); Little North Fork Big River (39.3497, –123.6242); Marten Creek (39.3290, –123.4279); Mettick Creek (39.2591, –123.5193); Middle Fork North Fork Casper Creek (39.3575, –123.7170); North Fork Big River (39.3762, –123.4591); North Fork Casper Creek (39.3610, –123.7356); North Fork James Creek (39.3980, –123.4939); North Fork Ramone Creek (39.2760, –123.4846); Pig Pen Gulch (39.3226, –123.4609); Pruitt Creek (39.2592, –123.3812); Ramone Creek (39.2714, –123.4415); Rice Creek (39.2809, –123.3963); Russell Brook (39.2863, –123.4461); Russian Gulch (39.3237, –123.7650); Snuffins Creek (39.1836, –123.3854); Soda Creek (39.2230, –123.4239); South Fork Big River (39.2317, –123.3687); South Fork Casper Creek (39.3493, –123.7216); Two Log Creek (39.3484, –123.5781); Unnamed Tributary (39.3897, –123.5556); Unnamed Tributary (39.3637, –123.5464); Unnamed Tributary (39.3776, –123.5274); Unnamed Tributary (39.4029, –123.5771); Valentine Creek (39.2694, –123.3957); Water Gulch (39.3607, –123.5891).

(vi) *Albion River Hydrologic Sub-area 111340.* Outlet(s) = Albion River (Lat 39.2253, Long –123.7679); Big Salmon Creek (39.2150, –123.7660); Buckhorn Creek (39.2593, –123.7839); Dark Gulch (39.2397, –123.7740); Little Salmon Creek (39.2150, –123.7660); Little River (39.2734, –123.7914) upstream to endpoint(s) in: Albion River (39.2613,

–123.5766); Big Salmon Creek (39.2070, –123.6514); Buckhorn Creek (39.2513, –123.7595); Dark Gulch (39.2379, –123.7592); Duck Pond Gulch (39.2456, –123.6960); East Railroad Gulch (39.2604, –123.6381); Hazel Gulch (39.2141, –123.6418); Kaison Gulch (39.2733, –123.6803); Little North Fork South Fork Albion River (39.2350, –123.6431); Little River (39.2683, –123.7190); Little Salmon Creek (39.2168, –123.7515); Marsh Creek (39.2325, –123.5596); Nordon Gulch (39.2489, –123.6503); North Fork Albion River (39.2854, –123.5752); Pleasant Valley Gulch (39.2379, –123.6965); Railroad Gulch (39.2182, –123.6932); Soda Springs Creek (39.2943, –123.5944); South Fork Albion River (39.2474, –123.6107); Tom Bell Creek (39.2805, –123.6519); Unnamed Tributary (39.2279, –123.6972); Unnamed Tributary (39.2194, –123.7100); Unnamed Tributary (39.2744, –123.5889); Unnamed Tributary (39.2254, –123.6733).

(vii) *Navarro River Hydrologic Sub-area 111350.* Outlet(s) = Navarro River (Lat 39.1921, Long –123.7611) upstream to endpoint(s) in: Alder Creek (38.9830, –123.3946); Anderson Creek (38.9644, –123.2907); Bailey Creek (39.1733, –123.4804); Barton Gulch (39.1804, –123.6783); Bear Creek (39.1425, –123.4326); Bear Wallow Creek (39.0053, –123.4075); Beasley Creek (38.9366, –123.3265); Bottom Creek (39.2117, –123.4607); Camp 16 Gulch (39.1937, –123.6095); Camp Creek (38.9310, –123.3527); Cold Spring Creek (39.0376, –123.5027); Con Creek (39.0374, –123.3816); Cook Creek (39.1879, –123.5109); Cune Creek (39.1622, –123.6014); Dago Creek (39.0731, –123.5068); Dead Horse Gulch (39.1576, –123.6124); Dutch Henry Creek (39.2112, –123.5794); Floodgate Creek (39.1291, –123.5365); Fluem Gulch (39.1615, –123.6695); Flynn Creek (39.2099, –123.6032); German Creek (38.9452, –123.4269); Gut Creek (39.0803, –123.3312); Ham Canyon (39.0164, –123.4265); Horse Creek (39.0144, –123.4960); Hungry Hollow Creek (39.1327, –123.4488); Indian Creek (39.0708, –123.3301); Jimmy Creek (39.0117, –123.2888); John Smith Creek (39.2275, –123.5366); Little North Fork Navarro River (39.1941, –123.4553); Low Gap Creek (39.1590, –123.3783); Navarro River (39.0537, –123.4409); Marsh Gulch (39.1692, –123.7049); McCarvey Creek (39.1589, –123.4048); Mill Creek (39.1270, –123.4315); Minnie Creek (38.9751, –123.4529); Murray Gulch (39.1755, –123.6966); Mustard Gulch (39.1673, –123.6393); North Branch (39.2069, –123.5361); North Fork Indian Creek (39.1213, –123.3345); North Fork Navarro River (39.1708, –123.5606); Parkinson Gulch (39.0768, –123.4070); Perry Gulch (39.1342, –123.5707); Rancheria Creek (38.8626, –123.2417); Ray Gulch (39.1792, –123.6494); Robinson Creek (38.9845, –123.3513); Rose Creek (39.1358, –123.3672); Shingle Mill Creek (39.1671, –123.4223); Soda Creek (39.0238, –123.3149); Soda Creek (39.1531, –123.3734); South Branch (39.1409, –123.3196); Spooner Creek (39.2221, –123.4811); Tramway Gulch (39.1481, –123.5958); Yale Creek (38.8882, –123.2785).

(viii) *Greenwood Creek Hydrologic Sub-area 111361.* Outlet(s) = Greenwood Creek (Lat 39.1262, Long –123.7181) upstream to endpoint(s) in: Greenwood Creek (39.0894, –123.5924).

(ix) *Elk Creek Hydrologic Sub-area 111362.* Outlet(s) = Elk Creek (Lat 39.1024, Long –123.7080) upstream to endpoint(s) in: Elk Creek (39.0657, –123.6245).

(x) *Alder Creek Hydrologic Sub-area 111363.* Outlet(s) = Alder Creek (Lat 39.0044, Long –123.6969); Mallo Pass Creek (39.0341, –123.6896) upstream to endpoint(s) in: Alder Creek (38.9961, –123.6471); Mallo Pass Creek (39.0287, –123.6373).

(xi) *Brush Creek Hydrologic Sub-area 111364.* Outlet(s) = Brush Creek (Lat 38.9760, Long –123.7120) upstream to endpoint(s) in: Brush Creek (38.9730, –123.5563); Mill Creek (38.9678, –123.6515); Unnamed Tributary (38.9724, –123.6571).

(xii) *Garcia River Hydrologic Sub-area 111370.* Outlet(s) = Garcia River (Lat 38.9550, Long –123.7338); Point Arena Creek (38.9141, –123.7103); Schooner Gulch (38.8667, –123.6550) upstream to endpoint(s) in: Blue Water Hole Creek (38.9378, –123.5023); Flemming Creek (38.8384, –123.5361); Garcia River (38.8965, –123.3681); Hathaway Creek (38.9287, –123.7011); Inman Creek (38.8804, –123.4370); Larmour Creek (38.9419, –123.4469); Mill Creek (38.9078, –123.3143); North Fork Garcia River (38.9233, –123.5339); North Fork Schooner Gulch (38.8758, –123.6281); Pardaloe Creek (38.8895, –123.3423); Point Arena Creek (38.9069, –123.6838); Redwood Creek (38.9241, –123.3343); Rolling Brook (38.8965, –123.5716); Schooner Gulch (38.8677, –123.6198); South Fork Garcia River (38.8450, –123.5420); Stansburry Creek (38.9422, –123.4720); Signal Creek (38.8639, –123.4414); Unnamed Tributary (38.8758, –123.5692); Unnamed Tributary (38.8818, –123.5723); Whitlow Creek (38.9141, –123.4624).

(xiii) *North Fork Gualala River Hydrologic Sub-area 111381.* Outlet(s) = North Fork Gualala River (Lat 38.7784, Long –123.4992) upstream to endpoint(s) in: Bear Creek (38.8347, –123.3842); Billings Creek (38.8652, –123.3496); Doty Creek (38.8495, –123.5131); Dry Creek (38.8416, –123.4455); Little North Fork Gualala River (38.8295, –123.5570); McGann Gulch (38.8026, –123.4458); North Fork Gualala River (38.8479, –123.4113); Robinson Creek (38.8416, –123.3725); Robinson Creek (38.8386, –123.4991); Stewart Creek (38.8109, –123.4157); Unnamed Tributary (38.8487, –123.3820).

(xiv) *Rockpile Creek Hydrologic Sub-area 111382.* Outlet(s) = Rockpile Creek (Lat 38.7507, Long –123.4706) upstream to endpoint(s) in: Rockpile Creek (38.7966, –123.3872).

(xv) *Buckeye Creek Hydrologic Sub-area 111383.* Outlet(s) = Buckeye Creek (Lat 38.7403, Long –123.4580) upstream to endpoint(s) in: Buckeye Creek (38.7400, –123.2697); Flat Ridge Creek (38.7616, –123.2400); Franchini Creek (38.7500, –123.3708); North Fork Buckeye (38.7991, –123.3166).

(xvi) *Wheatfield Fork Hydrologic Sub-area 111384.* Outlet(s) = Wheatfield Fork Gualala River (Lat 38.7018, Long –123.4168) upstream to endpoint(s) in: Danfield Creek (38.6369, –123.1431); Fuller Creek (38.7109, –123.3256); Haupt Creek (38.6220, –123.2551); House Creek (38.6545, –123.1184); North Fork Fuller Creek (38.7252, –123.2968); Pepperwood Creek (38.6205, –123.1665); South Fork Fuller Creek (38.6973, –123.2860); Tombs Creek (38.6989, –123.1616); Unnamed Tributary (38.7175, –123.2744); Wheatfield Fork Gualala River (38.7497, –123.2215).

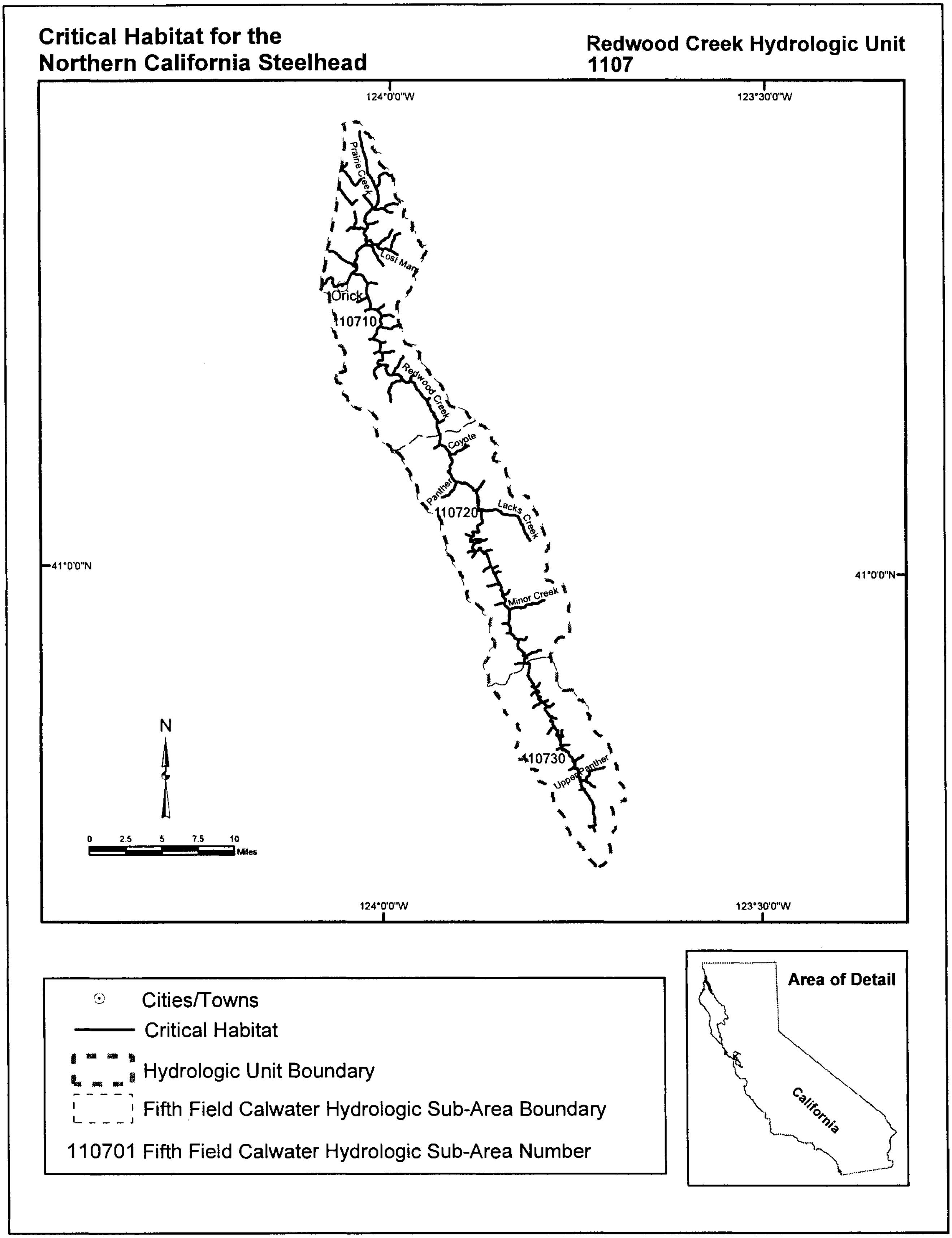
(xvii) *Gualala Hydrologic Sub-area 111385.* Outlet(s) = Fort Ross Creek (Lat 38.5119, Long –123.2436); Gualala River (38.7687, –123.5334); Kolmer Gulch (38.5238, –123.2646) upstream to endpoint(s) in: Big Pepperwood Creek (38.7951, –123.4638); Carson Creek (38.5653, –123.1906); Fort Ross Creek (38.5174, –123.2363); Groshong Gulch (38.7814, –123.4904); Gualala River (38.7780, –123.4991); Kolmer Gulch (38.5369, –123.2247); Little Pepperwood (38.7738, –123.4427); Marshall Creek (38.5647, –123.2058); McKenzie Creek (38.5895, –123.1730); Palmer Canyon Creek (38.6002, –123.2167); South Fork Gualala River (38.5646, –123.1689); Sproule Creek (38.6122, –123.2739); Turner Canyon (38.5294, –123.1672); Unknown Tributary (38.5634, –123.2003).

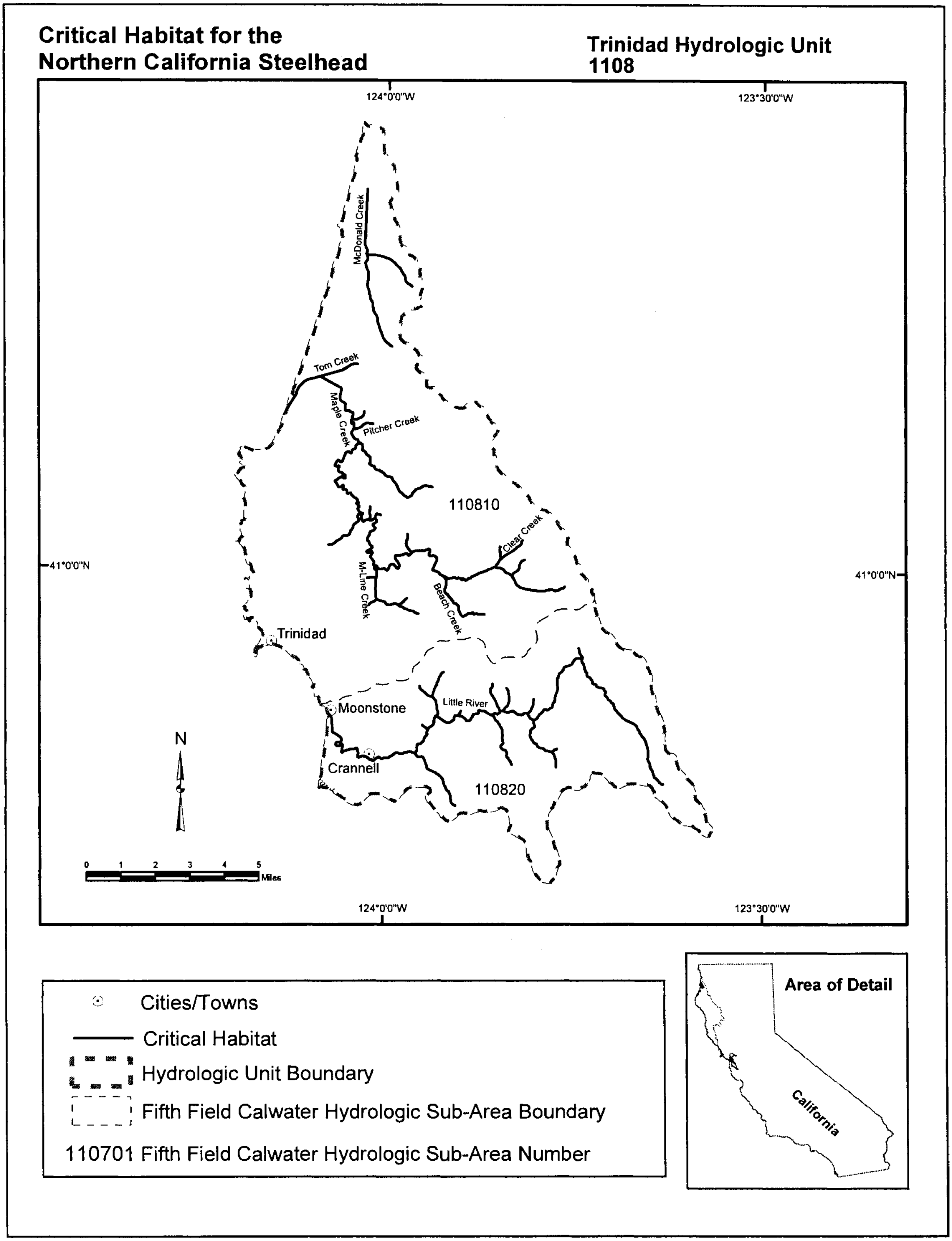
(xviii) *Russian Gulch Hydrologic Sub-area 111390.* Outlet(s) = Russian Gulch

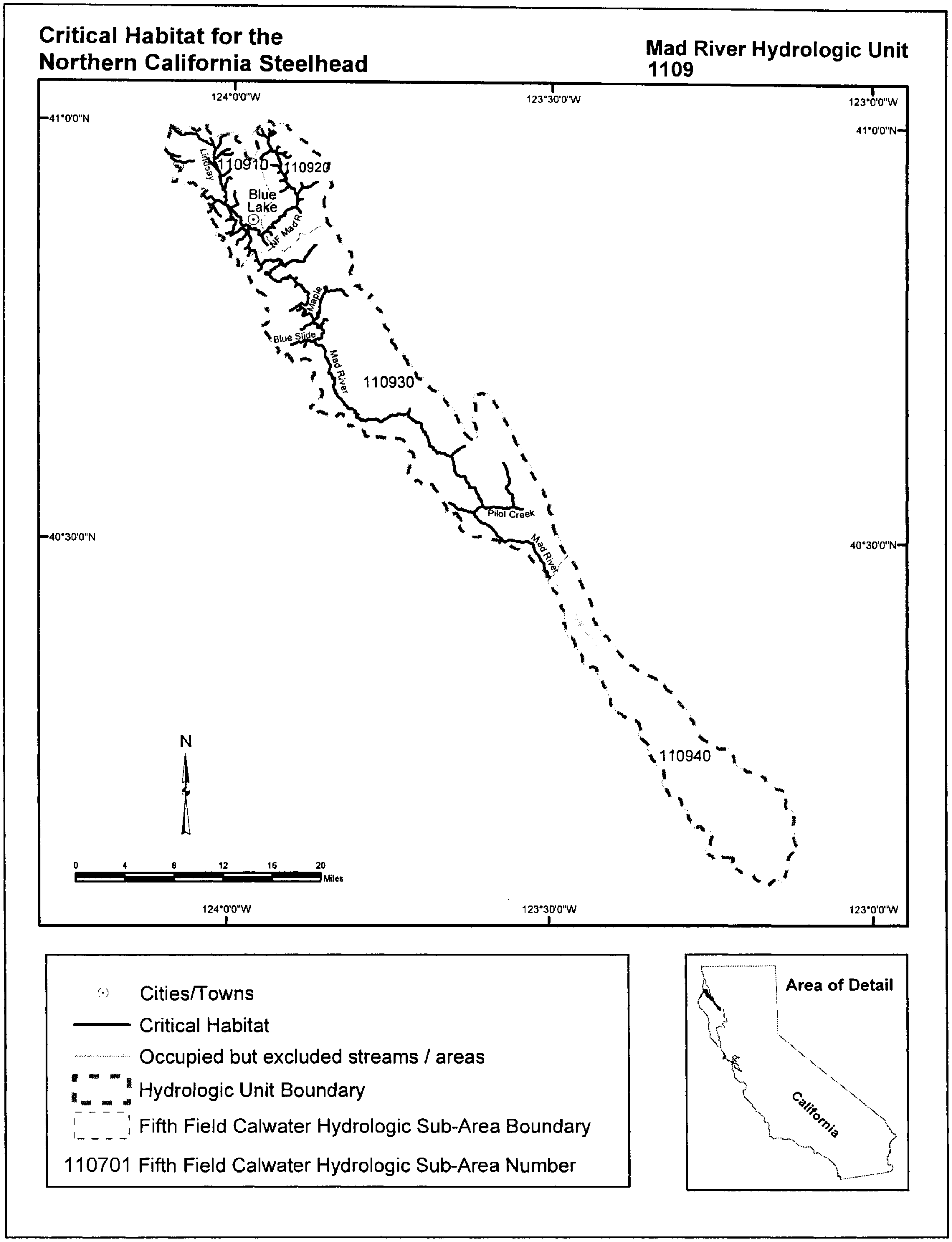
Creek (Lat 38.4669, Long –123.1569) upstream to endpoint(s) in: Russian Gulch Creek (38.4956, –123.1535); West Branch Russian Gulch Creek (38.4968, –123.1631).

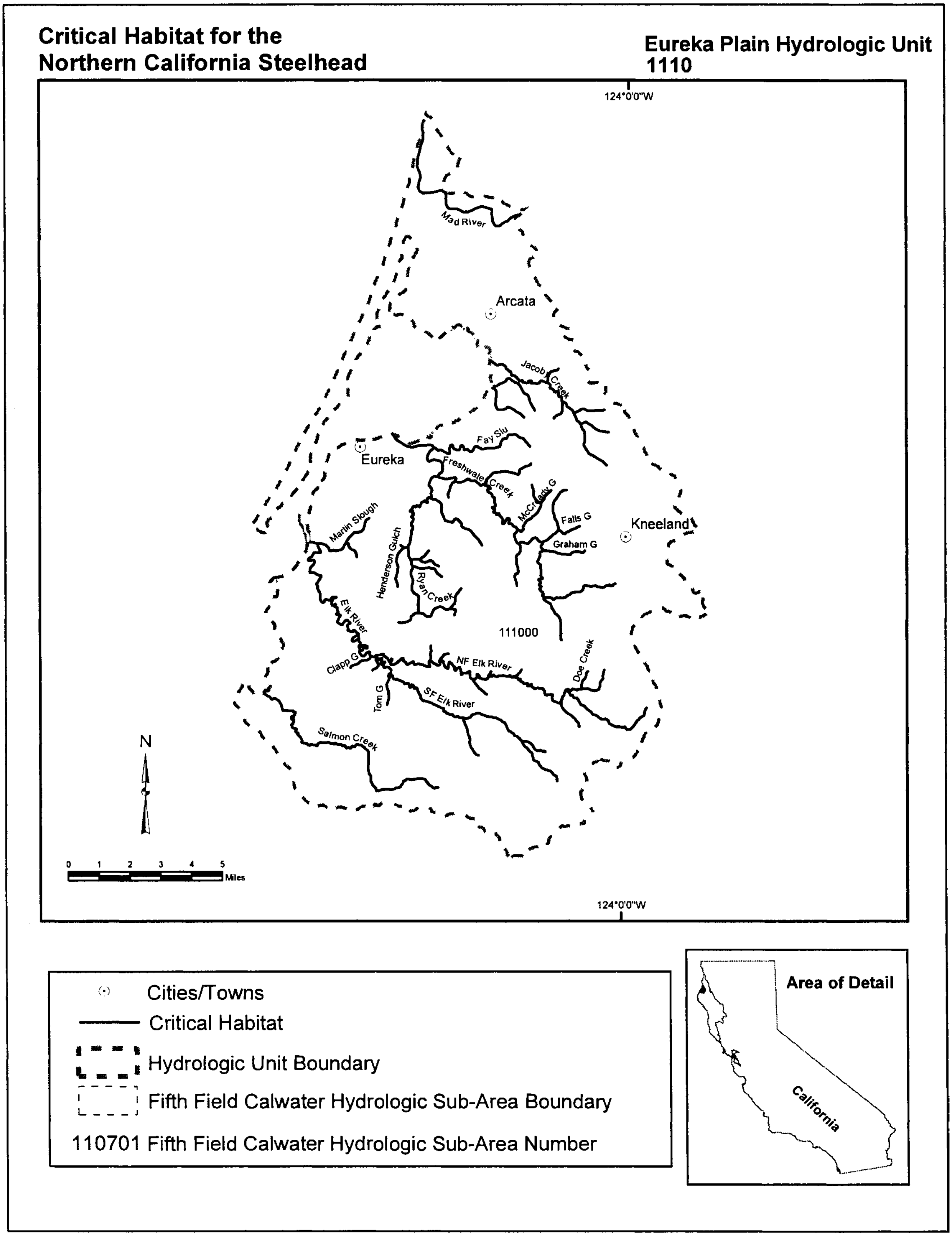
(8) Maps of critical habitat for the Northern California Steelhead ESU follow:

BILLING CODE 3510–22–P

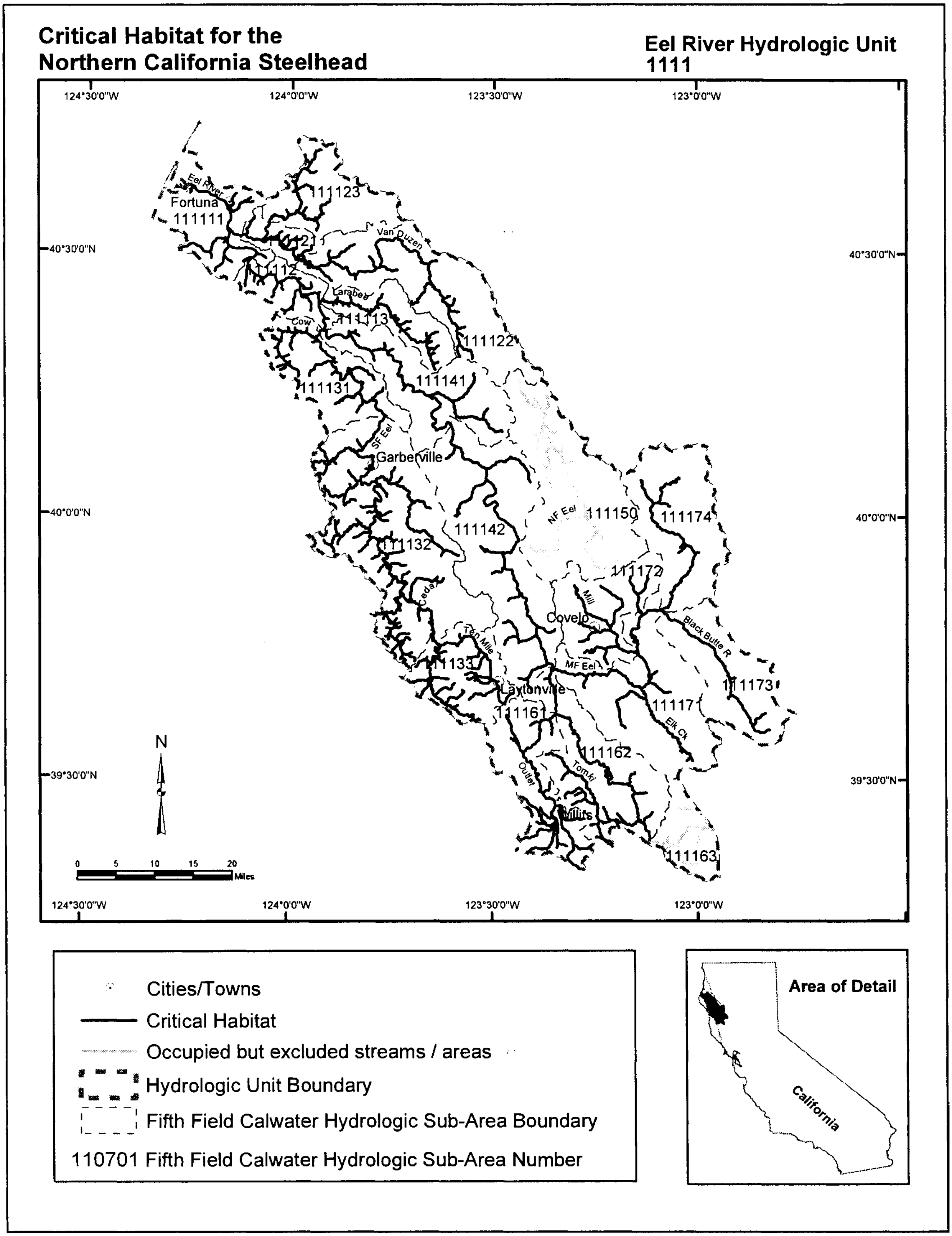

Critical Habitat for the Northern California Steelhead
Redwood Creek Hydrologic Unit 1107
124°0'0"W
123°30'0"W
41°0'0"N
Prairie Creek
Lost Man
Orick
110710
Redwood Creek
Coyote
Panther
110720
Lacks Creek
Minor Creek
110730
Upper Panther
N
0 2.5 5 7.5 10 Miles
Cities/Towns
Critical Habitat
Hydrologic Unit Boundary
Fifth Field Calwater Hydrologic Sub-Area Boundary
110701 Fifth Field Calwater Hydrologic Sub-Area Number
Area of Detail
California

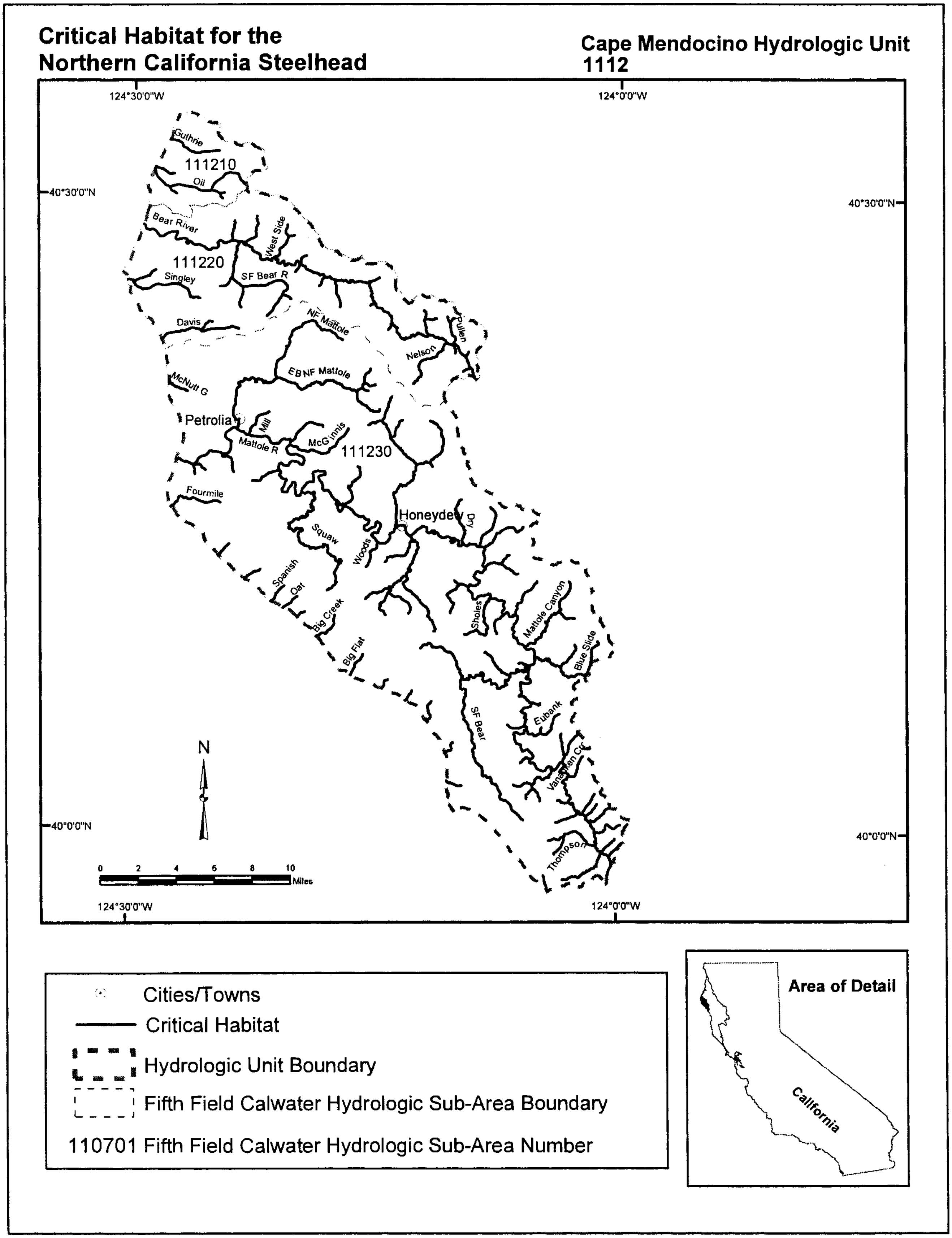

Critical Habitat for the
Northern California Steelhead
Trinidad Hydrologic Unit
1108
124°0'0"W
123°30'0"W
41°0'0"N
McDonald Creek
Tom Creek
Maple Creek
Pitcher Creek
110810
Clear Creek
M-Line Creek
Beach Creek
Trinidad
Moonstone
Little River
Crannell
110820
N
0 1 2 3 4 5 Miles
Cities/Towns
Critical Habitat
Hydrologic Unit Boundary
Fifth Field Calwater Hydrologic Sub-Area Boundary
110701 Fifth Field Calwater Hydrologic Sub-Area Number
Area of Detail
California

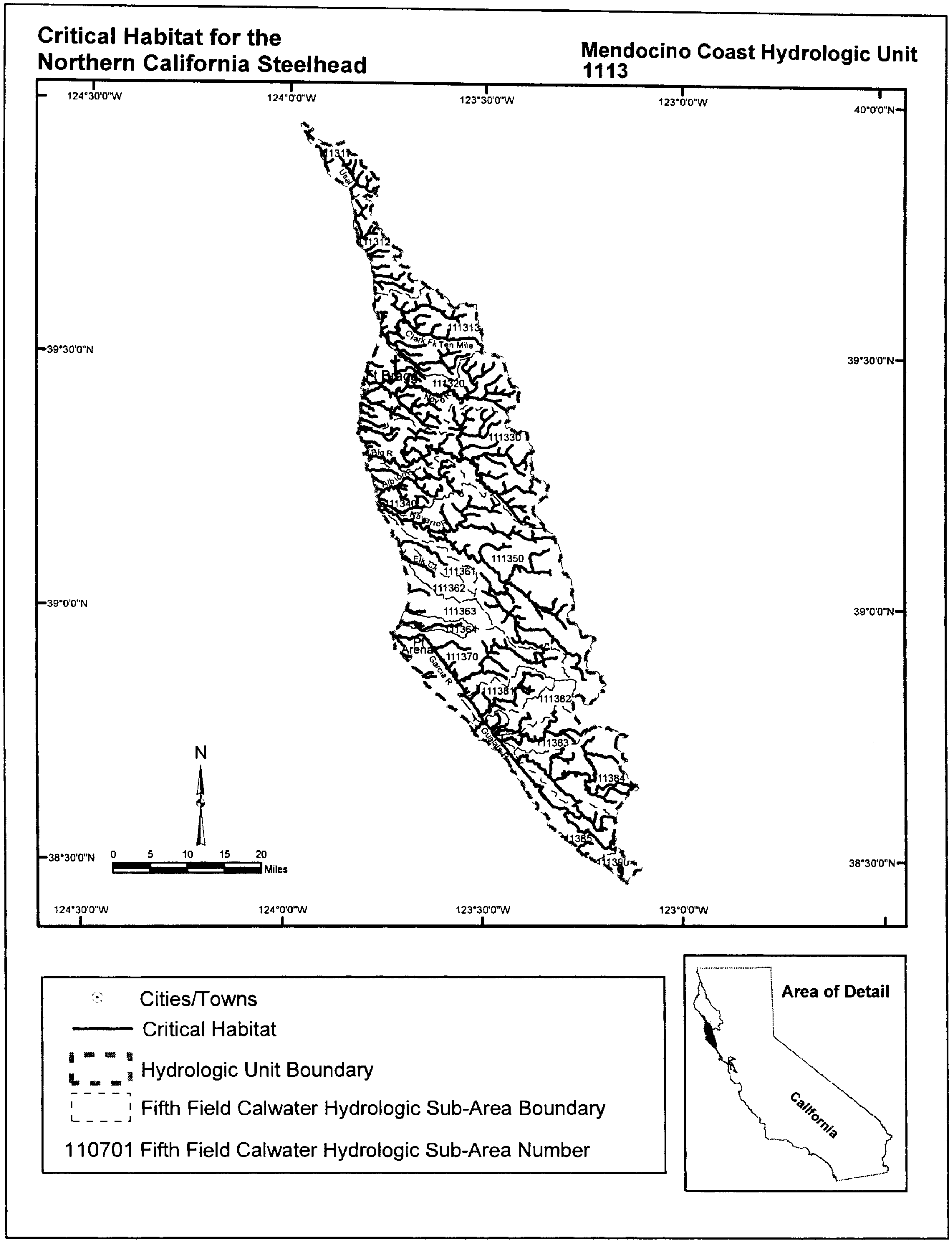

Critical Habitat for the
Northern California Steelhead
Mad River Hydrologic Unit
1109
124°0'0"W
123°30'0"W
123°0'0"W
41°0'0"N
40°30'0"N
110910
110920
110930
110940
Blue Lake
Lindsay
NF Mad R
Maple
Blue Slide
Mad River
Pilot Creek
Mad River
N
0 4 8 12 16 20 Miles
Cities/Towns
Critical Habitat
Occupied but excluded streams / areas
Hydrologic Unit Boundary
Fifth Field Calwater Hydrologic Sub-Area Boundary
110701 Fifth Field Calwater Hydrologic Sub-Area Number
Area of Detail
California



Critical Habitat for the
Northern California Steelhead
Eureka Plain Hydrologic Unit
1110
124°0'0"W
Mad River
Arcata
Jacoby Creek
Fay Slu
Eureka
Freshwater Creek
McCready G
Falls G
Kneeland
Graham G
Martin Slough
Henderson Gulch
Ryan Creek
Elk River
111000
Doe Creek
Clapp G
NF Elk River
Tom G
SF Elk River
Salmon Creek
N
0 1 2 3 4 5
Miles
124°0'0"W
Cities/Towns
Critical Habitat
Hydrologic Unit Boundary
Fifth Field Calwater Hydrologic Sub-Area Boundary
110701 Fifth Field Calwater Hydrologic Sub-Area Number
Area of Detail
California


Critical Habitat for the
Northern California Steelhead
Eel River Hydrologic Unit
1111
124°30'0"W
124°0'0"W
123°30'0"W
123°0'0"W
40°30'0"N
40°0'0"N
39°30'0"N
Eel River
Fortuna
111111
111123
111121
Van Duzen
111112
Larabee
111113
Cow
111122
111141
111131
SF Eel
Garberville
NF Eel
111150
111174
111142
111132
111172
Mill
Cedar
Covelo
Black Butte R
Ten Mile
111133
MF Eel
Laytonville
111173
111171
111161
Elk Ck
111162
Outlet
Tomki
Willits
111163
N
0 5 10 15 20 Miles
Cities/Towns
Critical Habitat
Occupied but excluded streams / areas
Hydrologic Unit Boundary
Fifth Field Calwater Hydrologic Sub-Area Boundary
110701 Fifth Field Calwater Hydrologic Sub-Area Number
Area of Detail
California


Critical Habitat for the
Northern California Steelhead
Cape Mendocino Hydrologic Unit
1112
124°30'0"W
124°0'0"W
40°30'0"N
40°0'0"N
111210
111220
111230
Guthrie
Oil
Bear River
West Side
Singley
SF Bear R
Davis
NF Mattole
Pullen
Nelson
EBNF Mattole
McNutt G
Petrolia
Mill
Mattole R
McGinnis
Fourmile
Honeydew
Dry
Squaw
Woods
Spanish
Oat
Big Creek
Big Flat
Sholes
Mattole Canyon
Blue Slide
SF Bear
Eubank
Vanauken Cr
Thompson
N
0 2 4 6 8 10 Miles
Cities/Towns
Critical Habitat
Hydrologic Unit Boundary
Fifth Field Calwater Hydrologic Sub-Area Boundary
110701 Fifth Field Calwater Hydrologic Sub-Area Number
Area of Detail
California



BILLING CODE 3510–22–C

(h) *Central California Coast Steelhead (O. mykiss)*. Critical habitat is designated to include the areas defined in the following CALWATER Hydrologic Units:

(1) Russian River Hydrologic Unit 1114—(i) *Guerneville Hydrologic Sub-area 111411*. Outlet(s) = Russian River (Lat 38.4507, Long –123.1289) upstream to endpoint(s) in: Atascadero Creek (38.3473, –122.8626); Austin Creek (38.5098, –123.0680); Baumert Springs (38.4195, –122.9658); Dutch Bill Creek (38.4132, –122.9508); Duvoul Creek (38.4527, –122.9525); Fife Creek (38.5584, –122.9922); Freezeout Creek (38.4405, –123.0360); Green Valley Creek, (38.4445, –122.9185); Grub Creek (38.4411, –122.9636); Hobson Creek (38.5334, –122.9401); Hulbert Creek (38.5548, –123.0362); Jenner Gulch (38.4869, –123.0996); Kidd Creek (38.5029, –123.0935); Lancel Creek (38.4247, –122.9322); Mark West Creek (38.4961, –122.8489); Mays Canyon (38.4800, –122.9715); North Fork Lancel Creek (38.4447, –122.9444); Pocket Canyon (38.4650, –122.9267); Porter Creek (38.5435, –122.9332); Purrington Creek (38.4083, –122.9307); Sheep House Creek (38.4820, –123.0921); Smith Creek (38.4622, –122.9585); Unnamed Tributary (38.4560, –123.0246); Unnamed Tributary (38.3976, –122.8994); Unnamed Tributary (38.3772, –122.8938); Willow Creek (38.4249, –123.0022).

(ii) *Austin Creek Hydrologic Sub-area 111412*. Outlet(s) = Austin Creek (Lat 38.5098, Long –123.0680) upstream to endpoint(s) in: Austin Creek (38.6262, –123.1347); Bear Pen Creek (38.5939, –123.1644); Big Oat Creek (38.5615, –123.1299); Black Rock Creek (38.5586, –123.0730); Blue Jay Creek (38.5618, –123.1399); Conshea Creek (38.5830, –123.0824); Devil Creek (38.6163, –123.0425); East Austin Creek (38.6349, –123.1238); Gilliam Creek (38.5803, –123.0152); Gray Creek (38.6132, –123.0107); Thompson Creek (38.5747, –123.0300); Pole Mountain Creek (38.5122, –123.1168); Red Slide Creek (38.6039, –123.1141); Saint Elmo Creek (38.5130, –123.1125); Schoolhouse Creek (38.5595, –123.0175); Spring Creek (38.5041, –123.1364); Sulphur Creek (38.6187, –123.0553); Ward Creek (38.5720, –123.1547).

(iii) *Mark West Hydrologic Sub-area 111423*. Outlet(s) = Mark West Creek (Lat 38.4962, Long –122.8492) upstream to endpoint(s) in: Humbug Creek (38.5412, –122.6249); Laguna de Santa Rosa (38.4526, –122.8347); Mark West Creek (38.5187, –122.5995); Pool Creek (38.5486, –122.7641); Pruit Creek (38.5313, –122.7615); Windsor Creek (38.5484, –122.8101).

(iv) *Warm Springs Hydrologic Sub-area 111424*. Outlet(s) = Dry Creek (Lat 38.5862, Long –122.8577) upstream to endpoint(s) in: Angel Creek (38.6101, –122.9833); Crane Creek (38.6434, –122.9451); Dry Creek (38.7181, –123.0091); Dutcher Creek (38.7223, –122.9770); Felta Creek (38.5679, –122.9379); Foss Creek (38.6244, –122.8754); Grape Creek (38.6593, –122.9707); Mill Creek (38.5976, –122.9914); North Slough Creek (38.6392, –122.8888); Palmer Creek (38.5770, –122.9904); Pena Creek (38.6384, –123.0743); Redwood Log Creek (38.6705, –123.0725); Salt Creek (38.5543, –122.9133); Wallace Creek (38.6260, –122.9651); Wine Creek (38.6662, –122.9682); Woods Creek (38.6069, –123.0272).

(v) *Geyserville Hydrologic Sub-area 111425*. Outlet(s) = Russian River (Lat 38.6132, Long –122.8321) upstream to endpoint(s) in: Ash Creek (38.8556, –123.0082); Bear Creek (38.7253, –122.7038); Bidwell Creek (38.6229, –122.6320); Big Sulphur Creek (38.8279, –122.9914); Bluegum Creek (38.6988, –122.7596); Briggs Creek (38.6845, –122.6811); Coon Creek (38.7105, –122.6957); Crocker Creek (38.7771, –122.9595); Edwards Creek (38.8592, –123.0758); Foote Creek (38.6433, –122.6797); Foss Creek (38.6373, –122.8753); Franz Creek (38.5726, –122.6343); Gill Creek (38.7552, –122.8840); Gird Creek (38.7055, –122.8311); Ingalls Creek (38.7344, –122.7192); Kellog Creek (38.6753, –122.6422); Little Briggs Creek (38.7082, –122.7014); Maacama Creek (38.6743, –122.7431); McDonnell Creek (38.7354, –122.7338); Mill Creek (38.7009, –122.6490); Miller Creek (38.7211, –122.8608); Oat Valley Creek (38.8461, –123.0712); Redwood Creek (38.6342, –122.6720); Sausal Creek (38.6924, –122.7930); South Fork Gill Creek (38.7420, –122.8760); Unnamed Tributary (38.7329, –122.8601); Yellowjacket Creek (38.6666, –122.6308).

(vi) *Sulphur Creek Hydrologic Sub-area 111426*. Outlet(s) = Big Sulphur Creek (Lat 38.8279, Long –122.9914) upstream to endpoint(s) in: Alder Creek (38.8503, –122.8953); Anna Belcher Creek (38.7537, –122.7586); Big Sulphur Creek (38.8243, –122.8774); Frasier Creek (38.8439, –122.9341); Humming Bird Creek (38.8460, –122.8596); Little Sulphur Creek (38.7469, –122.7425); Lovers Gulch (38.7396, –122.8275); North Branch Little Sulphur Creek (38.7783, –122.8119); Squaw Creek (38.8199, –122.7945).

(vii) *Ukiah Hydrologic Sub-area 111431*. Outlet(s) = Russian River (Lat 38.8828, Long –123.0557) upstream to endpoint(s) in: Pieta Creek (38.8622, –122.9329).

(viii) *Forsythe Creek Hydrologic Sub-area 111433*. Outlet(s) = West Branch Russian River (Lat 39.2257, Long –123.2012) upstream to endpoint(s) in: Bakers Creek (39.2859, –123.2432); Eldridge Creek (39.2250, –123.3309); Forsythe Creek (39.2976, –123.2963); Jack Smith Creek (39.2754, –123.3421); Mariposa Creek (39.3472, –123.2625); Mill Creek (39.2969, –123.3360); Salt Hollow Creek (39.2585, –123.1881); Seward Creek (39.2606, –123.2646); West Branch Russian River (39.3642, –123.2334).

(2) Bodega Hydrologic Unit 1115—(i) *Salmon Creek Hydrologic Sub-area 111510*. Outlet(s) = Salmon Creek (Lat 38.3554, Long –123.0675) upstream to endpoint(s) in: Coleman Valley Creek (38.3956, –123.0097); Faye Creek (38.3749, –123.0000); Finley Creek (38.3707, –123.0258); Salmon Creek (38.3877, –122.9318); Tannery Creek (38.3660, –122.9808).

(ii) *Estero Americano Hydrologic Sub-area 111530*. Outlet(s) = Estero Americano (Lat 38.2939, Long –123.0011) upstream to endpoint(s) in: Estero Americano (38.3117, –122.9748); Ebabias Creek (38.3345, –122.9759).

(3) Marin Coastal Hydrologic Unit 2201—(i) *Walker Creek Hydrologic Sub-area 220112*. Outlet(s) = Walker Creek (Lat 38.2213, Long –122.9228); Millerton Gulch (38.1055, –122.8416) upstream to endpoint(s) in: Chileno Creek (38.2145, –122.8579); Frink Canyon (38.1761, –122.8405); Millerton Gulch (38.1376, –122.8052); Verde Canyon (38.1630, –122.8116); Unnamed Tributary (38.1224, –122.8095); Walker Creek (38.1617, –122.7815).

(ii) *Lagunitas Creek Hydrologic Sub-area 220113*. Outlet(s) = Lagunitas Creek (Lat 38.0827, Long –122.8274) upstream to endpoint(s) in: Cheda Creek (38.0483, –122.7329); Devil's Gulch (38.0393, –122.7128); Giacomini Creek (38.0075, –122.7386); Horse Camp Gulch (38.0078, –122.7624); Lagunitas Creek (37.9974, –122.7045); Olema Creek (37.9719, –122.7125); Quarry Gulch (38.0345, –122.7639); San Geronimo Creek (38.0131, –122.6499); Unnamed Tributary (37.9893, –122.7328); Unnamed Tributary (37.9976, –122.7553).

(iii) *Point Reyes Hydrologic Sub-area 220120*. Outlet(s) = Creamery Bay Creek (Lat 38.0779, Long –122.9572); East Schooner Creek (38.0913, –122.9293); Home Ranch (38.0705, –122.9119); Laguna Creek (38.0235, –122.8732); Muddy Hollow Creek (38.0329, –122.8842) upstream to endpoint(s) in: Creamery Bay Creek (38.0809, –122.9561); East Schooner Creek

(38.0928, –122.9159); Home Ranch Creek (38.0784, –122.9038); Laguna Creek (38.0436, –122.8559); Muddy Hollow Creek (38.0549, –122.8666).

(iv) *Bolinas Hydrologic Sub-area 220130.* Outlet(s) = Easkoot Creek (Lat 37.9026, Long –122.6474); McKinnon Gulch (37.9126, –122.6639); Morse Gulch (37.9189, –122.6710); Pine Gulch Creek (37.9218, –122.6882); Redwood Creek (37.8595, –122.5787); Stinson Gulch (37.9068, –122.6517); Wilkins Creek (37.9343, –122.6967) upstream to endpoint(s) in: Easkoot Creek (37.8987, –122.6370); Kent Canyon (37.8866, –122.5800); McKinnon Gulch (37.9197, –122.6564); Morse Gulch (37.9240, –122.6618); Pine Gulch Creek (37.9557, –122.7197); Redwood Creek (37.9006, –122.5787); Stinson Gulch (37.9141, –122.6426); Wilkins Creek (37.9450, –122.6910).

(4) San Mateo Hydrologic Unit 2202—(i) *San Mateo Coastal Hydrologic Sub-area 220221.* Outlet(s) = Denniston Creek (37.5033, –122.4869); Frenchmans Creek (37.4804, –122.4518); San Pedro Creek (37.5964, –122.5057) upstream to endpoint(s) in: Denniston Creek (37.5184, –122.4896); Frenchmans Creek (37.5170, –122.4332); Middle Fork San Pedro Creek (37.5758, –122.4591); North Fork San Pedro Creek (37.5996, –122.4635).

(ii) *Half Moon Bay Hydrologic Sub-area 220222.* Outlet(s) = Pilarcitos Creek (Lat 37.4758, Long –122.4493) upstream to endpoint(s) in: Apanolio Creek (37.5202, –122.4158); Arroyo Leon Creek (37.4560, –122.3442); Mills Creek (37.4629, –122.3721); Pilarcitos Creek (37.5259, –122.3980); Unnamed Tributary (37.4705, –122.3616).

(iii) *Tunitas Creek Hydrologic Sub-area 220223.* Outlet(s) = Lobitos Creek (Lat 37.3762, Long –122.4093); Tunitas Creek (37.3567, –122.3999) upstream to endpoint(s) in: East Fork Tunitas Creek (37.3981, –122.3404); Lobitos Creek (37.4246, –122.3586); Tunitas Creek (37.4086, –122.3502).

(iv) *San Gregorio Creek Hydrologic Sub-area 220230.* Outlet(s) = San Gregorio Creek (Lat 37.3215, Long –122.4030) upstream to endpoint(s) in: Alpine Creek (37.3062, –122.2003); Bogess Creek (37.3740, –122.3010); El Corte Madera Creek (37.3650, –122.3307); Harrington Creek (37.3811, –122.2936); La Honda Creek (37.3680, –122.2655); Langley Creek (37.3302, –122.2420); Mindego Creek (37.3204, –122.2239); San Gregorio Creek (37.3099, –122.2779); Woodruff Creek (37.3415, –122.2495).

(v) *Pescadero Creek Hydrologic Sub-area 220240.* Outlet(s) = Pescadero Creek (Lat 37.2669, Long –122.4122); Pomponio Creek (37.2979, –122.4061) upstream to endpoint(s) in: Bradley Creek (37.2819, –122.3802); Butano Creek (37.2419, –122.3165); Evans Creek (37.2659, –122.2163); Honsinger Creek (37.2828, –122.3316); Little Boulder Creek (37.2145, –122.1964); Little Butano Creek (37.2040, –122.3492); Oil Creek (37.2572, –122.1325); Pescadero Creek (37.2320, –122.1553); Lambert Creek (37.3014, –122.1789); Peters Creek (37.2883, –122.1694); Pomponio Creek (37.3030, –122.3805); Slate Creek (37.2530, –122.1935); Tarwater Creek (37.2731, –122.2387); Waterman Creek (37.2455, –122.1568).

(5) Bay Bridge Hydrologic UnitT 2203—(i) *San Rafael Hydrologic Sub-area 220320.* Outlet(s) = Arroyo Corte Madera del Presidio (Lat 37.8917, Long –122.5254); Corte Madera Creek (37.9425, –122.5059) upstream to endpoint(s) in: Arroyo Corte Madera del Presidio (37.9298, –122.5723); Cascade Creek (37.9867, –122.6287); Cascade Creek (37.9157, –122.5655); Larkspur Creek (37.9305, –122.5514); Old Mill Creek (37.9176, –122.5746); Ross Creek (37.9558, –122.5752); San Anselmo Creek (37.9825, –122.6420); Sleepy Hollow Creek (38.0074, –122.5794); Tamalpais Creek (37.9481, –122.5674).

(ii) [Reserved]

(6) Santa Clara Hydrologic Unit 2205—(i) *Coyote Creek Hydrologic Sub-area 220530.* Outlet(s) = Coyote Creek (Lat 37.4629, Long –121.9894; 37.2275, –121.7514) upstream to endpoint(s) in: Arroyo Aguague (37.3907, –121.7836); Coyote Creek (37.2778, –121.8033; 37.1677, –121.6301); Upper Penitencia Creek (37.3969, –121.7577).

(ii) *Guadalupe River—San Jose Hydrologic Sub-area 220540.* Outlet(s) = Coyote Creek (Lat 37.2778, Long –121.8033) upstream to endpoint(s) in: Coyote Creek (37.2275, –121.7514).

(iii) *Palo Alto Hydrologic Sub-area 220550.* Outlet(s) = Guadalupe River (Lat 37.4614, Long –122.0240); San Francisquito Creek (37.4658, –122.1152); Stevens Creek (37.4456, –122.0641) upstream to endpoint(s) in: Bear Creek (37.4164, –122.2690); Corte Madera Creek (37.4073, –122.2378); Guadalupe River (37.3499, –.121.9094); Los Trancos (37.3293, –122.1786); McGarvey Gulch (37.4416, –122.2955); Squealer Gulch (37.4335, –122.2880); Stevens Creek (37.2990, –122.0778); West Union Creek (37.4528, –122.3020).

(7) San Pablo Hydrologic Unit 2206—(i) *Petaluma River Hydrologic Sub-area 220630.* Outlet(s) = Petaluma River (Lat 38.1111, Long –122.4944) upstream to endpoint(s) in: Adobe Creek (38.2940, –122.5834); Lichau Creek (38.2848, –122.6654); Lynch Creek (38.2748, –122.6194); Petaluma River (38.3010, –122.7149); Schultz Slough (38.1892, –122.5953); San Antonio Creek (38.2049, –122.7408); Unnamed Tributary (38.3105, –122.6146); Willow Brook (38.3165, –122.6113).

(ii) *Sonoma Creek Hydrologic Sub-area 220640.* Outlet(s) = Sonoma Creek (Lat 38.1525, Long –122.4050) upstream to endpoint(s) in: Agua Caliente Creek (38.3368, –122.4518); Asbury Creek (38.3401, –122.5590); Bear Creek (38.4656, –122.5253); Calabazas Creek (38.4033, –122.4803); Carriger Creek (38.3031, –122.5336); Graham Creek (38.3474, –122.5607); Hooker Creek (38.3809, –122.4562); Mill Creek (38.3395, –122.5454); Nathanson Creek (38.3350, –122.4290); Rodgers Creek (38.2924, –122.5543); Schell Creek (38.2554, –122.4510); Sonoma Creek (38.4507, –122.4819); Stuart Creek (38.3936, –122.4708); Yulupa Creek (38.3986, –122.5934).

(iii) *Napa River Hydrologic Sub-area 220650.* Outlet(s) = Napa River (Lat 38.0786, Long –122.2468) upstream to endpoint(s) in: Bale Slough (38.4806, –122.4578); Bear Canyon Creek (38.4512, –122.4415); Bell Canyon Creek (38.5551, –122.4827); Brown's Valley Creek (38.3251, –122.3686); Canon Creek (38.5368, –122.4854); Carneros Creek (38.3108, –122.3914); Conn Creek (38.4843, –122.3824); Cyrus Creek (38.5776, –122.6032); Diamond Mountain Creek (38.5645, –122.5903); Dry Creek (38.4334, –122.4791); Dutch Henery Creek (38.6080, –122.5253); Garnett Creek (38.6236, –122.5860); Huichica Creek (38.2811, –122.3936); Jericho Canyon Creek (38.6219, –122.5933); Miliken Creek (38.3773, –122.2280); Mill Creek (38.5299, –122.5513); Murphy Creek (38.3155, –122.2111); Napa Creek (38.3047, –122.3134); Napa River (38.6638, –122.6201); Pickle Canyon Creek (38.3672, –122.4071); Rector Creek (38.4410, –122.3451); Redwood Creek (38.3765, –122.4466); Ritchie Creek (38.5369, –122.5652); Sarco Creek (38.3567, –122.2071); Soda Creek (38.4156, –122.2953); Spencer Creek (38.2729, –122.1909); Sulphur Creek (38.4895, –122.5088); Suscol Creek (38.2522, –122.2157); Tulucay Creek (38.2929, –122.2389); Unnamed Tributary (38.4248, –122.4935); Unnamed Tributary (38.4839, –122.5161); York Creek (38.5128, –122.5023).

(8) Big Basin Hydrologic Unit 3304—(i) *Davenport Hydrologic Sub-area 330411.* Outlet(s) = Baldwin Creek (Lat 36.9669, –122.1232); Davenport Landing Creek (37.0231, –122.2153); Laguna Creek (36.9824, –122.1560); Liddell Creek (37.0001, –122.1816); Majors Creek (36.9762, –122.1423); Molino Creek (37.0368, –122.2292); San Vicente

Creek (37.0093, –122.1940); Scott Creek (37.0404, –122.2307); Waddell Creek (37.0935, –122.2762); Wilder Creek (36.9535, –122.0775) upstream to endpoint(s) in: Baldwin Creek (37.0126, –122.1006); Bettencourt Creek (37.1081, –122.2386); Big Creek (37.0832, –122.2175); Davenport Landing Creek (37.0475, –122.1920); East Branch Waddell Creek (37.1482, –122.2531); East Fork Liddell Creek (37.0204, –122.1521); Henry Creek (37.1695, –122.2751); Laguna Creek (37.0185, –122.1287); Little Creek (37.0688, –122.2097); Majors Creek (36.9815, –122.1374); Middle Fork East Fork Liddell Creek (37.0194, –122.1608); Mill Creek (37.1034, –122.2218); Mill Creek (37.0235, –122.2218); Molino Creek (37.0384, –122.2125); Peasley Gulch (36.9824, –122.0861); Queseria Creek (37.0521, –122.2042); San Vicente Creek (37.0417, –122.1741); Scott Creek (37.1338, –122.2306); West Branch Waddell Creek (37.1697, –122.2642); West Fork Liddell Creek (37.0117, –122.1763); Unnamed Tributary (37.0103, –122.0701); Wilder Creek (37.0107, –122.0770).

(ii) *San Lorenzo Hydrologic Sub-area 330412.* Outlet(s) = Arana Gulch Creek (Lat 36.9676, Long –122.0028); San Lorenzo River (36.9641, –122.0125) upstream to endpoint(s) in: Arana Gulch Creek (37.0270, –121.9739); Bean Creek (37.0956, –122.0022); Bear Creek (37.1711, –122.0750); Boulder Creek (37.1952, –122.1892); Bracken Brae Creek (37.1441, –122.1459); Branciforte Creek (37.0701, –121.9749); Crystal Creek (37.0333, –121.9825); Carbonera Creek (37.0286, –122.0202); Central Branch Arana Gulch Creek (37.0170, –121.9874); Deer Creek (37.2215, –122.0799); Fall Creek (37.0705, –122.1063); Gold Gulch Creek (37.0427, –122.1018); Granite Creek (37.0490, –121.9979); Hare Creek (37.1544, –122.1690); Jameson Creek (37.1485, –122.1904); Kings Creek (37.2262, –122.1059); Lompico Creek (37.1250, –122.0496); Mackenzie Creek (37.0866, –122.0176); Mountain Charlie Creek (37.1385, –121.9914); Newell Creek (37.1019, –122.0724); San Lorenzo River (37.2276, –122.1384); Two Bar Creek (37.1833, –122.0929); Unnamed Tributary (37.2106, –122.0952); Unnamed Tributary (37.2032, –122.0699); Zayante Creek (37.1062, –122.0224).

(iii) *Aptos-Soquel Hydrologic Sub-area 330413.* Outlet(s) = Aptos Creek (Lat 36.9692, Long –121.9065); Soquel Creek (36.9720, –121.9526) upstream to endpoint(s) in: Amaya Creek (37.0930, –121.9297); Aptos Creek (37.0545, –121.8568); Bates Creek (37.0099, –121.9353); Bridge Creek (37.0464, –121.8969); East Branch Soquel Creek (37.0690, –121.8297); Hester Creek (37.0967, –121.9458); Hinckley Creek (37.0671, –121.9069); Moores Gulch (37.0573, –121.9579); Valencia Creek (37.0323, –121.8493); West Branch Soquel Creek (37.1095, –121.9606).

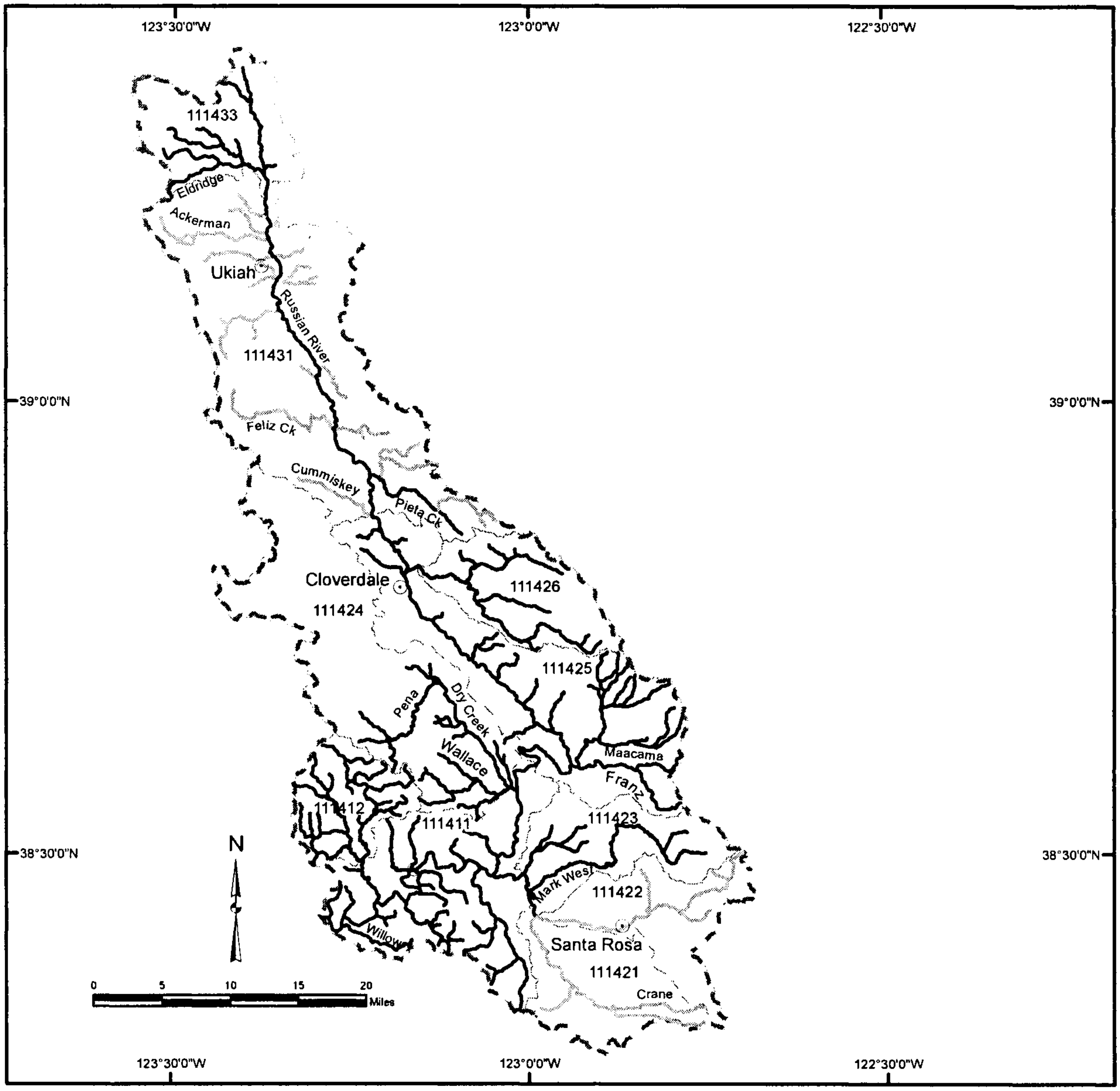
(iv) *Ano Nuevo Hydrologic Sub-area 330420.* Outlet(s) = Ano Nuevo Creek (Lat 37.1163, Long –122.3060); Gazos Creek (37.1646, –122.3625); Whitehouse Creek (37.1457, –122.3469) upstream to endpoint(s) in: Ano Nuevo Creek (37.1269, –122.3039); Bear Gulch (37.1965, –122.2773); Gazos Creek (37.2088, –122.2868); Old Womans Creek (37.1829, –122.3033); Whitehouse Creek (37.1775, –122.2900).

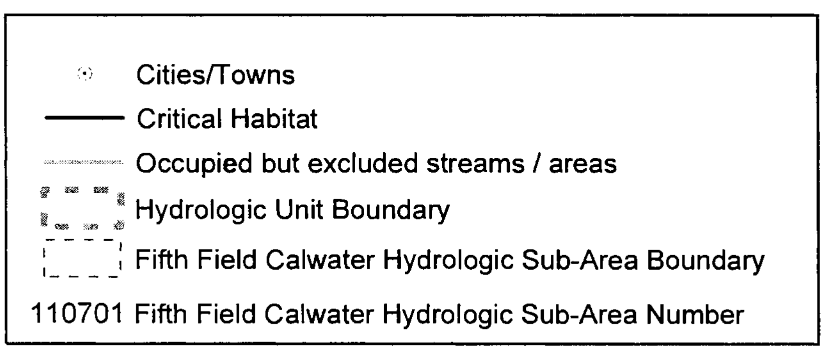
(9) Maps of critical habitat for the Central California Coast Steelhead ESU follow:

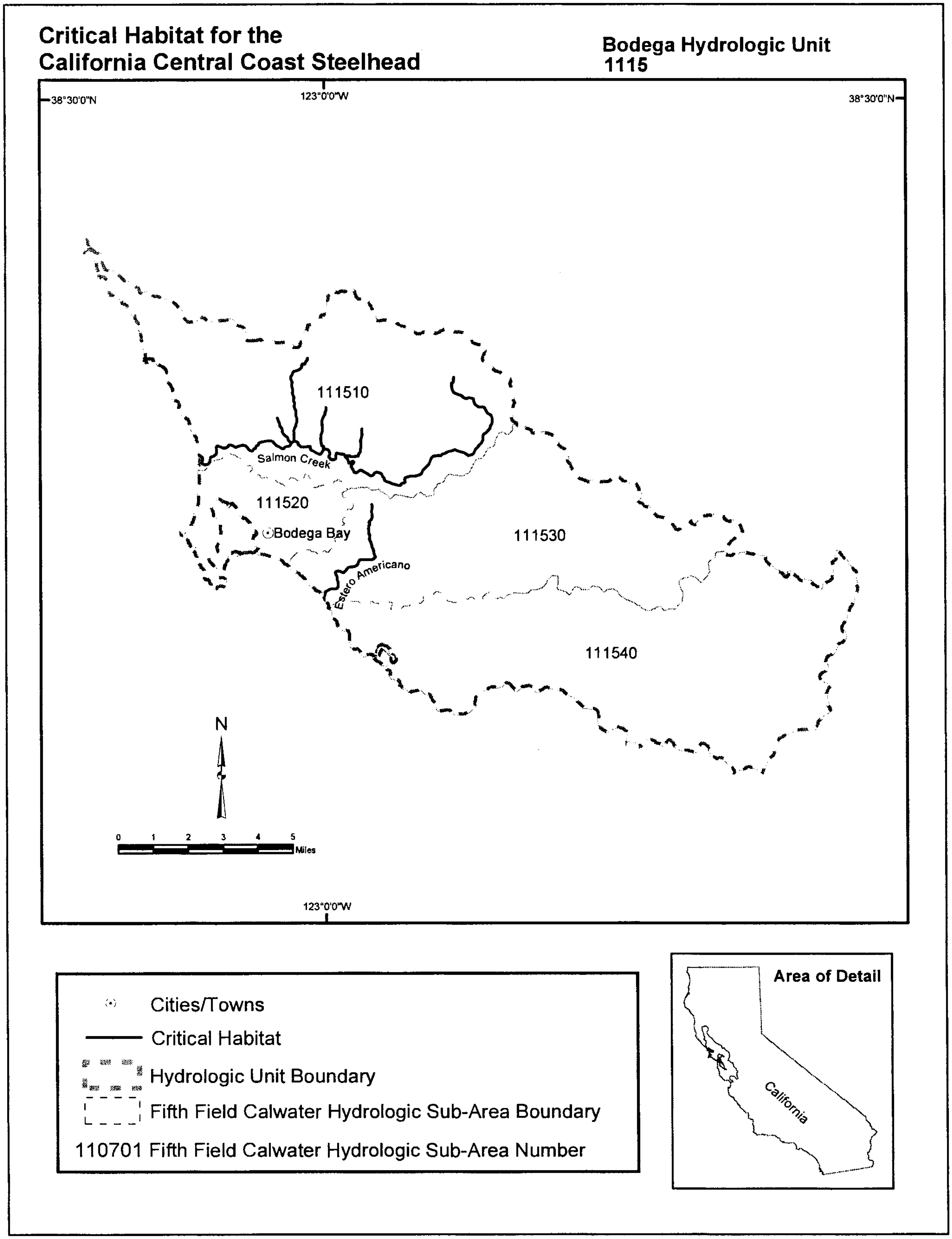
BILLING CODE 3510–22–P

Critical Habitat for the California Central Coast Steelhead

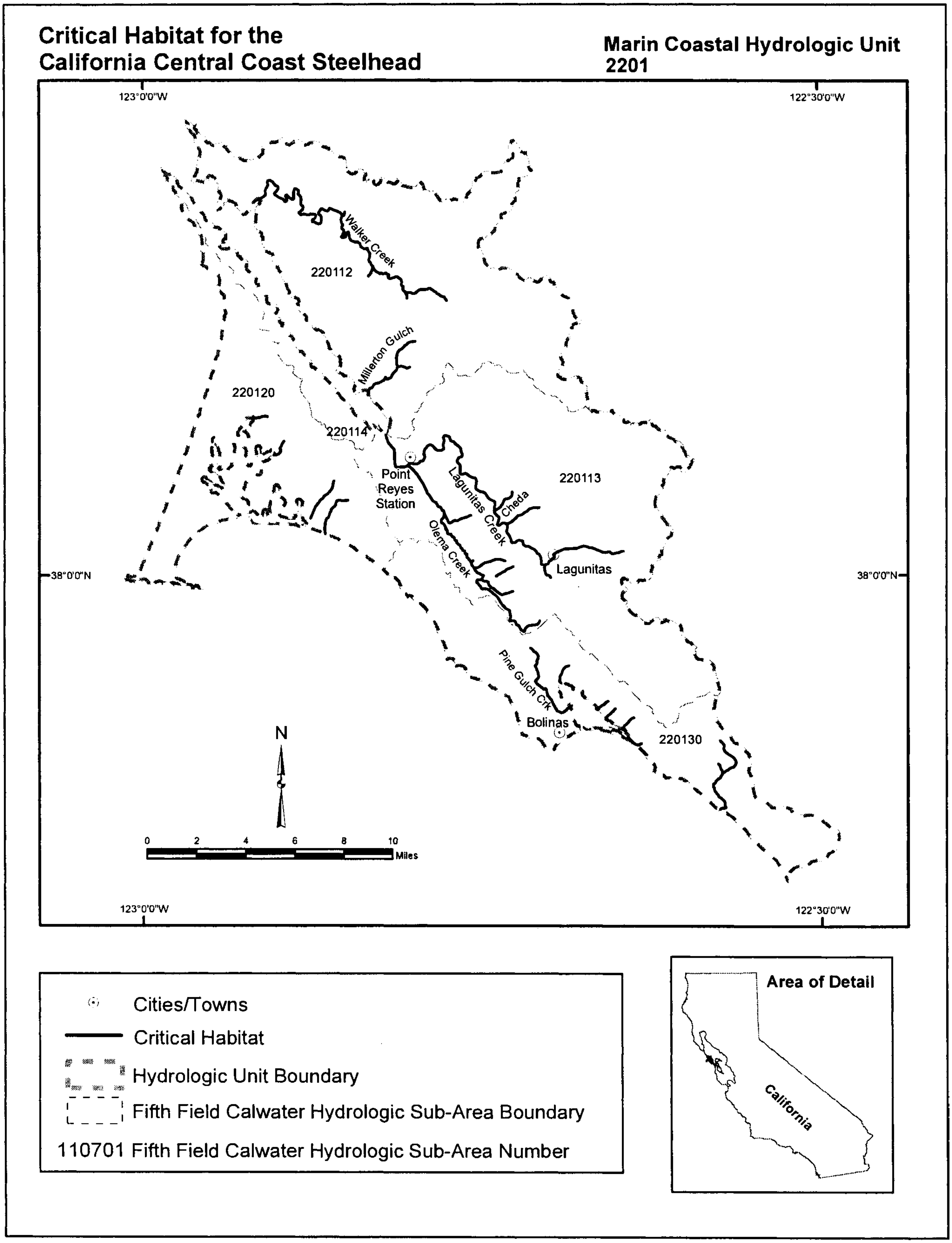
Russian River Hydrologic Unit 1114





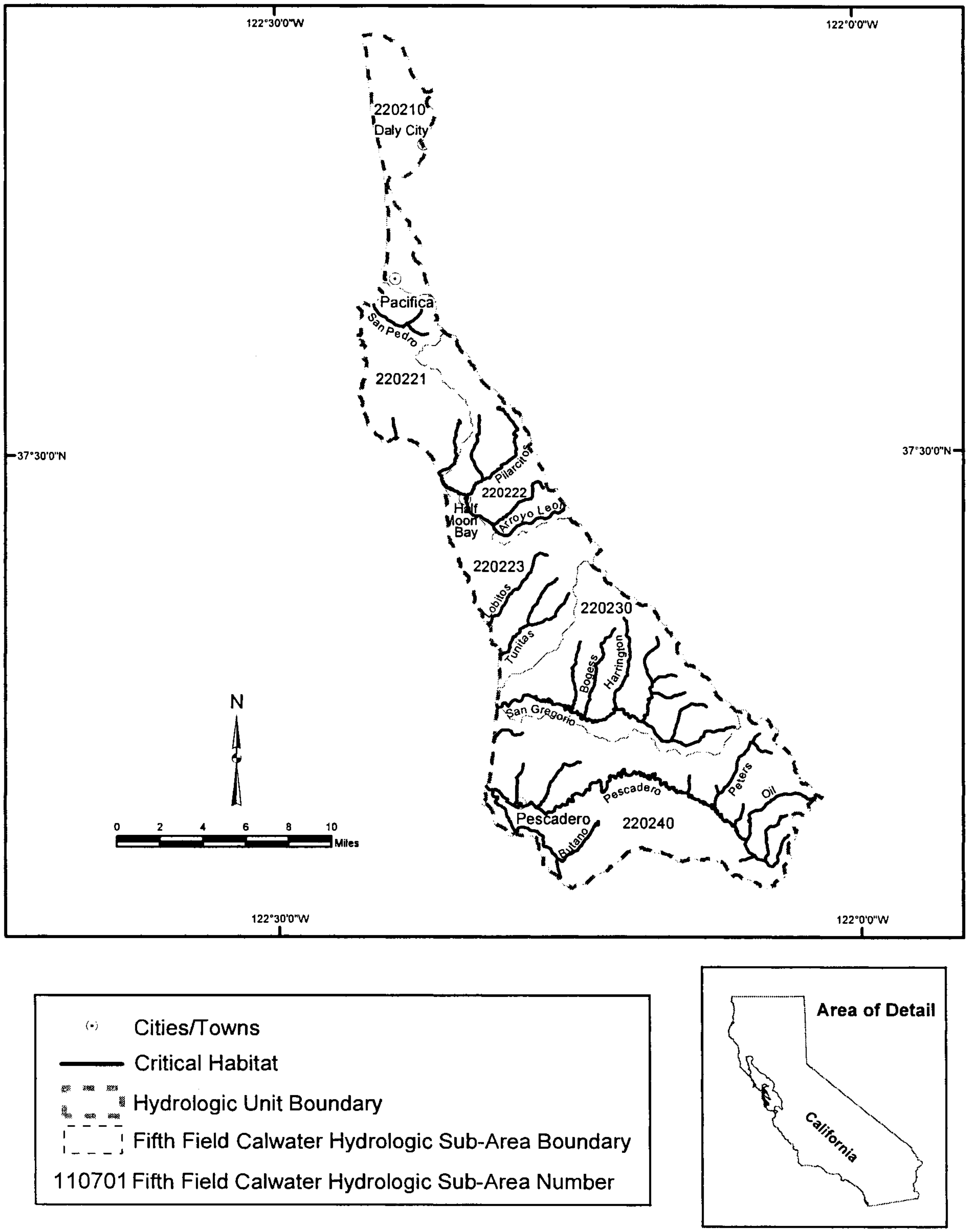


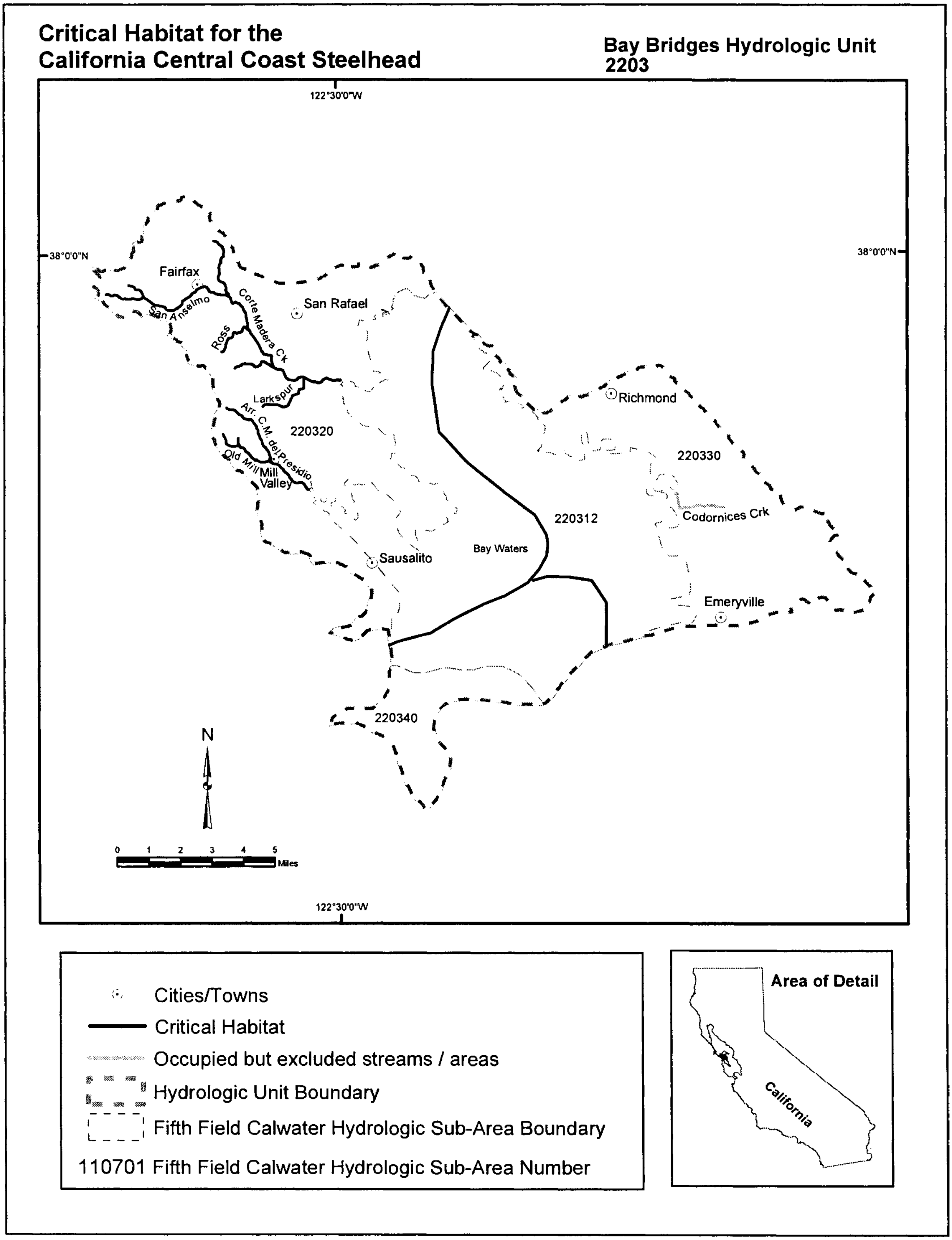
Critical Habitat for the
California Central Coast Steelhead
Bodega Hydrologic Unit
1115
38°30'0"N
123°0'0"W
38°30'0"N
111510
Salmon Creek
111520
Bodega Bay
111530
Estero Americano
111540
N
0 1 2 3 4 5
Miles
123°0'0"W
Cities/Towns
Critical Habitat
Hydrologic Unit Boundary
Fifth Field Calwater Hydrologic Sub-Area Boundary
110701 Fifth Field Calwater Hydrologic Sub-Area Number
Area of Detail
California


Critical Habitat for the
California Central Coast Steelhead
Marin Coastal Hydrologic Unit
2201
123°0'0"W
122°30'0"W
38°0'0"N
Walker Creek
220112
Millerton Gulch
220120
220114
Point
Reyes
Station
Lagunitas Creek
Cheda
220113
Olema Creek
Lagunitas
Pine Gulch Crk
Bolinas
220130
N
0
2
4
6
8
10
Miles
Cities/Towns
Critical Habitat
Hydrologic Unit Boundary
Fifth Field Calwater Hydrologic Sub-Area Boundary
110701 Fifth Field Calwater Hydrologic Sub-Area Number
Area of Detail
California

Critical Habitat for the California Central Coast Steelhead

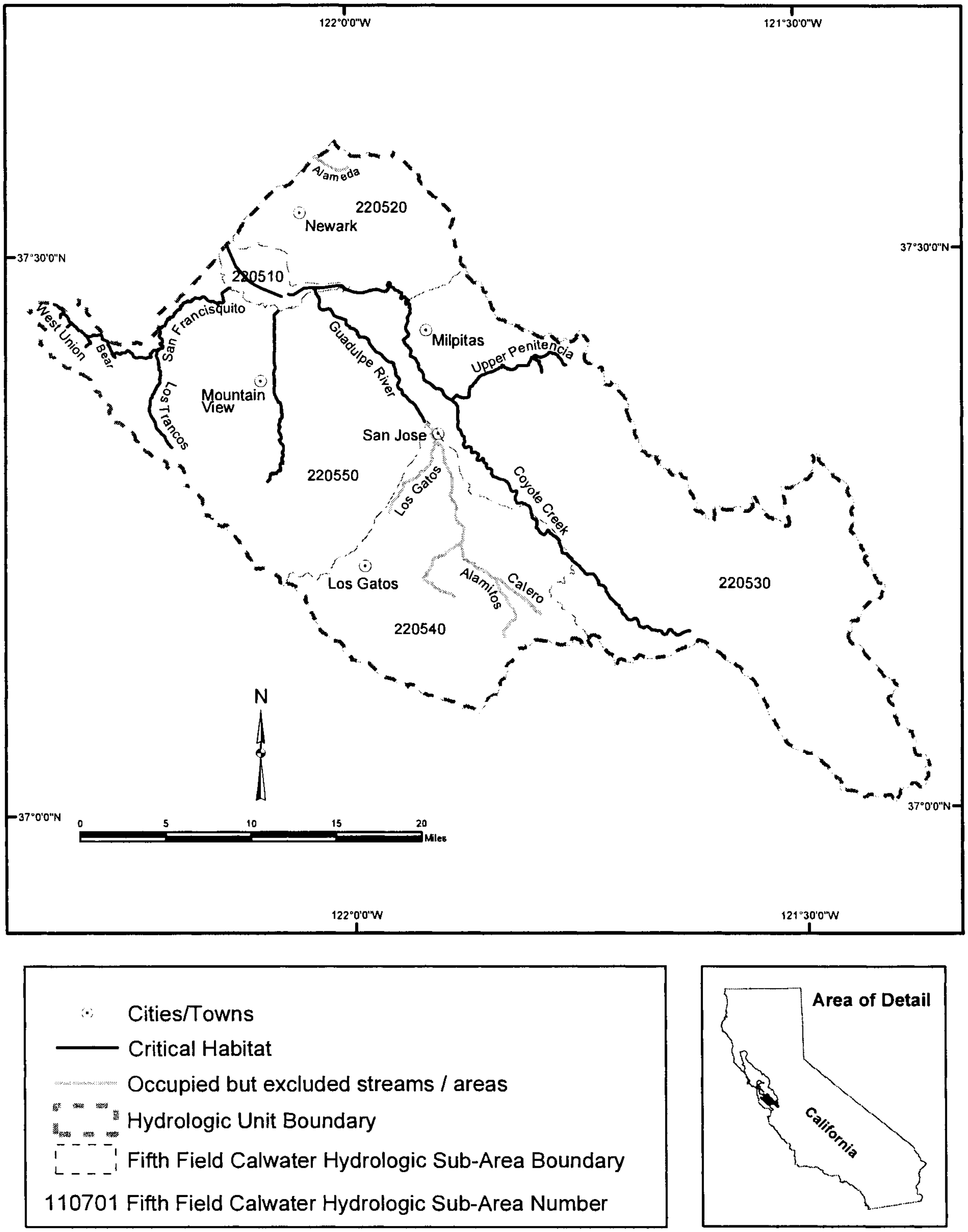
San Mateo Hydrologic Unit 2202

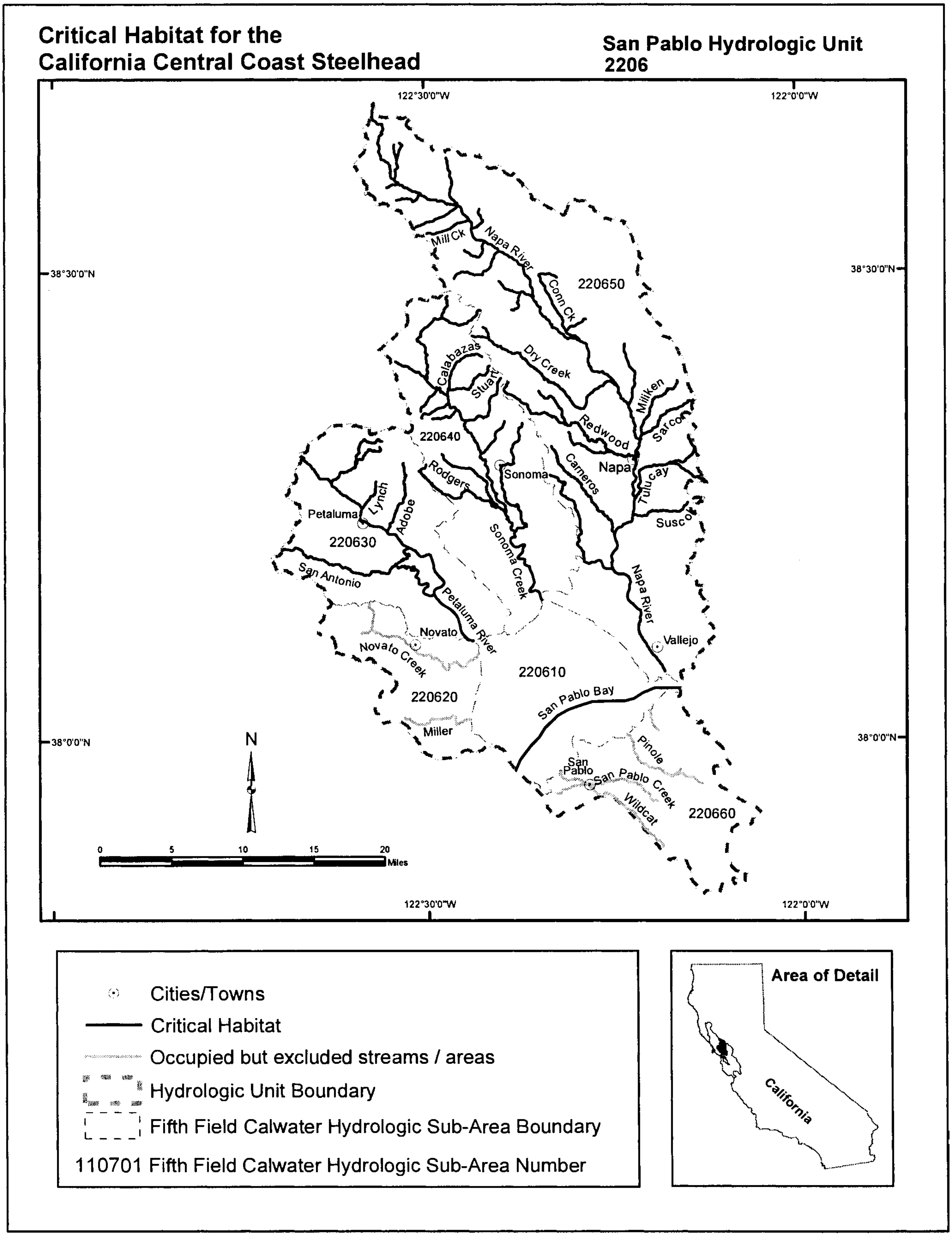


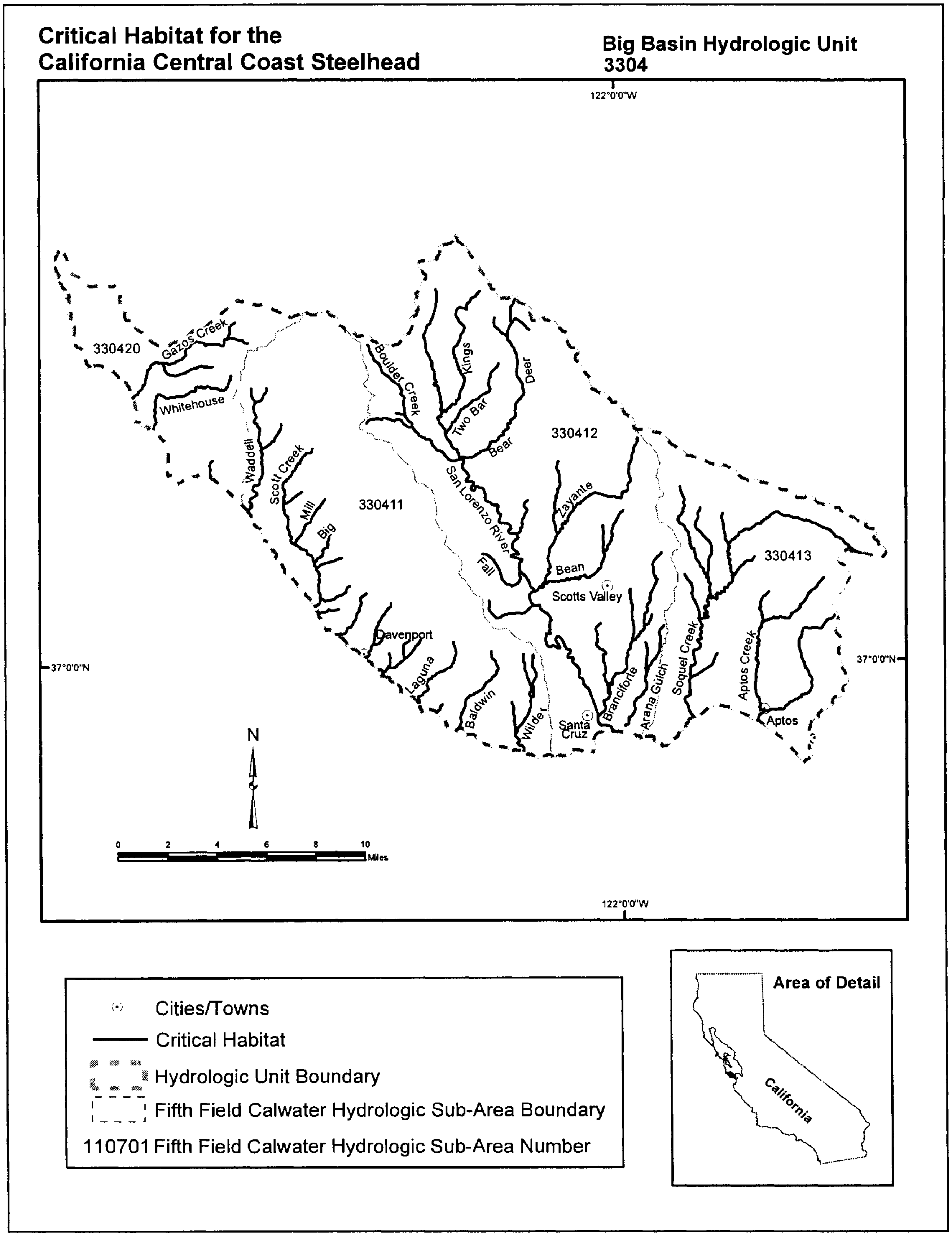

Critical Habitat for the
California Central Coast Steelhead
Bay Bridges Hydrologic Unit
2203
122°30'0"W
38°0'0"N
38°0'0"N
Fairfax
San Anselmo
San Rafael
Corte Madera Ck
Ross
Larkspur
Arr. C.M. del Presidio
220320
Old Mill
Mill Valley
Richmond
220330
Codornices Crk
220312
Bay Waters
Sausalito
Emeryville
220340
N
0 1 2 3 4 5
Miles
122°30'0"W
Cities/Towns
Critical Habitat
Occupied but excluded streams / areas
Hydrologic Unit Boundary
Fifth Field Calwater Hydrologic Sub-Area Boundary
110701 Fifth Field Calwater Hydrologic Sub-Area Number
Area of Detail
California

Critical Habitat for the California Central Coast Steelhead

Santa Clara Hydrologic Unit 2205




Critical Habitat for the
California Central Coast Steelhead
San Pablo Hydrologic Unit
2206
122°30'0"W
122°0'0"W
38°30'0"N
38°0'0"N
Mill Ck
Napa River
Conn Ck
220650
Calabazas
Dry Creek
Stuart
Milliken
Redwood
Sarco
220640
Napa
Rodgers
Sonoma
Cameros
Tulucay
Lynch
Adobe
Petaluma
Suscol
220630
San Antonio
Sonoma Creek
Napa River
Petaluma River
Novato
Vallejo
Novato Creek
220610
220620
San Pablo Bay
Miller
N
Pinole
San Pablo
San Pablo Creek
Wildcat
220660
0 5 10 15 20 Miles
Cities/Towns
Critical Habitat
Occupied but excluded streams / areas
Hydrologic Unit Boundary
Fifth Field Calwater Hydrologic Sub-Area Boundary
110701 Fifth Field Calwater Hydrologic Sub-Area Number
Area of Detail
California



BILLING CODE 3510–22–C

(i) *South-Central California Coast Steelhead (O. mykiss).* Critical habitat is designated to include the areas defined in the following CALWATER Hydrologic Units:

(1) Pajaro River Hydrologic Unit 3305—(i) *Watsonville Hydrologic Sub-area 330510.* Outlet(s) = Pajaro River (Lat 36.8506, Long –121.8101) upstream to endpoint(s) in: Banks Canyon Creek (36.9958, –121.7264); Browns Creek (37.0255, –121.7754); Casserly Creek (36.9902, –121.7359); Corralitos Creek (37.0666, –121.8359); Gaffey Creek (36.9905, –121.7132); Gamecock Canyon (37.0362, –121.7587); Green Valley Creek (37.0073, –121.7256); Ramsey Gulch (37.0447, –121.7755); Redwood Canyon (37.0342, –121.7975); Salsipuedes Creek (36.9350, –121.7426); Shingle Mill Gulch (37.0446, –121.7971).

(ii) *Santa Cruz Mountains Hydrologic Sub-area 330520.* Outlet(s) = Pajaro River (Lat 36.9010, Long –121.5861); Bodfish Creek (37.0041, –121.6667); Pescadero Creek (36.9125, –121.5882); Tar Creek (36.9304, –121.5520); Uvas Creek (37.0146, –121.6314) upstream to endpoint(s) in: Blackhawk Canyon (37.0168, –121.6912); Bodfish Creek (36.9985, –121.6859); Little Arthur Creek (37.0299, –121.6874); Pescadero Creek (36.9826, –121.6274); Tar Creek (36.9558, –121.6009); Uvas Creek (37.0660, –121.6912).

(iii) *South Santa Clara Valley Hydrologic Sub-area 330530.* Outlet(s) = San Benito River (Lat 36.8961, Long –121.5625); Pajaro River (36.9222, –121.5388) upstream to endpoint(s) in: Arroyo Dos Picachos (36.8866, –121.3184); Bodfish Creek (37.0080, –121.6652); Bodfish Creek (37.0041, –121.6667); Carnadero Creek (36.9603, –121.5328); Llagas Creek (37.1159, –121.6938); Miller Canal (36.9698, –121.4814); Pacheco Creek (37.0055, –121.3598); San Felipe Lake (36.9835, –121.4604); Tar Creek (36.9304, –121.5520); Tequisquita Slough (36.9170, –121.3887); Uvas Creek (37.0146, –121.6314).

(iv) *Pacheco-Santa Ana Creek Hydrologic Sub-area 330540.* Outlet(s) = Arroyo Dos Picachos (Lat 36.8866, Long –121.3184); Pacheco Creek (37.0055, –121.3598) upstream to endpoint(s) in: Arroyo Dos Picachos (36.8912, –121.2305); Cedar Creek (37.0922, –121.3641); North Fork Pacheco Creek (37.0514, –121.2911); Pacheco Creek (37.0445, –121.2662); South Fork Pacheco Creek (37.0227, –121.2603).

(v) *San Benito River Hyddrologic Sub-area 330550.* Outlet(s) = San Benito River (Lat 36.7838, Long –121.3731) upstream to endpoint(s) in: Bird Creek (36.7604, –121.4506); Pescadero Creek (36.7202, –121.4187); San Benito River (36.3324, –120.6316); Sawmill Creek (36.3593, –120.6284).

(2) Carmel River Hydrologic Unit 3307—(i) *Carmel River Hydrologic Sub-area 330700.* Outlet(s) = Carmel River (Lat 36.5362, Long –121.9285) upstream to endpoint(s) in: Aqua Mojo Creek (36.4711, –121.5407); Big Creek (36.3935, –121.5419); Blue Creek (36.2796, –121.6530); Boronda Creek (36.3542, –121.6091); Bruce Fork (36.3221, –121.6385); Cachagua Creek (36.3909 , –121.5950); Carmel River (36.2837, –121.6203); Danish Creek (36.3730, –121.7590); Hitchcock Canyon Creek (36.4470, –121.7597); James Creek (36.3235, –121.5804); Las Garzas Creek (36.4607, –121.7944); Millers Fork (36.2961, –121.5697); Pinch Creek (36.3236, –121.5574); Pine Creek (36.3827, –121.7727); Potrero Creek (36.4801, –121.8258); Rana Creek (36.4877, –121.5840); Rattlesnake Creek (36.3442, –121.7080); Robertson Canyon Creek (36.4776, –121.8048); Robertson Creek (36.3658, –121.5165); San Clemente Creek (36.4227, –121.8115); Tularcitos Creek (36.4369, –121.5163); Ventana Mesa Creek (36.2977, –121.7116).

(ii) [Reserved]

(3) Santa Lucia Hydrologic Unit 3308-(i) *Santa Lucia Hydrologic Sub-area 330800.* Outlet(s) = Alder Creek (Lat 35.8578, Long –121.4165); Big Creek (36.0696, –121.6005); Big Sur River (36.2815, –121.8593); Bixby Creek (36.3713, –121.9029); Garrapata Creek (36.4176, –121.9157); Limekiln Creek (36.0084, –121.5196); Little Sur River (36.3350, –121.8934); Malpaso Creek (36.4814, –121.9384); Mill Creek (35.9825, –121.4917); Partington Creek (36.1753, –121.6973); Plaskett Creek (35.9195, –121.4717); Prewitt Creek (35.9353, –121.4760); Rocky Creek (36.3798, –121.9028); Salmon Creek (35.3558, –121.3634); San Jose Creek (36.5259, –121.9253); Vicente Creek (36.0442, –121.5855); Villa Creek (35.8495, –121.4087); Willow Creek (35.8935, –121.4619) upstream to endpoint(s) in: Alder Creek (35.8685, –121.3974); Big Creek (36.0830, –121.5884); Big Sur River (36.2490, –121.7269); Bixby Creek (36.3715, –121.8440); Devil's Canyon Creek (36.0773, –121.5695); Garrapata Creek (36.4042, –121.8594); Joshua Creek (36.4182, –121.9000); Limekiln Creek (36.0154, –121.5146); Little Sur River (36.3312, –121.7557); Malpaso Creek (36.4681, –121.8800); Mill Creek (35.9907, –121.4632); North Fork Big Sur River (36.2178, –121.5948); Partington Creek (36.1929, –121.6825); Plaskett Creek (35.9228, –121.4493); Prewitt Creek (35.9419, –121.4598); Redwood Creek (36.2825, –121.6745); Rocky Creek (36.3805, –121.8440); San Jose Creek (36.4662, –121.8118); South Fork Little Sur River (36.3026, –121.8093); Vicente Creek (36.0463, –121.5780); Villa Creek (35.8525, –121.3973); Wildcat Canyon Creek (36.4124, –121.8680); Williams Canyon Creek (36.4466, –121.8526); Willow Creek (35.9050, –121.3851).

(ii) [Reserved]

(4) Salinas River Hydrologic Unit 3309–(i) *Neponset Hydrologic Sub-area 330911.* Outlet(s) = Salinas River (Lat 36.7498, Long –121.8055); upstream to endpoint(s) in: Gabilan Creek (36.6923, –121.6300); Old Salinas River (36.7728, –121.7884); Tembladero Slough (36.6865, –121.6409).

(ii) *Chualar Hydrologic Sub-area 330920.* Outlet(s) = Gabilan Creek (Lat 36.6923, Long –121.6300) upstream.

(iii) *Soledad Hydrologic Sub-area 330930.* Outlet(s) = Salinas River (Lat 36.4878, Long –121.4688) upstream to endpoint(s) in: Arroyo Seco River (36.2644, –121.3812); Reliz Creek (36.2438, –121.2881).

(iv) *Upper Salinas Valley Hydrologic Sub-area 330940.* Outlet(s) = Salinas River (Lat 36.3183, Long –121.1837) upstream.

(v) *Arroyo Seco Hydrologic Sub-area 330960.* Outlet(s) = Arroyo Seco River (Lat 36.2644, Long –121.3812); Reliz Creek (36.2438, –121.2881); Vasqueros Creek (36.2648, –121.3368) upstream to endpoint(s) in: Arroyo Seco River (36.2041, –121.5002); Calaboose Creek (36.2942, –121.5082); Church Creek (36.2762, –121.5877); Horse Creek (36.2046, –121.3931); Paloma Creek (36.3195, –121.4894); Piney Creek (36.3023, –121.5629); Reliz Creek (36.1935, –121.2777); Rocky Creek (36.2676, –121.5225); Santa Lucia Creek (36.1999, –121.4785); Tassajara Creek (36.2679, –121.6149); Vaqueros Creek (36.2479, –121.3369); Willow Creek (36.2059, –121.5642).

(vi) *Gabilan Range Hydrologic Sub-area 330970.* Outlet(s) = Gabilan Creek (Lat 36.7800, –121.5836) upstream to endpoint(s) in: Gabilan Creek (36.7335, –121.4939).

(vii) *Paso Robles Hydrologic Sub-area 330981.* Outlet(s) = Salinas River (Lat 35.9241, Long –120.8650) upstream to endpoint(s) in:

Atascadero Creek (35.4468, –120.7010); Graves Creek (35.4838, –120.7631); Jack Creek (35.5815, –120.8560); Nacimiento River (35.7610, –120.8853); Paso Robles Creek (35.5636, –120.8455); Salinas River (35.3886, –120.5582); San Antonio River (35.7991, –120.8849); San Marcos Creek (35.6734, –120.8140); Santa Margarita Creek (35.3923, –120.6619); Santa Rita Creek

(35.5262, –120.8396); Sheepcamp Creek (35.6145, –120.7795); Summit Creek (35.6441, –120.8046); Tassajera Creek (35.3895, –120.6926); Trout Creek (35.3394, –120.5881); Willow Creek (35.6107, –120.7720).

(5) Estero Bay Hydrologic Unit 3310—(i) *San Carpoforo Hydrologic Sub-area 331011.* Outlet(s) = San Carpoforo Creek (Lat 35.7646, Long –121.3247) upstream to endpoint(s) in: Dutra Creek (35.8197, –121.3273); Estrada Creek (35.7710, –121.2661); San Carpoforo Creek (35.8202, –121.2745); Unnamed Tributary (35.7503, –121.2703); Wagner Creek (35.8166, –121.2387).

(ii) *Arroyo De La Cruz Hydrologic Sub-area 331012.* Outlet(s) = Arroyo De La Cruz (Lat 35.7097, Long –121.3080) upstream to endpoint(s) in: Arroyo De La Cruz (35.6986, –121.1722); Burnett Creek (35.7520, –121.1920); Green Canyon Creek (35.7375 , –121.2314); Marmolejo Creek (35.6774, –121.1082); Spanish Cabin Creek (35.7234, –121.1497); Unnamed Tributary (35.7291, –121.1977); West Fork Burnett Creek (35.7516, –121.2075).

(iii) *San Simeon Hydrologic Sub-area 331013.* Outlet(s) = Arroyo del Corral (Lat 35.6838, Long –121.2875); Arroyo del Puerto (35.6432, –121.1889); Little Pico Creek (35.6336, –121.1639); Oak Knoll Creek (35.6512, –121.2197); Pico Creek (35.6155, –121.1495); San Simeon Creek (35.5950, –121.1272) upstream to endpoint(s) in: Arroyo Laguna (35.6895, –121.2337); Arroyo del Corral (35.6885, –121.2537); Arroyo del Puerto (35.6773, –121.1713); Little Pico Creek (35.6890, –121.1375); Oak Knoll Creek (35.6718, –121.2010); North Fork Pico Creek (35.6886, –121.0861); San Simeon Creek (35.6228, –121.0561); South Fork Pico Creek (35.6640, –121.0685); Steiner Creek (35.6032, –121.0640); Unnamed Tributary (35.6482, –121.1067); Unnamed Tributary (35.6616, –121.0639); Unnamed Tributary (35.6741, –121.0981); Unnamed Tributary (35.6777, –121.1503); Unnamed Tributary (35.6604, –121.1571); Unnamed Tributary (35.6579, –121.1356); Unnamed Tributary (35.6744, –121.1187); Unnamed Tributary (35.6460, –121.1373); Unnamed Tributary (35.6839, –121.0955); Unnamed Tributary (35.6431, –121.0795); Unnamed Tributary (35.6820, –121.2130); Unnamed Tributary (35.6977, –121.2613); Unnamed Tributary (35.6702, –121.1884); Unnamed Tributary (35.6817, –121.0885); Van Gordon Creek (35.6286, –121.0942).

(iv) *Santa Rosa Hydrologic Sub-area 331014.* Outlet(s) = Santa Rosa Creek (Lat 35.5685, Long –121.1113) upstream to endpoint(s) in: Green Valley Creek (35.5511, –120.9471); Perry Creek (35.5323–121.0491); Santa Rosa Creek (35.5525, –120.9278); Unnamed Tributary (35.5965, –120.9413); Unnamed Tributary (35.5684, –120.9211); Unnamed Tributary (35.5746, –120.9746).

(v) *Villa Hydrologic Sub-area 331015.* Outlet(s) = Villa Creek (Lat 35.4601, Long –120.9704) upstream to endpoint(s) in: Unnamed Tributary (35.4798, –120.9630); Unnamed Tributary (35.5080, –121.0171); Unnamed Tributary (35.5348, –120.8878); Unnamed Tributary (35.5510, –120.9406); Unnamed Tributary (35.5151, –120.9497); Unnamed Tributary (35.4917, –120.9584); Unnamed Tributary (35.5173, –120.9516); Villa Creek (35.5352, –120.8942).

(vi) *Cayucos Hydrologic Sub-area 331016.* Outlet(s) = Cayucos Creek (Lat 35.4491, Long –120.9079) upstream to endpoint(s) in: Cayucos Creek (35.5257, –120.9271); Unnamed Tributary (35.5157, –120.9005); Unnamed Tributary (35.4943, –120.9513); Unnamed Tributary (35.4887, –120.8968).

(vii) *Old Hydrologic Sub-area 331017.* Outlet(s) = Old Creek (Lat 35.4345, Long –120.8868) upstream to endpoint(s) in: Old Creek (35.4480, –120.8871)

(viii) *Toro Hydrologic Sub-area 331018.* Outlet(s) = Toro Creek (Lat 35.4126, Long –120.8739) upstream to endpoint(s) in: Toro Creek (35.4945, –120.7934); Unnamed Tributary (35.4917, –120.7983).

(ix) *Morro Hydrologic Sub-area 331021.* Outlet(s) = Morro Creek (Lat 35.3762, Long –120.8642) upstream to endpoint(s) in: East Fork Morro Creek (35.4218, –120.7282); Little Morro Creek (35.4155, –120.7532); Morro Creek (35.4291, –120.7515); Unnamed Tributary (35.4292, –120.8122); Unnamed Tributary (35.4458, –120.7906); Unnamed Tributary (35.4122, –120.8335); Unnamed Tributary (35.4420, –120.7796).

(x) *Chorro Hydrologic Sub-area 331022.* Outlet(s) = Chorro Creek (Lat 35.3413, Long –120.8388) upstream to endpoint(s) in: Chorro Creek (35.3340, –120.6897); Dairy Creek (35.3699, –120.6911); Pennington Creek (35.3655, –120.7144); San Bernardo Creek (35.3935, –120.7638); San Luisito (35.3755, –120.7100); Unnamed Tributary (35.3821, –120.7217); Unnamed Tributary (35.3815, –120.7350).

(xi) *Los Osos Hydrologic Sub-area 331023.* Outlet(s) = Los Osos Creek (Lat 35.3379, Long –120.8273) upstream to endpoint(s) in: Los Osos Creek (35.2718, –120.7627).

(xii) *San Luis Obispo Creek Hydrologic Sub-area 331024.* Outlet(s) = San Luis Obispo Creek (Lat 35.1822, Long –120.7303) upstream to endpoint(s) in: Brizziolari Creek (35.3236, –120.6411); Froom Creek (35.2525, –120.7144); Prefumo Creek (35.2615, –120.7081); San Luis Obispo Creek (35.3393, –120.6301); See Canyon Creek (35.2306, –120.7675); Stenner Creek (35.3447, –120.6584); Unnamed Tributary (35.2443, –120.7655).

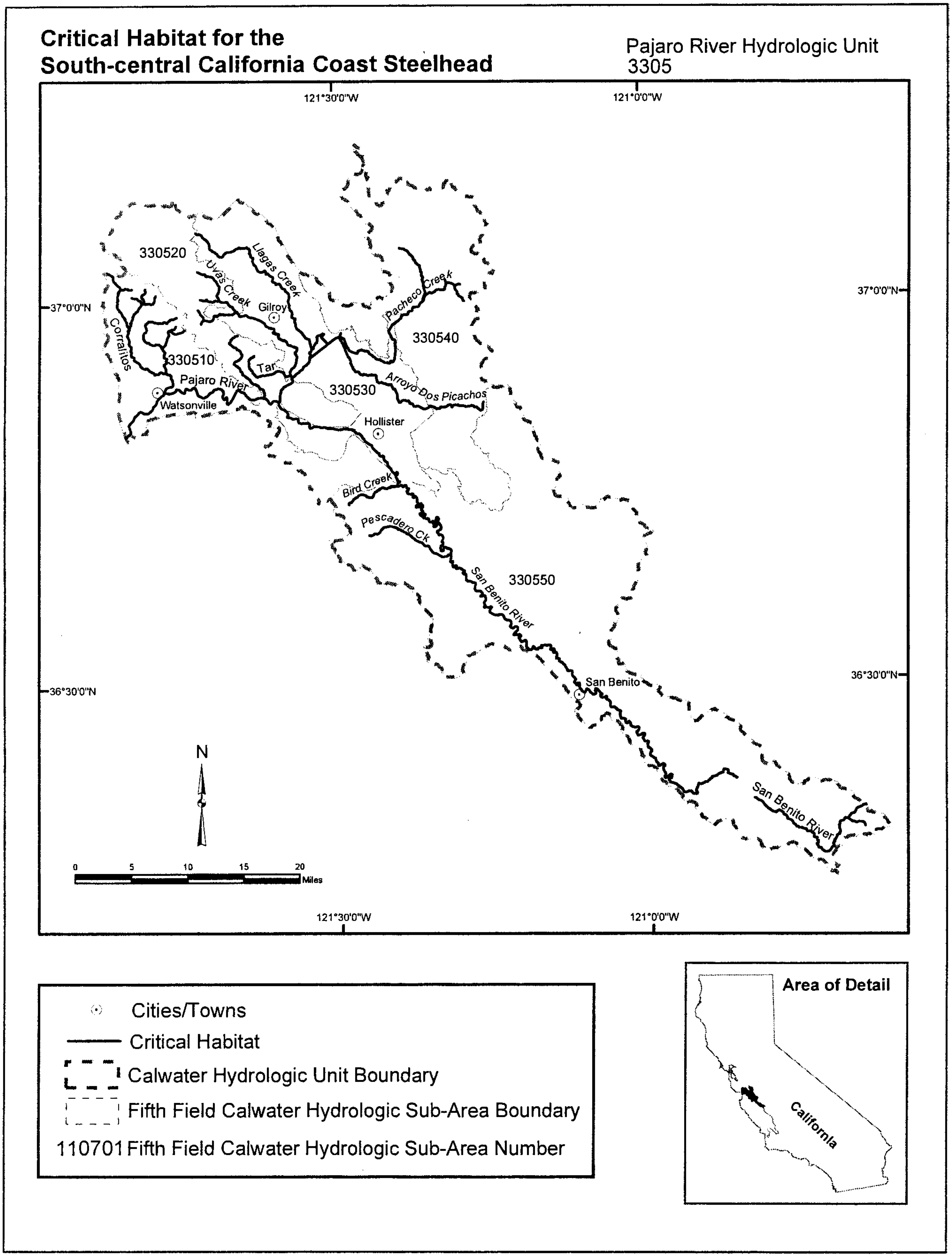
(xiii) *Point San Luis Hydrologic Sub-area 331025.* Outlet(s) = Coon Creek (Lat 35.2590, Long –120.8951); Islay Creek (35.2753, –120.8884) upstream to endpoint(s) in: Coon Creek (35.2493, –120.7774); Islay Creek (35.2574, –120.7810); Unnamed Tributary (35.2753, –120.8146); Unnamed Tributary (35.2809, –120.8147); Unnamed Tributary (35.2648, –120.7936).

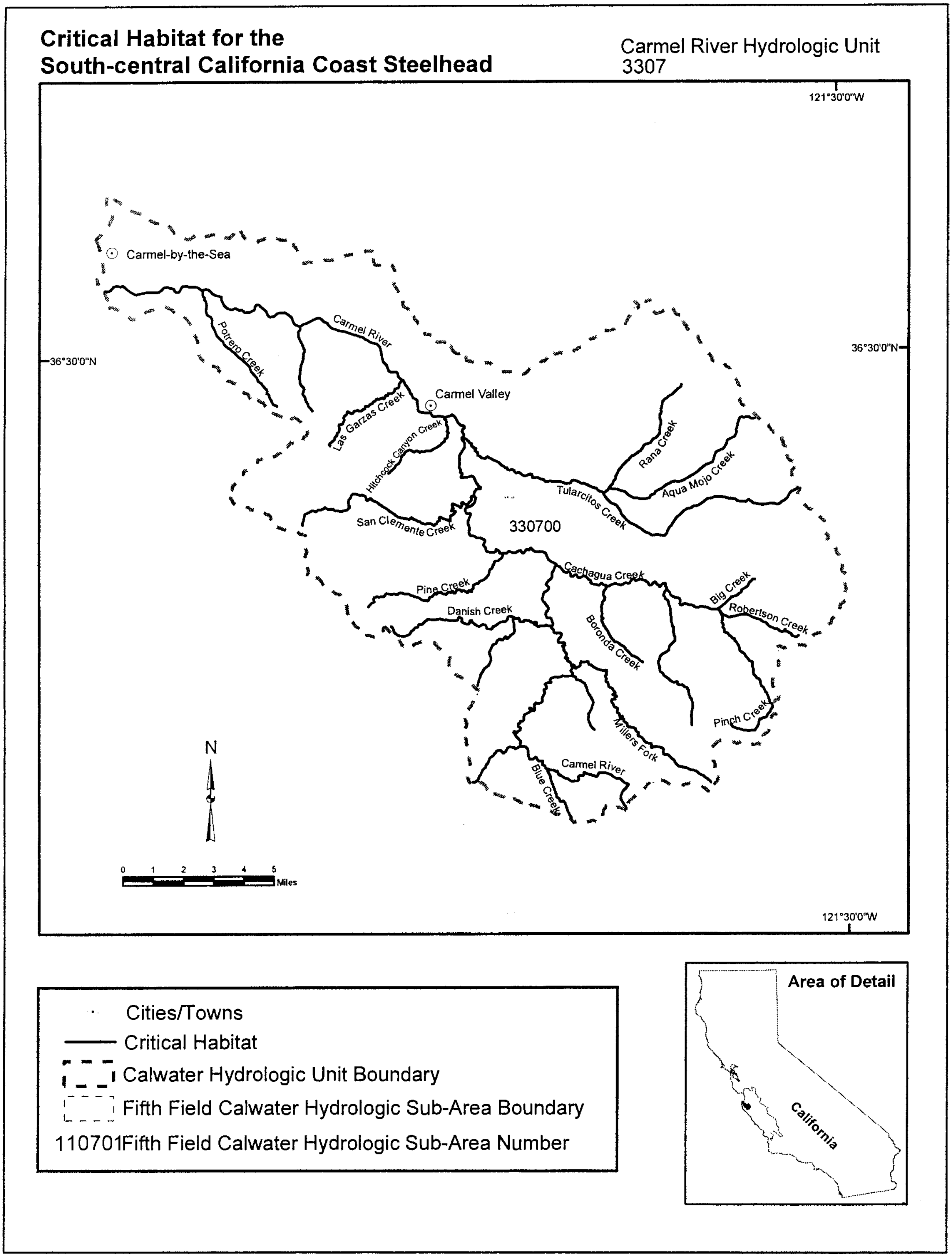
(xiv) *Pismo Hydrologic Sub-area 331026.* Outlet(s) = Pismo Creek (Lat 35.1336, Long –120.6408) upstream to endpoint(s) in: East Corral de Piedra Creek (35.2343, –120.5571); Pismo Creek (35.1969, –120.6107); Unnamed Tributary (35.2462, –120.5856).

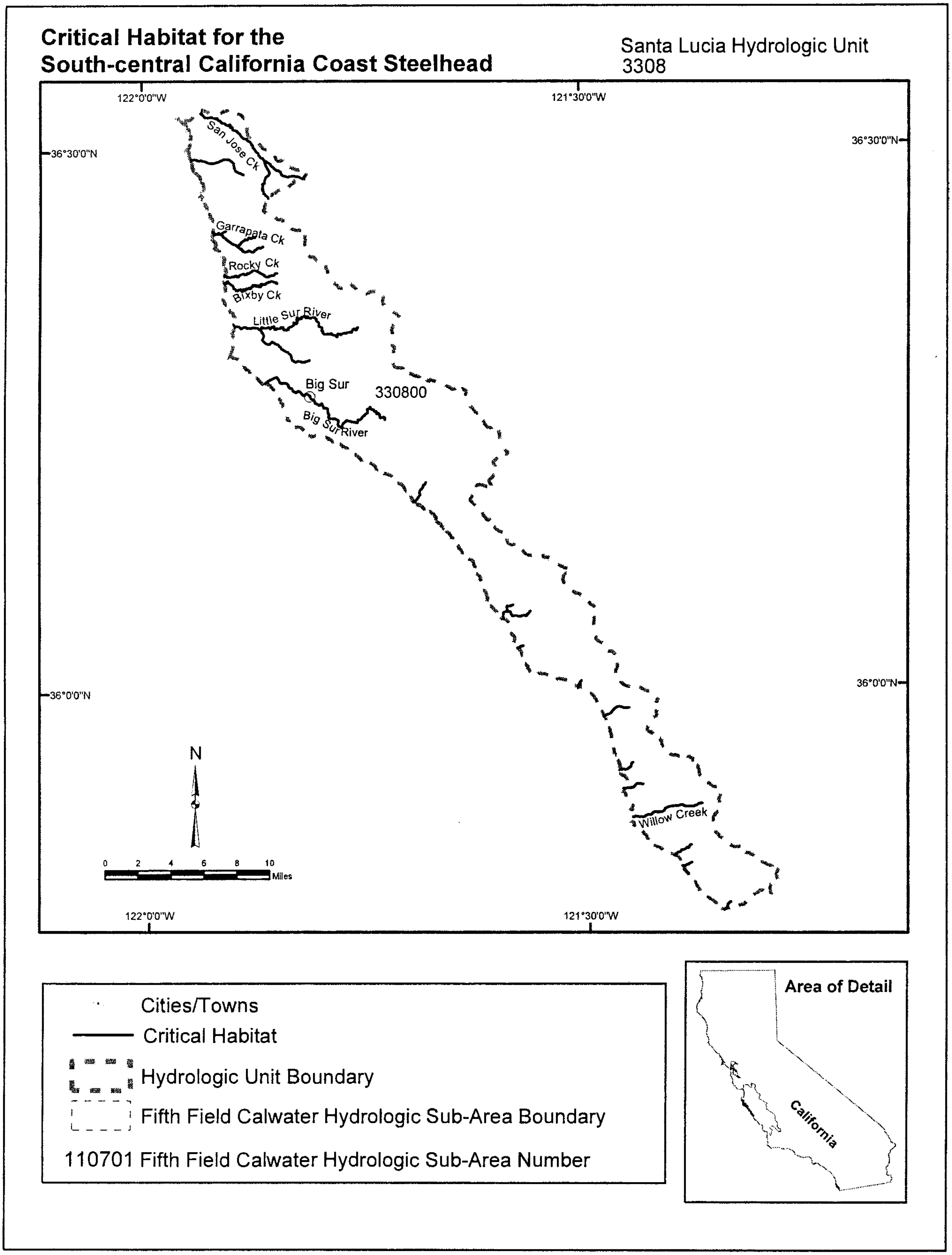
(xv) *Oceano Hydrologic Sub-area 331031.* Outlet(s) = Arroyo Grande Creek (Lat 35.1011, Long –120.6308) upstream to endpoint(s) in: Arroyo Grande Creek (35.1868, –120.4881); Los Berros Creek (35.0791, –120.4423).

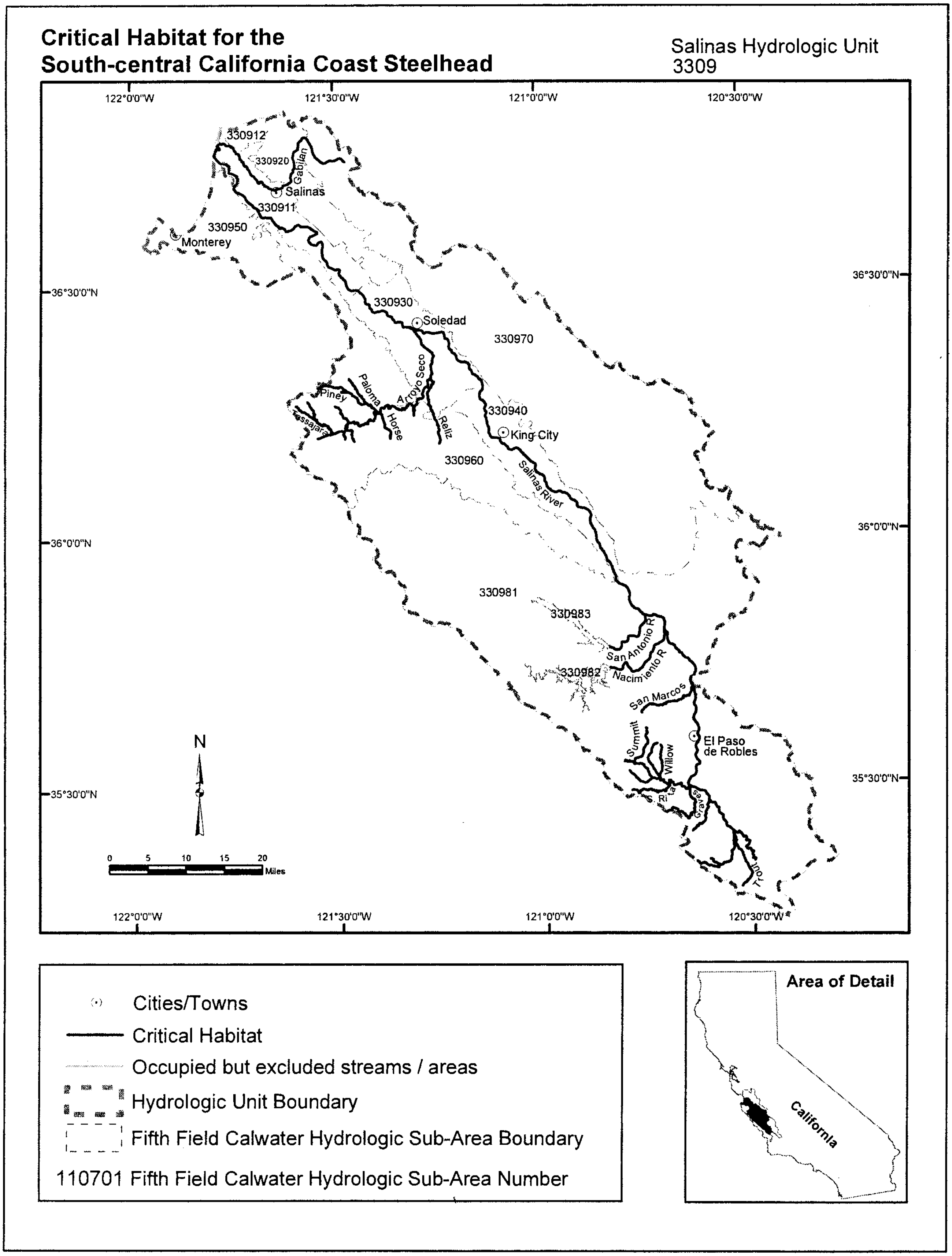
(6) Maps of critical habitat for the South-Central Coast Steelhead ESU follow:

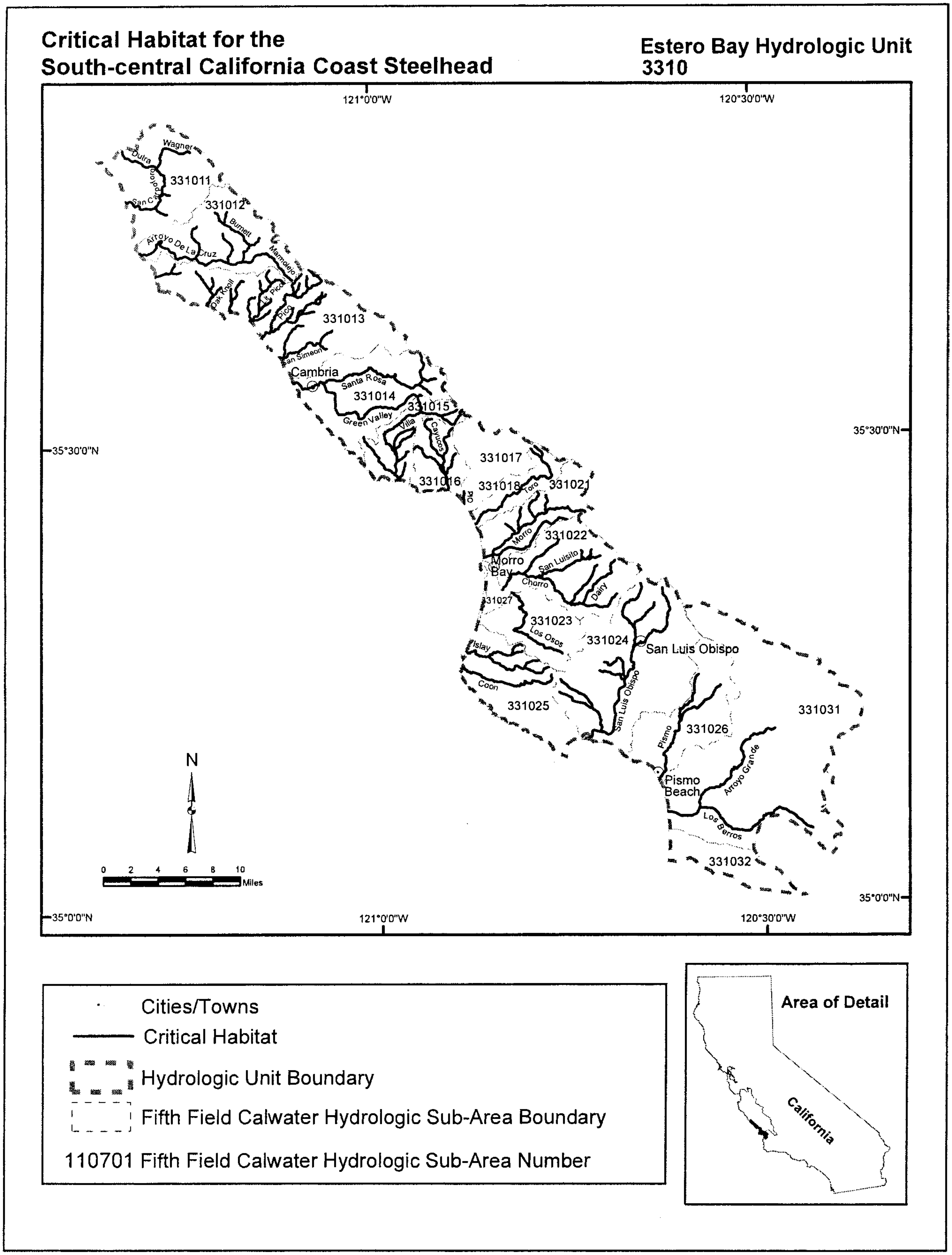
BILLING CODE 3510–22–P


Critical Habitat for the
South-central California Coast Steelhead
Pajaro River Hydrologic Unit
3305
121°30'0"W
121°0'0"W
37°0'0"N
36°30'0"N
330520
Uvas Creek
Llagas Creek
Gilroy
Pacheco Creek
330540
Corralitos
330510
Tar
Pajaro River
Watsonville
330530
Arroyo Dos Picachos
Hollister
Bird Creek
Pescadero Ck
330550
San Benito River
San Benito
N
0
5
10
15
20
Miles
Cities/Towns
Critical Habitat
Calwater Hydrologic Unit Boundary
Fifth Field Calwater Hydrologic Sub-Area Boundary
110701 Fifth Field Calwater Hydrologic Sub-Area Number
Area of Detail
California


Critical Habitat for the
South-central California Coast Steelhead
Carmel River Hydrologic Unit
3307
121°30'0"W
36°30'0"N
Carmel-by-the-Sea
Carmel River
Potrero Creek
Las Garzas Creek
Carmel Valley
Hitchcock Canyon Creek
Rana Creek
Aqua Mojo Creek
Tularcitos Creek
San Clemente Creek
330700
Cachagua Creek
Pine Creek
Danish Creek
Big Creek
Robertson Creek
Boronda Creek
Pinch Creek
Millers Fork
Carmel River
Blue Creek
N
0 1 2 3 4 5
Miles
Cities/Towns
Critical Habitat
Calwater Hydrologic Unit Boundary
Fifth Field Calwater Hydrologic Sub-Area Boundary
110701Fifth Field Calwater Hydrologic Sub-Area Number
Area of Detail
California


Critical Habitat for the
South-central California Coast Steelhead
Santa Lucia Hydrologic Unit
3308
122°0'0"W
121°30'0"W
36°30'0"N
36°0'0"N
San Jose Ck
Garrapata Ck
Rocky Ck
Bixby Ck
Little Sur River
Big Sur
330800
Big Sur River
Willow Creek
N
0 2 4 6 8 10
Miles
Cities/Towns
Critical Habitat
Hydrologic Unit Boundary
Fifth Field Calwater Hydrologic Sub-Area Boundary
110701 Fifth Field Calwater Hydrologic Sub-Area Number
Area of Detail
California


Critical Habitat for the
South-central California Coast Steelhead
Salinas Hydrologic Unit
3309
122°0'0"W
121°30'0"W
121°0'0"W
120°30'0"W
36°30'0"N
36°0'0"N
35°30'0"N
330912
330920
Gabilan
Salinas
330911
330950
Monterey
330930
Soledad
330970
Paloma
Arroyo Seco
Piney
Horse
Reliz
330940
King City
330960
Salinas River
330981
330983
San Antonio R
Nacimiento R
330982
San Marcos
El Paso
de Robles
Summit
Willow
Trout
N
0 5 10 15 20
Miles
Cities/Towns
Critical Habitat
Occupied but excluded streams / areas
Hydrologic Unit Boundary
Fifth Field Calwater Hydrologic Sub-Area Boundary
110701 Fifth Field Calwater Hydrologic Sub-Area Number
Area of Detail
California



BILLING CODE 3510–22–C

(j) *Southern California Steelhead (O. mykiss).* Critical habitat is designated to include the areas defined in the following CALWATER Hydrologic Units:

(1) Santa Maria River Hydrologic Unit 3312—(i) *Santa Maria Hydrologic Sub-area 331210.* Outlet(s) = Santa Maria River (Lat 34.9710, Long –120.6504) upstream to endpoint(s) in: Cuyama River (34.9058, –120.3026); Santa Maria River (34.9042, –120.3077); Sisquoc River (34.8941, –120.3063).

(ii) *Sisquoc Hydrologic Sub-area 331220.* Outlet(s) = Sisquoc River (Lat 34.8941, Long –120.3063) upstream to endpoint(s) in: Abel Canyon (34.8662, –119.8354); Davey Brown Creek (34.7541, –119.9650); Fish Creek (34.7531, –119.9100); Foresters Leap (34.8112, –119.7545); La Brea Creek (34.8804, –120.1316); Horse Creek (34.8372, –120.0171); Judell Creek (34.7613, –119.6496); Manzana Creek (34.7082, –119.8324); North Fork La Brea Creek (34.9681, –120.0112); Sisquoc River (34.7087, –119.6409); South Fork La Brea Creek (34.9543, –119.9793); South Fork Sisquoc River (34.7300, –119.7877); Unnamed Tributary (34.9342, –120.0589); Unnamed Tributary (34.9510, –120.0140); Unnamed Tributary (34.9687, –120.1419); Unnamed Tributary (34.9626, –120.1500); Unnamed Tributary (34.9672, –120.1194); Unnamed Tributary (34.9682, –120.0990); Unnamed Tributary (34.9973, –120.0662); Unnamed Tributary (34.9922, –120.0294); Unnamed Tributary (35.0158, –120.0337); Unnamed Tributary (34.9464, –120.0309); Unnamed Tributary (34.7544, –119.9476); Unnamed Tributary (34.7466, –119.9047); Unnamed Tributary (34.7646, –119.8673); Unnamed Tributary (34.8726, –119.9525); Unnamed Tributary (34.8884, –119.9325); Unnamed Tributary (34.8659, –119.8982); Unnamed Tributary (34.8677, –119.8513); Unnamed Tributary (34.8608, –119.8541); Unnamed Tributary (34.8784, –119.8458); Unnamed Tributary (34.8615, –119.8159); Unnamed Tributary (34.8694, –119.8229); Unnamed Tributary (34.7931, –119.8485); Unnamed Tributary (34.7846, –119.8337); Unnamed Tributary (34.7872, –119.7684); Unnamed Tributary (34.7866, –119.7552); Unnamed Tributary (34.8129, –119.7714); Unnamed Tributary (34.7760, –119.7448); Unnamed Tributary (34.7579, –119.7999); Unnamed Tributary (34.7510, –119.7921); Unnamed Tributary (34.7769, –119.7149); Unnamed Tributary (34.7617, –119.6878); Unnamed Tributary (34.7680, –119.6503); Unnamed Tributary (34.7738, –119.6493); Unnamed Tributary (34.7332, –119.6286); Unnamed Tributary (34.7519, –119.6209); Unnamed Tributary (34.7188, –119.6673); Water Canyon (34.8754, –119.9324).

(2) Santa Ynex Hydrologic Unit 3314—(i) *Mouth of Santa Ynez Hydrologic Sub-area 331410.* Outlet(s) = Santa Ynez River (Lat 34.6930, Long –120.6033) upstream to endpoint(s) in: San Miguelito Creek (34.6309, –120.4631).

(ii) *Santa Ynez, Salsipuedes Hydrologic Sub-area 331420.* Outlet(s) = Santa Ynez River (Lat 34.6335, Long –120.4126) upstream to endpoint(s) in: El Callejon Creek (34.5475, –120.2701); El Jaro Creek (34.5327, –120.2861); Llanito Creek (34.5499, –120.2762); Salsipuedes Creek (34.5711, –120.4076).

(iii) *Santa Ynez, Zaca Hydrologic Sub-area 331430.* Outlet(s) = Santa Ynez River (Lat 34.6172, Long –120.2352) upstream.

(iv) *Santa Ynez to Bradbury Hydrologic Sub-area 331440.* Outlet(s) = Santa Ynez River (Lat 34.5847, Long –120.1445) upstream to endpoint(s) in: Alisal Creek (34.5465, –120.1358); Hilton Creek (34.5839, –119.9855); Quiota Creek (34.5370, –120.0321); San Lucas Creek (34.5558, –120.0119); Santa Ynez River (34.5829, –119.9805); Unnamed Tributary (34.5646, –120.0043).

(3) South Coast Hydrologic Unit 3315—(i) *Arroyo Hondo Hydrologic Sub-area 331510.* Outlet(s) = Alegria Creek (Lat 34.4688, Long –120.2720); Arroyo Hondo Creek (34.4735, –120.1415); Cojo Creek (34.4531, –120.4165); Dos Pueblos Creek (34.4407, –119.9646); El Capitan Creek (34.4577, –120.0225); Gato Creek (34.4497, –119.9885); Gaviota Creek (34.4706, –120.2267); Jalama Creek (34.5119, –120.5023); Refugio Creek (34.4627, –120.0696); Sacate Creek (34.4708, –120.2942); San Augustine Creek (34.4588, –120.3542); San Onofre Creek (34.4699, –120.1872); Santa Anita Creek (34.4669, –120.3066); Tecolote Creek (34.4306, –119.9173) upstream to endpoint(s) in: Alegria Creek (34.4713, –120.2714); Arroyo Hondo Creek (34.5112, –120.1704); Cojo Creek (34.4840, –120.4106); Dos Pueblos Creek (34.5230, –119.9249); El Capitan Creek (34.5238, –119.9806); Escondido Creek (34.5663, –120.4643); Gato Creek (34.5203, –119.9758); Gaviota Creek (34.5176, –120.2179); Jalama Creek (34.5031, –120.3615); La Olla (34.4836, –120.4071); Refugio Creek (34.5109, –120.0508); Sacate Creek (34.4984, –120.2993); San Augustine Creek (34.4598, –120.3561); San Onofre Creek (34.4853, –120.1890); Santa Anita Creek (34.4742, –120.3085); Tecolote Creek (34.5133, –119.9058); Unnamed Tributary (34.5527, –120.4548); Unnamed Tributary (34.4972, –120.3026).

(ii) *UCSB Slough Hydrologic Sub-area 331531.* Outlet(s) = San Pedro Creek (Lat 34.4179, Long –119.8295); Tecolito Creek (34.4179, –119.8295) upstream to endpoint(s) in: Atascadero Creek (34.4345, –119.7755); Carneros Creek (34.4674, –119.8584); Cieneguitas Creek (34.4690, –119.7565); Glen Annie Creek (34.4985, –119.8666); Maria Ygnacio Creek (34.4900, –119.7830); San Antonio Creek (34.4553, –119.7826); San Pedro Creek (34.4774, –119.8359); San Jose Creek (34.4919, –119.8032); Tecolito Creek (34.4478, –119.8763); Unnamed Tributary (34.4774, –119.8846).

(iii) *Mission Hydrologic Sub-area 331532.* Outlet(s) = Arroyo Burro Creek (Lat 34.4023, Long –119.7430); Mission Creek (34.4124, –119.6876); Sycamore Creek (34.4166, –119.6668) upstream to endpoint(s) in: Arroyo Burro Creek (34.4620, –119.7461); Mission Creek (34.4482, –119.7089); Rattlesnake Creek (34.4633, –119.6902); San Roque Creek (34.4530, –119.7323); Sycamore Creek (34.4609, –119.6841).

(iv) *San Ysidro Hydrologic Sub-area 331533.* Outlet(s) = Montecito Creek (Lat 34.4167, Long –119.6344); Romero Creek (34.4186, –119.6208); San Ysidro Creek (34.4191, –119.6254); upstream to endpoint(s) in: Cold Springs Creek (34.4794, –119.6604); Montecito Creek (34.4594, –119.6542); Romero Creek (34.4452, –119.5924); San Ysidro Creek (34.4686, –119.6229); Unnamed Tributary (34.4753, –119.6437).

(v) *Carpinteria Hydrologic Sub-area 331534.* Outlet(s) = Arroyo Paredon (Lat 34.4146, Long –119.5561); Carpenteria Lagoon (Carpenteria Creek) (34.3904, –119.5204); Rincon Lagoon (Rincon Creek) (34.3733, –119.4769) upstream to endpoint(s) in: Arroyo Paredon (34.4371, –119.5481); Carpinteria Creek (34.4429, –119.4964); El Dorado Creek (34.4682, –119.4809); Gobernador Creek (34.4249, –119.4746); Rincon Lagoon (Rincon Creek) (34.3757, –119.4777); Steer Creek (34.4687, –119.4596); Unnamed Tributary (34.4481, –119.5112).

(4) Ventura River Hydrologic Unit 4402—(i) *Ventura Hydrologic Sub-area 440210.* Outlet(s) = Ventura Estuary (Ventura River) (Lat 34.2742, Long –119.3077) upstream to endpoint(s) in: Canada Larga (34.3675, –119.2377); Hammond Canyon (34.3903,

–119.2230); Sulphur Canyon (34.3727, –119.2362); Unnamed Tributary (34.3344, –119.2426); Unnamed Tributary (34.3901, –119.2747).

(ii) *Ventura Hydrologic Sub-area 440220.* Outlet(s) = Ventura River (Lat 34.3517, Long –119.3069) upstream to endpoint(s) in: Coyote Creek (34.3735, –119.3337); Matilija Creek (34.4846, –119.3086); North Fork Matilija Creek (34.5129, –119.2737); San Antonio Creek (34.4224, –119.2644); Ventura River (34.4852, –119.3001).

(iii) *Lions Hydrologic Sub-area 440231.* Outlet(s) = Lion Creek (Lat 34.4222, Long –119.2644) upstream to endpoint(s) in: Lion Creek (34.4331, –119.2004).

(iv) *Thatcher Hydrologic Sub-area 440232.* Outlet(s) = San Antonio Creek (Lat 34.4224, Long –119.2644) upstream to endpoint(s) in: San Antonio Creek (34.4370, –119.2417).

(5) Santa Clara Calleguas Hydrologic Unit 4403—(i) *Mouth of Santa Clara Hydrologic Sub-area 440310.* Outlet(s) = Santa Clara River (Lat 34.2348, Long –119.2568) upstream.

(ii) *Santa Clara, Santa Paula Hydrologic Sub-area 440321.* Outlet(s) = Santa Clara River (Lat 34.2731, Long –119.1474) upstream to endpoint(s) in: Santa Paula Creek (34.4500, –119.0563).

(iii) *Sisar Hydrologic Sub-area 440322.* Outlet(s) = Sisar Creek (Lat 34.4271, Long –119.0908) upstream to endpoint(s) in: Sisar Creek (34.4615, –119.1312).

(iv) *Sespe, Santa Clara Hydrologic Sub-area 440331.* Outlet(s) = Santa Clara River (Lat 34.3513, Long –119.0397) upstream to endpoint(s) in: Sespe Creek (34.4509, –118.9258).

(v) *Sespe Hydrologic Sub-area 440332.* Outlet(s) = Sespe Creek (Lat 34.4509, Long –118.9258) upstream to endpoint(s) in: Abadi Creek (34.6099, –119.4223); Alder Creek (34.5691, –118.9528); Bear Creek (34.5314, –119.1041); Chorro Grande Creek (34.6285, –119.3245); Fourfork Creek (34.4735, –118.8893); Howard Creek (34.5459, –119.2154); Lady Bug Creek (34.5724, –119.3173); Lion Creek (34.5047, –119.1101); Little Sespe Creek (34.4598, –118.8938); Munson Creek (34.6152, –119.2963); Park Creek (34.5537, –119.0028); Piedra Blanca Creek (34.6109, –119.1838); Pine Canyon Creek (34.4488, –118.9661); Portrero John Creek (34.6010, –119.2695); Red Reef Creek (34.5344, –119.0441); Rose Valley Creek (34.5195, –119.1756); Sespe Creek (34.6295, –119.4412); Timber Creek (34.5184, –119.0698); Trout Creek (34.5869, –119.1360); Tule Creek (34.5614, –119.2986); Unnamed Tributary (34.5125, –118.9311); Unnamed Tributary (34.5537, –119.0088); Unnamed Tributary (34.5537, –119.0048); Unnamed Tributary (34.5757, –119.3051); Unnamed Tributary (34.5988, –119.2736); Unnamed Tributary (34.5691, –119.3428); West Fork Sespe Creek (34.5106, –119.0502).

(vi) *Santa Clara, Hopper Canyon, Piru Hydrologic Sub-area 440341.* Outlet(s) = Santa Clara River (Lat 34.3860, Long –118.8711) upstream to endpoint(s) in: Hopper Creek (34.4263, –118.8309); Piru Creek (34.4613, –118.7537); Santa Clara River (34.3996, –118.7837).

(6) Santa Monica Bay Hydrologic Unit 4404—(i) *Topanga Hydrologic Sub-area 440411.* Outlet(s) = Topanga Creek (Lat 34.0397, Long –118.5831) upstream to endpoint(s) in: Topanga Creek (34.0838, –118.5980).

(ii) *Malibu Hydrologic Sub-area 440421.* Outlet(s) = Malibu Creek (Lat 34.0322, Long –118.6796) upstream to endpoint(s) in: Malibu Creek (34.0648, –118.6987).

(iii) *Arroyo Sequit Hydrologic Sub-area 440444.* Outlet(s) = Arroyo Sequit (Lat 34.0445, Long –118.9338) upstream to endpoint(s) in: Arroyo Sequit (34.0839, –118.9186); West Fork Arroyo Sequit (34.0909, –118.9235).

(7) Calleguas Hydrologic Unit 4408—(i) *Calleguas Estuary Hydrologic Sub-area 440813.* Outlet(s) = Mugu Lagoon (Calleguas Creek) (Lat 34.1093, Long –119.0917) upstream to endpoint(s) in: Mugu Lagoon (Calleguas Creek) (Lat 34.1125, Long –119.0816).

(ii) [Reserved]

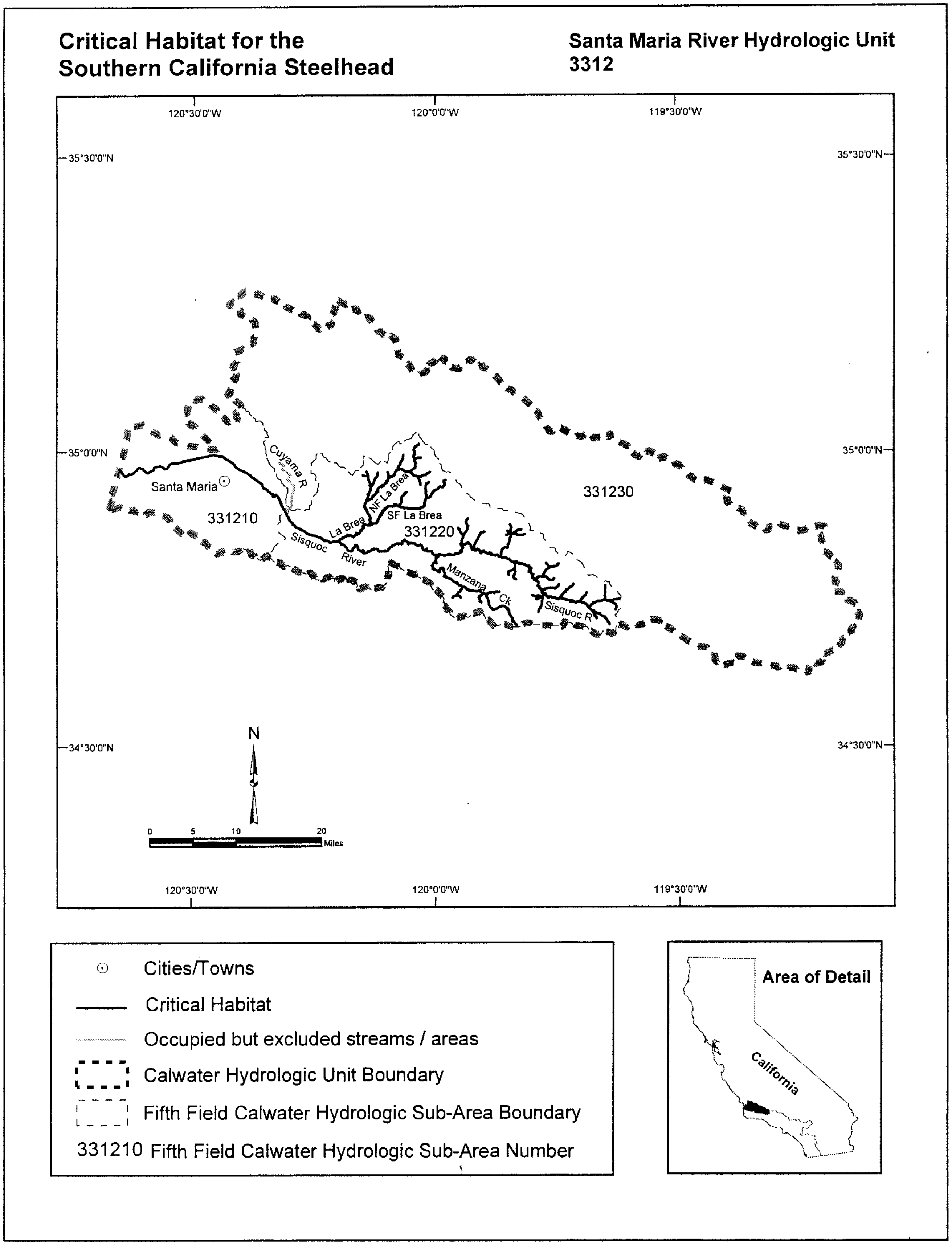
(8) San Juan Hydrologic Unit 4901—(i) *Middle Trabuco Hydrologic Sub-area 490123.* Outlet(s) = Trabuco Creek (Lat 33.5165, Long –117.6727) upstream to endpoint(s) in: Trabuco Creek (33.5264, –117.6700).

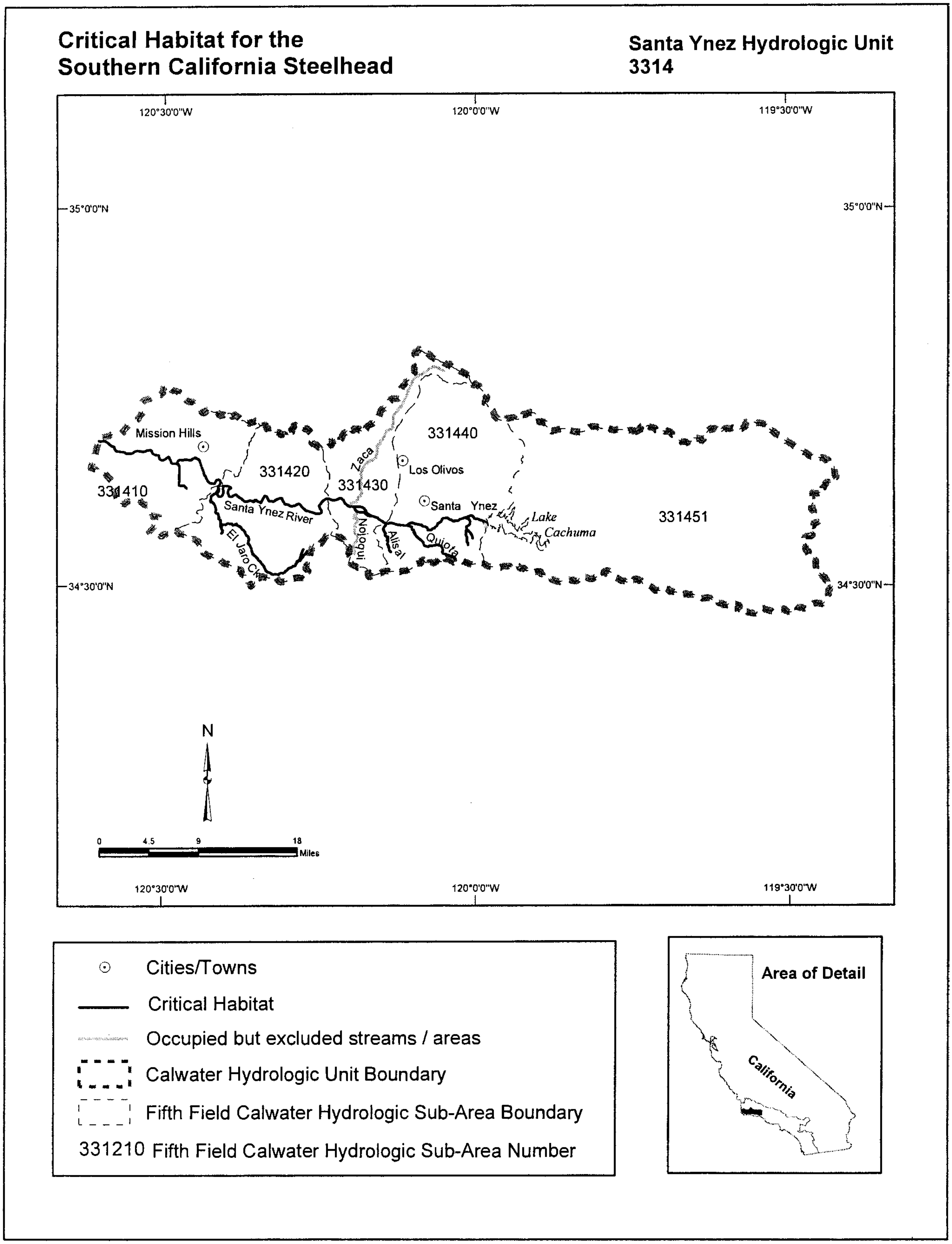
(ii) *Lower San Juan Hydrologic Sub-area 490127.* Outlet(s) = San Juan Creek (Lat 33.4621, Long –117.6842) upstream to endpoint(s) in: San Juan Creek (33.4929, –117.6610); Trabuco Creek (33.5165, –117.6727).

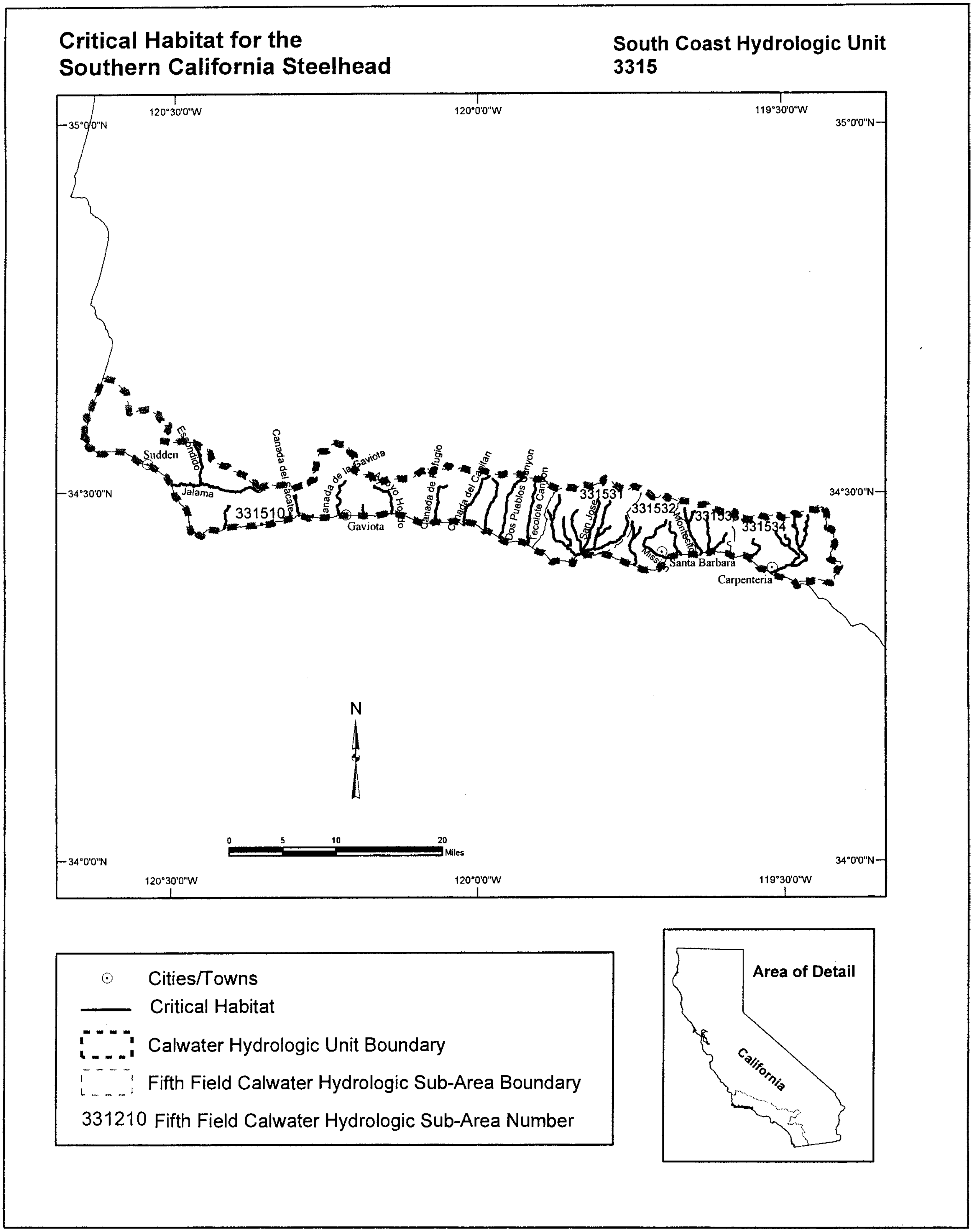
(iii) *San Mateo Hydrologic Sub-area 490140.* Outlet(s) = San Mateo Creek (Lat 33.3851, Long –117.5933) upstream to endpoint(s) in: San Mateo Creek (33.4779, –117.4386); San Mateo Canyon (33.4957, –117.4522).

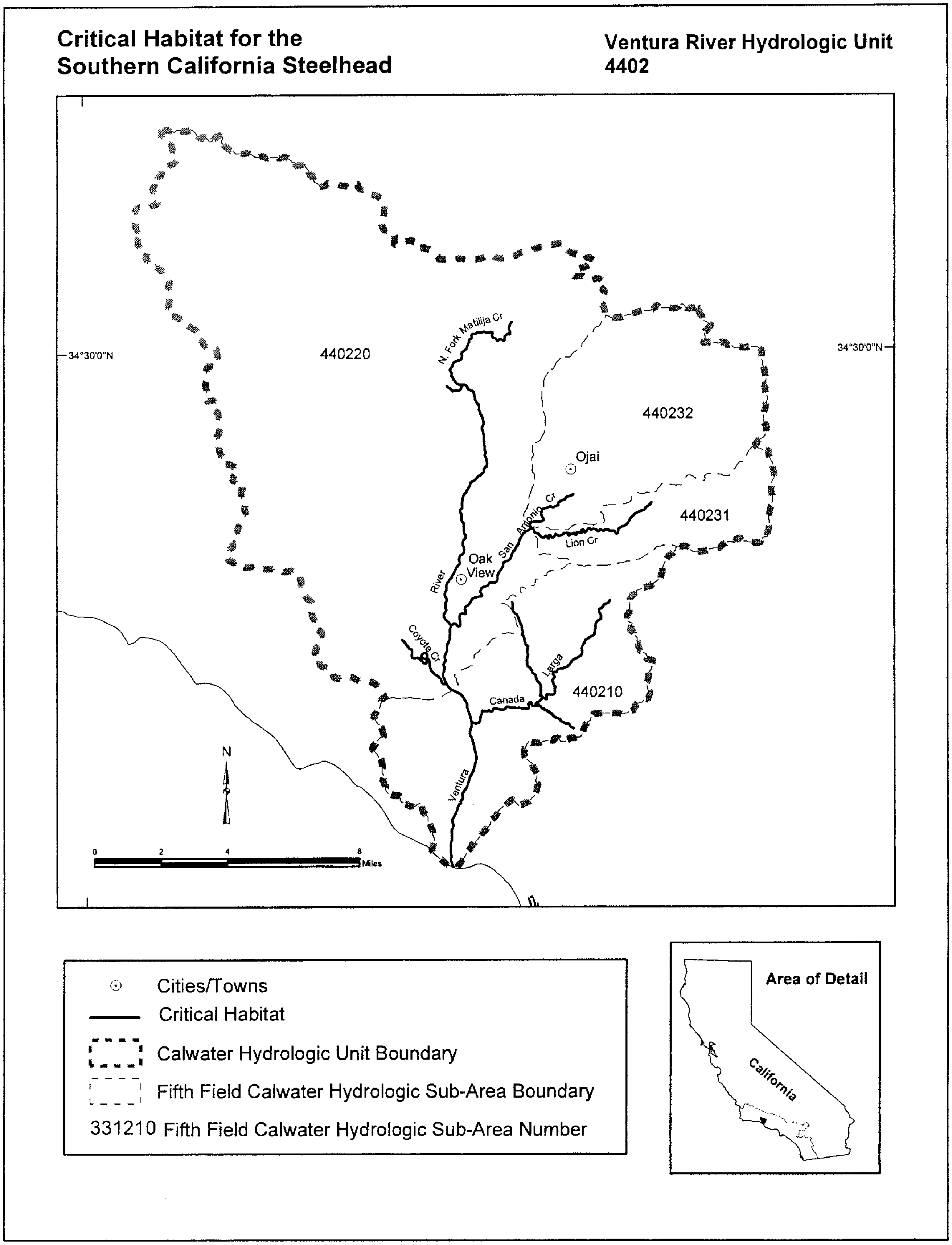
(9) Maps of critical habitat for the Southern California Steelhead ESU follow:

BILLING CODE 3510–22P


Critical Habitat for the
Southern California Steelhead
Santa Maria River Hydrologic Unit
3312
120°30'0"W
120°0'0"W
119°30'0"W
35°30'0"N
35°0'0"N
34°30'0"N
Cuyama R
Santa Maria
331210
331220
331230
NF La Brea
SF La Brea
La Brea
Sisquoc River
Manzana Ck
Sisquoc R
N
0 5 10 20 Miles
Cities/Towns
Critical Habitat
Occupied but excluded streams / areas
Calwater Hydrologic Unit Boundary
Fifth Field Calwater Hydrologic Sub-Area Boundary
331210 Fifth Field Calwater Hydrologic Sub-Area Number
Area of Detail
California

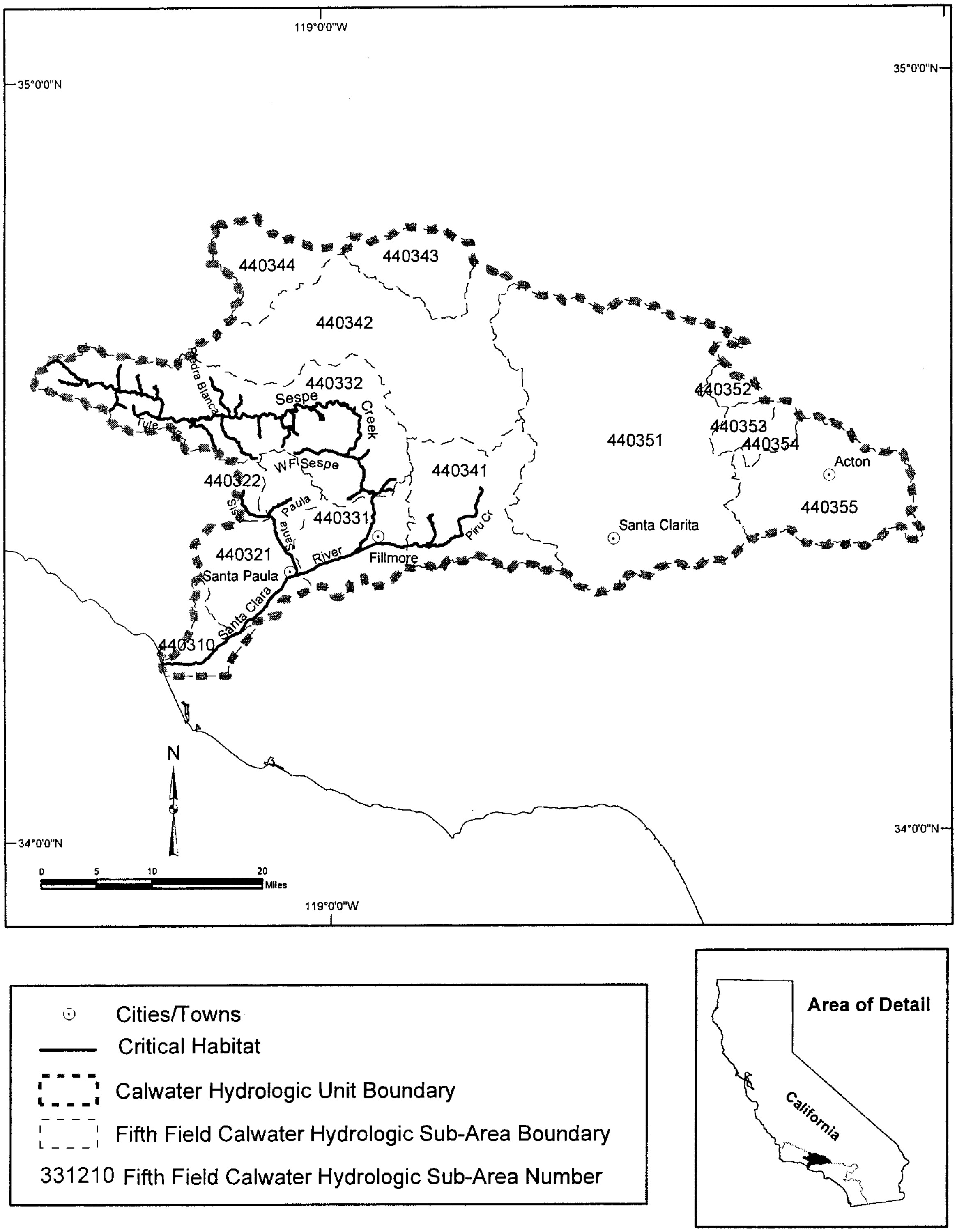

Critical Habitat for the
Southern California Steelhead
Santa Ynez Hydrologic Unit
3314
120°30'0"W
120°0'0"W
119°30'0"W
35°0'0"N
34°30'0"N
Mission Hills
331410
331420
331430
331440
331451
Los Olivos
Santa Ynez
Lake Cachuma
Santa Ynez River
El Jaro Ck
Zaca
Nojoqui
Alisal
Quiota
N
0 4.5 9 18
Miles
Cities/Towns
Critical Habitat
Occupied but excluded streams / areas
Calwater Hydrologic Unit Boundary
Fifth Field Calwater Hydrologic Sub-Area Boundary
331210 Fifth Field Calwater Hydrologic Sub-Area Number
Area of Detail
California

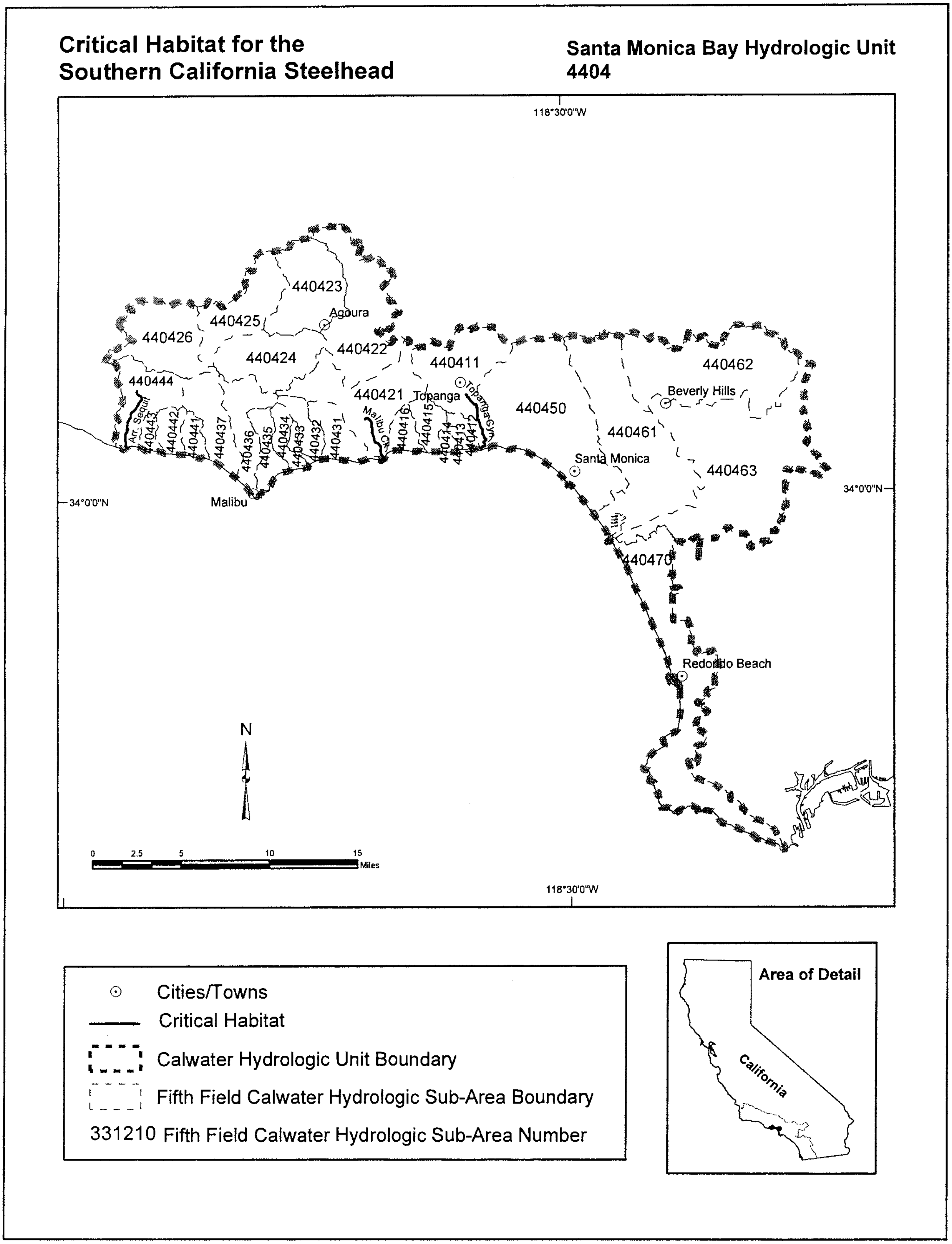

Critical Habitat for the
Southern California Steelhead
South Coast Hydrologic Unit
3315
120°30'0"W
120°0'0"W
119°30'0"W
35°0'0"N
34°30'0"N
34°0'0"N
Sudden
Espondido
Jalama
331510
Canada del Sacate
Canada de la Gaviota
Arroyo Hondo
Gaviota
Canada de Refugio
Canada del Capitan
Dos Pueblos Canyon
Tecolote Canyon
San Jose
331531
331532
331533
331534
Montecito
Mission
Santa Barbara
Carpenteria
N
0
5
10
20
Miles
Cities/Towns
Critical Habitat
Calwater Hydrologic Unit Boundary
Fifth Field Calwater Hydrologic Sub-Area Boundary
331210 Fifth Field Calwater Hydrologic Sub-Area Number
Area of Detail
California


Critical Habitat for the
Southern California Steelhead
Ventura River Hydrologic Unit
4402
34°30'0"N
34°30'0"N
440220
440232
440231
440210
N. Fork Matilija Cr
Ojai
San Antonio Cr
Lion Cr
Oak View
River
Coyote Cr
Larga
Canada
Ventura
N
0
2
4
8
Miles
Cities/Towns
Critical Habitat
Calwater Hydrologic Unit Boundary
Fifth Field Calwater Hydrologic Sub-Area Boundary
331210 Fifth Field Calwater Hydrologic Sub-Area Number
Area of Detail
California

Critical Habitat for the Southern California Steelhead

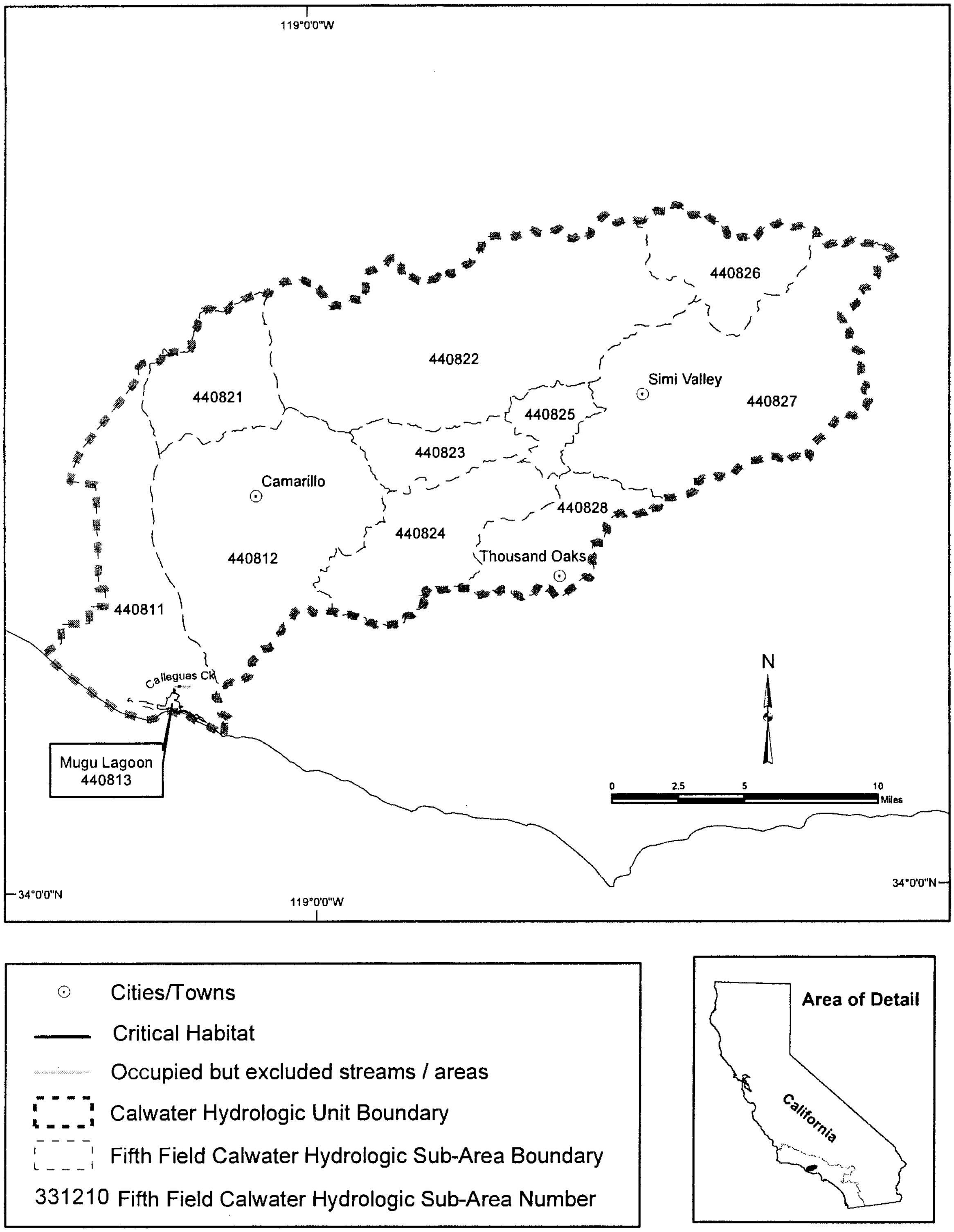
Santa Clara-Calleguas Hydrologic Unit 4403

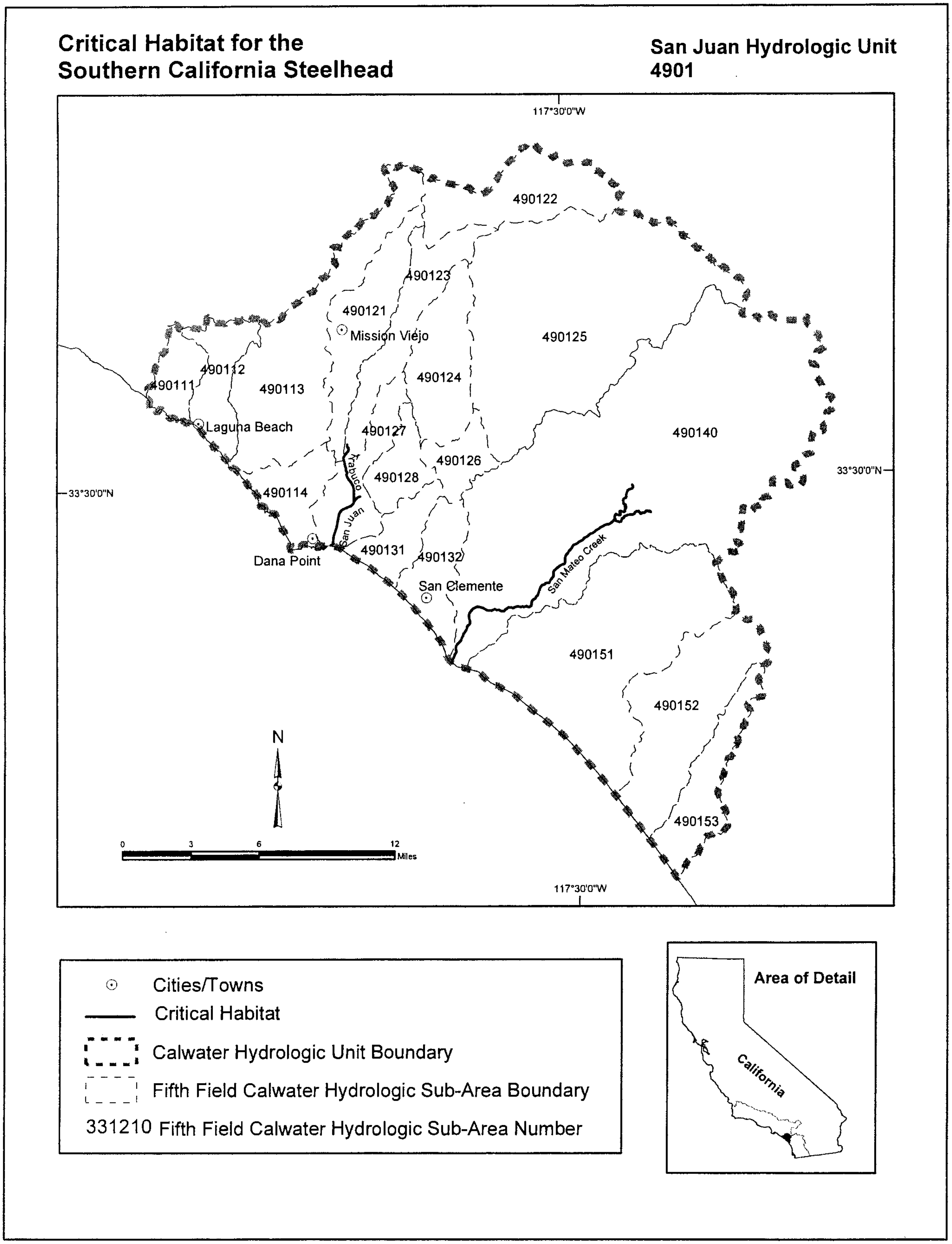



Critical Habitat for the
Southern California Steelhead
Santa Monica Bay Hydrologic Unit
4404
118°30'0"W
34°0'0"N
440423
Agoura
440425
440426
440424
440422
440411
440462
440444
440421
Topanga
Beverly Hills
440450
440461
Santa Monica
440463
Malibu
440470
Redondo Beach
N
0 2.5 5 10 15 Miles
Cities/Towns
Critical Habitat
Calwater Hydrologic Unit Boundary
Fifth Field Calwater Hydrologic Sub-Area Boundary
331210 Fifth Field Calwater Hydrologic Sub-Area Number
Area of Detail
California

Critical Habitat for the Southern California Steelhead

Calleguas Hydrologic Unit 4408





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(k) *Central Valley Spring Run Chinook Salmon (O. tshawytscha).* Critical habitat is designated to include the areas defined in the following CALWATER Hydrologic Units:

(1) Tehama Hydrologic Unit 5504—(i) *Lower Stony Creek Hydrologic Sub-area 550410.* Outlet(s) = Glenn-Colusa Canal (Lat 39.6762, Long –122.0151); Stony Creek (39.7122, –122.0072) upstream to endpoint(s) in: Glenn-Colusa Canal (39.7122, –122.0072); Stony Creek (39.8178, –122.3253).

(ii) *Red Bluff Hydrologic Sub-area 550420.* Outlet(s) = Sacramento River (Lat 39.6998, Long –121.9419) upstream to endpoint(s) in: Antelope Creek (40.2023, –122.1275); Big Chico Creek (39.7757, –121.7525); Blue Tent Creek (40.2284, –122.2551); Burch Creek (39.8526, –122.1502); Butler Slough (40.1579, –122.1320); Coyote Creek (40.0929, –122.1621); Craig Creek (40.1617, –122.1350); Deer Creek (40.0144, –121.9481); Dibble Creek (40.2003, –122.2420); Dye Creek (40.0904, –122.0767); Elder Creek (40.0526, –122.1717); Jewet Creek (39.8913, –122.1005); Kusal Slough (39.7577, –121.9699); Lindo Channel (39.7623, –121.7923); McClure Creek (40.0074, –122.1729); Mill Creek (40.0550, –122.0317); Mud Creek (39.7931, –121.8865); New Creek (40.1873, –122.1350); Oat Creek (40.0847, –122.1658); Pine Creek (39.8760, –121.9777); Red Bank Creek (40.1391, –122.2157); Reeds Creek (40.1687, –122.2377); Rice Creek (39.8495, –122.1626); Rock Creek (39.8189, –121.9124); Salt Creek (40.1869, –122.1845); Singer Creek (39.9200, –121.9612); Thomes Creek (39.8822, –122.5527); Toomes Creek (39.9808, –122.0642); Unnamed Tributary (39.8532, –122.1627); Unnamed Tributary (40.1682, –122.1459); Unnamed Tributary (40.1867, –122.1353).

(2) Whitmore Hydrologic Unit 5507—(i) *Inks Creek Hydrologic Sub-area 550711.* Outlet(s) = Inks Creek (Lat 40.3305, Long –122.1520) upstream to endpoint(s) in: Inks Creek 40.3418, –122.1332).

(ii) *Battle Creek Hydrologic Sub-area 550712* Outlet(s) = Battle Creek (Lat 40.4083, Long –122.1102) upstream to endpoint(s) in: Battle Creek (40.4228, –121.9975); North Fork Battle Creek (40.4746, –121.8436); South Fork Battle Creek (40.3549, –121.6861).

(iii) *Inwood Hydrologic Sub-area 550722.* Outlet(s) = Bear Creek (Lat 40.4352, Long –122.2039) upstream to endpoint(s) in: Bear Creek (40.4859, –122.1529); Dry Creek (40.4574, –122.1993).

(3) Redding Hydrologic Unit 5508—(i) *Enterprise Flat Hydrologic Sub-area 550810.* Outlet(s)= Sacramento River (Lat 40.2526, Long –122.1707) upstream to endpoint(s) in: Anderson Creek (40.3910, –122.1984); Ash Creek (40.4451, –122.1815); Battle Creek (40.4083, –122.1102); Churn Creek (40.5431, –122.3395); Clear Creek (40.5158, –122.5256); Cow Creek (40.5438, –122.1318); Olney Creek (40.5262, –122.3783); Paynes Creek (40.2810, –122.1587); Stillwater Creek (40.4789, –122.2597).

(ii) *Lower Cottonwood Hydrologic Sub-area 550820.* Outlet(s) = Cottonwood Creek (Lat 40.3777, Long –122.1991) upstream to endpoint(s) in: Cottonwood Creek (40.3943, –122.5254); Middle Fork Cottonwood Creek (40.3314, –122.6663); South Fork Cottonwood Creek (40.1578, –122.5809).

(4) Eastern Tehama Hydrologic Unit 5509—(i) *Big Chico Creek Hydrologic Sub-area 550914.* Outlet(s) = Big Chico Creek (Lat 39.7757, Long –121.7525) upstream to endpoint(s) in: Big Chico Creek (39.8873, –121.6979).

(ii) *Deer Creek Hydrologic Sub-area 550920.* Outlet(s) = Deer Creek (Lat 40.0144, Long –121.9481) upstream to endpoint(s) in: Deer Creek (40.2019, –121.5130).

(iii) *Upper Mill Creek Hydrologic Sub-area 550942.* Outlet(s) = Mill Creek (Lat 40.0550, Long –122.0317) upstream to endpoint(s) in: Mill Creek (40.3997, –121.5131).

(iv) *Antelope Creek Hydrologic Sub-area 550963.* Outlet(s) = Antelope Creek (Lat 40.2023, Long –122.1272) upstream to endpoint(s) in: Antelope Creek (40.2416, –121.8630); North Fork Antelope Creek (40.2691, –121.8226); South Fork Antelope Creek (40.2309, –121.8325).

(5) Sacramento Delta Hydrologic Unit 5510—(i) *Sacramento Delta Hydrologic Sub-area 551000.* Outlet(s) = Sacramento River (Lat 38.0612, Long –121.7948) upstream to endpoint(s) in: Cache Slough (38.3086, –121.7633); Delta Cross Channel (38.2433, –121.4964); Elk Slough (38.4140, –121.5212); Elkhorn Slough (38.2898, –121.6271); Georgiana Slough (38.2401, –121.5172); Miners Slough (38.2864, –121.6051); Prospect Slough (38.1477, –121.6641); Sevenmile Slough (38.1171, –121.6298); Steamboat Slough (38.3052, –121.5737); Sutter Slough (38.3321, –121.5838); Threemile Slough (38.1155, –121.6835); Yolo Bypass (38.5800, –121.5838).

(ii) [Reserved]

(6) Valley-Putah-Cache Hydrologic Unit 5511—(i) *Lower Putah Creek Hydrologic Sub-area 551120.* Outlet(s) = Yolo Bypass (Lat 38.5800, Long –121.5838) upstream to endpoint(s) in: Sacramento Bypass (38.6057, –121.5563); Yolo Bypass (38.7627, –121.6325).

(ii) [Reserved]

(7) Marysville Hydrologic Unit 5515—(i) *Lower Yuba River Hydrologic Sub-area 551510.* Outlet(s) = Bear River (Lat 38.9398, Long –121.5790) upstream to endpoint(s) in: Bear River (38.9783, –121.5166).

(ii) *Lower Yuba River Hydrologic Sub-area 551530.* Outlet(s) = Yuba River (Lat 39.1270, Long –121.5981) upstream to endpoint(s) in: Yuba River (39.2203, –121.3314).

(iii) *Lower Feather River Hydrologic Sub-area 551540.* Outlet(s) = Feather River (Lat 39.1270, Long –121.5981) upstream to endpoint(s) in: Feather River (39.5203, –121.5475).

(8) Yuba River Hydrologic Unit 5517—(i) *Browns Valley Hydrologic Sub-Area 551712.* Outlet(s) = Dry Creek (Lat 39.2207, Long –121.4088); Yuba River (39.2203, –121.3314) upstream to endpoint(s) in: Dry Creek (39.3201, –121.3117); Yuba River (39.2305, –121.2813).

(ii) *Englebright Hydrologic Sub-area 551714.* Outlet(s) = Yuba River (Lat 39.2305, Long –121.2813) upstream to endpoint(s) in: Yuba River (39.2388, –121.2698).

(9) Valley-American Hydrologic Unit 5519—(i) *Lower American Hydrologic Sub-area 551921.* Outlet(s) = American River (Lat 38.5971, Long –121.5088) upstream to endpoint(s) in: American River (38.5669, –121.3827).

(ii) *Pleasant Grove Hydrologic Sub-area 551922.* Outlet(s) = Sacramento River (Lat 38.5965, Long –121.5086) upstream to endpoint(s) in: Feather River (39.1270, –121.5981).

(10) Colusa Basin Hydrologic Unit 5520—(i) *Sycamore-Sutter Hydrologic Sub-area 552010.* Outlet(s) = Sacramento River (Lat 38.7604, Long –121.6767) upstream to endpoint(s) in: Tisdale Bypass (39.0261, –121.7456).

(ii) *Sutter Bypass Hydrologic Sub-area 552030.* Outlet(s) = Sacramento River (Lat 38.7849, Long –121.6219) upstream to endpoint(s) in: Butte Creek (39.1987, –121.9285); Butte Slough (39.1987, –121.9285); Nelson Slough (38.8901, –121.6352); Sacramento Slough (38.7843, –121.6544); Sutter Bypass (39.1417, –121.8196; 39.1484, –121.8386); Tisdale Bypass (39.0261, –121.7456); Unnamed Tributary (39.1586, –121.8747).

(iii) *Butte Basin Hydrologic Sub-area 552040.* Outlet(s) = Butte Creek (Lat 39.1990, Long –121.9286); Sacramento River (39.4141, –122.0087) upstream to endpoint(s) in: Butte creek (39.7095, –121.7506); Colusa Bypass (39.2276,

–121.9402); Unnamed Tributary (39.6762, –122.0151).

(11) Butte Creek Hydrologic Unit 5521—*Upper Little Chico Hydrologic Sub-area 552130.* Outlet(s) = Butte Creek (Lat 39.7096, –121.7504) upstream to endpoint(s) in Butte Creek (39.8665, –121.6344).

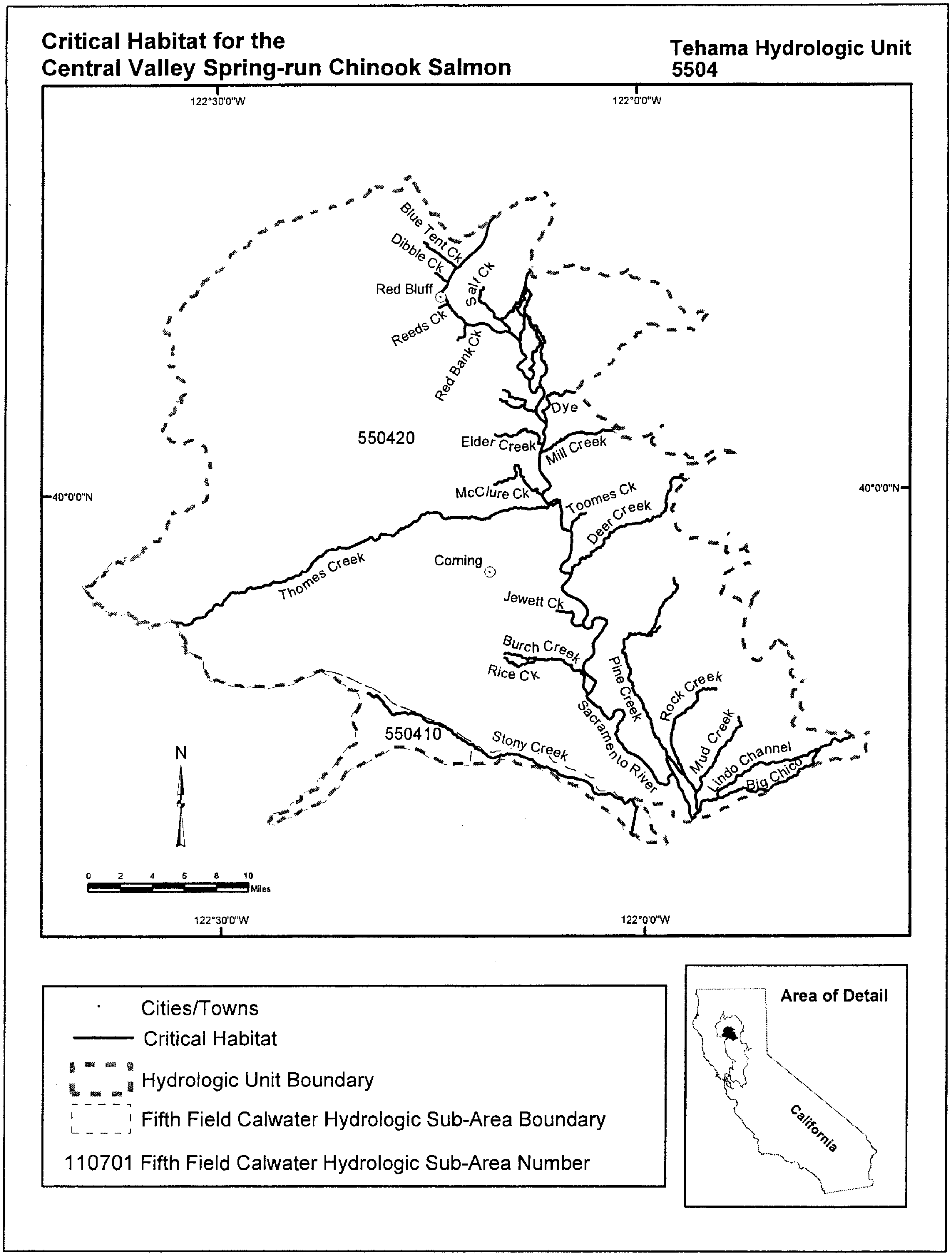
(12) Shasta Bally Hydrologic Unit 5524—(i) *Platina Hydrologic Sub-area 552436.* Outlet(s) = Middle Fork Cottonwood Creek (Lat 40.3314, –122.6663) upstream to endpoint(s) in Beegum Creek (40.3066, –122.9205); Middle Fork Cottonwood Creek (40.3655, –122.7451).

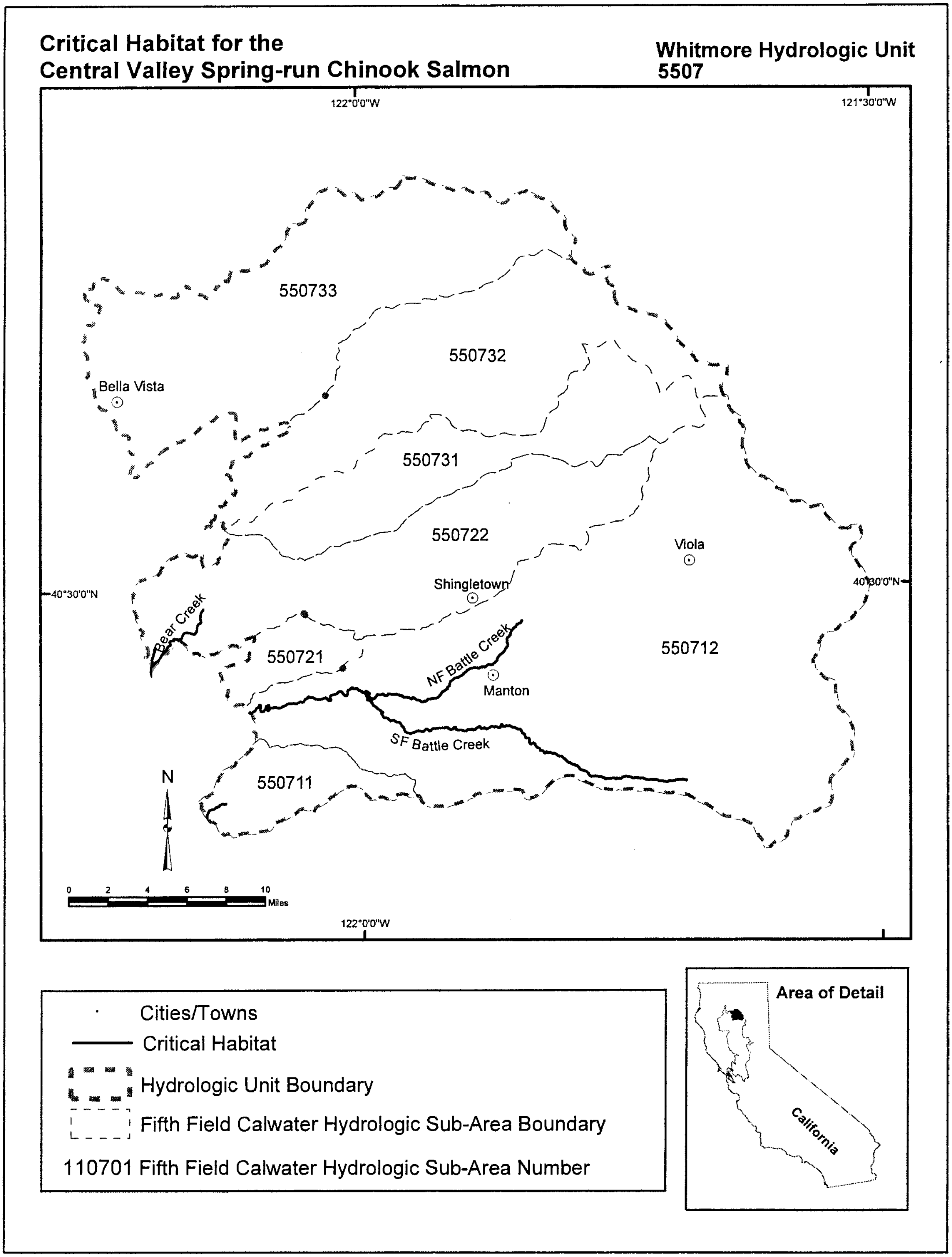
(ii) *Spring Creek Hydrologic Sub-area 552440.* Outlet(s) = Sacramento River (Lat 40.5943, Long –122.4343) upstream to endpoint(s) in: Sacramento River (40.6116, –122.4462)

(iii) *Kanaka Peak Hydrologic Sub-area 552462.* Outlet(s) = Clear Creek (Lat 40.5158, Long –122.5256) upstream to endpoint(s) in: Clear Creek (40.5992, –122.5394).

(13) Maps of critical habitat for the Central Valley Spring Run Chinook ESU follow:

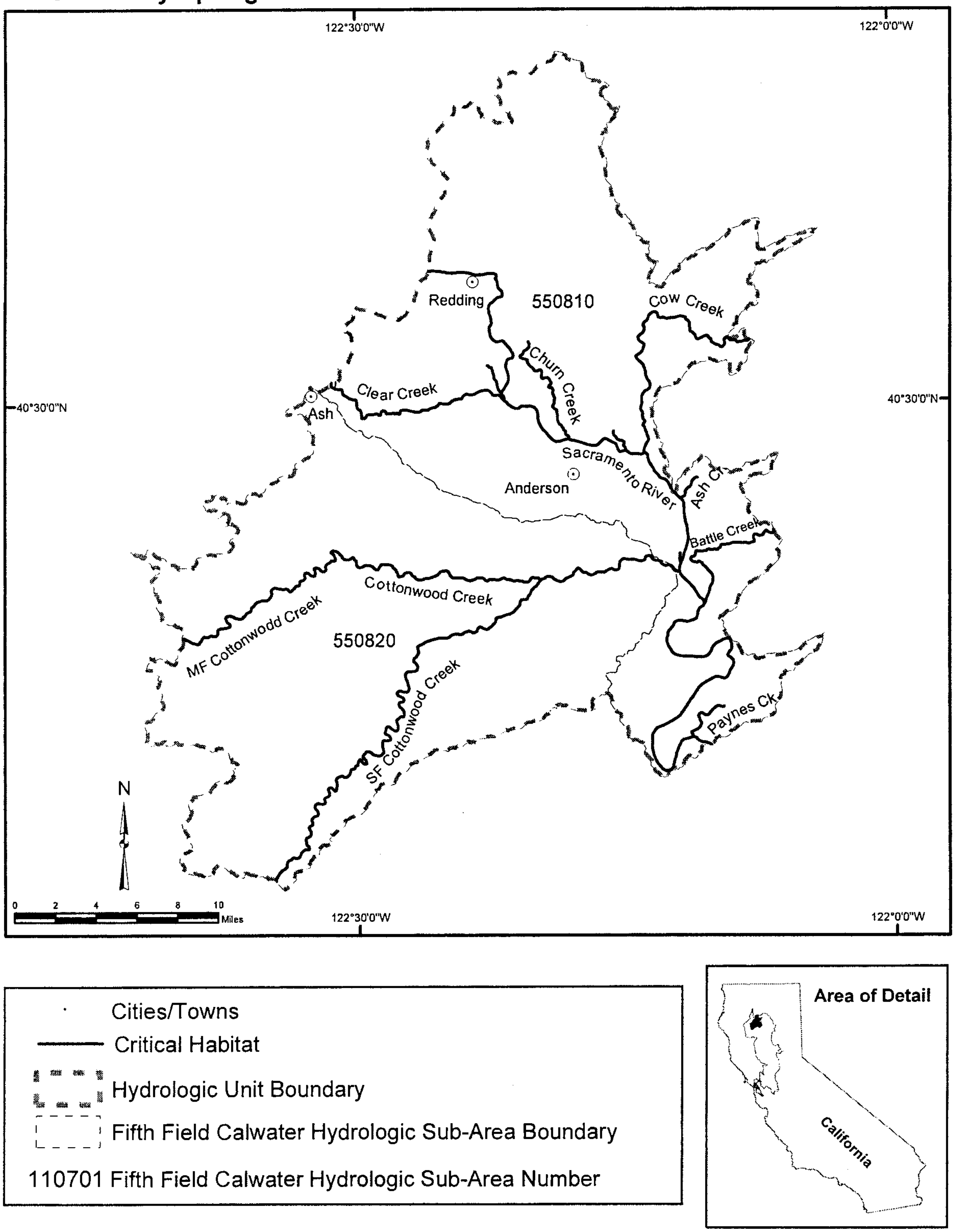
BILLING CODE 3510–22–P

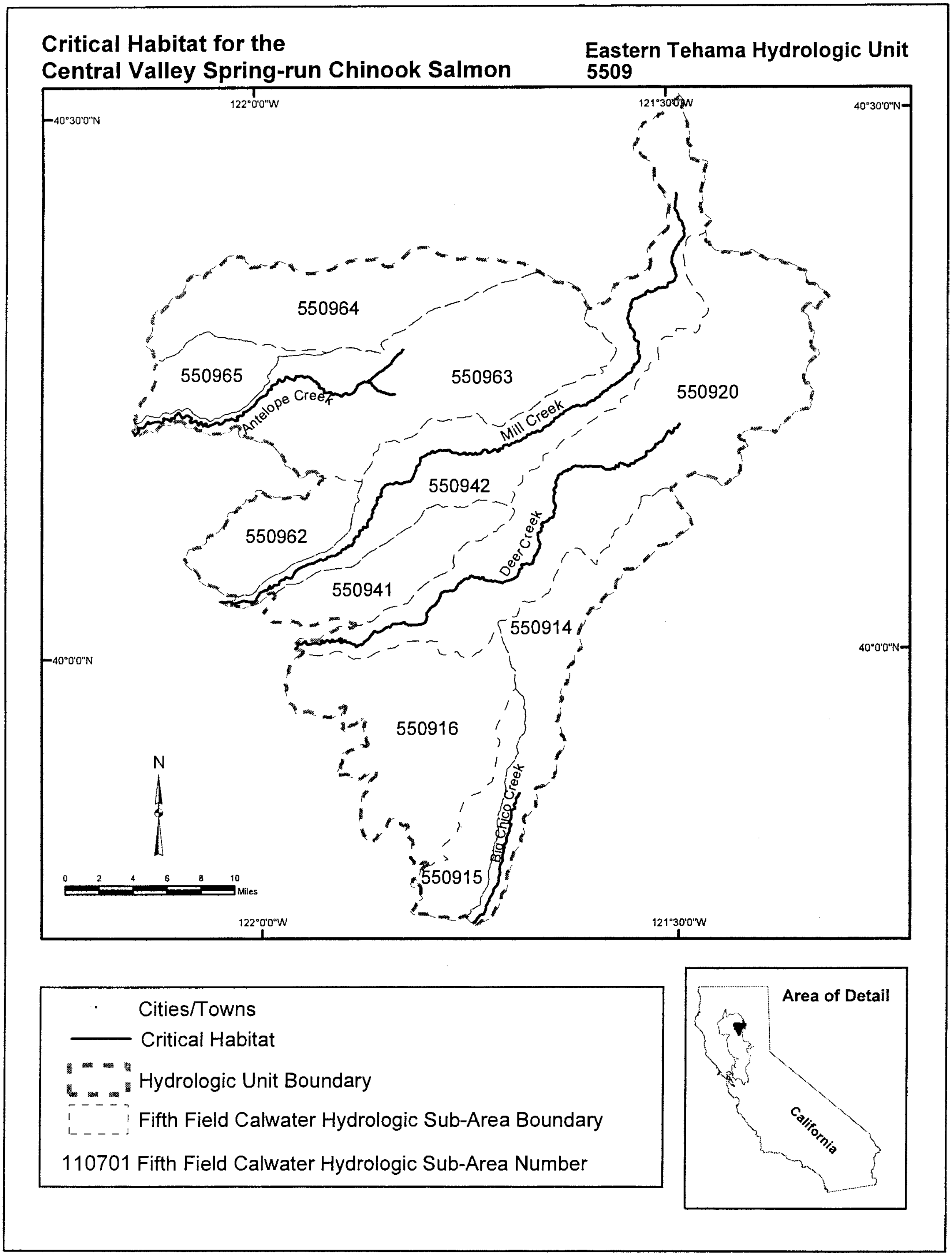

Critical Habitat for the
Central Valley Spring-run Chinook Salmon
Tehama Hydrologic Unit
5504
122°30'0"W
122°0'0"W
40°0'0"N
Blue Tent Ck
Dibble Ck
Red Bluff
Salt Ck
Reeds Ck
Red Bank Ck
Dye
550420
Elder Creek
Mill Creek
McClure Ck
Toomes Ck
Deer Creek
Corning
Thomes Creek
Jewett Ck
Burch Creek
Rice Ck
Pine Creek
Sacramento River
Rock Creek
Mud Creek
Lindo Channel
Big Chico
550410
Stony Creek
N
0 2 4 6 8 10
Miles
Cities/Towns
Critical Habitat
Hydrologic Unit Boundary
Fifth Field Calwater Hydrologic Sub-Area Boundary
110701 Fifth Field Calwater Hydrologic Sub-Area Number
Area of Detail
California

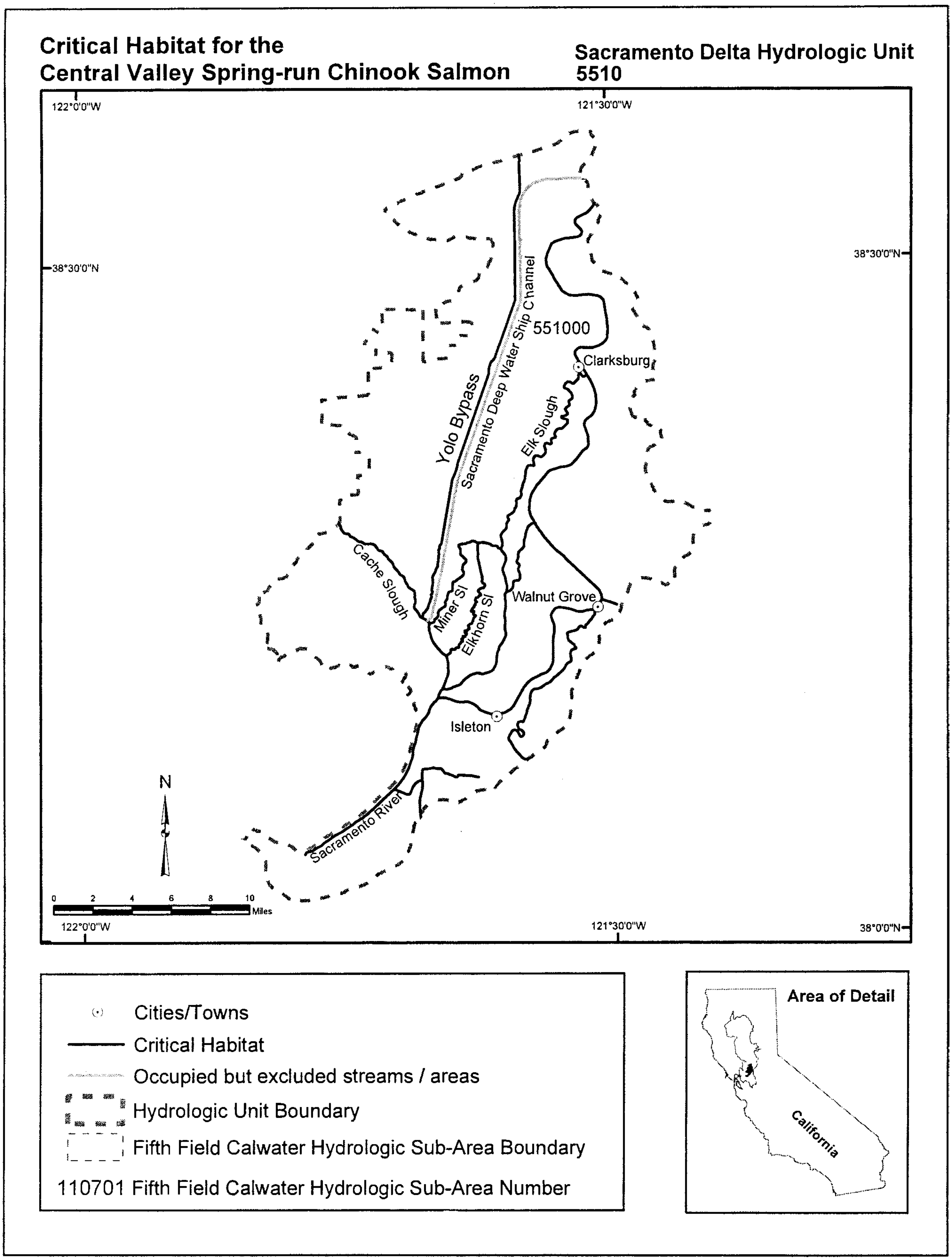

Critical Habitat for the
Central Valley Spring-run Chinook Salmon
Whitmore Hydrologic Unit
5507
122°0'0"W
121°30'0"W
550733
550732
Bella Vista
550731
550722
Viola
Shingletown
40°30'0"N
Bear Creek
550721
NF Battle Creek
Manton
550712
SF Battle Creek
550711
N
0 2 4 6 8 10
Miles
Cities/Towns
Critical Habitat
Hydrologic Unit Boundary
Fifth Field Calwater Hydrologic Sub-Area Boundary
110701 Fifth Field Calwater Hydrologic Sub-Area Number
Area of Detail
California

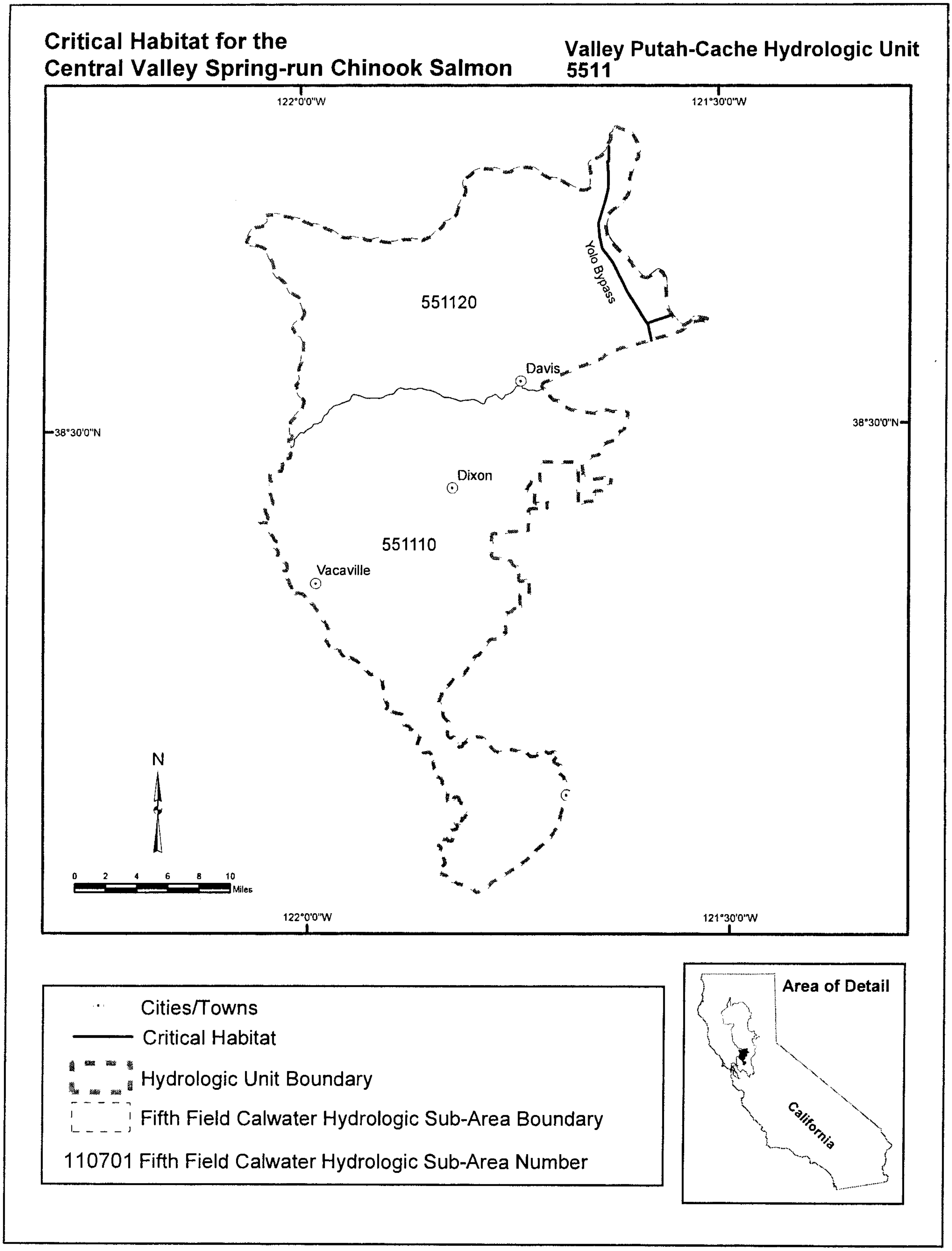
Critical Habitat for the Central Valley Spring-run Chinook Salmon

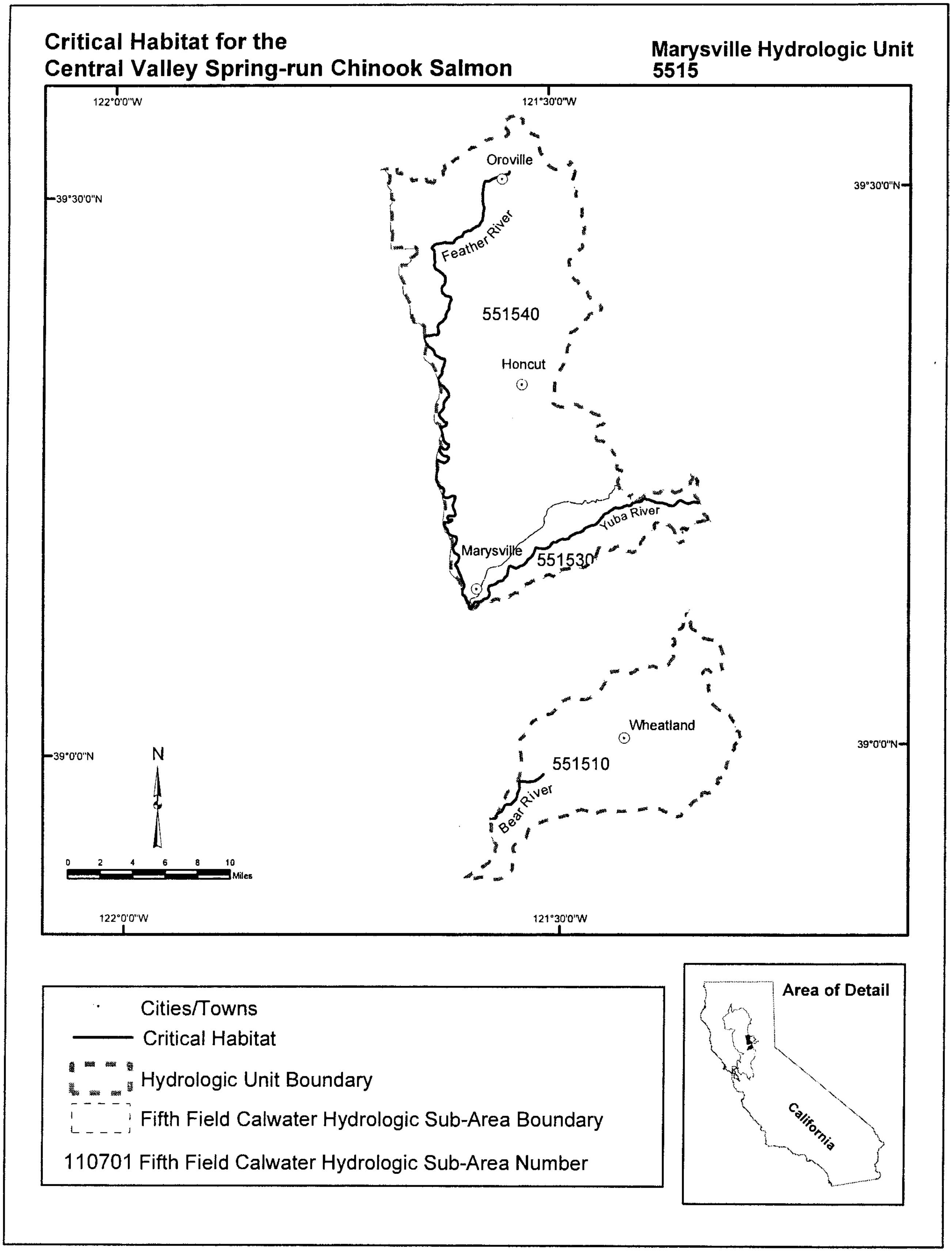
Redding Hydrologic Unit 5508

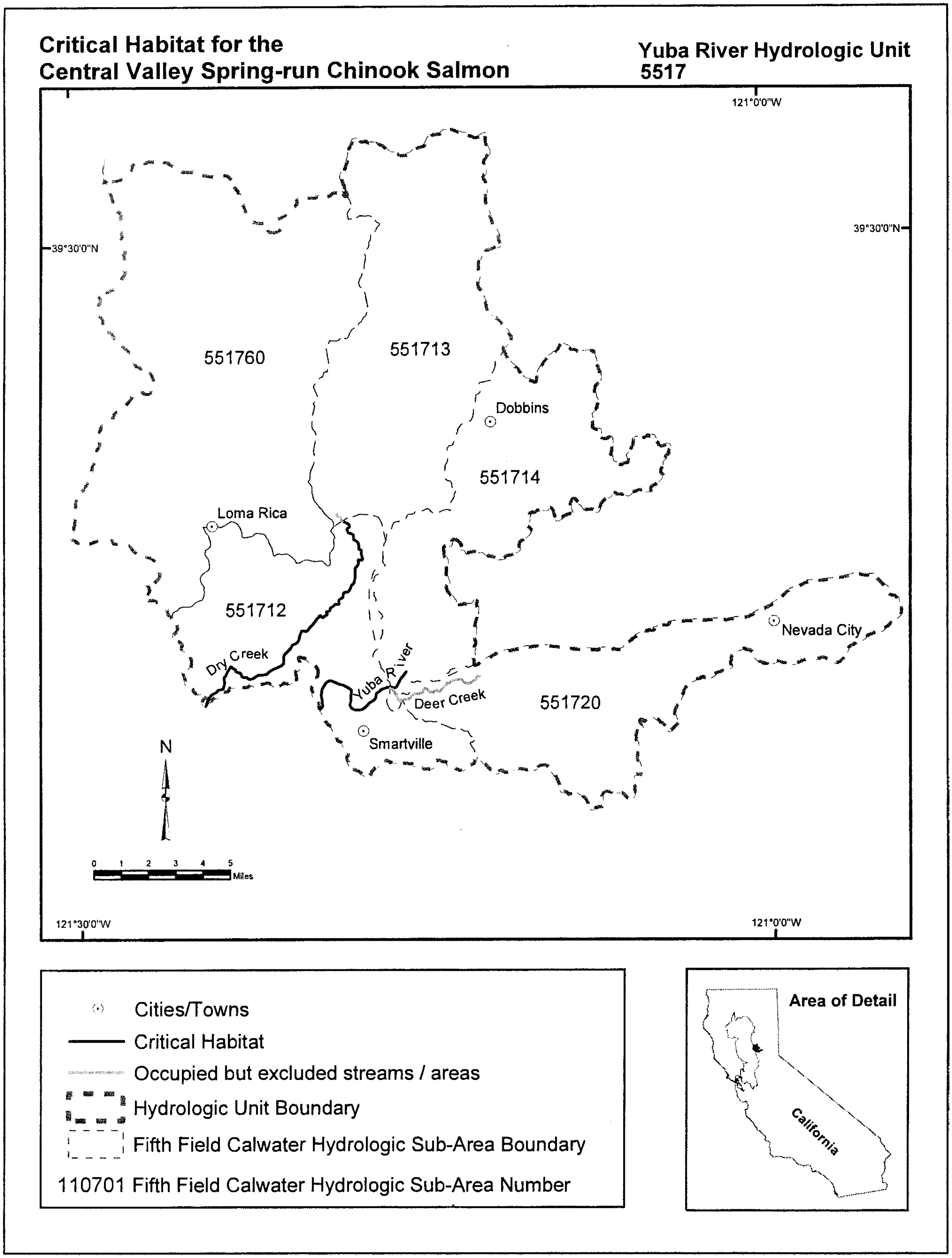


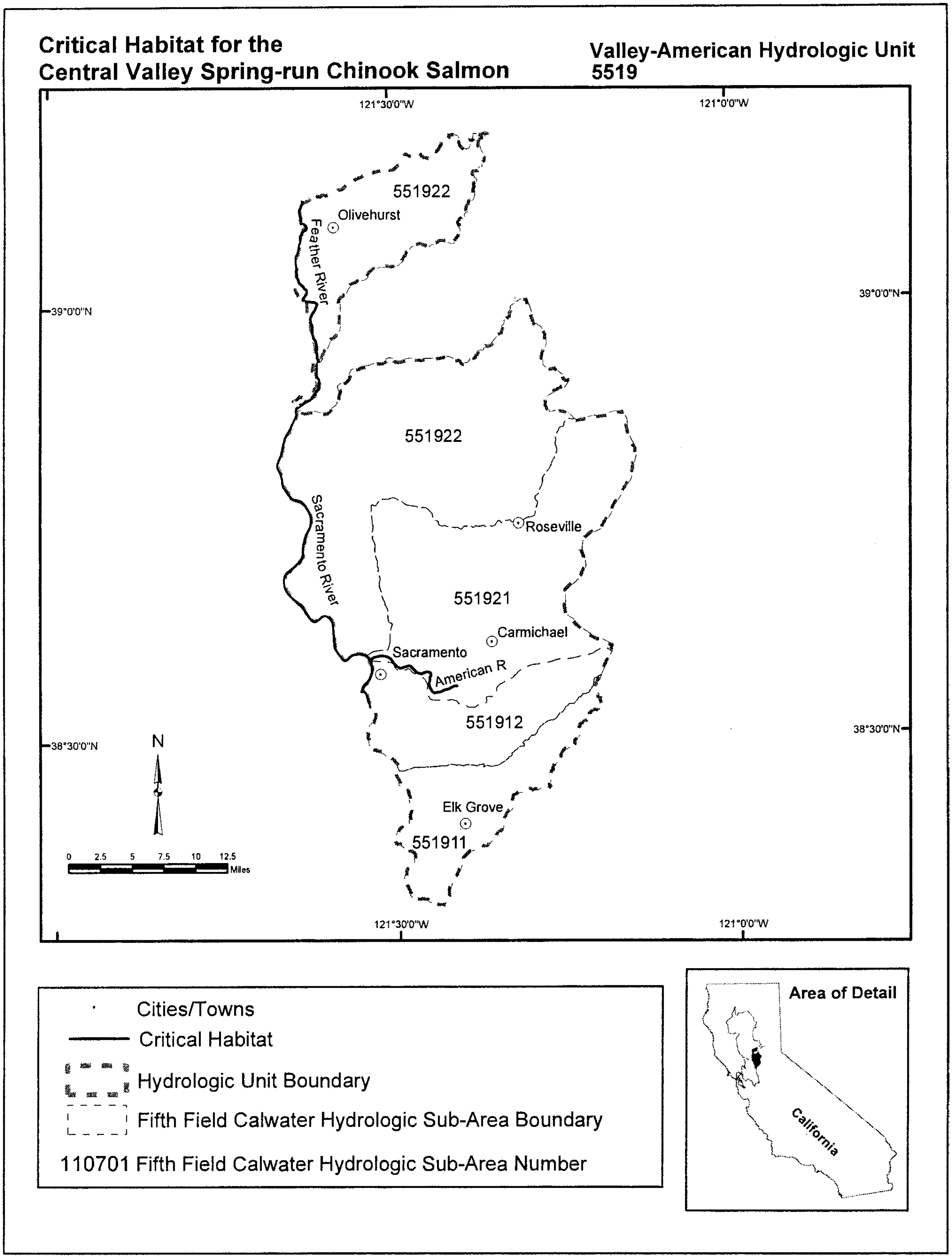

Critical Habitat for the
Central Valley Spring-run Chinook Salmon
Eastern Tehama Hydrologic Unit
5509
122°0'0"W
121°30'0"W
40°30'0"N
40°0'0"N
550964
550965
550963
550920
550942
550962
550941
550914
550916
550915
Antelope Creek
Mill Creek
Deer Creek
Big Chico Creek
N
0 2 4 6 8 10
Miles
Cities/Towns
Critical Habitat
Hydrologic Unit Boundary
Fifth Field Calwater Hydrologic Sub-Area Boundary
110701 Fifth Field Calwater Hydrologic Sub-Area Number
Area of Detail
California

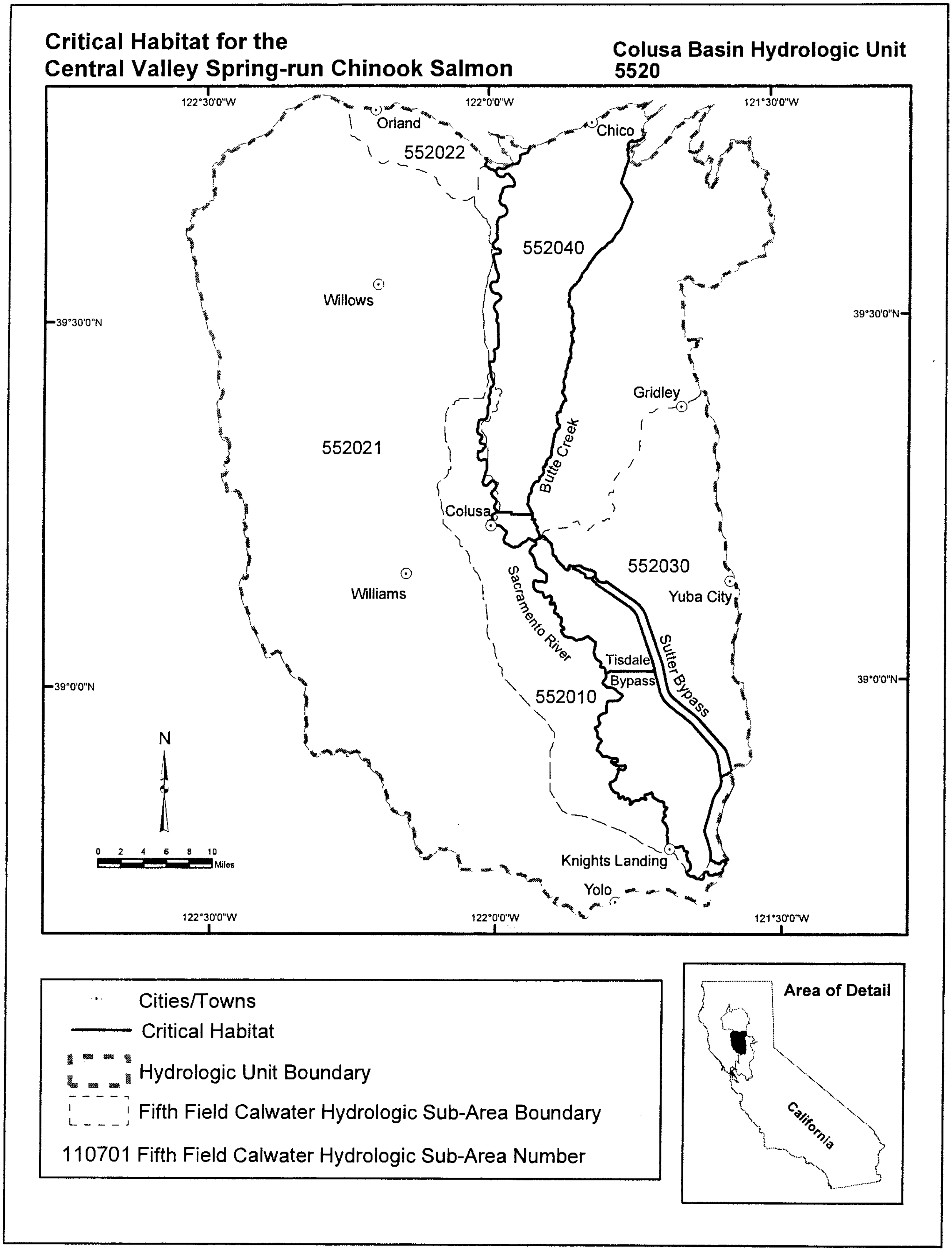

Critical Habitat for the
Central Valley Spring-run Chinook Salmon
Sacramento Delta Hydrologic Unit
5510
122°0'0"W
121°30'0"W
38°30'0"N
551000
Sacramento Deep Water Ship Channel
Yolo Bypass
Clarksburg
Elk Slough
Cache Slough
Miner Sl
Elkhorn Sl
Walnut Grove
Isleton
Sacramento River
N
0 2 4 6 8 10 Miles
38°0'0"N
Cities/Towns
Critical Habitat
Occupied but excluded streams / areas
Hydrologic Unit Boundary
Fifth Field Calwater Hydrologic Sub-Area Boundary
110701 Fifth Field Calwater Hydrologic Sub-Area Number
Area of Detail
California

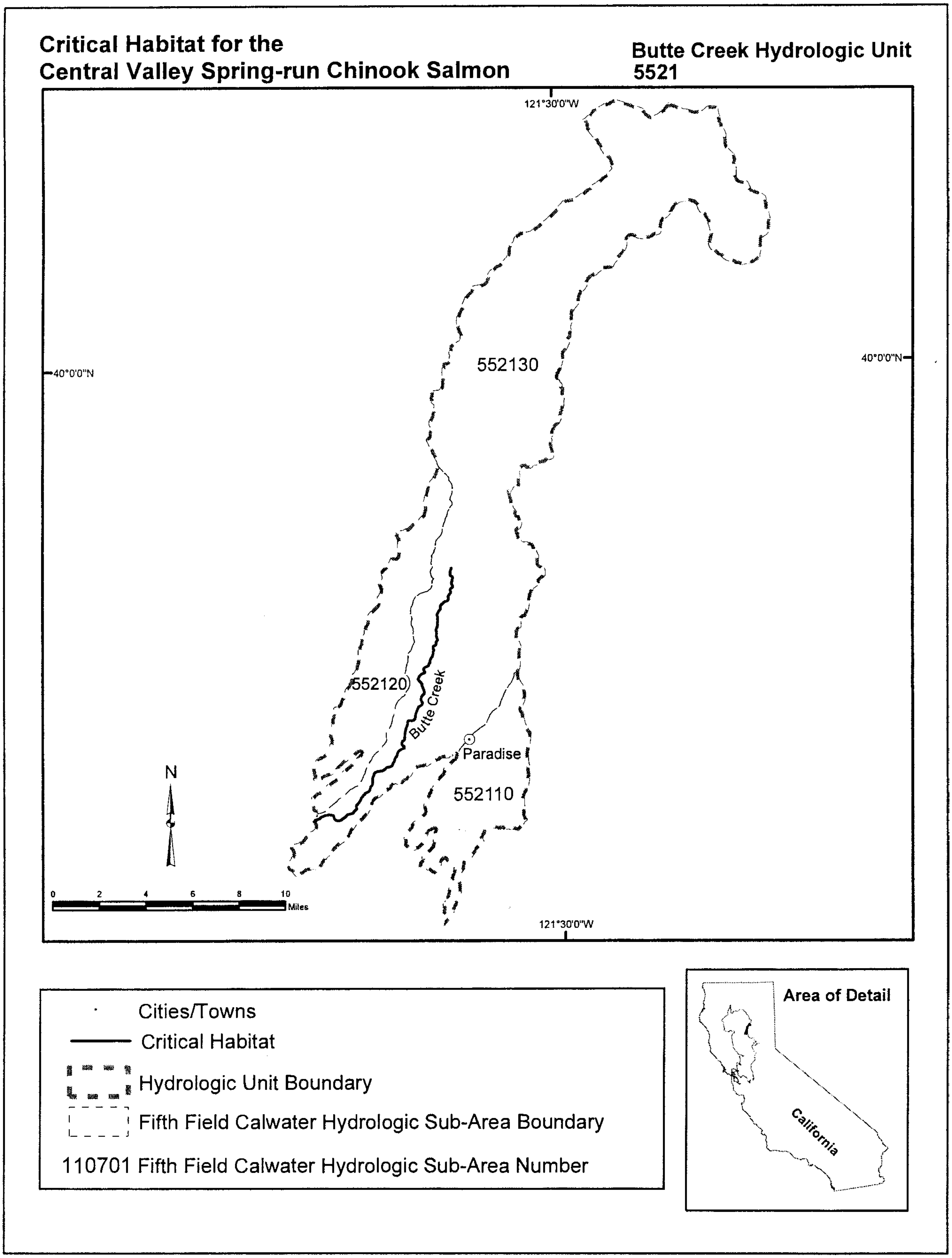

Critical Habitat for the
Central Valley Spring-run Chinook Salmon
Valley Putah-Cache Hydrologic Unit
5511
122°0'0"W
121°30'0"W
38°30'0"N
551120
551110
Yolo Bypass
Davis
Dixon
Vacaville
N
0 2 4 6 8 10
Miles
Cities/Towns
Critical Habitat
Hydrologic Unit Boundary
Fifth Field Calwater Hydrologic Sub-Area Boundary
110701 Fifth Field Calwater Hydrologic Sub-Area Number
Area of Detail
California


Critical Habitat for the
Central Valley Spring-run Chinook Salmon
Marysville Hydrologic Unit
5515
122°0'0"W
121°30'0"W
39°30'0"N
39°0'0"N
Oroville
Feather River
551540
Honcut
Yuba River
Marysville
551530
Wheatland
551510
Bear River
N
0 2 4 6 8 10
Miles
Cities/Towns
Critical Habitat
Hydrologic Unit Boundary
Fifth Field Calwater Hydrologic Sub-Area Boundary
110701 Fifth Field Calwater Hydrologic Sub-Area Number
Area of Detail
California

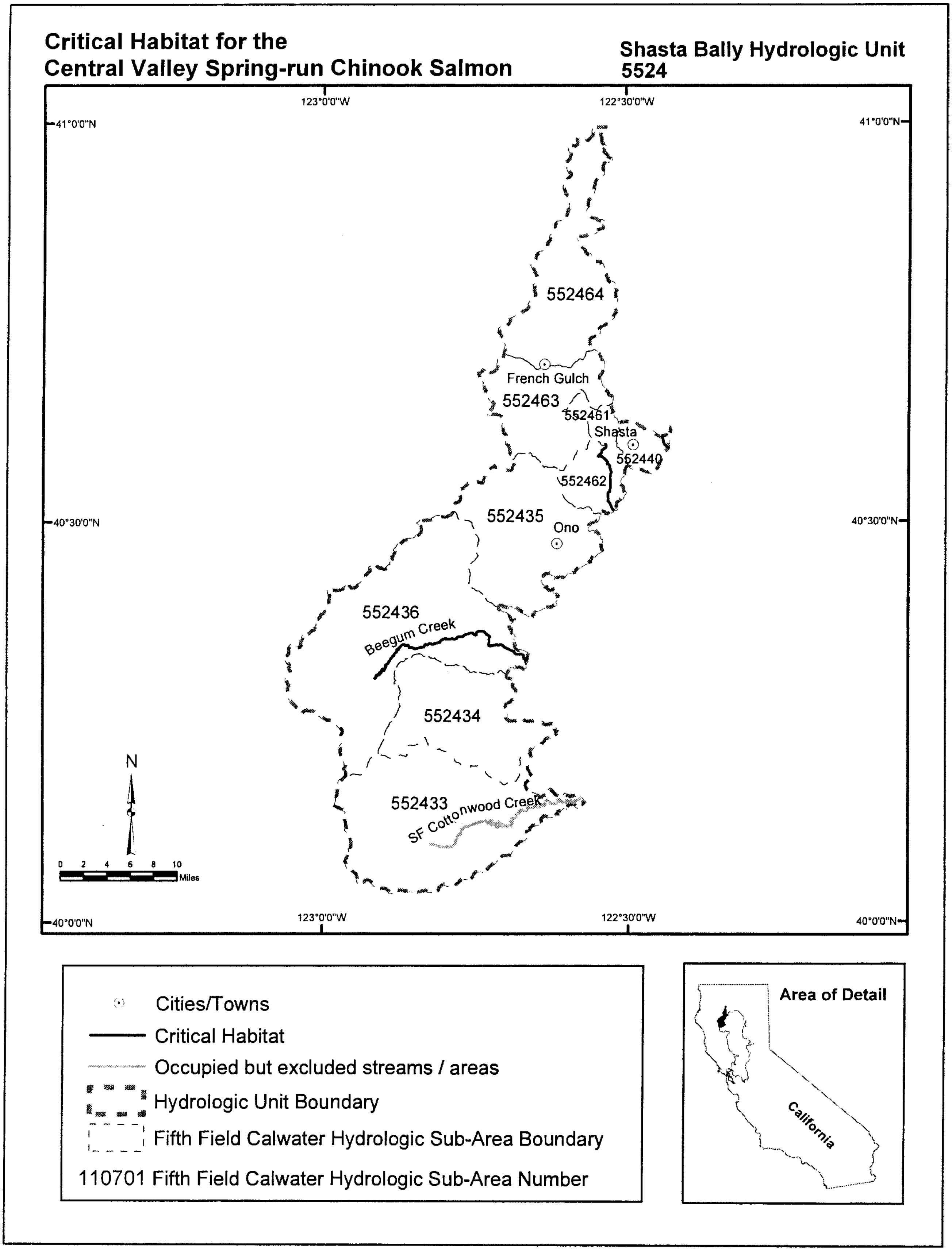

Critical Habitat for the
Central Valley Spring-run Chinook Salmon
Yuba River Hydrologic Unit
5517
121°0'0"W
39°30'0"N
39°30'0"N
551760
551713
551714
551712
551720
Dobbins
Loma Rica
Nevada City
Smartville
Dry Creek
Yuba River
Deer Creek
N
0 1 2 3 4 5
Miles
121°30'0"W
121°0'0"W
Cities/Towns
Critical Habitat
Occupied but excluded streams / areas
Hydrologic Unit Boundary
Fifth Field Calwater Hydrologic Sub-Area Boundary
110701 Fifth Field Calwater Hydrologic Sub-Area Number
Area of Detail
California


Critical Habitat for the
Central Valley Spring-run Chinook Salmon
Valley-American Hydrologic Unit
5519
121°30'0"W
121°0'0"W
39°0'0"N
38°30'0"N
551922
Olivehurst
Feather River
551922
Sacramento River
Roseville
551921
Carmichael
Sacramento
American R
551912
Elk Grove
551911
N
0 2.5 5 7.5 10 12.5
Miles
Cities/Towns
Critical Habitat
Hydrologic Unit Boundary
Fifth Field Calwater Hydrologic Sub-Area Boundary
110701 Fifth Field Calwater Hydrologic Sub-Area Number
Area of Detail
California


Critical Habitat for the
Central Valley Spring-run Chinook Salmon
Colusa Basin Hydrologic Unit
5520
122°30'0"W
122°0'0"W
121°30'0"W
39°30'0"N
39°0'0"N
Orland
Chico
552022
552040
Willows
Gridley
552021
Butte Creek
Colusa
552030
Williams
Yuba City
Sacramento River
Sutter Bypass
Tisdale
Bypass
552010
N
0 2 4 6 8 10
Miles
Knights Landing
Yolo
Cities/Towns
Critical Habitat
Hydrologic Unit Boundary
Fifth Field Calwater Hydrologic Sub-Area Boundary
110701 Fifth Field Calwater Hydrologic Sub-Area Number
Area of Detail
California



Critical Habitat for the
Central Valley Spring-run Chinook Salmon
Butte Creek Hydrologic Unit
5521
121°30'0"W
40°0'0"N
40°0'0"N
552130
552120
Butte Creek
Paradise
552110
N
0 2 4 6 8 10 Miles
121°30'0"W
Cities/Towns
Critical Habitat
Hydrologic Unit Boundary
Fifth Field Calwater Hydrologic Sub-Area Boundary
110701 Fifth Field Calwater Hydrologic Sub-Area Number
Area of Detail
California



BILLING CODE 3510–22–C

(l) *Central Valley steelhead (O. mykiss).* Critical habitat is designated to include the areas defined in the following CALWATER Hydrologic Units:

(1) Tehama Hydrologic Unit 5504—(i) *Lower Stony Creek Hydrologic Sub-area 550410.* Outlet(s) = Stony Creek (Lat 39.6760, Long –121.9732) upstream to endpoint(s) in: Stony Creek (39.8199, –122.3391).

(ii) Red Bluff Hydrologic Sub-area 550420. Outlet(s) = Sacramento River (Lat 39.6998, Long –121.9419) upstream to endpoint(s) in: Antelope Creek (40.2023, –122.1272); Big Chico Creek (39.7757, –121.7525); Blue Tent Creek (40.2166, –122.2362); Burch Creek (39.8495, –122.1615); Butler Slough (40.1579, –122.1320); Craig Creek (40.1617, –122.1350); Deer Creek (40.0144, –121.9481); Dibble Creek (40.2002, –122.2421); Dye Creek (40.0910, –122.0719); Elder Creek (40.0438, –122.2133); Lindo Channel (39.7623, –121.7923); McClure Creek (40.0074, –122.1723); Mill Creek (40.0550, –122.0317); Mud Creek (39.7985, –121.8803); New Creek (40.1873, –122.1350); Oat Creek (40.0769, –122.2168); Red Bank Creek (40.1421, –122.2399); Rice Creek (39.8495, –122.1615); Rock Creek (39.8034, –121.9403); Salt Creek (40.1572, –122.1646); Thomes Creek (39.8822, –122.5527); Unnamed Tributary (40.1867, –122.1353); Unnamed Tributary (40.1682, –122.1459); Unnamed Tributary (40.1143, –122.1259); Unnamed Tributary (40.0151, –122.1148); Unnamed Tributary (40.0403, –122.1009); Unnamed Tributary (40.0514, –122.0851); Unnamed Tributary (40.0530, –122.0769).

(2) Whitmore Hydrologic Unit 5507—(i) *Inks Creek Hydrologic Sub-area 550711.* Outlet(s) = Inks Creek (Lat 40.3305, Long –122.1520) upstream to endpoint(s) in: Inks Creek (40.3418, –122.1332).

(ii) *Battle Creek Hydrologic Sub-area 550712.* Outlet(s) = Battle Creek (Lat 40.4083, Long –122.1102) upstream to endpoint(s) in: Baldwin Creek (40.4369, –121.9885); Battle Creek (40.4228, –121.9975); Brush Creek (40.4913, –121.8664); Millseat Creek (40.4808, –121.8526); Morgan Creek (40.3654, –121.9132); North Fork Battle Creek (40.4877, –121.8185); Panther Creek (40.3897, –121.6106); South Ditch (40.3997, –121.9223); Ripley Creek (40.4099, –121.8683); Soap Creek (40.3904, –121.7569); South Fork Battle Creek (40.3531, –121.6682); Unnamed Tributary (40.3567, –121.8293); Unnamed Tributary (40.4592, –121.8671).

(iii) *Ash Creek Hydrologic Sub-area 550721.* Outlet(s) = Ash Creek (Lat 40.4401, Long –122.1375) upstream to endpoint(s) in: Ash Creek (40.4628, –122.0066).

(iv) *Inwood Hydrologic Sub-area 550722.* Outlet(s) = Ash Creek (Lat 40.4628, Long –122.0066); Bear Creek (40.4352, –122.2039) upstream to endpoint(s) in: Ash Creek (40.4859, –121.8993); Bear Creek (40.5368, –121.9560); North Fork Bear Creek (40.5736, –121.8683).

(v) *South Cow Creek Hydrologic Sub-area 550731.* Outlet(s) = South Cow Creek (Lat 40.5438, Long –122.1318) upstream to endpoint(s) in: South Cow Creek (40.6023, –121.8623).

(vi) *Old Cow Creek Hydrologic Sub-area 550732.* Outlet(s) = Clover Creek (Lat 40.5788, Long –122.1252); Old Cow Creek (40.5442, –122.1317) upstream to endpoint(s) in: Clover Creek (40.6305, –122.0304); Old Cow Creek (40.6295, –122.9619).

(vii) *Little Cow Creek Hydrologic Sub-area 550733.* Outlet(s) = Little Cow Creek (Lat 40.6148, –122.2271); Oak Run Creek (40.6171, –122.1225) upstream to endpoint(s) in: Little Cow Creek (40.7114, –122.0850); Oak Run Creek (40.6379, –122.0856).

(3) Redding Hydrologic Unit 5508—(i) *Enterprise Flat Hydrologic Sub-area 550810.* Outlet(s) = Sacramento River (Lat 40.2526, Long –122.1707) upstream to endpoint(s) in: Ash Creek (40.4401, –122.1375); Battle Creek (40.4083, –122.1102); Bear Creek (40.4360, –122.2036); Calaboose Creek (40.5742, –122.4142); Canyon Creek (40.5532, –122.3814); Churn Creek (40.5986, –122.3418); Clear Creek (40.5158, –122.5256); Clover Creek (40.5788, –122.1252); Cottonwood Creek (40.3777, –122.1991); Cow Creek (40.5437, –122.1318); East Fork Stillwater Creek (40.6495, –122.2934); Inks Creek (40.3305, –122.1520); Jenny Creek (40.5734, –122.4338); Little Cow Creek (40.6148, –122.2271); Oak Run (40.6171, –122.1225); Old Cow Creek (40.5442, –122.1317); Olney Creek (40.5439, –122.4687); Oregon Gulch (40.5463, –122.3866); Paynes Creek (40.3024, –122.1012); Stillwater Creek (40.6495, –122.2934); Sulphur Creek (40.6164, –122.4077).

(ii) *Lower Cottonwood Hydrologic Sub-area 550820.* Outlet(s) = Cottonwood Creek (Lat 40.3777, Long –122.1991) upstream to endpoint(s) in: Cold Fork Cottonwood Creek (40.2060, –122.6608); Cottonwood Creek (40.3943, –122.5254); Middle Fork Cottonwood Creek (40.3314, –122.6663); North Fork Cottonwood Creek (40.4539, –122.5610); South Fork Cottonwood Creek (40.1578, –122.5809).

(4) Eastern Tehama Hydrologic Unit 5509—(i) *Big Chico Creek Hydrologic Sub-area 550914.* Outlet(s) = Big Chico Creek (Lat 39.7757, Long –121.7525) upstream to endpoint(s) in: Big Chico Creek (39.8898, –121.6952).

(ii) *Deer Creek Hydrologic Sub-area 550920.* Outlet(s) = Deer Creek (Lat 40.0142, Long –121.9476) upstream to endpoint(s) in: Deer Creek (40.2025, –121.5130).

(iii) *Upper Mill Creek Hydrologic Sub-area 550942.* Outlet(s) = Mill Creek (Lat 40.0550, Long –122.0317) upstream to endpoint(s) in: Mill Creek (40.3766, –121.5098); Rocky Gulch Creek (40.2888, –121.5997).

(iv) *Dye Creek Hydrologic Sub-area 550962.* Outlet(s) = Dye Creek (Lat 40.0910, Long –122.0719) upstream to endpoint(s) in: Dye Creek (40.0996, –121.9612).

(v) *Antelope Creek Hydrologic Sub-area 550963.* Outlet(s) = Antelope Creek (Lat 40.2023, Long –122.1272) upstream to endpoint(s) in: Antelope Creek (40.2416, –121.8630); Middle Fork Antelope Creek (40.2673, –121.7744); North Fork Antelope Creek (40.2807, –121.7645); South Fork Antelope Creek (40.2521, –121.7575).

(5) Sacramento Delta Hydrologic Unit 5510—*Sacramento Delta Hydrologic Sub-area 551000.* Outlet(s) = Sacramento River (Lat 38.0653, Long –121.8418) upstream to endpoint(s) in: Cache Slough (38.2984, –121.7490); Elk Slough (38.4140, –121.5212); Elkhorn Slough (38.2898, –121.6271); Georgiana Slough (38.2401, –121.5172); Horseshoe Bend (38.1078, –121.7117); Lindsey Slough (38.2592, –121.7580); Miners Slough (38.2864, –121.6051); Prospect Slough (38.2830, –121.6641); Putah Creek (38.5155, –121.5885); Sevenmile Slough (38.1171, –121.6298); Streamboat Slough (38.3052, –121.5737); Sutter Slough (38.3321, –121.5838); Threemile Slough (38.1155, –121.6835); Ulatis Creek (38.2961, –121.7835); Unnamed Tributary (38.2937, –121.7803); Unnamed Tributary (38.2937, –121.7804); Yolo Bypass (38.5800, –121.5838).

(6) Valley-Putah-Cache Hydrologic Unit 5511—*Lower Putah Creek Hydrologic Sub-area 551120.* Outlet(s) = Sacramento Bypass (Lat 38.6057, Long –121.5563); Yolo Bypass (38.5800, –121.5838) upstream to endpoint(s) in: Sacramento Bypass (38.5969, –121.5888); Yolo Bypass (38.7627, –121.6325).

(7) American River Hydrologic Unit 5514—*Auburn Hydrologic Sub-area 551422.* Outlet(s) = Auburn Ravine (Lat 38.8921, Long –121.2181); Coon Creek (38.9891, –121.2556); Doty Creek (38.9401, –121.2434) upstream to

endpoint(s) in: Auburn Ravine (38.8888, –121.1151); Coon Creek (38.9659, –121.1781); Doty Creek (38.9105, –121.1244).

(8) Marysville Hydrologic Unit 5515—(i) *Lower Bear River Hydrologic Sub-area 551510.* Outlet(s) = Bear River (Lat 39.9398, Long –121.5790) upstream to endpoint(s) in: Bear River (39.0421, –121.3319).

(ii) *Lower Yuba River Hydrologic Sub-area 551530.* Outlet(s) = Yuba River (Lat 39.1270, Long –121.5981) upstream to endpoint(s) in: Yuba River (39.2203, –121.3314).

(iii) *Lower Feather River Hydrologic Sub-area 551540.* Outlet(s) = Feather River (Lat 39.1264, Long –121.5984) upstream to endpoint(s) in: Feather River (39.5205, –121.5475).

(9) Yuba River Hydrologic Unit 5517—(i) *Browns Valley Hydrologic Sub-area 551712.* Outlet(s) = Dry Creek (Lat 39.2215, Long –1121.4082); Yuba River (39.2203, –1121.3314) upstream to endpoint(s) in: Dry Creek (39.3232, Long –1121.3155); Yuba River (39.2305, –1121.2813).

(ii) *Englebright Hydrologic Sub-area 551714.* Outlet(s) = Yuba River (Lat 39.2305, Long –1121.2813) upstream to endpoint(s) in: Yuba River (39.2399, –1121.2689).

(10) Valley American Hydrologic Unit 5519—(i) *Lower American Hydrologic Sub-area 551921.* Outlet(s) = American River (Lat 38.5971, –1121.5088) upstream to endpoint(s) in: American River (38.6373, –1121.2202); Dry Creek (38.7554, –1121.2676); Miner's Ravine (38.8429, –1121.1178); Natomas East Main Canal (38.6646, –1121.4770); Secret Ravine(38.8541, –1121.1223).

(ii) *Pleasant Grove Hydrologic Sub-area 551922.* Outlet(s) = Sacramento River (Lat 38.6026, Long –1121.5155) upstream to endpoint(s) in: Auburn Ravine (38.8913, –1121.2424); Coon Creek (38.9883, –1121.2609); Doty Creek (38.9392, –1121.2475); Feather River (39.1264, –1121.5984).

(11) Colusa Basin Hydrologic Unit 5520—(i) *Sycamore-Sutter Hydrologic Sub-area 552010.* Outlet(s) = Sacramento River (Lat 38.7604, Long –1121.6767) upstream to endpoint(s) in: Tisdale Bypass (39.0261, –1121.7456).

(ii) *Sutter Bypass Hydrologic Sub-area 552030.* Outlet(s) = Sacramento River (Lat 38.7851, Long –1121.6238) upstream to endpoint(s) in: Butte Creek (39.1990, –1121.9286); Butte Slough (39.1987, –1121.9285); Nelson Slough (38.8956, –1121.6180); Sacramento Slough (38.7844, –1121.6544); Sutter Bypass (39.1586, –1121.8747).

(iii) *Butte Basin Hydrologic Sub-area 552040.* Outlet(s) = Butte Creek (Lat 39.1990, Long –1121.9286); Sacramento River (39.4141, –1122.0087) upstream to endpoint(s) in: Butte Creek (39.7096, –1121.7504); Colusa Bypass (39.2276, –1121.9402); Little Chico Creek (39.7380, –1121.7490); Little Dry Creek (39.6781, –1121.6580).

(12) Butte Creek Hydrologic Unit 5521—(i) *Upper Dry Creek Hydrologic Sub-area 552110.* Outlet(s) = Little Dry Creek (Lat 39.6781, –1121.6580) upstream to endpoint(s) in: Little Dry Creek (39.7424, –1121.6213).

(ii) *Upper Butte Creek Hydrologic Sub-area 552120.* Outlet(s) = Little Chico Creek (Lat 39.7380, Long –1121.7490) upstream to endpoint(s) in: Little Chico Creek (39.8680, –1121.6660).

(iii) *Upper Little Chico Hydrologic Sub-area 552130.* Outlet(s) = Butte Creek (Lat 39.7096, Long –1121.7504) upstream to endpoint(s) in: Butte Creek (39.8215, –1121.6468); Little Butte Creek (39.8159, –1121.5819).

(13) Ball Mountain Hydrologic Unit 5523—*Thomes Creek Hydrologic Sub-area 552310.* Outlet(s) = Thomes Creek (39.8822, –1122.5527) upstream to endpoint(s) in: Doll Creek (39.8941, –1122.9209); Fish Creek (40.0176, –1122.8142); Snake Creek (39.9945, –1122.7788); Thomes Creek (39.9455, –1122.8491); Willow Creek (39.8941, –1122.9209).

(14) Shasta Bally Hydrologic Unit 5524—(i) *South Fork Hydrologic Sub-area 552433.* Outlet(s) = Cold Fork Cottonwood Creek (Lat 40.2060, Long –1122.6608); South Fork Cottonwood Creek (40.1578, –1122.5809) upstream to endpoint(s) in: Cold Fork Cottonwood Creek (40.1881, –1122.8690); South Fork Cottonwood Creek (40.1232, –1122.8761).

(ii) *Platina Hydrologic Sub-area 552436.* Outlet(s) = Middle Fork Cottonwood Creek (Lat 40.3314, Long –1122.6663) upstream to endpoint(s) in: Beegum Creek (40.3149, –1122.9776): Middle Fork Cottonwood Creek (40.3512, –1122.9629).

(iii) *Spring Creek Hydrologic Sub-area 552440.* Outlet(s) = Sacramento River (Lat 40.5943, Long –1122.4343) upstream to endpoint(s) in: Middle Creek (40.5904, –1121.4825); Rock Creek (40.6155, –1122.4702); Sacramento River (40.6116, –1122.4462); Salt Creek (40.5830, –1122.4586); Unnamed Tributary (40.5734, –1122.4844).

(iv) *Kanaka Peak Hydrologic Sub-area 552462.* Outlet(s) = Clear Creek (Lat 40.5158, Long –1122.5256) upstream to endpoint(s) in: Clear Creek (40.5998, 122.5399).

(15) North Valley Floor Hydrologic Unit 5531—(i) *Lower Mokelumne Hydrologic Sub-area 553120.* Outlet(s) = Mokelumne River (Lat 38.2104, Long –1121.3804) upstream to endpoint(s) in: Mokelumne River (38.2263, –1121.0241); Murphy Creek (38.2491, –1121.0119).

(ii) *Lower Calaveras Hydrologic Sub-area 553130.* Outlet(s) = Calaveras River (Lat 37.9836, Long –1121.3110); Mormon Slough (37.9456,-121.2907) upstream to endpoint(s) in: Calaveras River (38.1025, –1120.8503); Mormon Slough (38.0532, –1121.0102); Stockton Diverting Canal (37.9594, –1121.2024).

(16) Upper Calaveras Hydrologic Unit 5533—*New Hogan Reservoir Hydrologic Sub-area 553310.* Outlet(s) = Calaveras River (Lat 38.1025, Long –1120.8503) upstream to endpoint(s) in: Calaveras River (38.1502, –1120.8143).

(17) Stanislaus River Hydrologic Unit 5534—*Table Mountain Hydrologic Sub-area 553410.* Outlet(s) = Stanislaus River (Lat 37.8355, Long –1120.6513) upstream to endpoint(s) in: Stanislaus River (37.8631, –1120.6298).

(18) San Joaquin Valley Floor Hydrologic Unit 5535—(i) *Riverbank Hydrologic Sub-area 553530.* Outlet(s) = Stanislaus River (Lat 37.6648, Long –1121.2414) upstream to endpoint(s) in: Stanislaus River (37.8355, –1120.6513).

(ii) *Turlock Hydrologic Sub-area 553550.* Outlet(s) = Tuolumne River (Lat 37.6059, Long –1121.1739) upstream to endpoint(s) in: Tuolumne River (37.6401, –1120.6526).

(iii) *Montpelier Hydrologic Sub-area 553560.* Outlet(s) = Tuolumne River (Lat 37.6401, Long –1120.6526) upstream to endpoint(s) in: Tuolumne River (37.6721, –1120.4445).

(iv) *El Nido-Stevinson Hydrologic Sub-area 553570.* Outlet(s) = Merced River (Lat 37.3505, Long –1120.9619) upstream to endpoint(s) in: Merced River (37.3620, –1120.8507).

(v) *Merced Hydrologic Sub-area 553580.* Outlet(s) = Merced River (Lat 37.3620, Long –1120.8507) upstream to endpoint(s) in: Merced River (37.4982, –1120.4612).

(vi) *Fahr Creek Hydrologic Sub-area 553590.* Outlet(s) = Merced River (Lat 37.4982, Long –1120.4612) upstream to endpoint(s) in: Merced River (37.5081, –1120.3581).

(19) Delta-Mendota Canal Hydrologic Unit 5541—(i) *Patterson Hydrologic Sub-area 554110.* Outlet(s) = San Joaquin River (Lat 37.6763, Long –1121.2653) upstream to endpoint(s) in: San Joaquin River (37.3491, –1120.9759).

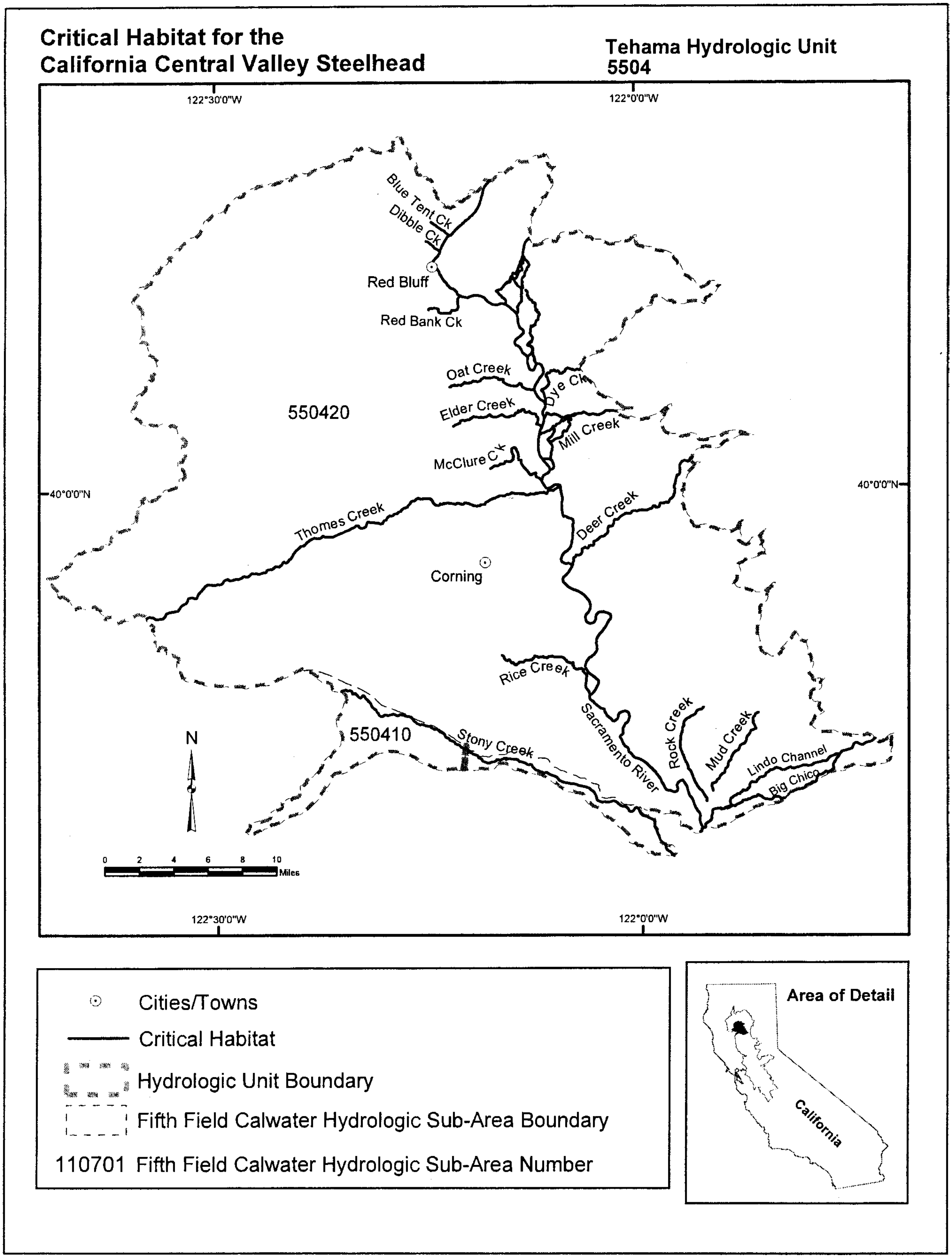
(ii) *Los Banos Hydrologic Sub-area 554120.* Outlet(s) = Merced River (Lat 37.3490, Long –1120.9756) upstream to endpoint(s) in: Merced River (37.3505, –1120.9619).

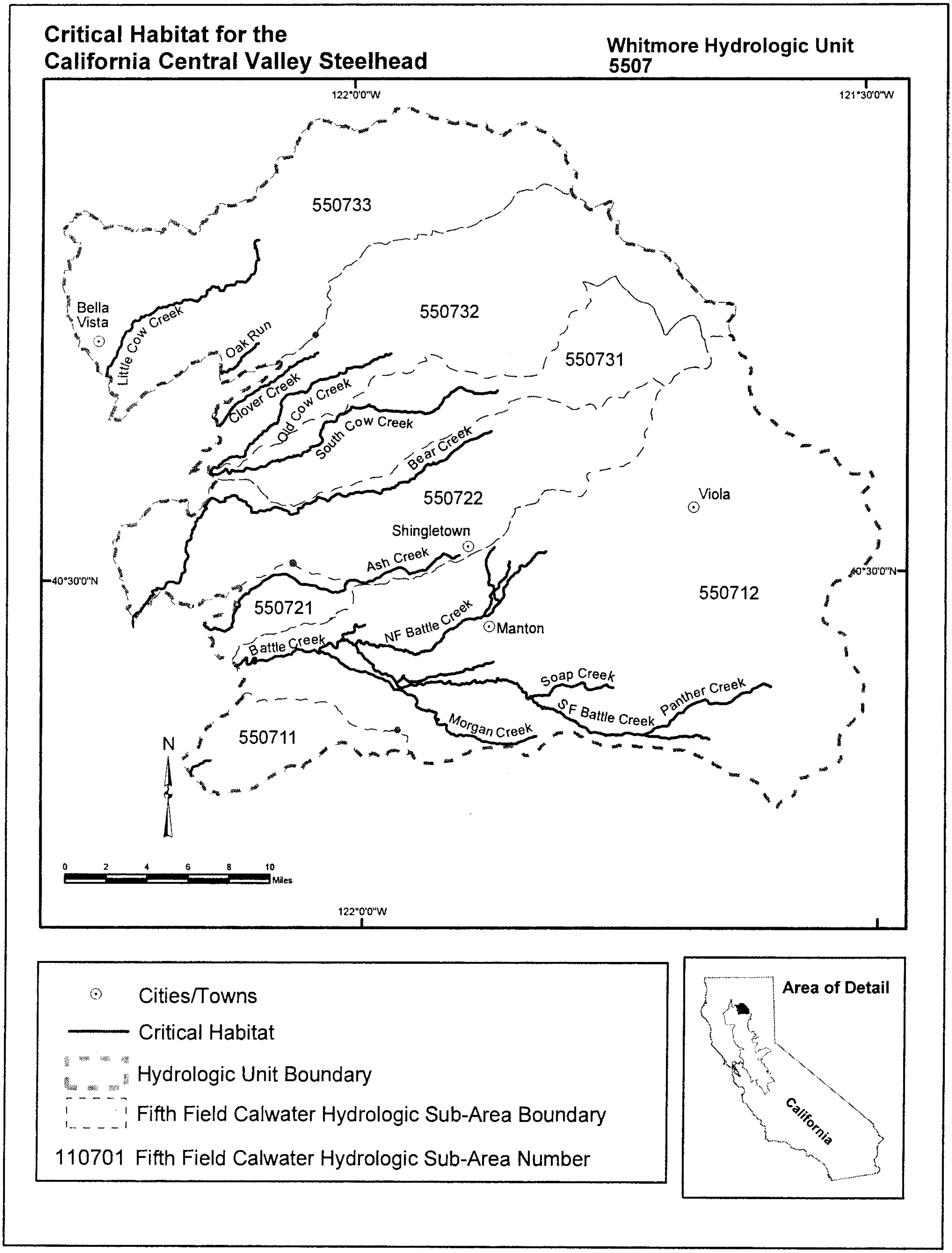
(20) North Diablo Range Hydrologic Unit 5543—*North Diablo Range Hydrologic Sub-area 554300.* Outlet(s) = San Joaquin River (Lat 38.0247, Long –1121.8218) upstream to endpoint(s) in: San Joaquin River (38.0246, –1121.7471).

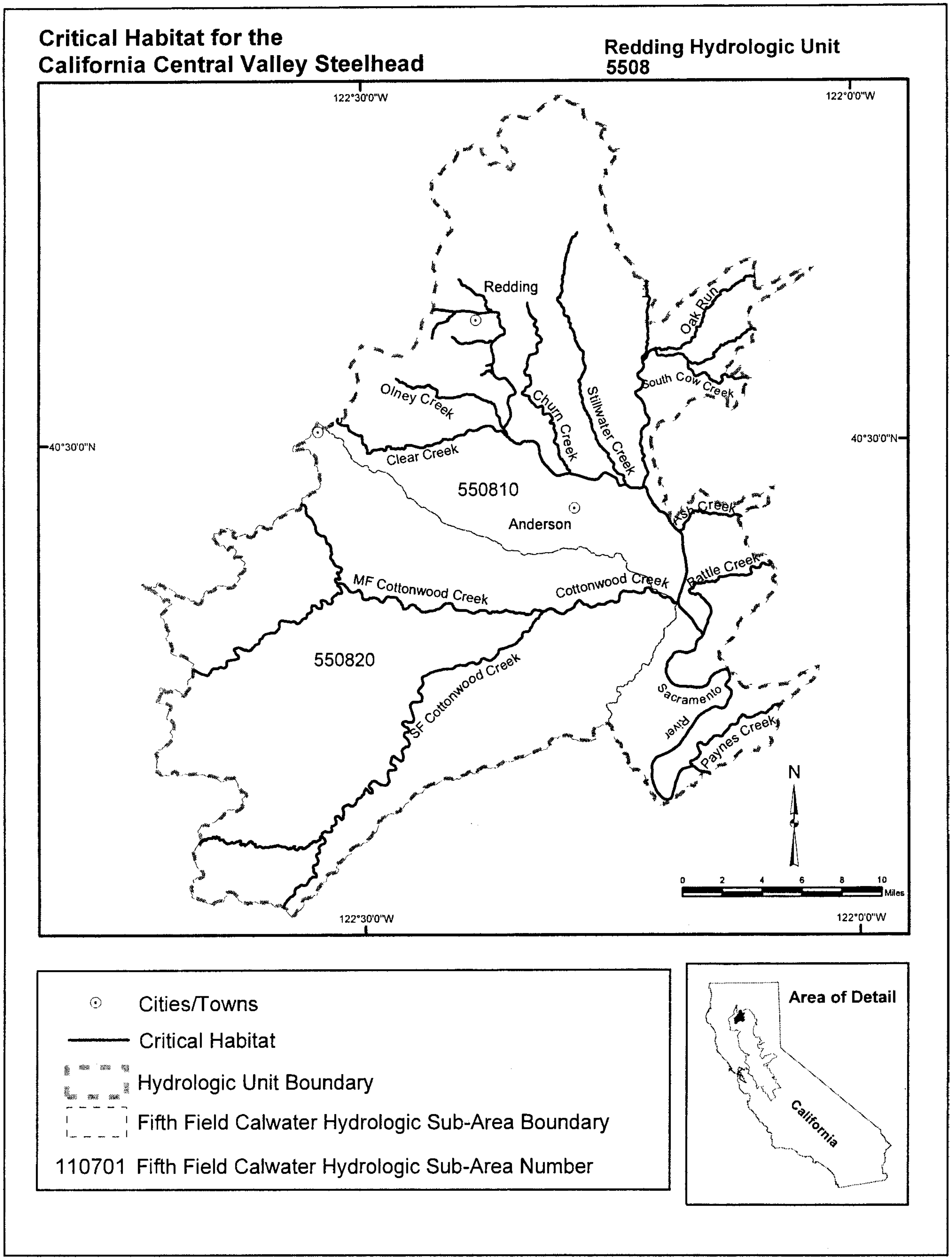
(21) San Joaquin Delta Hydrologic Unit 5544—*San Joaquin Delta Hydrologic Sub-area 554400.* Outlet(s) = San Joaquin River (Lat 38.0246, Long –1121.7471) upstream to endpoint(s) in: Big Break (38.0160, –1121.6849); Bishop Cut (38.0870, –1121.4158); Calaveras River (37.9836, –1121.3110); Cosumnes River (38.2538, –1121.4074); Disappointment Slough (38.0439, –1121.4201); Dutch Slough (38.0088, –1121.6281); Empire Cut (37.9714, –1121.4762); False River (38.0479, –1121.6232); Frank's Tract (38.0220, –1121.5997); Frank's Tract (38.0300, –1121.5830); Holland Cut (37.9939, –1121.5757); Honker Cut (38.0680, –1121.4589); Kellog Creek (37.9158, –1121.6051); Latham Slough (37.9716, –1121.5122); Middle River (37.8216, –1121.3747); Mokelumne River (38.2104, –1121.3804); Mormon Slough (37.9456,-121.2907); Mosher Creek (38.0327, –1121.3650); North Mokelumne River (38.2274, –1121.4918); Old River (37.8086, –1121.3274); Orwood Slough (37.9409, –1121.5332); Paradise Cut (37.7605, –1121.3085); Pixley Slough (38.0443, –1121.3868); Potato Slough (38.0440, –1121.4997); Rock Slough (37.9754, –1121.5795); Sand Mound Slough (38.0220, –1121.5997); Stockton Deep Water Channel (37.9957, –1121.4201); Turner Cut (37.9972, –1121.4434); Unnamed Tributary (38.1165, –1121.4976); Victoria Canal (37.8891, –1121.4895); White Slough (38.0818, –1121.4156); Woodward Canal (37.9037, –1121.4973).

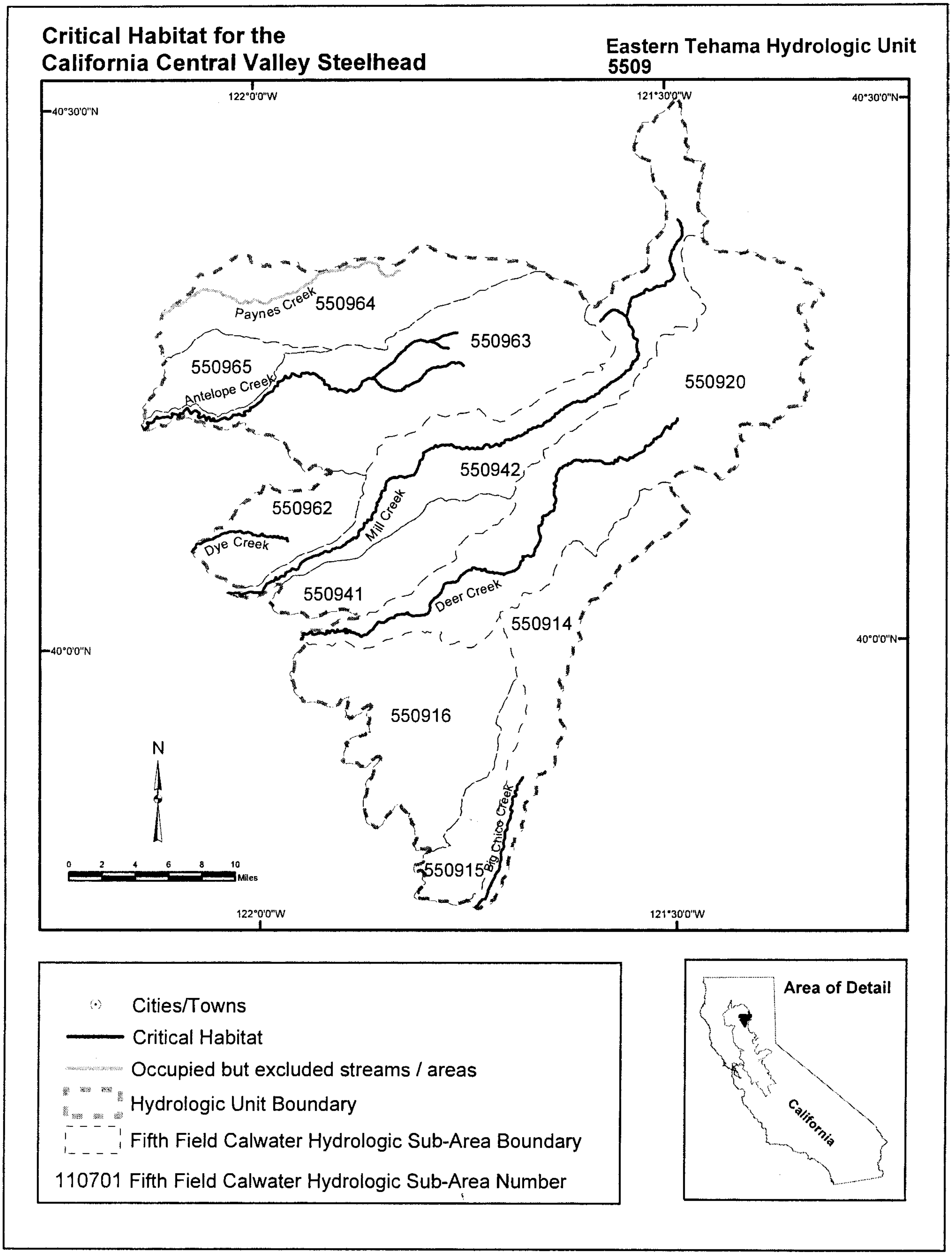
(22) Maps of critical habitat for the Central Valley Steelhead ESU follow:

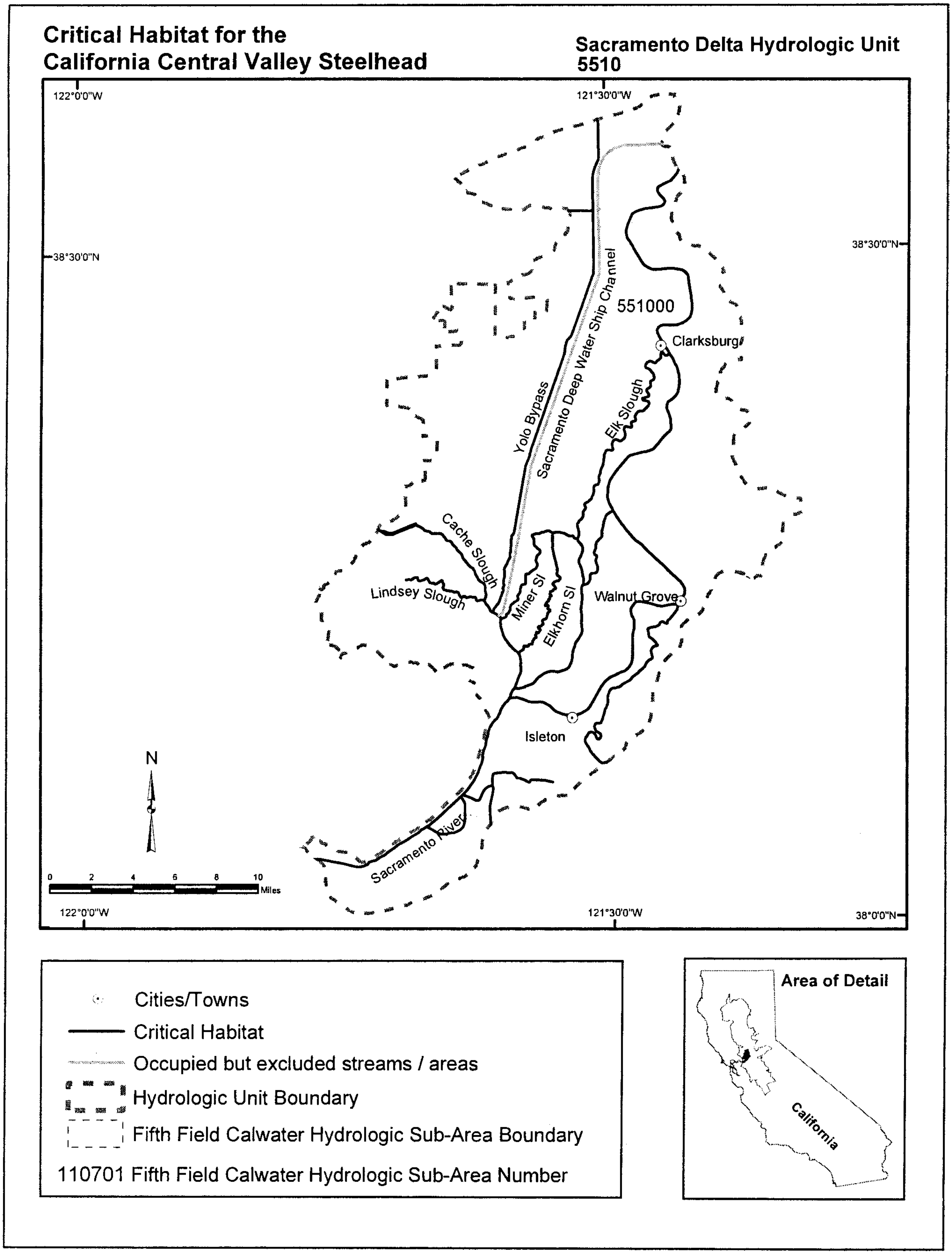
BILLING CODE 3510–22–P

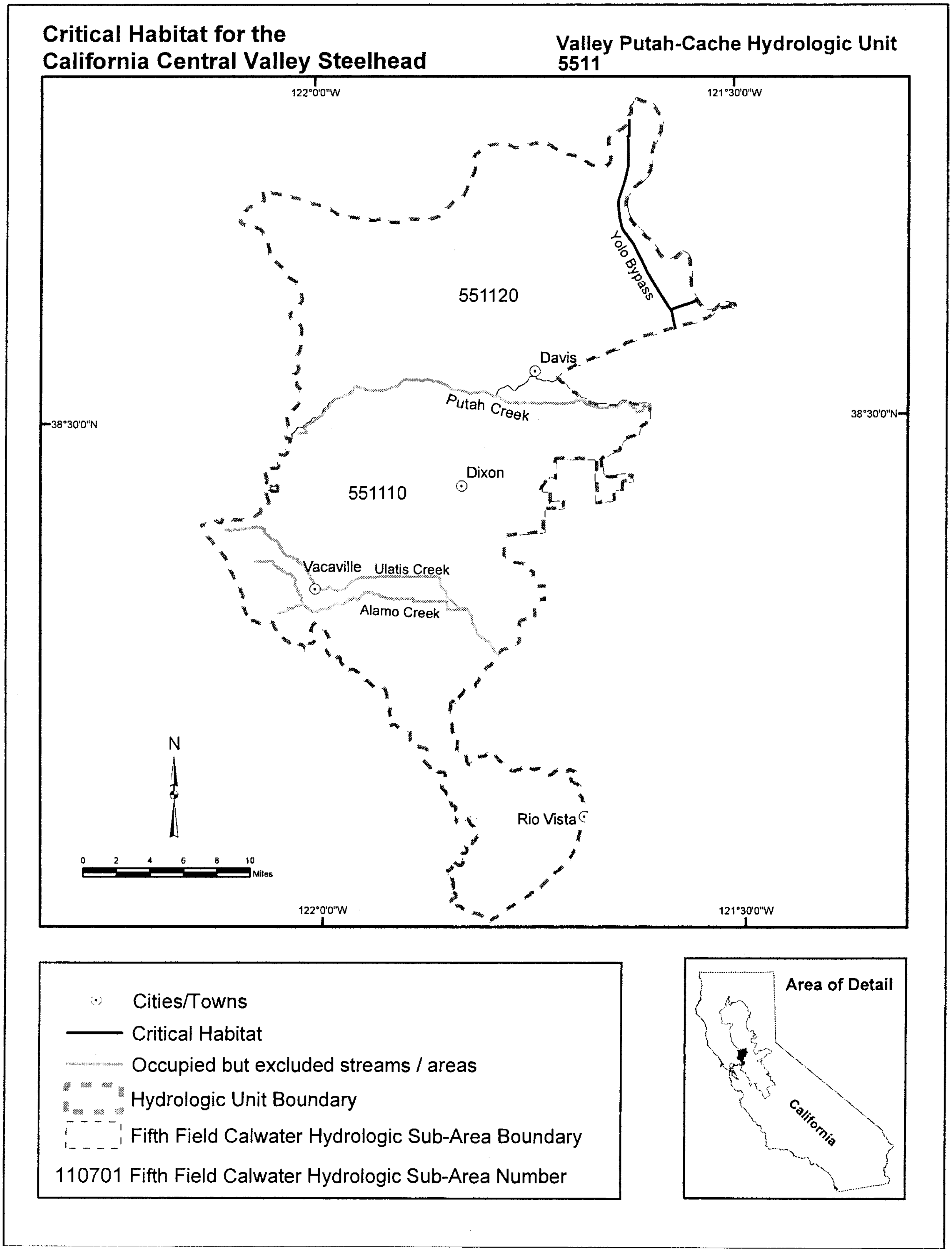

Critical Habitat for the
California Central Valley Steelhead
Tehama Hydrologic Unit
5504
122°30'0"W
122°0'0"W
40°0'0"N
Blue Tent Ck
Dibble Ck
Red Bluff
Red Bank Ck
Oat Creek
Dye Ck
Elder Creek
Mill Creek
McClure Ck
550420
Thomes Creek
Deer Creek
Corning
Rice Creek
Sacramento River
Rock Creek
Mud Creek
Lindo Channel
Big Chico
550410
Stony Creek
N
0 2 4 6 8 10
Miles
Cities/Towns
Critical Habitat
Hydrologic Unit Boundary
Fifth Field Calwater Hydrologic Sub-Area Boundary
110701 Fifth Field Calwater Hydrologic Sub-Area Number
Area of Detail
California

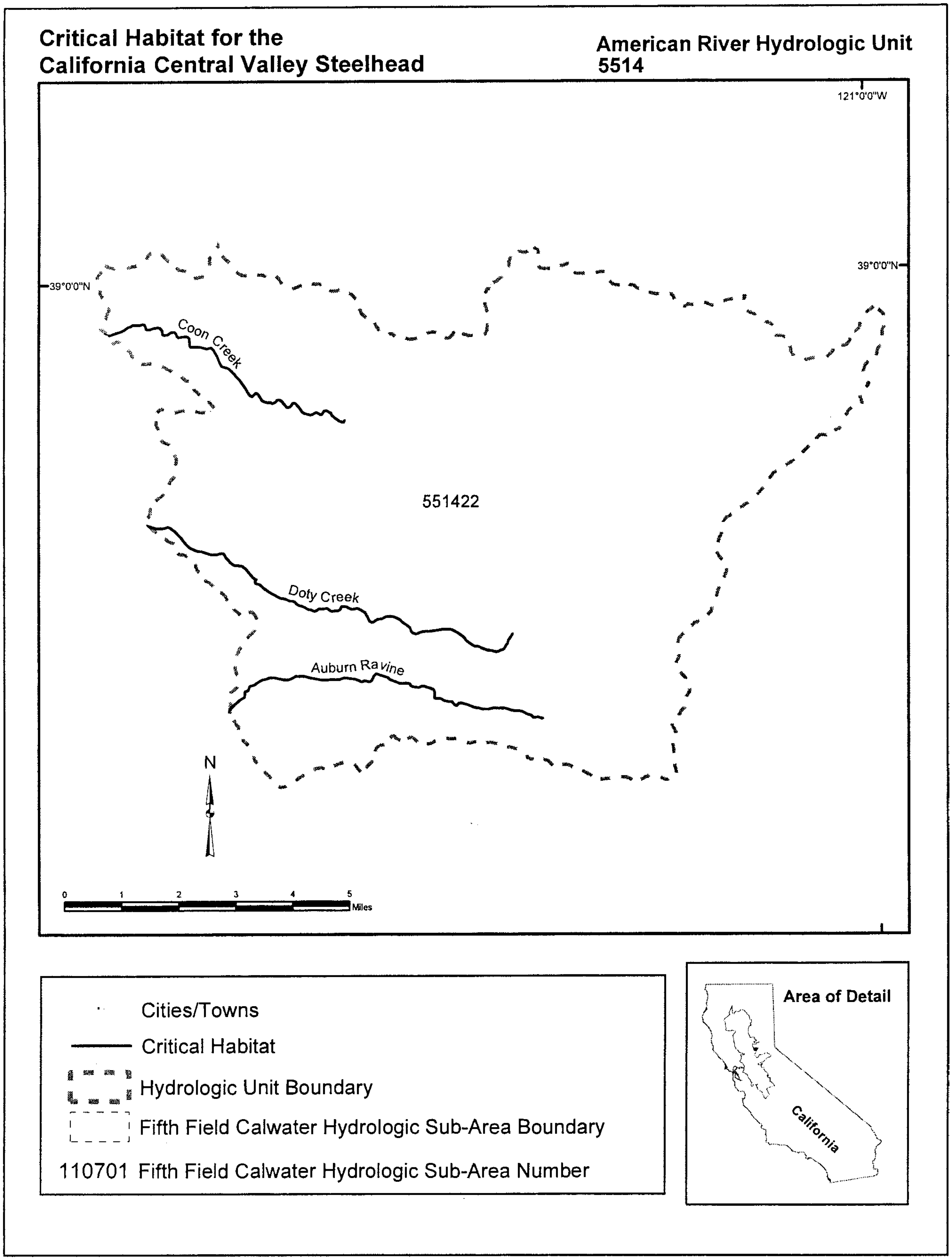

Critical Habitat for the
California Central Valley Steelhead
Whitmore Hydrologic Unit
5507
122°0'0"W
121°30'0"W
40°30'0"N
550733
550732
550731
550722
550721
550712
550711
Bella Vista
Shingletown
Viola
Manton
Little Cow Creek
Oak Run
Clover Creek
Old Cow Creek
South Cow Creek
Bear Creek
Ash Creek
NF Battle Creek
Battle Creek
Soap Creek
SF Battle Creek
Panther Creek
Morgan Creek
N
0 2 4 6 8 10 Miles
Cities/Towns
Critical Habitat
Hydrologic Unit Boundary
Fifth Field Calwater Hydrologic Sub-Area Boundary
110701 Fifth Field Calwater Hydrologic Sub-Area Number
Area of Detail
California


Critical Habitat for the
California Central Valley Steelhead
Redding Hydrologic Unit
5508
122°30'0"W
122°0'0"W
40°30'0"N
Redding
Oak Run
South Cow Creek
Olney Creek
Churn Creek
Stillwater Creek
Clear Creek
550810
Anderson
Ash Creek
Battle Creek
MF Cottonwood Creek
Cottonwood Creek
550820
SF Cottonwood Creek
Sacramento River
Paynes Creek
N
0 2 4 6 8 10 Miles
Cities/Towns
Critical Habitat
Hydrologic Unit Boundary
Fifth Field Calwater Hydrologic Sub-Area Boundary
110701 Fifth Field Calwater Hydrologic Sub-Area Number
Area of Detail
California


Critical Habitat for the
California Central Valley Steelhead
Eastern Tehama Hydrologic Unit
5509
122°0'0"W
121°30'0"W
40°30'0"N
40°0'0"N
Paynes Creek
550964
550963
550965
Antelope Creek
550920
550942
550962
Mill Creek
Dye Creek
550941
Deer Creek
550914
550916
Big Chico Creek
550915
N
0 2 4 6 8 10
Miles
Cities/Towns
Critical Habitat
Occupied but excluded streams / areas
Hydrologic Unit Boundary
Fifth Field Calwater Hydrologic Sub-Area Boundary
110701 Fifth Field Calwater Hydrologic Sub-Area Number
Area of Detail
California

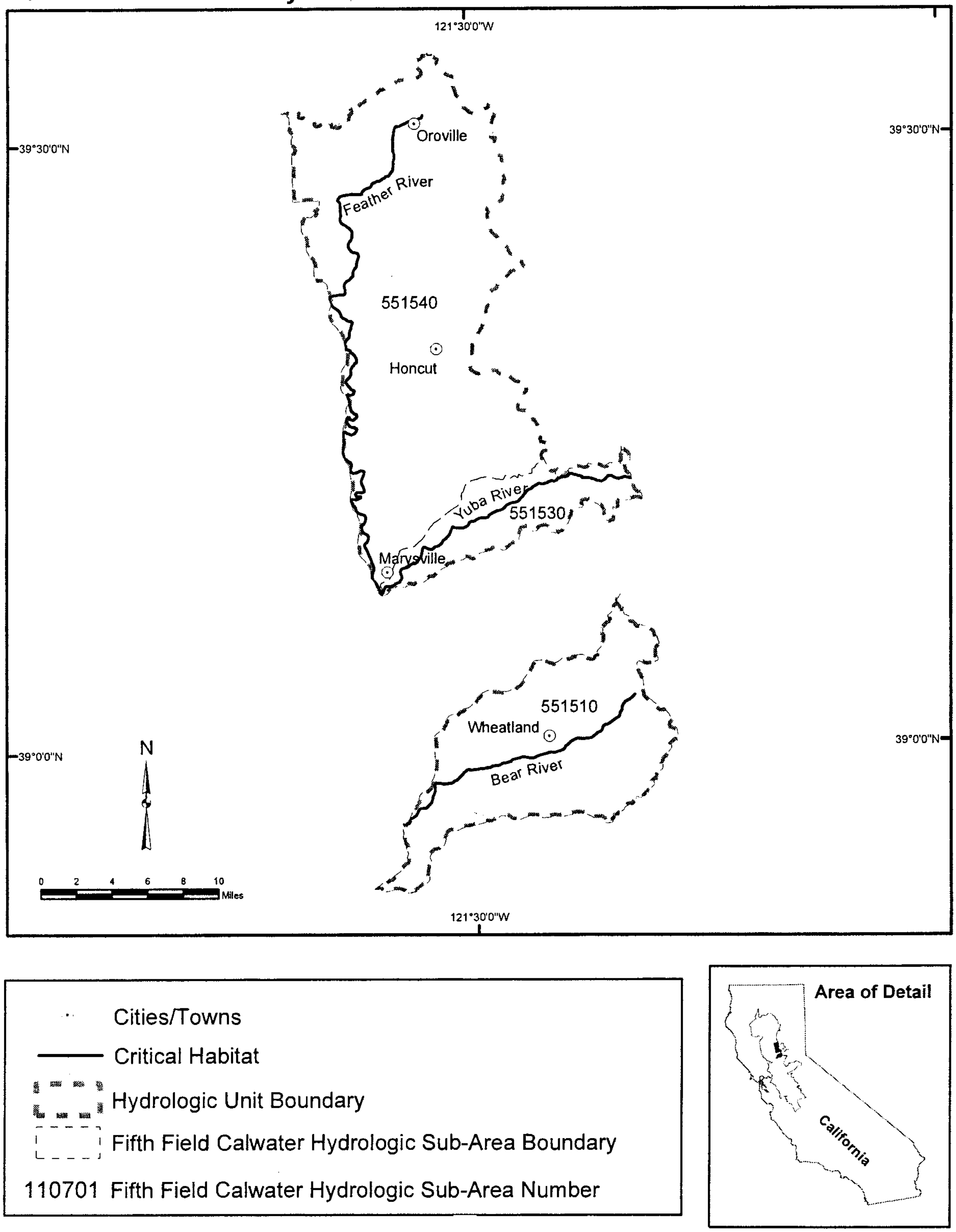

Critical Habitat for the
California Central Valley Steelhead
Sacramento Delta Hydrologic Unit
5510
122°0'0"W
121°30'0"W
38°30'0"N
551000
Clarksburg
Yolo Bypass
Sacramento Deep Water Ship Channel
Elk Slough
Cache Slough
Lindsey Slough
Miner Sl
Elkhorn Sl
Walnut Grove
Isleton
Sacramento River
N
0 2 4 6 8 10 Miles
38°0'0"N
Cities/Towns
Critical Habitat
Occupied but excluded streams / areas
Hydrologic Unit Boundary
Fifth Field Calwater Hydrologic Sub-Area Boundary
110701 Fifth Field Calwater Hydrologic Sub-Area Number
Area of Detail
California

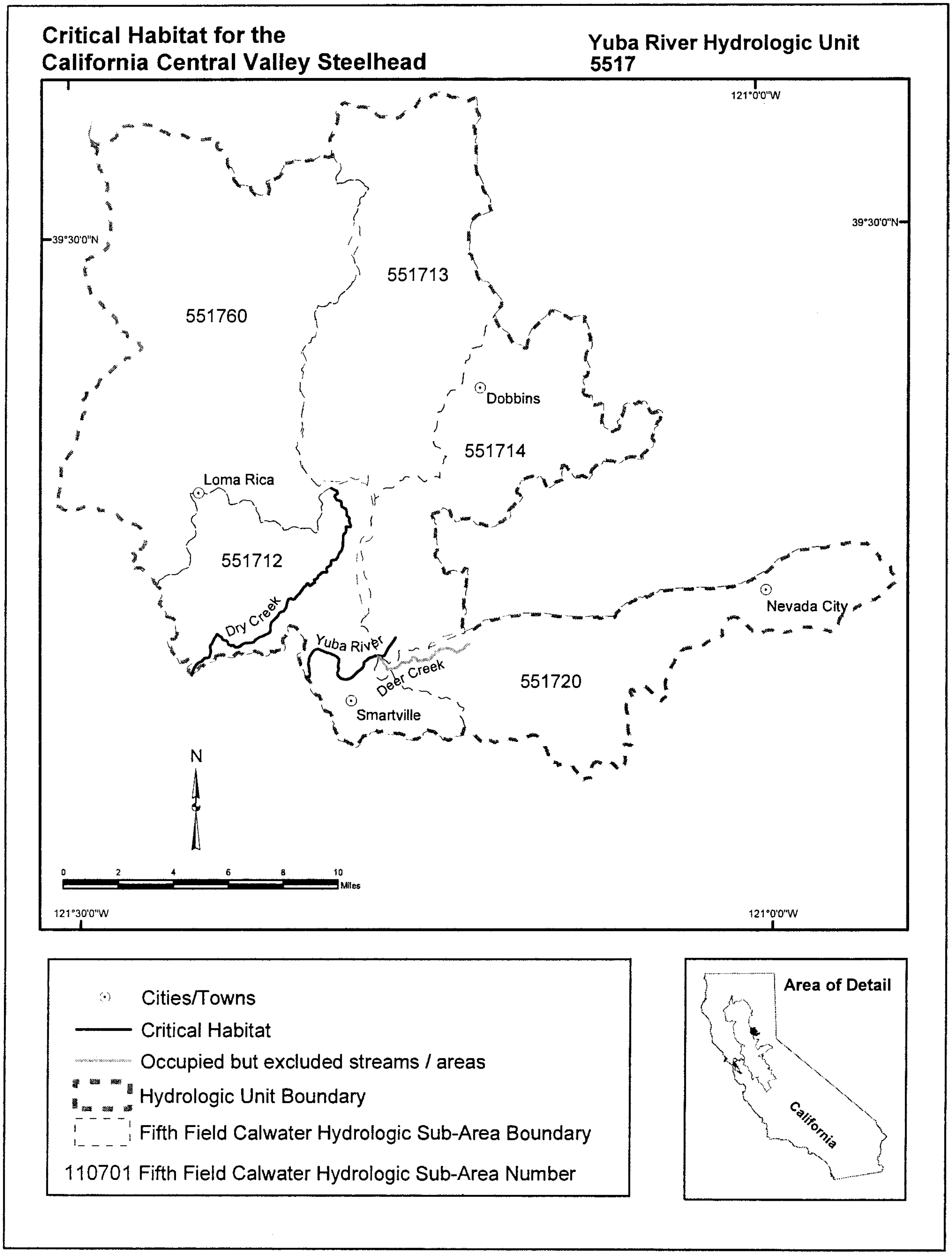

Critical Habitat for the
California Central Valley Steelhead
Valley Putah-Cache Hydrologic Unit
5511
122°0'0"W
121°30'0"W
38°30'0"N
551120
551110
Yolo Bypass
Davis
Putah Creek
Dixon
Vacaville
Ulatis Creek
Alamo Creek
Rio Vista
N
0 2 4 6 8 10
Miles
Cities/Towns
Critical Habitat
Occupied but excluded streams / areas
Hydrologic Unit Boundary
Fifth Field Calwater Hydrologic Sub-Area Boundary
110701 Fifth Field Calwater Hydrologic Sub-Area Number
Area of Detail
California

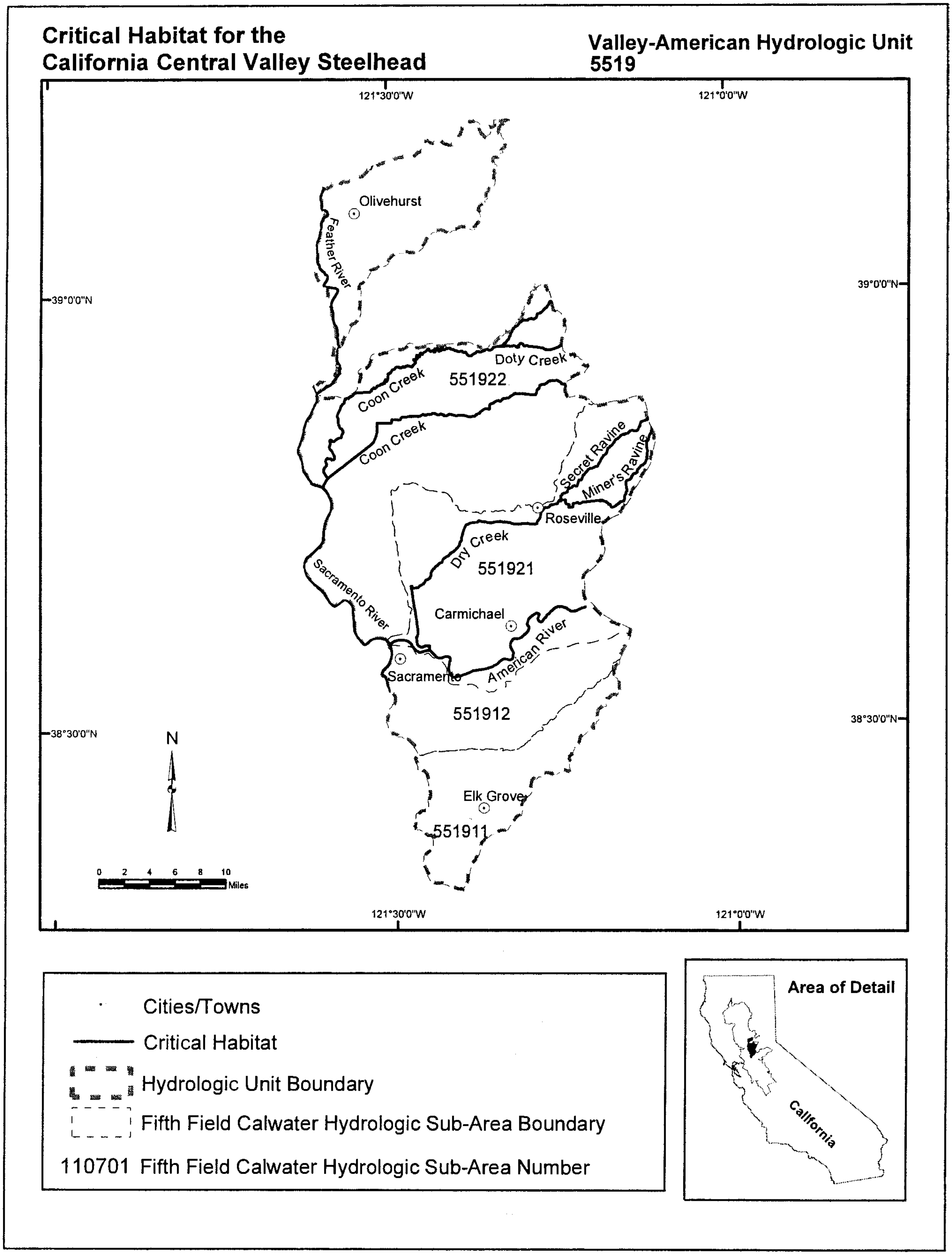

Critical Habitat for the
California Central Valley Steelhead
American River Hydrologic Unit
5514
121°0'0"W
39°0'0"N
39°0'0"N
Coon Creek
551422
Doty Creek
Auburn Ravine
N
0 1 2 3 4 5 Miles
Cities/Towns
Critical Habitat
Hydrologic Unit Boundary
Fifth Field Calwater Hydrologic Sub-Area Boundary
110701 Fifth Field Calwater Hydrologic Sub-Area Number
Area of Detail
California

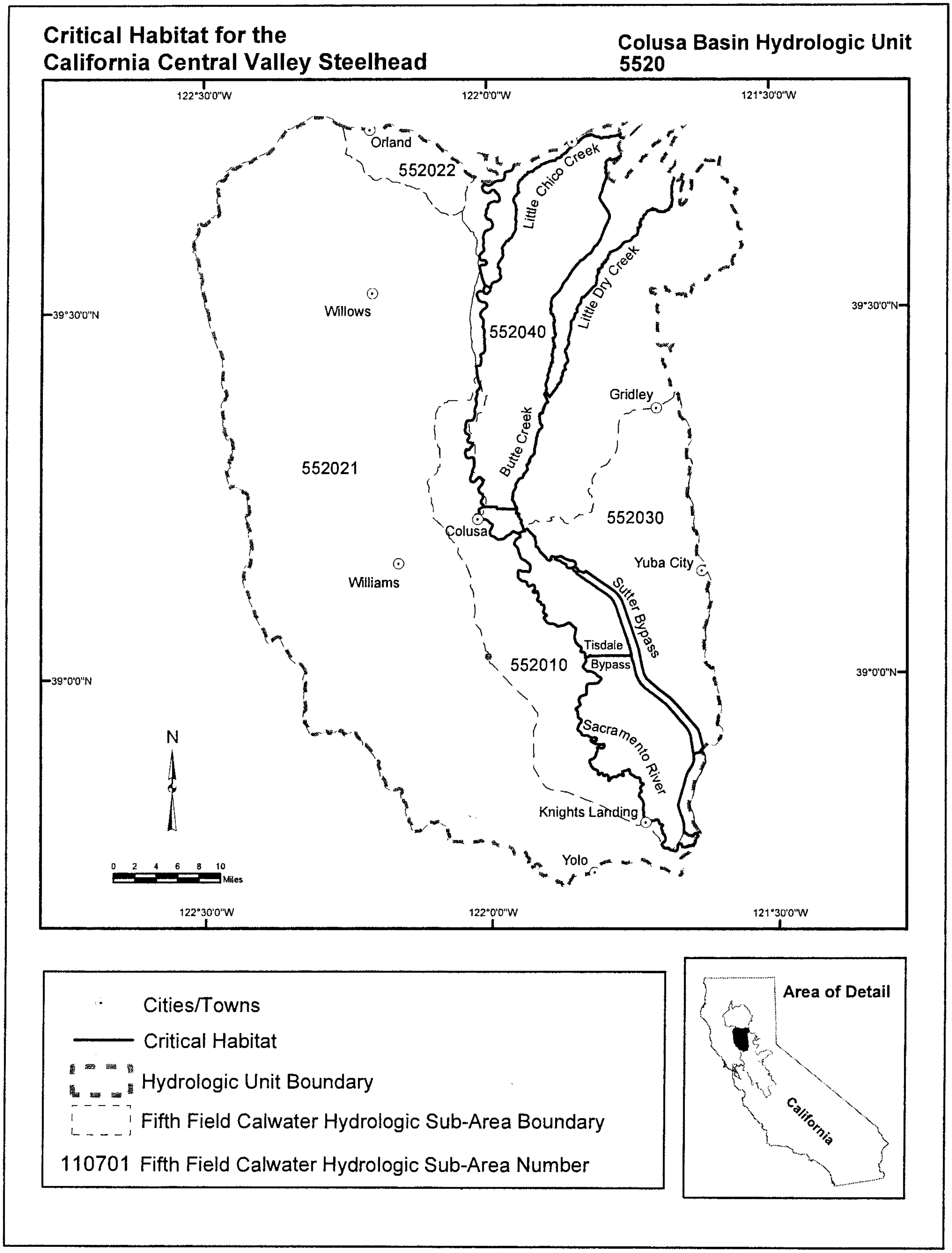
Critical Habitat for the California Central Valley Steelhead

Marysville Hydrologic Unit 5515

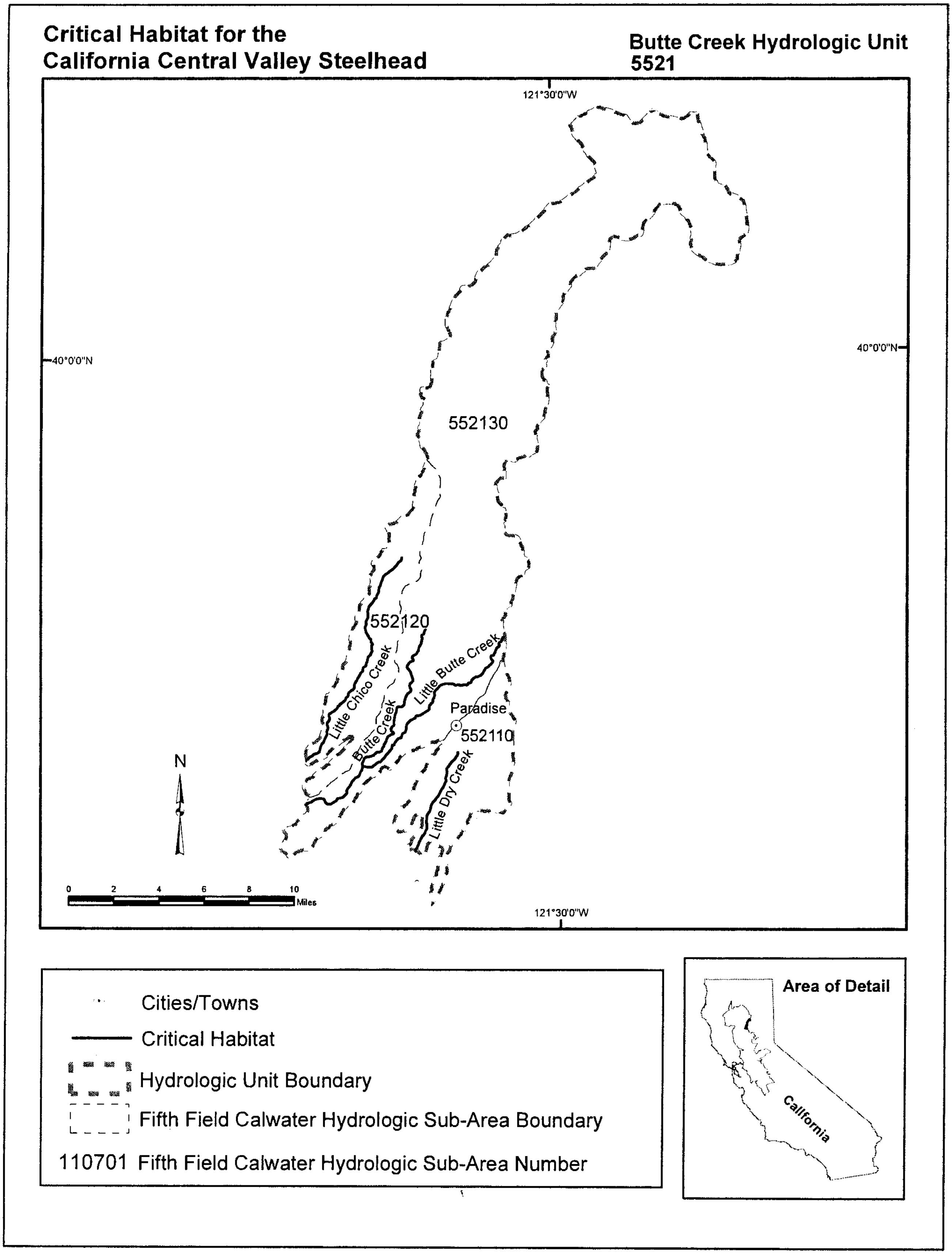


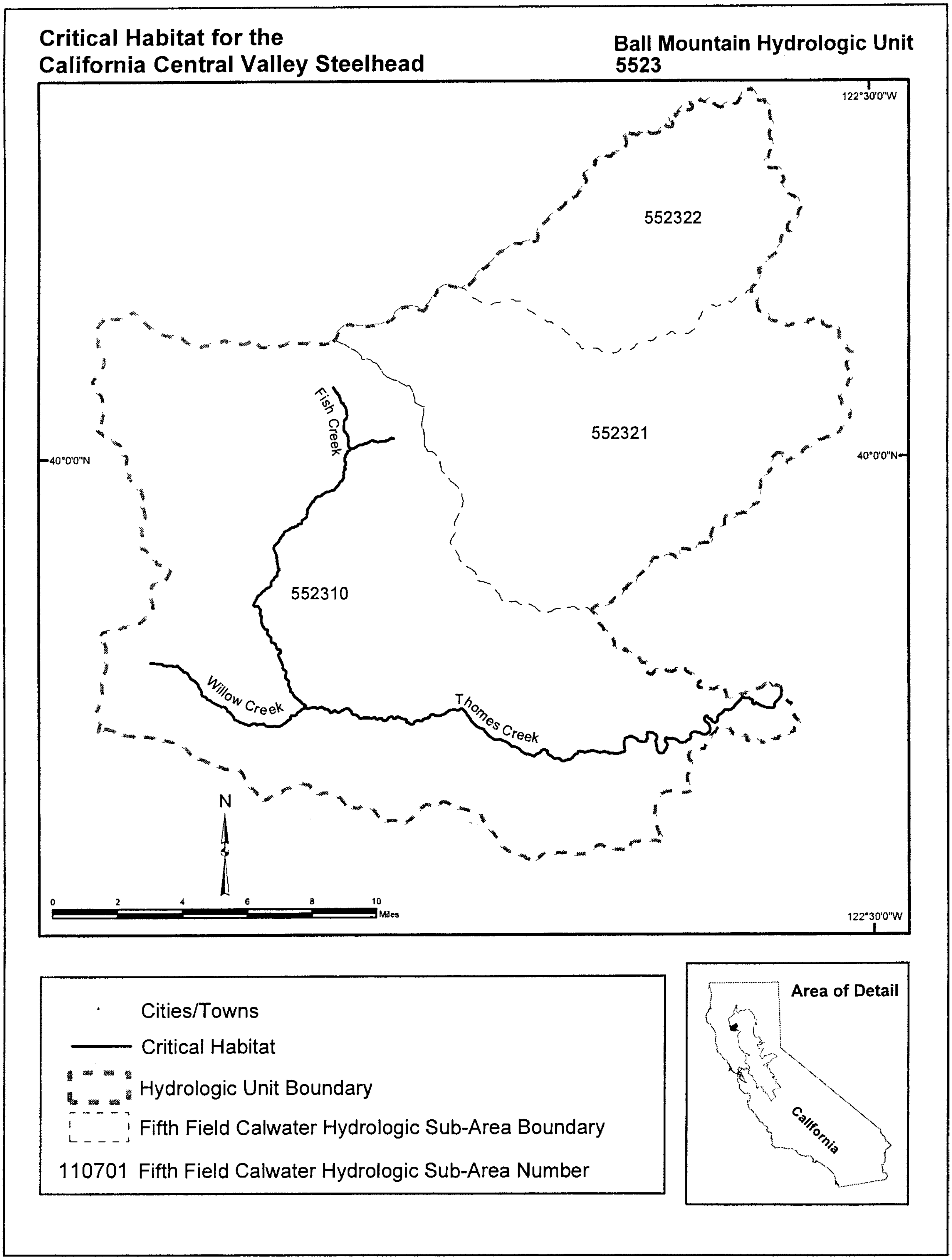

Critical Habitat for the
California Central Valley Steelhead
Yuba River Hydrologic Unit
5517
121°0'0"W
39°30'0"N
39°30'0"N
551713
551760
Dobbins
551714
Loma Rica
551712
Dry Creek
Yuba River
Deer Creek
Nevada City
551720
Smartville
N
0
2
4
6
8
10
Miles
121°30'0"W
121°0'0"W
Cities/Towns
Critical Habitat
Occupied but excluded streams / areas
Hydrologic Unit Boundary
Fifth Field Calwater Hydrologic Sub-Area Boundary
110701 Fifth Field Calwater Hydrologic Sub-Area Number
Area of Detail
California


Critical Habitat for the
California Central Valley Steelhead
Valley-American Hydrologic Unit
5519
121°30'0"W
121°0'0"W
39°0'0"N
38°30'0"N
Olivehurst
Feather River
Doty Creek
Coon Creek
551922
Coon Creek
Secret Ravine
Miner's Ravine
Roseville
Dry Creek
551921
Sacramento River
Carmichael
American River
Sacramento
551912
Elk Grove
551911
N
0 2 4 6 8 10
Miles
Cities/Towns
Critical Habitat
Hydrologic Unit Boundary
Fifth Field Calwater Hydrologic Sub-Area Boundary
110701 Fifth Field Calwater Hydrologic Sub-Area Number
Area of Detail
California

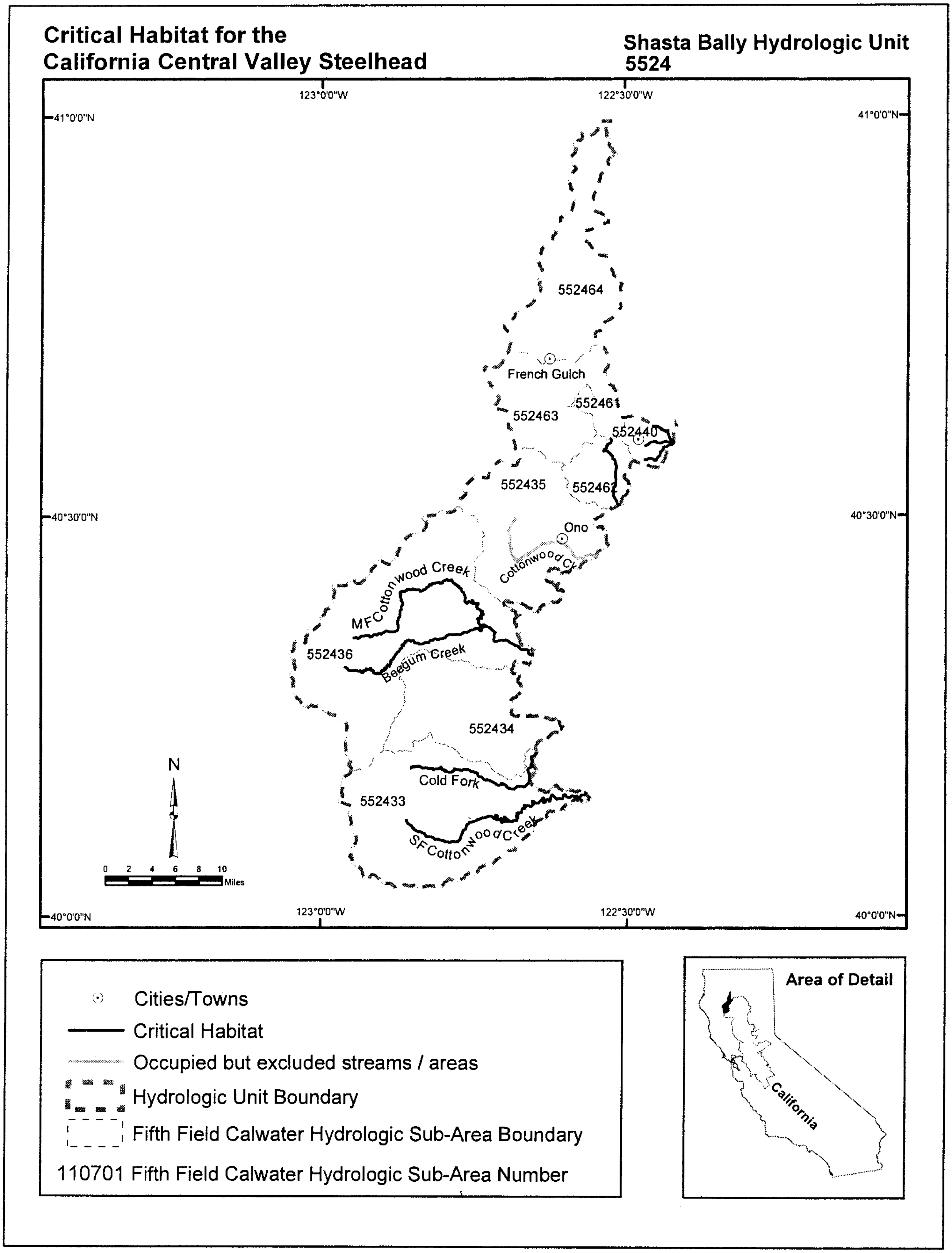


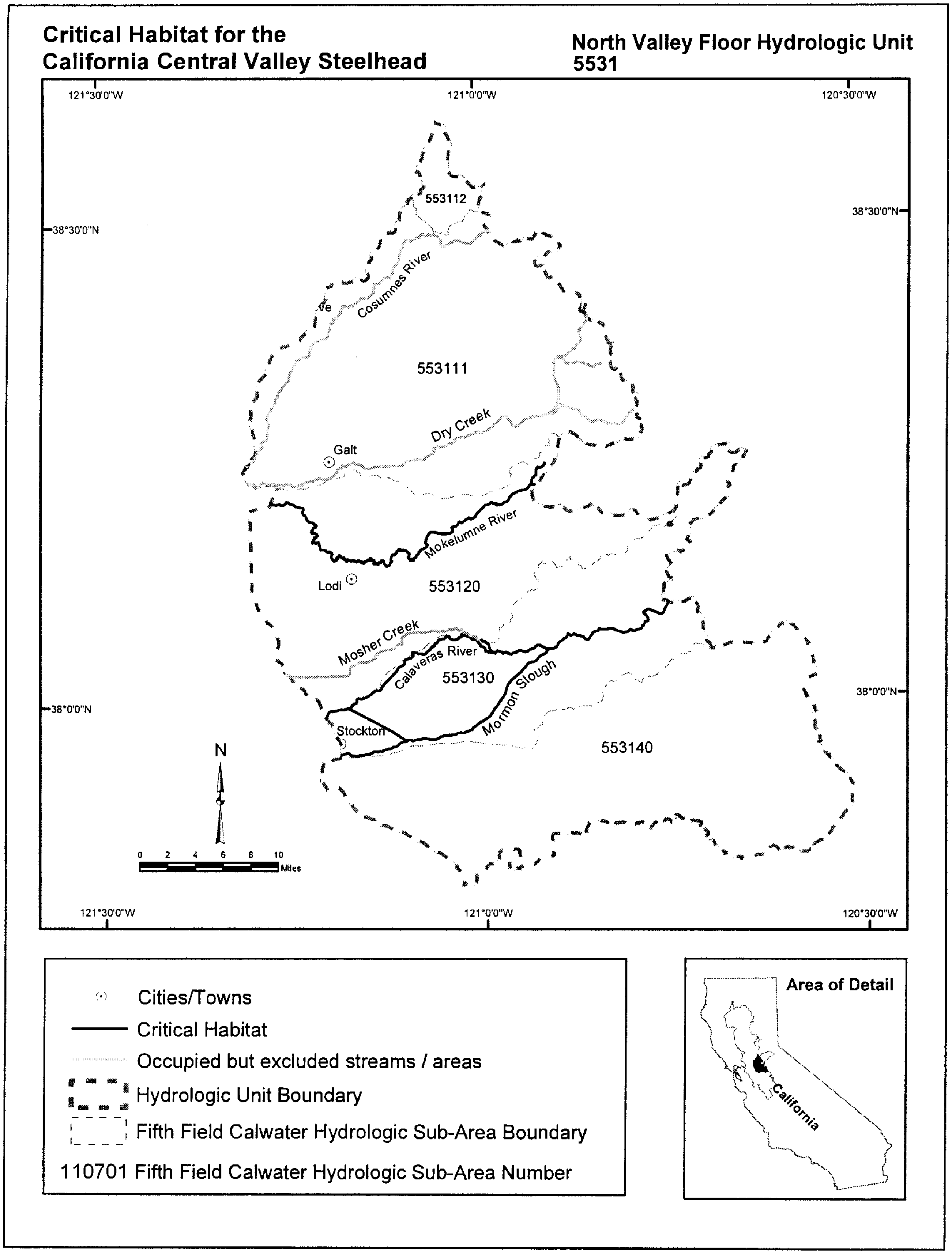
Critical Habitat for the
California Central Valley Steelhead
Colusa Basin Hydrologic Unit
5520
122°30'0"W
122°0'0"W
121°30'0"W
39°30'0"N
39°0'0"N
Orland
552022
Little Chico Creek
Little Dry Creek
Willows
552040
Gridley
Butte Creek
552021
552030
Colusa
Yuba City
Williams
Sutter Bypass
Tisdale
Bypass
552010
Sacramento River
Knights Landing
Yolo
N
0 2 4 6 8 10
Miles
Cities/Towns
Critical Habitat
Hydrologic Unit Boundary
Fifth Field Calwater Hydrologic Sub-Area Boundary
110701 Fifth Field Calwater Hydrologic Sub-Area Number
Area of Detail
California

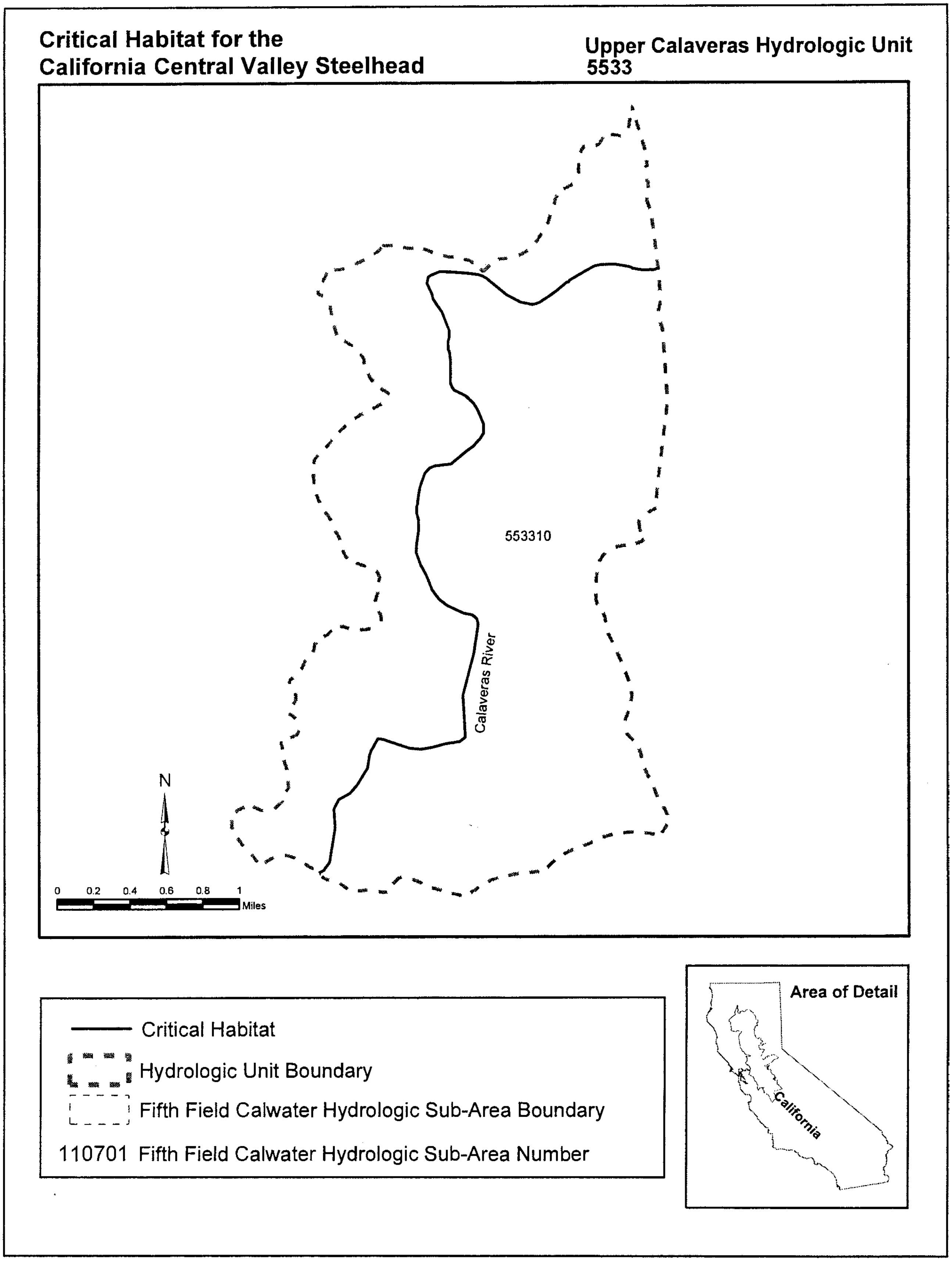

Critical Habitat for the
California Central Valley Steelhead
Butte Creek Hydrologic Unit
5521
121°30'0"W
40°0'0"N
552130
552120
552110
Little Chico Creek
Butte Creek
Little Butte Creek
Paradise
Little Dry Creek
N
0 2 4 6 8 10 Miles
Cities/Towns
Critical Habitat
Hydrologic Unit Boundary
Fifth Field Calwater Hydrologic Sub-Area Boundary
110701 Fifth Field Calwater Hydrologic Sub-Area Number
Area of Detail
California



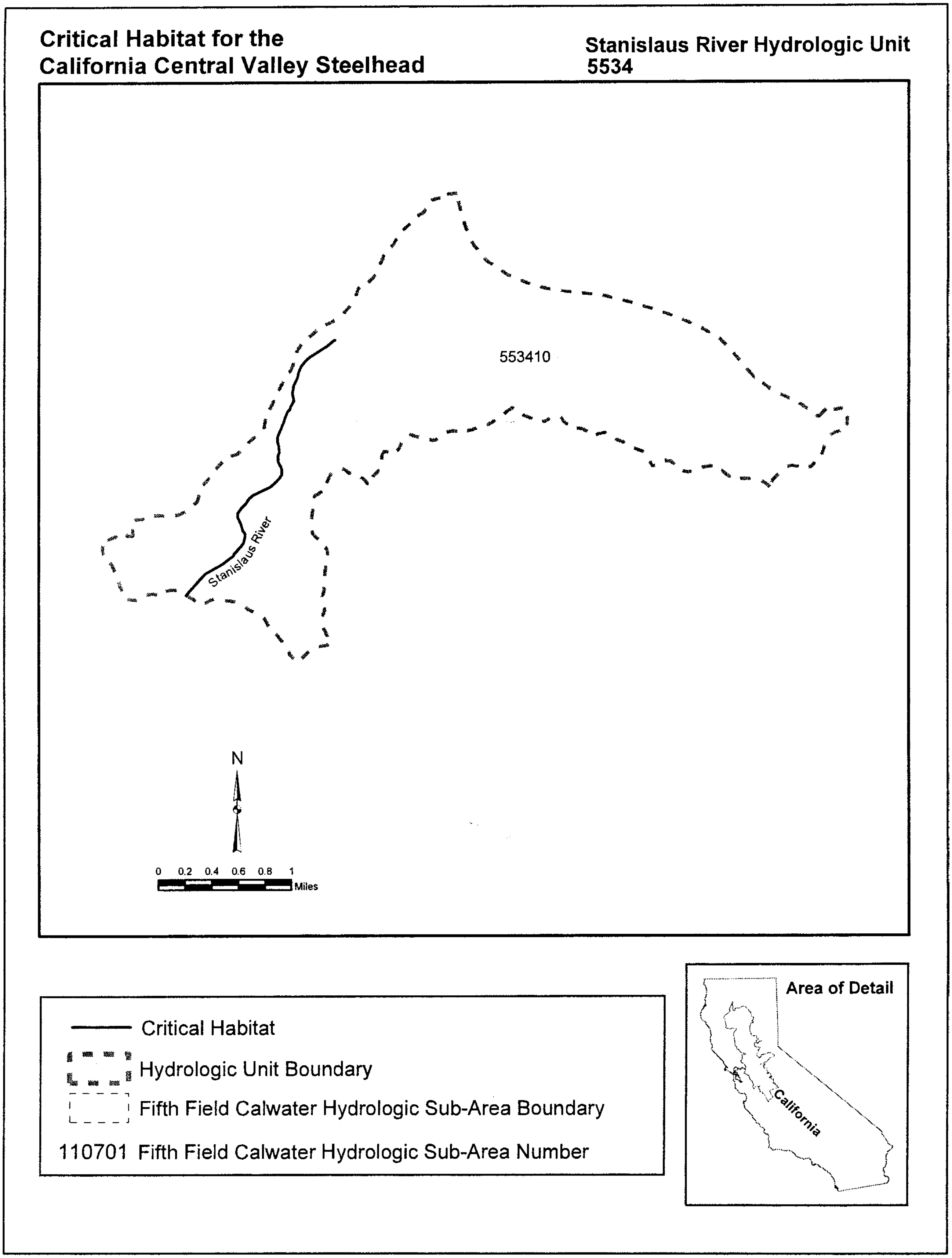
Critical Habitat for the
California Central Valley Steelhead
Ball Mountain Hydrologic Unit
5523
122°30'0"W
552322
552321
552310
40°0'0"N
40°0'0"N
Fish Creek
Willow Creek
Thomes Creek
N
0
2
4
6
8
10
Miles
122°30'0"W
Cities/Towns
Critical Habitat
Hydrologic Unit Boundary
Fifth Field Calwater Hydrologic Sub-Area Boundary
110701 Fifth Field Calwater Hydrologic Sub-Area Number
Area of Detail
California

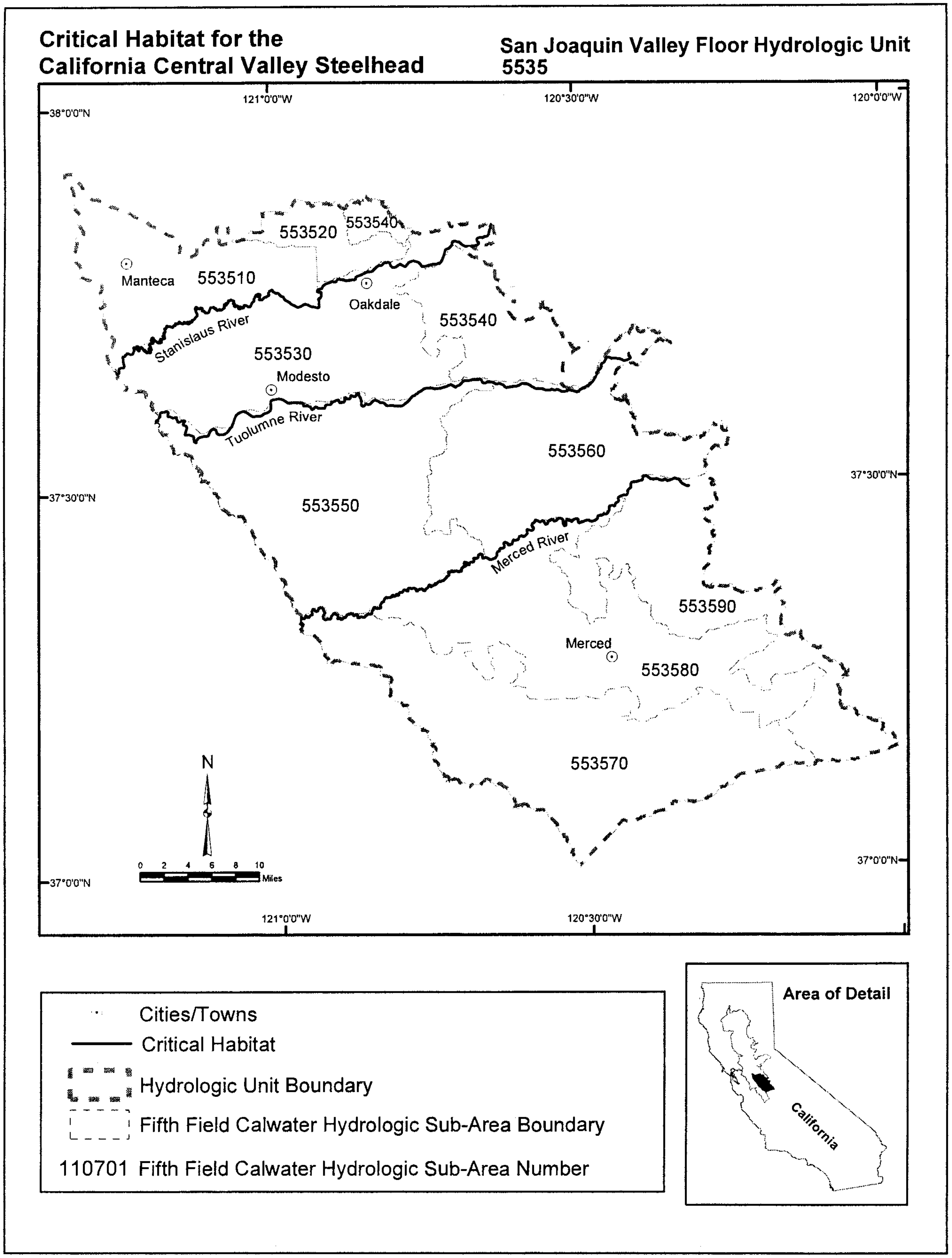

Critical Habitat for the
California Central Valley Steelhead
Shasta Bally Hydrologic Unit
5524
123°0'0"W
122°30'0"W
41°0'0"N
40°30'0"N
40°0'0"N
552464
French Gulch
552461
552463
552440
552435
552462
Ono
Cottonwood Ck
MF Cottonwood Creek
552436
Beegum Creek
552434
Cold Fork
552433
SF Cottonwood Creek
N
0 2 4 6 8 10
Miles
Cities/Towns
Critical Habitat
Occupied but excluded streams / areas
Hydrologic Unit Boundary
Fifth Field Calwater Hydrologic Sub-Area Boundary
110701 Fifth Field Calwater Hydrologic Sub-Area Number
Area of Detail
California

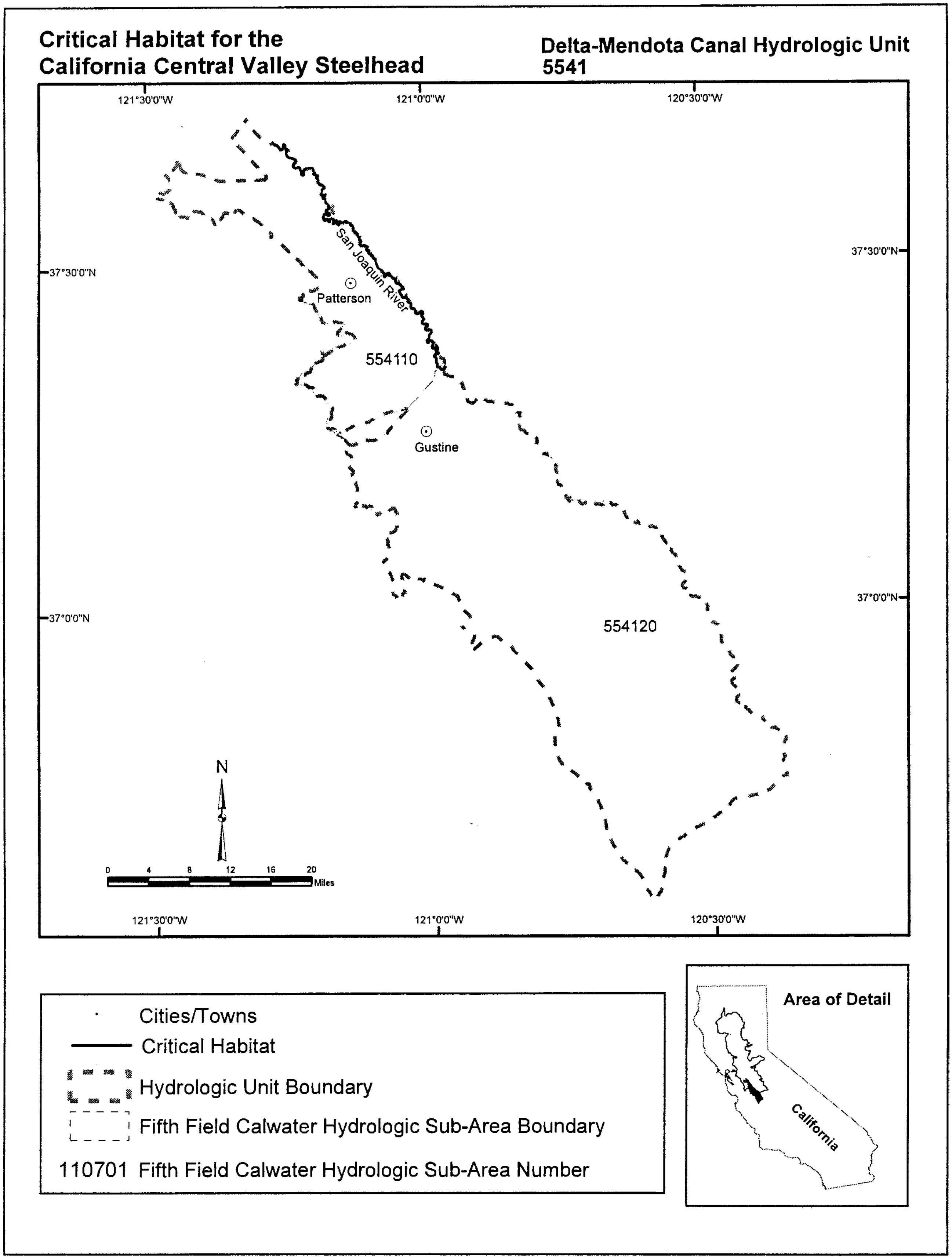

Critical Habitat for the
California Central Valley Steelhead
North Valley Floor Hydrologic Unit
5531
121°30'0"W
121°0'0"W
120°30'0"W
38°30'0"N
38°0'0"N
553112
553111
553120
553130
553140
Cosumnes River
Dry Creek
Galt
Mokelumne River
Lodi
Mosher Creek
Calaveras River
Mormon Slough
Stockton
N
0 2 4 6 8 10
Miles
Cities/Towns
Critical Habitat
Occupied but excluded streams / areas
Hydrologic Unit Boundary
Fifth Field Calwater Hydrologic Sub-Area Boundary
110701 Fifth Field Calwater Hydrologic Sub-Area Number
Area of Detail
California

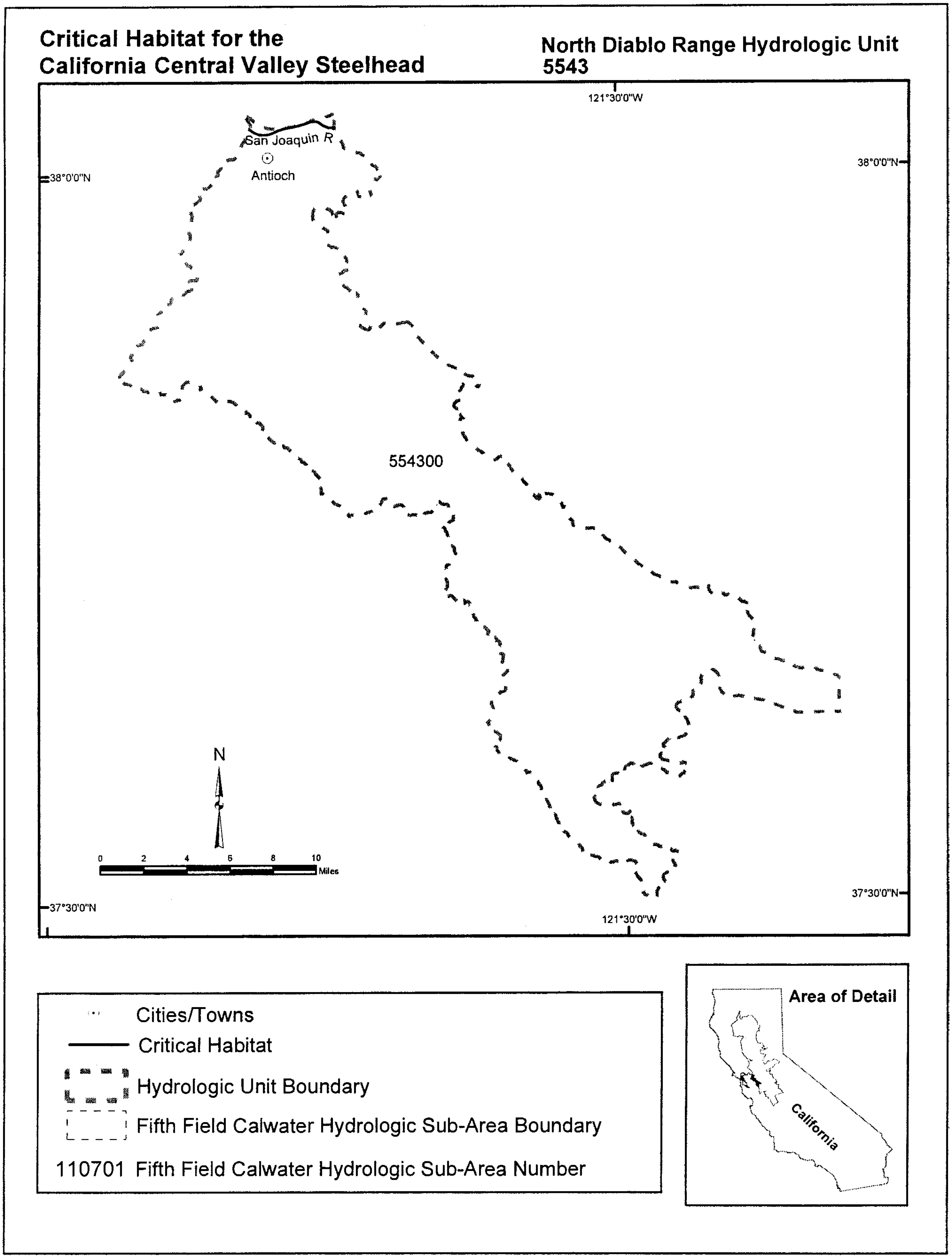


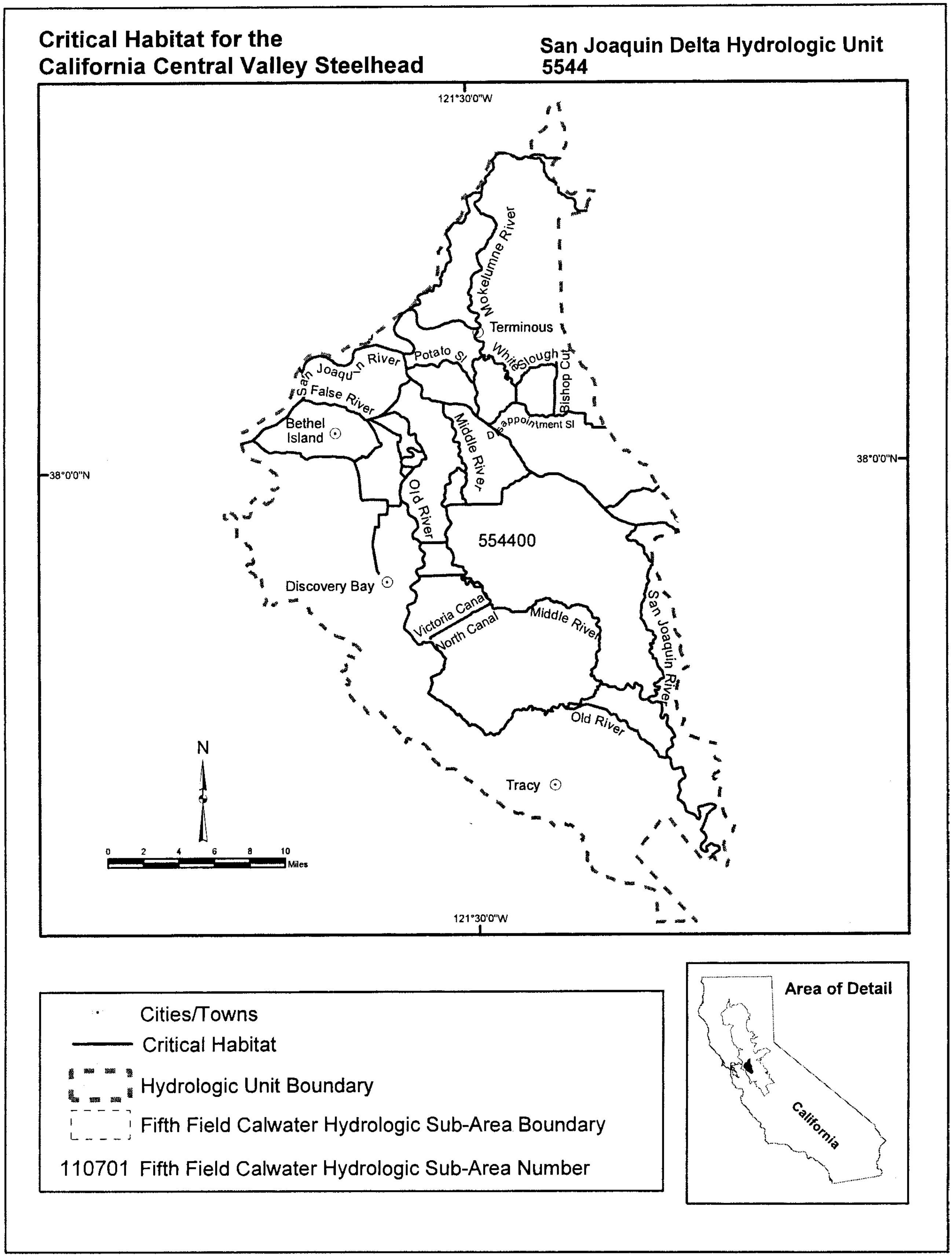
Critical Habitat for the
California Central Valley Steelhead
Upper Calaveras Hydrologic Unit
5533
553310
Calaveras River
N
0 0.2 0.4 0.6 0.8 1
Miles
Critical Habitat
Hydrologic Unit Boundary
Fifth Field Calwater Hydrologic Sub-Area Boundary
110701 Fifth Field Calwater Hydrologic Sub-Area Number
Area of Detail
California


Critical Habitat for the
California Central Valley Steelhead
Stanislaus River Hydrologic Unit
5534
553410
Stanislaus River
N
0 0.2 0.4 0.6 0.8 1
Miles
Critical Habitat
Hydrologic Unit Boundary
Fifth Field Calwater Hydrologic Sub-Area Boundary
110701 Fifth Field Calwater Hydrologic Sub-Area Number
Area of Detail
California


Critical Habitat for the
California Central Valley Steelhead
San Joaquin Valley Floor Hydrologic Unit
5535
121°0'0"W
120°30'0"W
120°0'0"W
38°0'0"N
37°30'0"N
37°0'0"N
553520
553540
553510
Manteca
Oakdale
553540
Stanislaus River
553530
Modesto
Tuolumne River
553560
553550
Merced River
553590
Merced
553580
553570
N
0 2 4 6 8 10
Miles
Cities/Towns
Critical Habitat
Hydrologic Unit Boundary
Fifth Field Calwater Hydrologic Sub-Area Boundary
110701 Fifth Field Calwater Hydrologic Sub-Area Number
Area of Detail
California


Critical Habitat for the
California Central Valley Steelhead
Delta-Mendota Canal Hydrologic Unit
5541
121°30'0"W
121°0'0"W
120°30'0"W
37°30'0"N
37°0'0"N
San Joaquin River
Patterson
554110
Gustine
554120
N
0 4 8 12 16 20 Miles
Cities/Towns
Critical Habitat
Hydrologic Unit Boundary
Fifth Field Calwater Hydrologic Sub-Area Boundary
110701 Fifth Field Calwater Hydrologic Sub-Area Number
Area of Detail
California


Critical Habitat for the
California Central Valley Steelhead
North Diablo Range Hydrologic Unit
5543
121°30'0"W
San Joaquin R
Antioch
38°0'0"N
38°0'0"N
554300
N
0 2 4 6 8 10
Miles
37°30'0"N
37°30'0"N
121°30'0"W
Cities/Towns
Critical Habitat
Hydrologic Unit Boundary
Fifth Field Calwater Hydrologic Sub-Area Boundary
110701 Fifth Field Calwater Hydrologic Sub-Area Number
Area of Detail
California



[FR Doc. 05–16389 Filed 9–1–05; 8:45 am]

BILLING CODE 3510–22–C

EXHIBIT 7

Fish & Wildlife Groundwater Planning Considerations

California Department of Fish and Wildlife

GROUNDWATER PROGRAM

contents

preface

In 2014, California passed the Sustainable Groundwater Management Act (SGMA) (AB1739, SB 1168, SB 1319), authorizing local groundwater sustainability agencies (GSAs) to develop groundwater sustainability plans (GSPs) for a subset of California's alluvial aquifers. To comply with SGMA, GSAs must achieve sustainable groundwater management, defined by SGMA as the avoidance of locally-defined undesirable results. To achieve sustainability, GSAs must develop and implement effective groundwater management plans that consider the interests of all beneficial uses and users of groundwater, including environmental users of groundwater. [Water Code § 10723.2.]

In many groundwater basins, fish and wildlife that rely on groundwater are among these beneficial uses and users. Many sensitive species and habitats comprise groundwater dependent ecosystems (GDEs), which are natural communities that rely on groundwater to sustain all or a portion of their water needs. The unsustainable use of groundwater can impact the shallow aquifers and interconnected surface waters on which GDEs depend and may lead to adverse impacts on fish and wildlife.

As trustee for California's fish and wildlife resources, CDFW intends to engage as a stakeholder in groundwater planning processes (where resources are available) to represent the groundwater needs of GDEs and fish and wildlife beneficial uses and users of groundwater. The information provided here is intended to help local groundwater planners, groundwater planning proponents and consultants, and CDFW staff work together to consider the needs of fish and wildlife when developing groundwater management plans and implementing SGMA. The document includes three categories of groundwater planning considerations:

- Scientific Considerations;
- Management Considerations; and
- Legal, Regulatory, and Policy Considerations.

Links to additional guidance and considerations developed by CDFW and other organizations that address the impacts of groundwater pumping on GDEs and depletion of interconnected surface water can be found at the end of this document.

Except to the extent that this document directly references existing statutory or regulatory requirements, use of these groundwater planning considerations is not mandated under law and should not be interpreted as a rule, regulation, order, or standard for local groundwater plans. Practical application of these considerations must be based on the best available information and groundwater basin-specific conditions.

Relevance to CDFW Mission

As trustee for the State's fish and wildlife resources, the California Department of Fish and Wildlife (CDFW) has jurisdiction over the conservation, protection, and management of fish, wildlife, native plants, and the habitat necessary for biologically sustainable populations of such species. [FGC §§ 1802 and 711.7(a).] CDFW has an interest in the sustainable management of groundwater, as many sensitive ecosystems and public trust resources depend on groundwater and interconnected surface waters.

Accordingly, CDFW encourages thoughtful groundwater planning that carefully considers fish and wildlife and the habitats on which they depend. This groundwater planning considerations document focuses on impacts to groundwater dependent ecosystems (GDEs) and interconnected surface waters (ISW), both of which may provide habitat for fish and wildlife and are defined under SGMA as:

GROUNDWATER DEPENDENT ECOSYSTEMS: ecological communities or species that depend on groundwater emerging from aquifers or on groundwater occurring near the ground surface. [23 CCR § 351(m).]

INTERCONNECTED SURFACE WATER:
surface water that is hydraulically connected at any point by a continuous saturated zone to the underlying aquifer, and the overlying surface water is not completely depleted. [23 CCR § 351(o).]

SGMA statute and regulations require specific consideration of both GDEs and ISW in the development of a groundwater sustainability plan (GSP). SGMA-governed groundwater plans must:

- Identify GDEs within the basin [23 CCR § 354.16(g)];
- Consider impacts to GDEs [Water Code § 10727.4(l)]; and
- Address six undesirable results, one of which is depletions of interconnected surface water that have significant and unreasonable adverse impacts on beneficial uses of the surface water. [Water Code § 10721(x)(6).]

To encourage GSAs to examine groundwater management impacts on fish and wildlife and the GDE and ISW habitats on which they depend, the CDFW Groundwater Program has catalogued fish and wildlife groundwater planning considerations that address CDFW's key interests.

Key Groundwater Planning Questions

CDFW suggests GSAs consider the following questions during GSP development:

GROUNDWATER DEPENDENT ECOSYSTEMS (GDES)

1. How will groundwater plans identify GDEs and address GDE protection?
2. How will GSAs determine if GDEs are being adversely impacted by groundwater management?
3. If GDEs are adversely impacted, how will groundwater plans facilitate appropriate and timely monitoring and management response actions?

INTERCONNECTED SURFACE WATERS (ISW)

1. How will groundwater plans document the timing, quantity, and location of ISW depletions attributable to groundwater extraction and determine whether these depletions will impact fish and wildlife?
2. How will GSAs determine if fish and wildlife are being adversely impacted by groundwater management impacts on ISW?
3. If adverse impacts to ISW-dependent fish and wildlife are observed, how will GSAs facilitate appropriate and timely monitoring and management response actions?

Groundwater Planning Considerations[1]

CDFW encourages GSAs to think holistically about ecosystem protection and enhancement when designing groundwater plans. The following compilation of fish and wildlife considerations is provided for GSAs to consider during the development of GSPs.

SCIENTIFIC CONSIDERATIONS

The Department of Water Resources GSP Regulations (DWR's Regulations) generally require reliance on 'best available science[2],' consistent with scientific and engineering professional standards of practice. [23 CCR § 351(h).] CDFW relies on ecosystem-based management informed by credible science in all resource management decisions to the extent feasible. [FGC § 703.3.] Accordingly, CDFW expects groundwater plans and supporting documentation to follow 'best available science' practices. Application of the following scientific concepts can improve the likelihood that a groundwater plan will avoid impacts to fish and wildlife beneficial uses and users of groundwater, GDEs, and ISW.

1. Hydrologic Connectivity[3]

Whether terrestrial vegetation can access groundwater and whether surface water is hydrologically connected with groundwater are important determinations in the context of groundwater planning. If hydrologic connectivity exists between a terrestrial or aquatic ecosystem and groundwater, then that ecosystem is a potential GDE and must be identified in a GSP. [23 CCR §354.16 (g).] Aquatic ecosystems reliant on ISW are also specifically relevant to the regulatory requirement to avoid significant and unreasonable adverse impacts to beneficial uses of surface water. [Water Code § 10721 (x)(6).] Hydrologic connectivity between surface water and groundwater, as well as groundwater accessibility to terrestrial vegetation, must therefore be evaluated carefully, and conclusions should be well-supported. Hydrologic connectivity considerations include:

a. *Connected surface waters:* As defined by DWR's Regulations, ISW are surface waters that are hydraulically connected at any point by a continuous saturated zone to the underlying aquifer and the overlying surface water is not completely depleted. [23 CCR § 351(o).] These waters can receive water from the aquifer, or lose water to the aquifer, depending on hydraulic gradients.

b. *Disconnected surface waters:* Disconnected streams occur where surface water is not connected by a continuous saturated zone to an underlying aquifer. In disconnected surface water, lowering the groundwater table does not affect the rate of loss from the surface water to groundwater.

c. *Transition surface waters:* In a transition surface water, the surface waters are hydraulically connected to the underlying aquifer by a capillary fringe[4]. Due to the capillary fringe connection, water table elevation changes can still affect the exchange rate of surface waters[5]. Therefore, in some cases, lowering the groundwater elevation under a streambed without a continuous saturated connection to the underlying aquifer may increase the rate of loss from the surface water body into the underlying aquifer. This potential for increased loss rates during transitional states of connectivity can ultimately increase the area or flow-duration of stream reaches that may be perceived as 'disconnected.'

d. *Terrestrial vegetation:* Many terrestrial plants known as phreatophytes depend on water from shallow aquifers. The depth to which these plants can root and the depth to groundwater collectively determine if the plants can rely on groundwater resources to sustain them. Depth to groundwater fluctuates across seasons and over time, as does plant rooting depth, so connectivity between terrestrial vegetation and shallow groundwater may change over time. Understanding baseline conditions and vegetation groundwater needs across time and species, as well as tolerance for rate of change, can inform groundwater management thresholds.

e. *Geospatial extent of connectivity:* Groundwater interconnectivity with surface water and groundwater accessibility by terrestrial vegetation are impacted by groundwater management regimes that raise or lower the groundwater table. These changes in water table elevation can impact the geospatial extent of connectivity, expanding or decreasing the connected interface. This means gaining and losing stream reaches[6] can grow or shrink in length, and interconnected wetlands and phreatophyte vegetation can grow or shrink in acres of coverage based on changes to groundwater table depth.

f. *Temporal duration of connectivity:* Raising and lowering the groundwater table can also impact the temporal duration of: 1) hydrologic connectivity between the water table and surface waters, and 2) accessibility of groundwater to terrestrial vegetation. Groundwater elevation changes over time can cause transitions from connected/accessible groundwater to disconnected/inaccessible groundwater, and vice versa.

2. Interconnected Surface Water Depletions

ISW depletions attributable to groundwater extraction can occur through two different mechanisms: captured recharge and induced infiltration (described below). Both should be considered when evaluating the possibility of depletions to ISW and establishing ISW sustainability criteria in GSPs. This evaluation is often best accomplished through empirical measurements coupled with numerical modeling.

a. *Captured recharge:* Groundwater withdrawals from aquifers hydrologically connected to surface waters can intercept groundwater travelling downgradient that would otherwise have discharged to surface waters.

b. *Induced infiltration:* Groundwater withdrawal can create a localized cone of depression and induce flow from ISW to groundwater, transforming a previously gaining stream reach to a losing stream reach.

3. Fish and Wildlife Species Water Needs

An evaluation of GDEs and ISW depletions should identify possible impacts to fish and wildlife beneficial uses and users of groundwater and ISW and should consider the following aspects of species water needs across life history phases when defining undesirable results and setting minimum thresholds required by DWR's Regulations.

a. *Temporal Water Needs:* Aquatic and terrestrial species require different quantities and qualities of water at different times and for different durations. There are climate-driven, seasonal variations in water availability to which species are accustomed – for example, migratory water fowl rely on wetlands during fall and spring migrating seasons when surface water was historically available. There are anthropogenic-driven variations in temporal water availability that can compromise species survival – for example, groundwater capture from a stream in summer months caused by irrigation well pumping near a stream can decrease flow, reduce cold groundwater inflows, and increase instream temperatures; thereby degrading cold-water refuge critical to migrating and spawning salmonids. Importantly, groundwater pumping and recharge actions have 'lag' impacts on water availability that are governed by the location and quantity of groundwater extraction as well as aquifer characteristics. Understanding the timing of water availability with respect to species needs across all life history phases will allow groundwater planners to better account for groundwater management impacts to fish and wildlife beneficial uses and users of groundwater and ISW.

b. *Spatial Water Needs:* Similar to temporal water needs, species are sensitive to the location and coverage of ISW and GDE wetland habitat available to them. Wetland geographic coverage dictates associated migratory bird carrying capacities, and specific instream salmonid habitats receiving groundwater inflows can best support spawning and rearing success. Therefore, the location of groundwater extraction and any associated cones of depression can impact GDE and ISW habitats. Wells closer to GDEs and ISW – both laterally and vertically – may have more influence on the location and coverage of available habitat than wells farther away. These spatial relationships between groundwater extraction, and spatial coverage and location of GDE and ISW habitat are dependent on aquifer and well characteristics.

c. *Hydrologic Variability:* Water availability is naturally variable, and many species rely on a degree of hydrologic variability. This variability can be important to cue animal behavior such as spawning, growth, and migration. Groundwater plans should consider how groundwater management influences the hydrologic variability of ISW quality and quantity and what cascading impacts these variations may have on fish and wildlife species and their habitat.

d. *Water Availability:* At a basic level, water available for fish and wildlife species is subject to the same regulatory paradigms and dynamic climate conditions as water available for municipal and agricultural uses. CDFW expects groundwater budget projections to include fish and wildlife water needs and, when possible, anticipate regulatory and climate impacts on water availability.

e. *Water Quality:* Groundwater quality and ISW quality play a significant role in habitat adequacy. Groundwater pumping can impact many components of water quality including water temperature, dissolved oxygen, salinity, turbidity, and contaminants. Pumping can reverse hydraulic gradients and reduce cold and oxygen-rich inflows to ISW, leach soil constituents such as nitrates, and convey underground point source contamination to ISW. Groundwater plans should demonstrate an understanding of how groundwater management actions will affect water quality.

4. Habitat Value

Groundwater management plans that seek to minimize impacts to GDEs and avoid ISW depletion should consider the following:

a. *Connectivity:* Habitat connectivity is a key ecological attribute of thriving ecosystems. A functional network of connected terrestrial and aquatic habitats is essential to the continued existence of California's diverse species and natural communities. Components of natural and semi-natural landscapes must be large enough and connected enough to meet the needs of all species that use them. In identifying and evaluating groundwater management impacts to beneficial uses and users of groundwater, GDEs, and ISW, habitat connectivity impacts should also be considered.

b. *Heterogeneity:* Habitat heterogeneity, such as vegetation age and diversity, is a key ecological attribute of many functional ecosystems and often a predictor of animal species richness. In identifying and evaluating groundwater management impacts to beneficial uses and users of groundwater, GDEs, and ISW; habitat heterogeneity impacts should be considered.

c. *Groundwater Elevation:* Groundwater-dependent habitats, including ISW, are particularly susceptible to changes in the depth of the groundwater. Lowered water tables that drop beneath root zones can cutoff phreatophyte vegetation from water resources, stressing or ultimately converting vegetated terrestrial habitat. Induced infiltration attributable to groundwater pumping can reverse hydraulic gradients and may cause streams to stop flowing, compromising instream dissolved oxygen and temperature characteristics, and eventually causing streams to go dry. The frequency and duration of exposure to lowered groundwater tables and low-flow or no-flow conditions caused by groundwater pumping, as well as habitat and species resilience, will dictate vulnerability to changes in groundwater elevation. For example, some species rely on perennial instream flow, and any interruption to flow can risk species survival. Impacts caused by changes in groundwater elevation should be considered in the evaluation of groundwater management effects on GDEs and ISW.

5. Monitoring Systems

Effective monitoring methods and systems can aid in understanding groundwater management impacts to GDEs and ISW and informing subsequent action. Groundwater planners are encouraged to design robust monitoring systems with meaningful methods for tracking GDE and ISW conditions over time that account for the following monitoring considerations:

a. *Fundamental Components*: An effective monitoring system to evaluate impacts to GDEs and ISW depletions will ideally provide data that is representative of groundwater-dependent habitat throughout the alluvial basin and will be designed to capture geospatial and temporal variability at a scale meaningful to fish and wildlife beneficial uses and users of groundwater and ISW. GSAs should consider frequency of measurements and observation point density to ensure measurements capture seasonal and operational variability. Monitoring methods should follow accepted technical procedures established by the USGS[7,8], (or equivalently robust methods) and reference DWR's best management practices[9].

b. *Early Recognition*: An effective monitoring system to evaluate impacts to GDEs and ISW depletions will be designed to capture early signs of adverse impacts, so that adaptive management can initiate to avoid undesirable results. Early signs of adverse impacts may manifest as stressed phreatophyte vegetation, increased instream temperature, etc.

c. *Meaningful Baselines*: Where historical baseline information on GDEs and ISW is absent, prompt groundwater information collection is critical to understanding the relationship between climatic variations/water year type and groundwater demand/availability. Monitoring systems can help inform baselines that reflect hydrologic variability and that can be used to measure the impact of management actions on groundwater resources.

d. *Interconnectivity Efficacy*: An effective monitoring system to evaluate impacts to GDEs and ISW depletions will be able to identify and help characterize groundwater-surface water interaction by using appropriate methods including but not limited to paired groundwater and streamflow monitoring; seepage measurements; nested piezometers; geochemical and physical property monitoring; and application of monitoring data to water budget calculations, analytical modeling, and numerical modeling.

e. *Monitoring Characteristics*: A groundwater plan may consider tracking a range of GDE and ISW characteristics to determine groundwater management impacts over time. These characteristics include but are not limited to: geospatial and temporal habitat coverage; changes in groundwater interconnectivity status; habitat connectivity, heterogeneity, or density; habitat 'health' (e.g., application of biological indices, remote sensing/aerial imagery); and species/vegetation presence (e.g., biological surveys).

f. *Scalability*: An effective monitoring system will be designed to improve information gaps over time as resources become available; groundwater plans may choose to identify prioritized monitoring locations and systems that can be implemented in phases based on resource availability.

6. Data Quality

Data quality underscores all components of a groundwater plan and subsequent plan updates. Transparent groundwater plans will clearly identify data used to develop plans and include narratives on data collection methods, equipment calibration, quality assurance checks, data processing steps, and on how data were used to inform plan components. Groundwater plans may also choose to identify available data that were not used and explain why it was excluded from analysis.

SCIENTIFIC CONSIDERATIONS		
	✓	Hydrologic Connectivity
	✓	Interconnected Surface Water Depletion
	✓	Fish and Wildlife Species Water Needs
	✓	Habitat Value
	✓	Monitoring Systems
	✓	Data Quality

MANAGEMENT CONSIDERATIONS

CDFW encourages groundwater planners to detail how management actions will consider fish and wildlife beneficial uses and users of groundwater and what management actions will be initiated on what timeline if adverse impacts to fish and wildlife beneficial uses and users of groundwater, GDEs, or ISW are observed. The following are considerations to inform responsive management.

1. Data Gaps and Conservative Decision-Making Under Uncertain Conditions

Current groundwater management suffers from information gaps, but it is expected that groundwater management agencies (local, state, and federal) will develop or expand groundwater monitoring systems to improve information availability over time. Even with existing data gaps, GSAs must avoid significant and unreasonable adverse impacts to beneficial uses of groundwater and ISW. Information shortages should trigger conservative groundwater management decisions that err on the side of caution when it comes to protecting fish and wildlife and their habitats. For example, in determining the presence of GDEs, if hydrologic connectivity with the water table is uncertain, CDFW recommends including a GDE until hydrologic connectivity can be disproven. The same cautionary principle applies to establishing minimum thresholds for sustainability criteria; conservative thresholds have a higher likelihood of avoiding adverse impacts to fish and wildlife beneficial uses and users of groundwater and ISW. For example, groundwater is a critical cold-water reserve for aquatic inhabitants of ISW, and ISW are expected to increase in water temperature under warming climate conditions. The amount of increase in ISW temperature due to climate change is a data gap and sufficient groundwater elevations to buffer increasing ISW temperatures is important to consider.

2. Adaptive Management

Decision-making with imperfect information requires groundwater managers to be agile and responsive to dynamic circumstances. Groundwater plans should detail how groundwater monitoring and management structures will be designed to adapt to changing resource conditions and information availability. Plans should include discussions on how and on what timeline adverse impacts will be addressed, if observed. Plans should also consider implementation of adaptive management strategies to account for 'lag' impacts wherein groundwater responses to changes in management regimes are delayed due to aquifer characteristics. 'Lag' effects may necessitate conservative aquifer-rebound timeline projections.

3. **Prioritized Resource Allocation**
   With limited resources available, groundwater planners may choose to allocate available monitoring and management resources (e.g., DWR Technical Support Services funding) to prioritized GDEs and ISW. Prioritization may reflect criteria such as habitat value or vulnerability, species dependency, and/or 'indicator' GDEs or ISW.

4. **Multi-Benefit Approach**
   Groundwater planners are encouraged to design project and management actions for multiple-benefit solutions, including habitat improvements. Evaluation of supply augmentation management actions (e.g., managed aquifer recharge) and demand reduction management actions (e.g., limitations on groundwater extraction) may include a quantification of impacts on GDEs and ISW to justify actions that serve multiple beneficial uses and users of groundwater. Planners may also consider marginal cost increases in project and management actions to optimize habitat outcomes, thereby broadening funding opportunities, such as recharge projects that contribute both to aquifers as well as instream flow.

MANAGEMENT CONSIDERATIONS		
	✓	Data Gaps and Conservative Decision-Making Under Uncertain Conditions
	✓	Adaptive Management
	✓	Prioritized Resource Allocation
	✓	Multi-Benefit Approach

LEGAL, REGULATORY, AND POLICY CONSIDERATIONS

Apart from SGMA requirements, there are numerous laws, regulations, and policies that protect fish and wildlife. The following compilation is provided for GSAs to consider during the development and implementation of groundwater plans. Where applicable and reasonable, GSAs should consider the list below to ensure compliance with existing laws, regulation, and policies. These include but are not limited to:

1. **California Endangered Species Act (CESA), Federal Endangered Species Act (ESA)**
   GDEs and ISW in SGMA-regulated basins contribute to habitat for over 120 federal or State-listed Threatened and Endangered (T&E) species. GDEs and ISW in SGMA-regulated basins also overlap with federally-designated Critical Habitat, areas that contain features essential to the conservation of T&E species. Groundwater management decisions in basins with T&E species and/or Critical Habitat should evaluate groundwater management impacts to species and habitats of concern.[10]

2. **Lake and Streambed Alteration (LSA)**
   The Fish and Game Code requires an entity to notify the Department prior to commencing any activity that may substantially divert or obstruct the natural flow of, or substantially change or use the material from the bed, channel, or bank of any river, stream, or lake, or deposit debris, waste, or other materials where it could pass into any river, stream, or lake. An LSA Agreement is required when the activity may substantially adversely affect existing fish and wildlife resources.

3. **California Environmental Quality Act (CEQA)**
   Groundwater plans developed under SGMA are exempt from CEQA. However, project and management actions needed to achieve basin sustainability are subject to CEQA. CDFW will likely have a CEQA review and permitting nexus with groundwater project and management actions (e.g., Incidental Take Permits, Lake and Streambed Alteration Agreements, etc.). Accordingly, CDFW will expect CEQA lead agencies to thoroughly address proposed groundwater management project impacts (i.e., 'significant effects') to GDEs and ISW.

4. Public Trust Doctrine

Public trust resources entitled to protections under the Public Trust Doctrine include navigable surface waters and fisheries. Tributary waters, including groundwater hydrologically connected to navigable surface waters and surface waters tributary to navigable surface waters, are also subject to the Public Trust Doctrine to the extent that extractions affect or may affect public trust uses. Accordingly, groundwater plans should consider public trust protections for navigable ISW and their tributaries, and ISW that support fisheries, including the level of groundwater contribution to those waters.

5. Clean Water Act and Porter Cologne Act

Water quality degradation, one of the six sustainability indicators required in SGMA groundwater sustainability plans, is also governed by the Clean Water Act and Porter-Cologne Act and has a significant impact on habitat viability. GDEs and ISW are vulnerable to groundwater quality shortcomings. For example, groundwater pollutants can be taken up by phreatophytic vegetation in GDEs or flow into gaining streams. Groundwater extraction can also compound existing ISW water quality impairment designations under the Clean Water Act. For example, reduced streamflow recharge from depleted aquifers can exacerbate temperature and algae Total Maximum Daily Loads. In addition, the preservation and enhancement of fish, wildlife, and other aquatic resources are designated as beneficial uses under the Porter-Cologne Act. Groundwater extraction could cause or exacerbate temperature or other water quality conditions for those uses. Thorough groundwater plans will consider groundwater quality impacts under the Clean Water Act/Porter Cologne Act.

6. State, Federal, Tribal Protected Lands and Waters

Lands and waters governed by state, federal, and tribal governments are held in the protection of the public trust, including CDFW Wildlife Areas, Ecological Reserves, and conservation easements. These lands merit specific consideration and protection in groundwater plans to ensure no adverse impacts occur to the GDEs and ISW on these lands so they can continue to meet their habitat management objectives. This policy consideration applies to groundwater allocations and groundwater fees – public lands providing valuable habitat should be considered for categorical allocations or pricing that allow the lands to continue to serve their public functions successfully.

7. Instream Flow Requirements/Recommendations

The State Water Resources Control Board (SWRCB) and Regional Water Quality Control Boards (RWQCBs) enforce legally-mandated instream flow requirements, such as the instream flow requirements for cannabis compliance gages[11]. CDFW and other environmental organizations develop instream flow recommendations based on field measurements, desktop analyses, and species/habitat needs. Both instream flow requirements and instream flow recommendations can inform development of sustainability criteria (e.g., minimum thresholds) in groundwater plans to help prevent the occurrence of undesirable results. Because flow requirements and/or recommendations represent thresholds beyond which adverse impacts to water rights holders and/or aquatic species are expected to occur, they should be considered in groundwater plans.

8. SWRCB Water Quality Control Plan

The SWRCB adopted a Water Quality Control Plan in December 2018 for the Bay Delta: San Joaquin River Flows and Southern Delta Water Quality, which set new regulatory requirements for instream flow. The Lower San Joaquin River flow requirements, as adopted[12], would provide a range of 30 to 50 percent of unimpaired flow from February through June in the Merced, Tuolumne, and Stanislaus Rivers. Groundwater plan water budgets and projections should account for these instream flow regulatory requirements accordingly.

9. California Water Action Plan (WAP)

The California Natural Resources Agency state-wide WAP identifies a list of actions to support reliable water supply in California for all beneficial uses and users and calls for the protection and restoration of important ecosystems. Among priority efforts is ensuring sufficient water for wetlands and waterfowl and enhancing water flows in streams statewide. These statewide priorities should be reflected in groundwater planning for GDEs and ISW.

10. California Biodiversity Initiative[13]

This initiative addressing Executive Order B-54-18 seeks to work across agencies and organizations to secure California's biodiversity benefits for the State's short- and long-term environmental and economic health. Two key groundwater-related facets of this initiative are: 1) improving understanding and protection of the State's native plants, and 2) managing lands and waters to achieve biodiversity goals. This initiative supports CDFW's interest in planning for the conservation of non-listed rare plants and species of concern, in addition to T&E species, and should be reflected in groundwater plan GDE considerations.

LEGAL, REGULATORY AND POLICY CONSIDERATIONS		
	✓	California Endangered Species Act, Endangered Species Act
	✓	Lake and Streambed Alteration
	✓	California Environmental Quality Act
	✓	Public Trust Doctrine
	✓	Clean Water Act/Porter Cologne Act
	✓	State, Federal, Tribal Protected Lands and Waters
	✓	SWRCB Water Quality Control Plan
	✓	Instream Flow Requirements/Recommendations
	✓	California Water Action Plan
	✓	California Biodiversity Initiative

Resources

CDFW RESOURCES

The following CDFW resources are publicly available to help identify, prioritize, and protect GDE and ISW habitats and the species therein in the context of groundwater planning processes. These reports, programs, plans, and tools are best used in conjunction with groundwater planning resources from other organizations and agencies (see Additional Resources).

1. **California State Wildlife Action Plan (2015 Update; SWAP)**
   SWAP identifies priorities for conserving California's aquatic and terrestrial resources and includes habitat conservation targets by geographic area. Among SWAP goals are: *maintain and enhance the integrity of ecosystems by conserving key natural processes and functions, habitat qualities, and sustainable native species population levels*; and *integrate wildlife conservation with working landscapes and environments*. Groundwater is specifically recognized as a critical component of habitat connectivity and water quality, quantity, and availability goals for enhancing ecosystems.

2. **CDFW Instream Flow Program**
   The CDFW Instream Flow Program conducts instream flow studies and establishes instream flow recommendations pursuant to PRC § 10000. Instream flow studies are carried out based on statewide stream priorities, including Water Action Plan priorities. The studies assess the amount and timing of surface water flow and collect data to recommend flow regimes required to maintain healthy aquatic resources. Groundwater planners are encouraged to cross-reference groundwater plan development (including water budgets and surface water-groundwater models) with CDFW's Instream Flow Program data and recommendations. Specifically, groundwater planners may wish to consider instream flow criteria and recommendations detailed in the program's technical reports to inform surface water depletion undesirable result definitions and monitoring approaches.

3. **California National Diversity Database (CNDDB)**
   CNDDB inventories narrative and geospatial information on the status and locations of rare plants and animals in California. The CNDDB spatial data can be downloaded as a shapefile or accessed via the Biogeographic Information and Observation System (BIOS) Data Viewer, a system designed to enable the management, visualization, and analysis of biogeographic data. This tool may inform GDE and ISW identification and prioritization for monitoring and protection. Note, CNDDB may not cover all GDEs and ISW, and as a positive detection database, it is not a replacement for on-the-ground surveys. Geographic areas with limited information on CNDDB often signify an absence of survey work. It is therefore inappropriate to imply that rare and endangered plants and animals do not occur in an area due to lack of information in the CNDDB.

4. Areas of Conservation Emphasis (ACE)
   ACE contains geospatial data on native species richness, rarity, endemism, and sensitive habitats for six taxonomic groups: birds, fish, amphibians, plants, mammals, and reptiles. ACE also summarizes information on the location of four sensitive habitat types (i.e., wetlands, riparian habitat, rare upland natural communities, and high-value salmonid habitat) which may inform the identification of GDEs and ISW and integration of habitat protection into groundwater plans.

5. Vegetation Classification and Mapping Program (VegCAMP)
   VegCAMP develops and maintains maps classifying vegetation and habitat in the state to support conservation and management decisions at the local, regional, and state levels. This tool may help identify and prioritize GDEs, as well as provide information regarding their vegetation composition. Note, the tool may not map all GDEs.

6. Natural Community Conservation Plans (NCCP)
   NCCP identify and provide for the regional protection of plants, animals, and their habitats, while allowing compatible and appropriate economic activity. Not all groundwater basins intersect an approved (n=16) or developing (n=10+) NCCP. Where groundwater basins do intersect an NCCP, the NCCP may be referenced to identify local habitat priorities and protections that may inform GDE and ISW monitoring and management.

7. Regional Conservation Investment Strategies (RCIS)
   RCIS use a science-based approach to identify conservation and enhancement opportunities that, if implemented, will help California's declining and vulnerable species by protecting, creating, restoring, and reconnecting habitat. These opportunities are paired with investment strategies and mitigation credits to incentivize habitat protection. There is potential for groundwater plans to leverage crediting opportunities with project and management actions that optimize GDEs and ISW for habitat value for fish and wildlife beneficial uses and users of groundwater.

ADDITIONAL RESOURCES

The following resources may also be useful in the development of local GSPs that protect GDEs and ISW for fish and wildlife beneficial uses and users of groundwater and ISW. This list is non-exhaustive, and CDFW does not endorse all aspects of these documents; they are included for information purposes only.

1. *Center for Law, Energy & the Environment, UC Berkeley School of Law. 2018.* *Navigating Groundwater-Surface Water Interactions under SGMA.* A report on legal and institutional questions on groundwater-surface water interactions under SGMA.

2. *Community Water Center. 2019.* *Guide to protecting Drinking Water Quality Under the Sustainable Groundwater Management Act.* A factsheet to address best management practices for drinking water concerns.

3. *Department of Water Resources. 2018.* *Natural Communities Commonly Associated with Groundwater Dataset.* A map viewer and data-base allowing viewing and download of Vegetation and Wetland layers that are contained in the Natural Communities Commonly Associated with Groundwater dataset.

4. *Department of Water Resources. 2018.* *SGMA Data Viewer*. Online mapping tool displaying a variety of datasets related to the SGMA sustainability indicators.

5. *Environmental Defense Fund. 2018.* *Addressing Regional Surface Water Depletions in California*. A proposed approach for SGMA compliance on the avoidance of depletions of ISW that have significant and unreasonable adverse impacts on beneficial uses of surface water.

6. *Golden Gate University Center on Urban Environmental Law. 2018.* *Drafting SGMA Groundwater Plans with Fisheries in Mind*. A guidebook for using SGMA to protect fisheries.

7. *Stanford University. 2018.* *Guide to Compliance with California's SGMA*. A guide on how to avoid the "undesirable result" of "significant and unreasonable adverse impacts on beneficial uses of surface waters."

8. *The Nature Conservancy. 2014.* *Groundwater and Stream Interaction in California's Central Valley: Insights for Sustainable Groundwater Management*. A report providing technical information on the state of streams and groundwater resources in the Central Valley to illustrate the physical inter-relationship between the surface and groundwater.

9. *The Nature Conservancy. 2018.* Considering Nature Under *SGMA: Environmental User Checklist*. A checklist to help ensure that groundwater plans adequately address nature as required under SGMA.

10. *The Nature Conservancy. 2018* *Groundwater Dependent Ecosystems under SGMA*. Guidance for preparing groundwater sustainability plans with careful consideration of GDEs.

11. *The Nature Conservancy. 2018* *GDE Rooting Depth Database*. A maximum-rooting depth database provides information that can help assess whether groundwater dependent plants are accessing groundwater.

12. *The Nature Conservancy. 2019* *GDE Pulse Tool.* Compilation of 35 years of satellite imagery for every polygon in the Natural Communities Commonly Associated with Groundwater Dataset to assess changes in GDEs

13. *Union of Concerned Scientists. 2017.* *Navigating a Flood of Information*. Guidance for evaluating and integrating climate science into California groundwater planning.

Fish & Wildlife Groundwater Planning Considerations Summary

1. CDFW cares about sustainable groundwater management, because groundwater is a critical component of functional ecosystems and habitats, and because it is within CDFW's jurisdiction to conserve, protect, and manage fish, wildlife, native plants and the habitats on which they depend. [FGC § 1802, 711.7(a).] As trustee for California's fish and wildlife resources, CDFW intends to engage in groundwater planning processes (where resources are available) to represent the groundwater needs of GDEs and fish and wildlife beneficial uses and users of groundwater.

2. Groundwater plans should answer key questions about GDEs and ISW including the existence of GDEs and ISW, the determination of adverse impacts attributable to groundwater management, and the identification of appropriate management response actions that minimize or mitigate adverse impacts to GDEs and ISW.

3. GSAs may choose to evaluate and integrate into groundwater plans a range of scientific, management, and legal fish and wildlife planning considerations – complementary to the SGMA statute and regulations – to carefully account for groundwater management impacts to fish and wildlife beneficial uses and users of groundwater.

4. CDFW and other public entities have a variety of publicly available resources that can be used to help identify, prioritize, and protect GDE and ISW habitats and the species therein in the context of groundwater planning processes.

CDFW provides this document only as a consideration in groundwater planning. CDFW is neither dispensing legal advice nor warranting any outcome that could result from the use of these considerations. Following these considerations does not guarantee success of a GSP or compliance with SGMA which will be determined by the Department of Water Resources and the State Water Resources Control Board, or compliance with other applicable laws and regulations. Furthermore, except to the extent that this document directly references existing statutory or regulatory requirements, the information contained herein merely represents considerations, not requirements, that may be considered in light of the individual circumstances of each groundwater plan.

Appendix

FISH & WILDLIFE GROUNDWATER PLANNING CONSIDERATIONS TABLES

The following is a distilled, tabular compilation of fish and wildlife groundwater planning considerations intended to support the development of groundwater sustainability plans (GSPs) that protect fish and wildlife and the groundwater dependent ecosystems (GDEs) on which they depend.

Find the complete Fish and Wildlife Groundwater Planning Considerations Document here: https://www.wildlife.ca.gov/Conservation/Watersheds/Groundwater.

Scientific Considerations	
CDFW expects groundwater plans and supporting documentation to follow 'best available science' practices, including careful application of scientific concepts to help avoid adverse impacts to fish and wildlife beneficial uses and users of groundwater.	
HYDROLOGIC CONNECTIVITY	Whether terrestrial vegetation can access groundwater and whether surface water is hydrologically connected with groundwater are important determinations in the context of groundwater planning. If hydrologic connectivity exists between a terrestrial or aquatic ecosystem and groundwater, then that ecosystem is a potential GDE and must be identified in a GSP. Changes in geospatial extent and temporal groundwater interconnectivity of these ecosystems can impact their habitat value to fish and wildlife.
SURFACE WATER DEPLETIONS	Interconnected surface water (ISW) depletions attributable to groundwater extraction can occur through two different mechanisms: captured recharge and induced infiltration. Both should be considered when evaluating the possibility of depletions to ISW and establishing ISW sustainability criteria in GSPs.
FISH AND WILDLIFE SPECIES WATER NEEDS	An evaluation of GDEs and ISW depletions should identify possible impacts to fish and wildlife beneficial uses and users of groundwater and should consider a range of species water needs across life history phases including basic spatial and temporal water availability, as wells as sufficient hydrologic variability and water quality.
HABITAT VALUE	GSPs that seek to minimize impacts to GDEs and avoid ISW depletion should contemplate impacts to habitat characteristics including habitat connectivity, heterogeneity, and sensitivity to groundwater elevation changes.
MONITORING SYSTEMS	Effective monitoring methods and systems can aid in understanding groundwater management impacts to GDEs and ISW and inform subsequent action. An effective monitoring system will provide data representative of groundwater-dependent habitats throughout the alluvial basin and will be designed to capture geospatial and temporal variability at a scale meaningful to fish and wildlife beneficial uses and users of groundwater and ISW. Robust monitoring systems will be scalable; and capable of identifying early signs of adverse impacts, informing baselines, and characterizing interconnected surface waters.
DATA QUALITY	Data quality underscores all components of a groundwater plan and subsequent plan updates. Transparent groundwater plans will clearly identify data used to develop plans and include narratives on data collection methods, equipment calibration, quality assurance checks, data processing steps, and on how data was used to inform plan components.

Management Considerations

CDFW encourages groundwater planners to detail how management actions will consider fish and wildlife beneficial uses and users of groundwater and what management actions will be initiated on what timeline if adverse impacts to fish and wildlife beneficial uses and users of groundwater, GDEs, or ISW are observed.

CONSERVATIVE DECISIONS UNDER UNCERTAIN CONDITIONS	Information gaps common to groundwater management should inspire conservative groundwater management decisions that err on the side of caution when it comes to protecting fish and wildlife and their habitats.
ADAPTIVE MANAGEMENT	Decision-making with imperfect information requires groundwater managers to be agile and responsive to dynamic circumstances. GSPs should detail how groundwater monitoring and management will be able to adapt to changing resource conditions and information availability.
PRIORITIZED RESOURCE ALLOCATION	With limited resources available, groundwater planners may choose to allocate available monitoring and management resources to prioritized GDEs and ISWs. Prioritization may reflect criteria such as habitat value or vulnerability, species dependency, and/or 'indicator' GDEs or ISWs.
MULTI-BENEFIT APPROACH	Groundwater planners are encouraged to design project and management actions for multiple-benefit solutions, including habitat improvements. Evaluation of supply augmentation and demand reduction management actions may quantify or describe impacts on GDEs and ISW to justify actions that serve multiple beneficial users of groundwater.

Legal, Regulatory, and Policy Considerations

Apart from SGMA requirements, there are numerous laws, regulations, and policies that protect species and habitat and can inform development and implementation of GSPs.

CALIFORNIA ENDANGERED SPECIES ACT, ENDANGERED SPECIES ACT	GDEs and ISWs in SGMA-regulated basins contribute to habitat for over 120 federal or State-listed Threatened and Endangered (T&E) species. Basins with T&E species should evaluate groundwater management impacts to species and habitats of concern.
LAKE AND STREAMBED ALTERATION (LSA)	The Fish and Game Code requires an entity to notify the Department prior to commencing an activity that may substantially divert/obstruct the natural flow of any river/stream/lake.
CALIFORNIA ENVIRONMENTAL QUALITY ACT (CEQA)	SGMA project and management actions necessary to achieve basin sustainability may be subject to CEQA.
PUBLIC TRUST DOCTRINE	Public trust resources entitled to protections under the Public Trust Doctrine include navigable surface waters and fisheries. Tributary waters, including groundwater hydrologically connected to navigable surface waters and surface waters tributary to navigable surface waters, are also subject to the Public Trust Doctrine to the extent that extractions affect or may affect public trust uses.
CLEAN WATER ACT AND PORTER COLOGNE ACT	Water quality degradation, one of the six sustainability indicators required in GSPs, is also governed by the Clean Water Act and Porter Cologne Act and has a significant impact on habitat viability.
STATE, FEDERAL, TRIBAL PROTECTED LANDS AND WATERS	Lands and waters governed by state, federal, and tribal governments are held in the protection of the public trust, including CDFW Wildlife Areas, Ecological Reserves, and conservation easements. These lands merit specific consideration in GSPs.
INSTREAM FLOW REQUIREMENTS/ RECOMMENDATIONS	The State Water Resources Control Board (SWRCB) and Regional Water Quality Control Boards enforce legally-mandated instream flow requirements. CDFW and other environmental organizations develop instream flow recommendations based on field measurements, desktop analyses, and species/habitat needs. These requirements and recommendations can inform GSP sustainability criteria.
SWRCB WATER QUALITY CONTROL PLAN	The SWRCB adopted a Water Quality Control Plan in December 2018 for the Bay Delta: San Joaquin River Flows and Southern Delta Water Quality, which set new regulatory requirements for instream flow that inform future water availability.
CALIFORNIA WATER ACTION PLAN (WAP)	The California Natural Resources Agency state-wide WAP identifies a list of actions to support reliable water supply in California for all beneficial users and calls for the protection and restoration of important ecosystems.
CALIFORNIA BIODIVERSITY INITIATIVE	This initiative addressing Executive Order B-54-18 seeks to work across agencies and organizations to secure California's biodiversity benefits for the State's short- and long-term environmental and economic health.

Endnotes

[1] CDFW acknowledges that groundwater knowledge and understanding is imperfect and reserves the right to update these groundwater planning considerations as additional information becomes available and knowledge of groundwater systems in relationship to habitat and species needs improves over time.

[2] 'Best available science' refers to the use of sufficient and credible information and data specific to the decision being made and the time frame available for making that decision. [23 CCR § 351(h).]

[3] SGMA states, "the groundwater sustainability agency shall consider the interests of all beneficial uses and users of groundwater, as well as those responsible for implementing groundwater sustainability plans including surface water users, if there is a hydrologic connection between surface and groundwater bodies." [Water Code § 10723.2(f).] SGMA also defines 'significant depletions of interconnected surface waters' as "reductions in flow or levels of surface water that is hydrologically connected to the basin such that the reduced surface water flow or levels have a significant and unreasonable adverse impact on beneficial uses of the surface water." [Water Code § 10735.2(d).] These uses of the term hydrologic connectivity in SGMA may differ from other state and federal wetland identification protocols such as the SWRCB Wetland Delineation methods.

[4] The capillary fringe is the area directly above the water table that may hold water in the pores through capillary pressure, a property of surface tension that draws water upward.

[5] Cook, P.G., P. Brunner, C.T. Simmons, and S. Lamontagne. 2010. What is a Disconnected Stream?

[6] A gaining stream is one in which the stream channel bottom is lower than the adjacent groundwater elevation, meaning water moves from the aquifer into the channel. A losing stream is one in which the stream channel bottom is above the groundwater elevation, and water moves from the channel into the surrounding aquifer.

[7] Cunningham, W. L., and C. W. Schalk. 2011. Groundwater Technical Procedures of the U.S. Geological Survey.

[8] Rantz, S.E. 1982. Measurement and Computation of Streamflow: Vol. 1. Measurement of Stage and Discharge.

[9] Department of Water Resources. Best Management Practices for Sustainable Management of Groundwater.

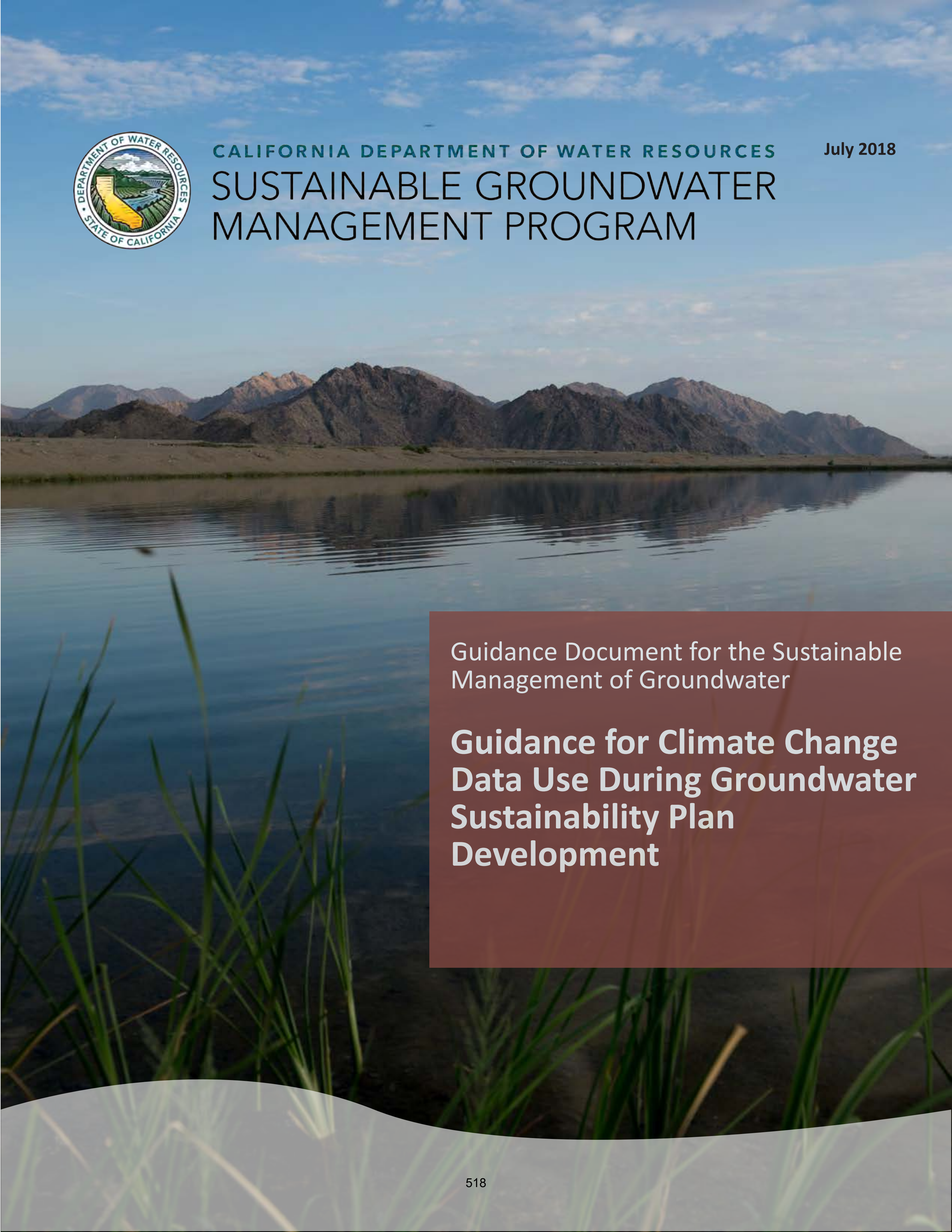
[10] CDFW also seeks protection and preservation of non-T&E species, with specific consideration for Species of Special Concern that directly depend on groundwater for survival.

[11] SWRCB. 2018. Cannabis Compliance Gages (Cannabis Policy, Attachment A, Section 4).

[12] SWRCB. 2018. Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary.

[13] 2018. California Biodiversity Initiative. California Natural Resources Agency, California Department of Food and Agricultures, Governor's Office of Planning and Research.

EXHIBIT 8



CALIFORNIA DEPARTMENT OF WATER RESOURCES

SUSTAINABLE GROUNDWATER MANAGEMENT PROGRAM

July 2018

Guidance Document for the Sustainable Management of Groundwater

Guidance for Climate Change Data Use During Groundwater Sustainability Plan Development

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CALIFORNIA DEPARTMENT OF WATER RESOURCES
SUSTAINABLE GROUNDWATER MANAGEMENT PROGRAM

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Guidance for Climate Change Data Use During Groundwater Sustainability Plan Development

July 2018

The objective of this Guidance Document is to provide Groundwater Sustainability Agencies (GSAs) and other stakeholders with information regarding climate change datasets and related tools provided by the California Department of Water Resources (DWR) for use in developing Groundwater Sustainability Plans (GSPs). The datasets and methods are provided as technical assistance to GSAs to develop projected water budgets.

Information pertaining to the use of climate change datasets to develop projected water budgets may be found in Section 354.18(c)(3) of the GSP Regulations, which describes projected water budget assessments. The water budget and modeling best management practices (BMPs)[1] describe the use of climate change data to compute projected water budgets and simulate related actions in groundwater/ surface water models.

The information provided in this Guidance Document describes the approach, development, application, and limitations of the DWR-provided climate change datasets. However, GSAs may choose not to use the DWR-provided Data, Tools and Guidance to develop projected water budgets.

[1] https://water.ca.gov/Programs/Groundwater-Management/SGMA-Groundwater-Management/Best-Management-Practices-and-Guidance-Documents

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Executive Summary

This *Guidance for Climate Change Data Use During Groundwater Sustainability Plan Development* (Guidance Document) explains the California Department of Water Resources (DWR)-provided climate change data, including how the data were developed, the methods and assumptions used for data development, and how they can be used in the development of a projected water budget. This Guidance Document also describes tools and processes relevant to perform climate change data analysis (i.e., incorporating climate change analysis into projected water budgets, with and without numerical surface water/groundwater models).

DWR provides processed climate change datasets related to climatology, hydrology, and water operations. The climatological data provided are change factors for precipitation and reference evapotranspiration gridded over the entire State. The hydrological data provided are projected stream inflows for major streams in the Central Valley, and streamflow change factors for areas outside of the Central Valley and smaller ungaged watersheds within the Central Valley. The water operations data provided are Central Valley reservoir outflows, diversions, and State Water Project (SWP) and Central Valley Project (CVP) water deliveries and select streamflow data. Most of the Central Valley inflows and all of the water operations data were simulated using the CalSim II model and produced for all projections.

These data were originally developed for the California Water Commission's Water Storage Investment Program (WSIP). However, additional processing steps were performed to improve user experience, ease of use for GSP development, and for Sustainable Groundwater Management Act (SGMA) implementation. Data are provided for projected climate conditions centered around 2030 and 2070. The climate projections are provided for these two future climate periods, and include one scenario for 2030 and three scenarios for 2070: a 2030 central tendency, a 2070 central tendency, and two 2070 extreme scenarios (i.e., one drier with extreme warming and one wetter with moderate warming). The climate scenario development process represents a climate period analysis where historical interannual variability from January 1915 through December 2011 is preserved while the magnitude of events may be increased or decreased based on projected changes in precipitation and air temperature from general circulation models.

These climate change data are available for download on the SGMA Data Viewer (under the Water Budget section), which is an online geographic information system (GIS)-based interactive map for downloading spatial data and associated time-series (temporal) data in accordance with a user-defined region. In addition, DWR provides several desktop tools that can be downloaded and used by Groundwater Sustainability Agencies (GSAs) to process the climate change datasets for their water budget or to incorporate into a groundwater/surface water model. These and the other tools listed in this Guidance Document can be downloaded from DWR's Data and Tools website. These tools can help GSAs analyze projected climate change.

While DWR is providing these climate change resources to assist GSAs in their projected water budget calculations, the data and methods described in this Guidance Document are optional. Other local analysis and methods can be used, including existing climate change analysis. If the DWR-provided datasets are used, the Guidance Document describes two paths that may be followed to develop a projected water budget. The intent is to provide guidance on a possible method to help GSAs include the effects of climate change into their projected water budget calculations, especially if no local climate change analysis has been done before.

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Acronyms and Abbreviations

1995 HTD	1995 historical temperature detrended
BMP	best management practice
C2VSim	California Central Valley Simulation Model
CalSim	California Water Resources Simulation Model
CCTAG	Climate Change Technical Advisory Group
CDF	cumulative distribution function
CMIP3	Coupled Model Intercomparison Project Phase 3
CMIP5	Coupled Model Intercomparison Project Phase 5
CVP	Central Valley Project
DEW	drier with extreme warming
DSM2	Delta Simulation Model 2
DWR	California Department of Water Resources
ET	evapotranspiration
ET_o	reference evapotranspiration
GCM	general circulation model
GIS	geographic information system
GSA	Groundwater Sustainability Agency
GSP	Groundwater Sustainability Plan
HUC	hydrologic unit code
IWFM	integrated water flow model
LOCA	localized constructed analog
METRIC	mapping evapotranspiration at high resolution using internal calibration
NRC	National Research Council
RCP	representative concentration pathway
SGMA	Sustainable Groundwater Management Act
SGMP	Sustainable Groundwater Management Program
SWP	State Water Project
SVSim	Sacramento Valley Simulation Model
VIC	variable infiltration capacity
WMW	wetter with moderate warming
WSIP	Water Storage Investment Program

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SECTION 1

Purpose and Scope

This Guidance Document was developed to help Groundwater Sustainability Agencies (GSAs) incorporate California Department of Water Resources (DWR)-provided climate change and related data into their Groundwater Sustainability Plans (GSPs).

The purpose of this Guidance Document is as follows:

- Provide relevant data and tools for GSAs to incorporate climate change into their GSPs.
- Provide an analysis approach using the provided data and tools that incorporates the best available science and best available information to date.

This Guidance Document focuses on the use of DWR-provided climate change data and provides documentation about the following:

- Climate change data development approach
- Climate change data development methods and processes
- Applications for using the provided climate change data
- Climate change data assumptions and limitations

This Guidance Document provides a process for using DWR-provided climate change data for computing projected water budgets and serves as a companion document to the water budget best management practices (BMPs)[2] and the modeling BMP[3]. For Sustainable Groundwater Management Act (SGMA) implementation purposes, the use of climate change data can help with the following:

- Developing projected water budgets
- Long-term planning of groundwater basin sustainability
- Assessing projects and management actions by performing sensitivity analyses of projected conditions
- Adaptive Management

[2] https://www.water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/Groundwater-Management/Sustainable-Groundwater-Management/Best-Management-Practices-and-Guidance-Documents/Files/BMP-4-Water-Budget.pdf

[3] https://www.water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/Groundwater-Management/Sustainable-Groundwater-Management/Best-Management-Practices-and-Guidance-Documents/Files/BMP-5-Modeling.pdf

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Approach Used for DWR-Provided Climate Change Analysis

2.1 Introduction

The Sustainable Groundwater Management Program (SGMP) is providing the California Water Commission's Water Storage Investment Program (WSIP) climate change datasets for use by GSAs. The WSIP dataset is provided for the following reasons:

- Consistent with other DWR programs
- Based on best available science
- Builds on previous efforts and incorporates latest advances
- Follows Climate Change Technical Advisory Group (CCTAG) guidance

This dataset is the first that includes all necessary climate, hydrology, and water supply variables for the entire state. The inclusion of these variables in the dataset allows any GSA or other local water management entity to conduct water resources planning analysis under projected climate change conditions. These recently developed climate datasets are consistent with CCTAG recommendations, use the latest climate data (i.e., Coupled Model Intercomparison Project Phase 5 [CMIP5]), and have been developed using recommended analysis methods.

Available datasets from WSIP have been reviewed, formatted as needed, and additional datasets were developed specifically for SGMA as described further in this Guidance Document.

2.2 DWR-Provided Climate Change Dataset

In 2016, the California Water Commission, assisted by DWR as the technical lead, published climate change datasets to be used for WSIP grant application analysis. The WSIP climate change data development process resulted in recommendations for Steps 3, 4, and 5 (described in Section 2.1.1), as further detailed below.

WSIP climate projections for 2030 and 2070 conditions were derived from a selection of 20 global climate projections recommended by the CCTAG as the most appropriate projections for California water resources evaluation and planning (CCTAG, 2015). Scripps Institution of Oceanography downscaled the 20 climate projections using the localized constructed analog (LOCA) method at 1/16th degree (approximately 6-kilometer [km], or approximately 3.75-mile) spatial resolution (Pierce et al., 2014; 2015). The climate projections for 2030 and 2070 future conditions were derived using a quantile mapping approach that adjusts changes in historical air temperature and precipitation fluxes previously developed by Livneh et. al., 2013.

Adjusted air temperature and precipitation time series for 2030 and 2070 future conditions were used as input to the Variable Infiltration Capacity (VIC) hydrologic model (Liang et al., 1994; 1996) to generate projections of future streamflows. Future streamflow and sea-level rise projections (15 centimeters and 45 centimeters for 2030 and 2070, respectively) were used as inputs to California Water Resources Simulation Model II (CalSim II) and Delta Simulation Model 2 (DSM2) to generate projections of future State Water Project (SWP) and Central Valley Project (CVP) performance and Sacramento–San Joaquin Delta (Delta) conditions. Figure 2-1 illustrates the WSIP climate change dataset development and modeling process. A detailed description of the dataset development process is provided in the WSIP Technical Reference Document's Appendix A (California Water Commission, 2016) as well as Appendix A associated with the SGMA Guidance Document.

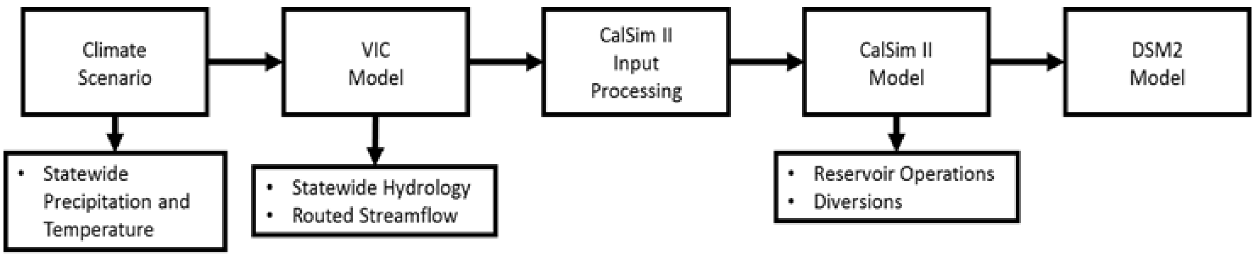

Figure 2-1. Sequence of Models Used for Climate Change Analysis Based on WSIP Approach

2.3 Overview of Climate Change Data and Tool Development Methods

This section describes components of climate data development and information on the modeling approaches used.

2.3.1 Climate Simulation Approach

The provided dataset was developed using climate period analysis. Climate period analysis provides advantages because it isolates the climate change signal from the inter-annual variability signal. In a climate period analysis, inter-annual variability is based on the reference period from which change is being measured, meaning that all differences between the future simulation and the reference period are the result of the climate change signal alone. For additional information on the climate period analysis method and comparison to the transient analysis method, see the provided factsheet on the DWR SGM Data and Tools webpage.

2.3.2 Simulation Period

DWR is providing two future climate period conditions for GSAs to use, including one scenario for 2030 and three scenarios for 2070:

- 2030 (near future):
  - Central tendency of the ensemble of general circulation models (GCMs)
- 2070 (late future):
  - Central tendency of the ensemble of GCMs
  - Drier with extreme warming (2070 DEW) conditions (extreme scenario, single GCM: HadGEM2-ES with representative concentration pathway [RCP] 8.5)
  - Wetter with moderate warming (2070 WMW) conditions (extreme scenario, single GCM: CNRM-CM5 with RCP 4.5)

The 2030 and 2070 central tendency projections, were developed using cumulative distribution functions (CDFs) produced for monthly temperature and monthly precipitation for the reference historical period (1981-2010) and each of the future climate periods (2016-2045 and 2056-2085, for 2030 and 2070, respectively). The CDFs for the central tendency scenarios were developed using an ensemble of climate models such that the entire probability distribution at the monthly scale was transformed to reflect the mean of the 20 climate projections. The extreme scenarios were developed using only the most extreme single model from the ensemble such that the entire probability distribution at the monthly scale was transformed to reflect the change indicated by the single model projection.

Datasets are developed for each climate period to enable GSAs to evaluate a sequence of hydrology with historical variability. The concept of analyzing a hydrological sequence at a projected future time using a climate period analysis is described in Appendix A.

The climate scenario development process represents a climate period analysis with which historical variability from January 1915 through December 2011 is preserved while the magnitude of events may be dampened or amplified based on projected changes in precipitation and air temperature from GCMs.

2.3.3 Climate Model Selection and Spatial Downscaling

DWR used an ensemble of 20 global climate projections (i.e., a combination of 10 GCMs and two RCPs) for the 2030 and 2070 central tendency scenarios from CMIP5. See Appendix A for more information about RCPs.

DWR determined that LOCA, a statistical downscaling technique, was appropriate for use in California water resources planning for the following reasons:

- LOCA is one of the recommended techniques mentioned in the Perspectives Document by CCTAG (CCTAG, 2015)
- LOCA is used in WSIP data development
- LOCA is also being used for California's Fourth Climate Change Assessment analyses

As a result, LOCA was used to downscale the 20 global climate projections used to develop this dataset.

Please refer to the WSIP Technical Reference Document's Appendix A (California Water Commission, 2016) for detailed information on the use of LOCA. Appendix A of this Guidance Document also provides more information on the various downscaling methods generally used in California.

2.3.4 Hydrological Model and Systems Operations Model

The VIC model was used for macroscale hydrologic modeling the downscaled climate data. The VIC model developed for WSIP and configured at 1/16th degrees (approximately 6-km, or 3.75-mile) spatial resolution throughout California was used in this data development process. CalSim II, the SWP and CVP operations model developed by DWR and the Bureau of Reclamation (Reclamation), is used to simulate potential changes in California water system operations, such as changes in project deliveries or reservoir releases.

2.3.5 Sea-Level Rise Approach

The sea-level rise estimates by the National Research Council (NRC) suggested projections at three future times relative to 2000 (i.e., at 2030, 2050, and 2100), along with upper- and lower-bound projections for San Francisco (NRC, 2012). The NRC's projections have been adopted by the California Ocean Protection Council as guidance for incorporating sea-level rise projections into planning and decision making for projects in California. By 2030 and 2070, the median range of expected sea-level rise, as estimated by the NRC, is around 15 and 45 centimeters, respectively. For the provided climate change datasets, projections of 15 and 45 centimeters were selected as representative of 2030 and 2070 future sea-level rise conditions for use in CalSim II and other models.

Development of the Provided Climate Change Datasets

The following sections describe how the existing datasets were compiled and processed for GSAs.

3.1 Overview of Climate Data and Application Processes

The water budget BMP[4] defines and describes the types of data that are typically used to develop a comprehensive water budget, and provides source information. The modeling BMP[5] describes the methods and processes to apply existing and new models for GSP development. The data and tools described in these BMPs can be modified for incorporation of climate change assumptions, future water budgets, and groundwater conditions, as described below.

Figure 3-1 summarizes the various models used as part of the DWR-provided climate change datasets and how they can be linked to groundwater models. Details of model data linkages are provided in the following sections.

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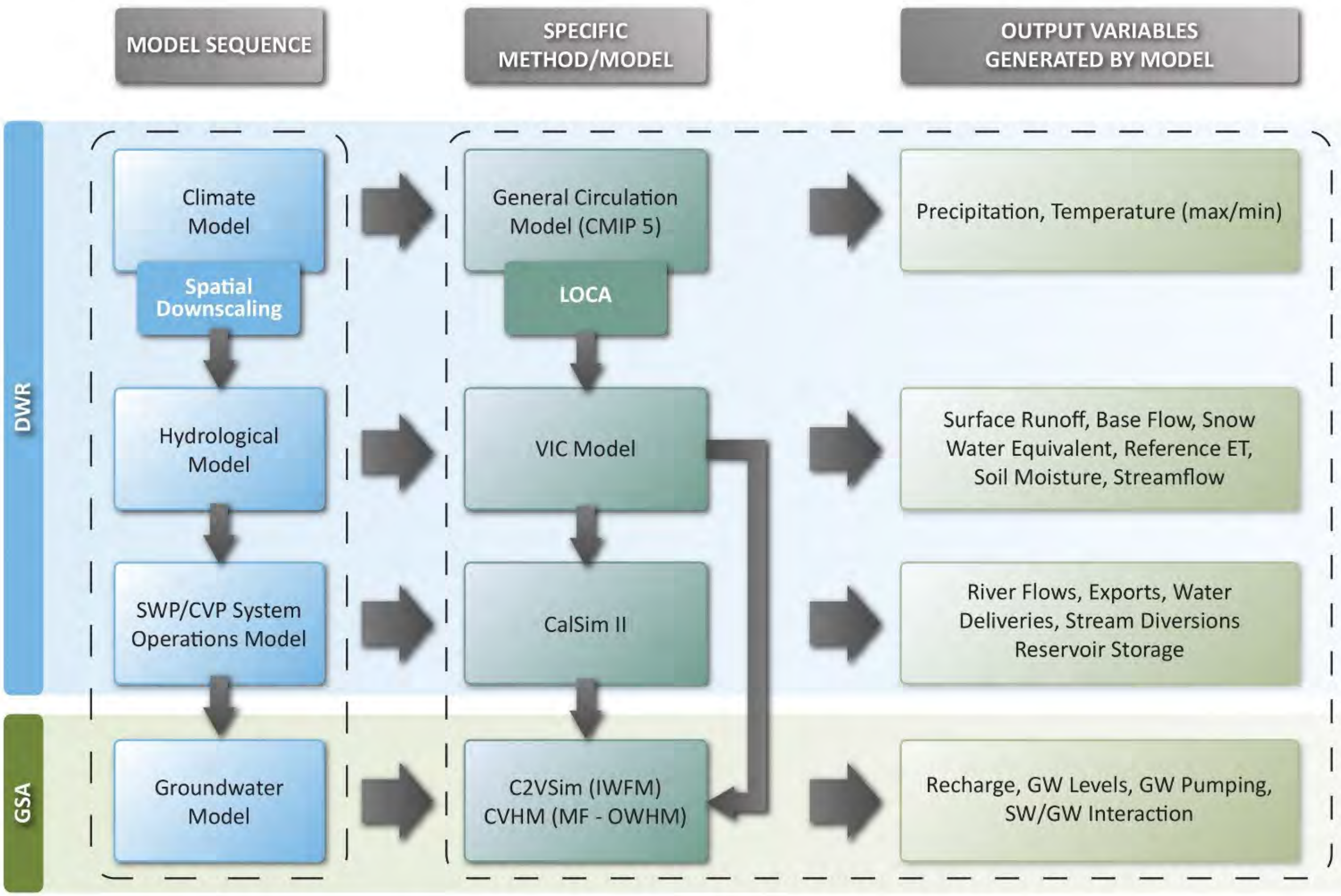
[4] https://www.water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/Groundwater-Management/Sustainable-Groundwater-Management/Best-Management-Practices-and-Guidance-Documents/Files/BMP-4-Water-Budget.pdf

[5] https://www.water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/Groundwater-Management/Sustainable-Groundwater-Management/Best-Management-Practices-and-Guidance-Documents/Files/BMP-5-Modeling.pdf

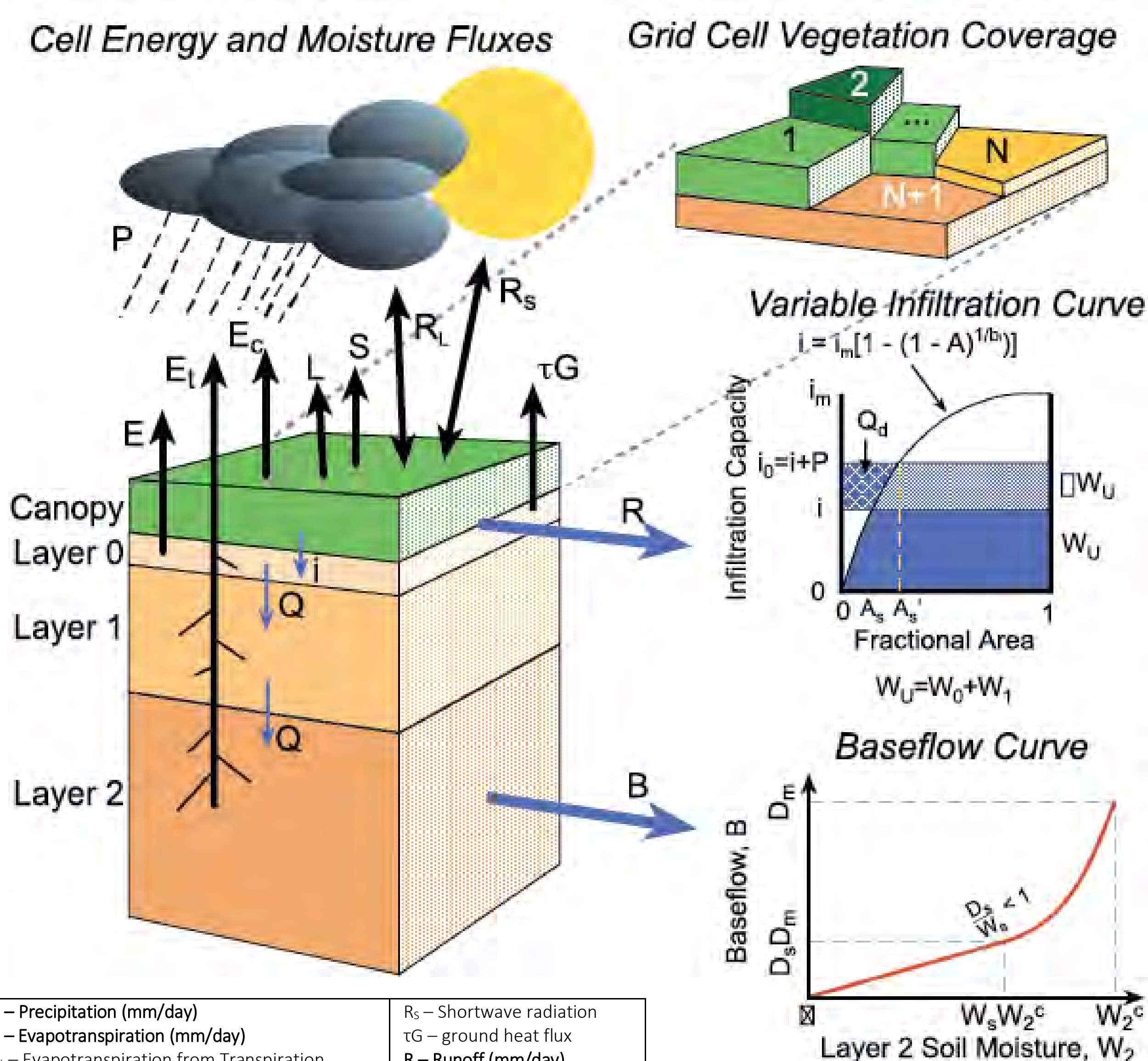


DWR: Department of Water Resources; GSA: Groundwater Sustainability Agency; SWP: State Water Project; CVP: Central Valley Project; LOCA: Localized Constructed Analogs; VIC: Variable Infiltration Capacity; CalSim: SWP & CVP Operations Model; C2VSim: California Central Valley Groundwater - Surface Water Simulation Model; IWFM: Integrated Water Flow Model; CVHM: Central Valley Hydrologic Model; MF - OWHM: MODFLOW One Water Hydrologic Flow Model; ET: Evapotranspiration, SW: Surface Water; GW: Groundwater; CMIP 5: Coupled Model Intercomparison Project

Figure 3-1. General Framework of Linking Climate/Hydrologic Models with Groundwater Models for SGMA Application

3.2 Data from the Variable Infiltration Capacity Hydrologic Model

The VIC model (Liang et al., 1994, 1996; Nijssen et al., 1997) simulates land-surface atmosphere exchanges of moisture and energy at each model grid cell. The VIC model incorporates spatially distributed parameters describing topography, soils, land use, and vegetation classes. It accepts input meteorological data directly from global or national-gridded databases or from global climate model projections. To compensate for the coarseness of the discretization, the VIC model is unique in its incorporation of subgrid variability to describe variations in the land parameters, as well as precipitation distribution. Figure 3-2 shows the hydrologic processes included in the VIC model.



P – Precipitation (mm/day)	R_S – Shortwave radiation
E – Evapotranspiration (mm/day)	τG – ground heat flux
E_t – Evapotranspiration from Transpiration (mm/day)	**R – Runoff (mm/day)**
	B – Baseflow (mm/day)
E_c – Evapotranspiration from Vegetation Canopy (mm/day)	i – infiltration capacity (mm/day)
S and L - related to heat flux	W – soil moisture
R_L – Longwave radiation	

Figure 3-2. Graphical Representation of VIC Model.
Source: University of Washington, 2016

The major parameters of Figure 3-2 are defined above (after Liang et al., 1994). The bolded parameters are the ones primarily used for determining the hydrologic response to projected climate change conditions.

Input and output parameters from the VIC model have been compiled and processed for GSAs to use to assess how changes in climatological conditions could affect hydrologic conditions within their groundwater basins. Detailed descriptions of the climate scenario development process are available in the Technical Reference Document's Appendix A (California Water Commission, 2016).

Precipitation and reference evapotranspiration (ET) for the 2030 and 2070 climate scenarios are available at 1/16th degree (approximately 6-km, or 3.75-mile) spatial resolution throughout California. Using these data, GSAs will be able to incorporate changes in precipitation and ET into groundwater models and water budget calculations to assess changes in the land surface water budget under projected conditions.

Two additional climate datasets are also available that represent extreme projections of climate change at the 2070 climate period. These climate scenarios represent projected conditions from a single GCM for the following conditions, respectively:

- 2070 DEW conditions, as represented by the GCM: HadGEM2-ES with RCP 8.5
- 2070 WMW conditions, as represented by the GCM: CNRM-CM5 with RCP 4.5

These two scenarios can be used to further explore the range of uncertainty in future climate conditions and the impacts of such uncertainty on future water budgets and potential management strategies.

Precipitation and reference ET datasets for each of the four scenarios are packaged as monthly change factor ratios that can be used to perturb historical data to represent projected future conditions. Change factor ratios are calculated as the future scenario (2030 or 2070) divided by the 1995 historical temperature detrended (1995 HTD) scenario. The 1995 HTD scenario represents historical climatic conditions where the increasing temperature trend observed later in the century is added to the data in the earlier part of the century. The result of the temperature detrending process produces a historical record with no observed warming trend in the temperature data. Removing the temperature trend is important to isolate projected changes in climate from the GCMs to establish a basis for projected future conditions. Further discussion about applying change factors and tools to help facilitate this process is provided in Section 4.

3.3 Output Data from the CalSim II Model

CalSim II model runs were produced at 2030 and 2070 projected future conditions for the four scenarios. CalSim II uses projected hydrology from the VIC model, including unimpaired watershed inflows to the Central Valley reservoirs. Based on projected hydrology, CalSim II estimates projected reservoir outflows based on operational constraints, as well as diversions and deliveries for SWP and CVP water. Various input and output datasets are available to GSAs to define predicted reservoir inflows/outflows, river channel flows, streamflow diversions, and SWP/CVP water project deliveries. Reservoir inflows, outflows, river channel flows, and diversions have all been spatially referenced to improve the ease of use of these datasets in groundwater models (Figure 3-3).

Reservoir inflows and local inflows are presented in Table B-1 of Appendix B. CalSim II outputs, including reservoir outflows, river channel flows, and streamflow diversions are presented in Table B-2 of Appendix B. SWP/CVP contractor delivery timeseries data are provided in table format where entities can query data by region and contracting agency. This information will be available on the DWR SGMA Data Viewer online and is further described in Appendix B.

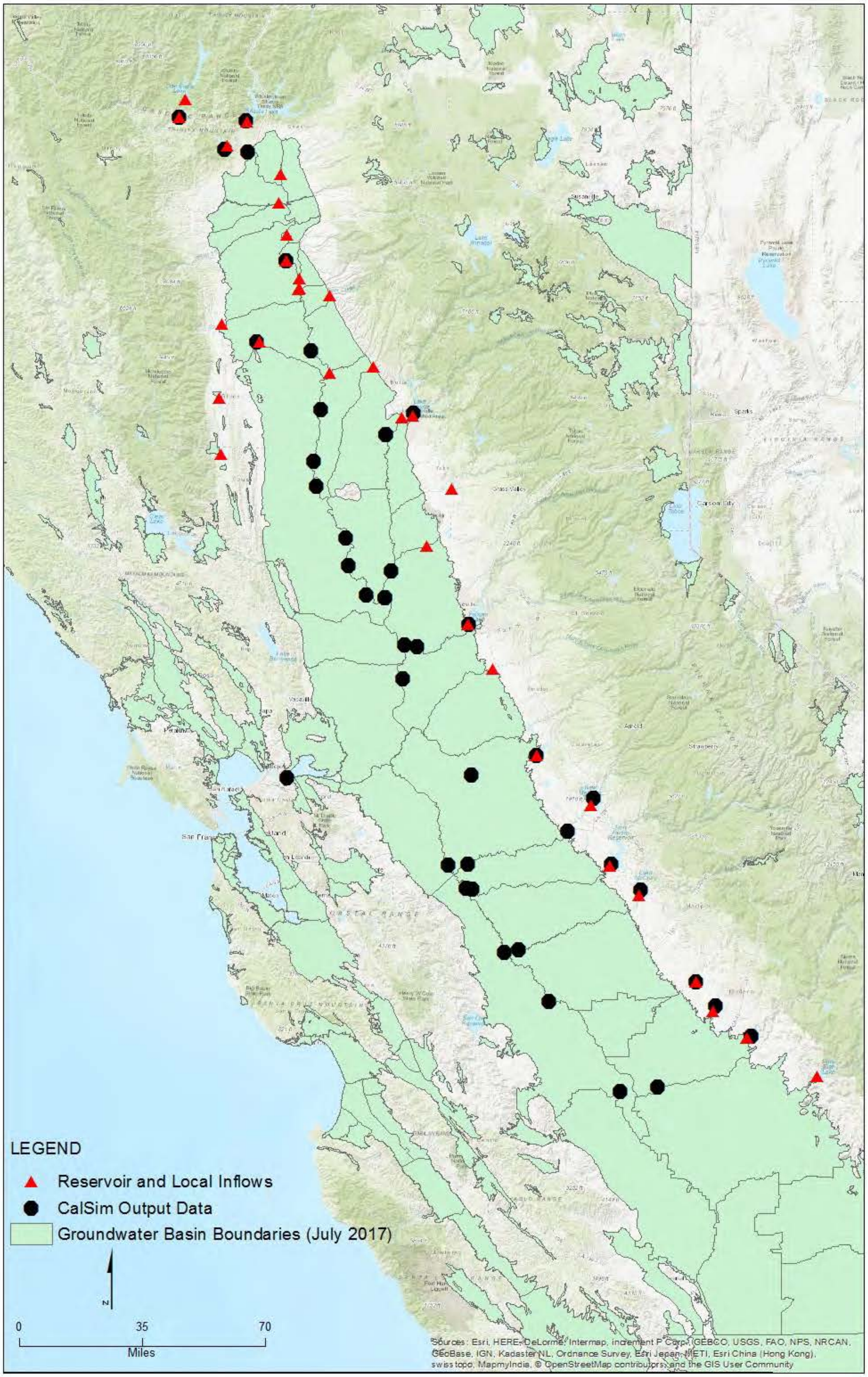


Figure 3-3. Map Displaying Spatially Referenced CalSim II Datasets

3.4 Additional Dataset Development

For WSIP, streamflow datasets primarily included major tributaries in the Central Valley that are represented in the CalSim II model. For SGMA purposes, additional streamflow datasets are needed for areas outside of the area modeled by CalSim II. This section describes the methods adopted to develop these statewide unimpaired streamflow datasets. Note that these are not entirely new datasets, but were developed through further post-processing of existing data provided by WSIP.

3.4.1 Unimpaired Streamflow Data

Three different methodologies were applied to develop datasets that can be used to assess changes in unimpaired streamflow under 2030 and 2070 projected climate conditions. The three methods are as follows:

- **Method 1:** Direct VIC routed streamflow with bias correction
- **Method 2:** VIC routed streamflow change factor (no bias correction)
- **Method 3:** Basin average change factor based on average runoff and baseflow computed over Hydrologic Unit Code (HUC) 8 watershed boundaries

Figure 3-4 presents the distribution of each method across California as they apply to specific watershed areas.

Methods 1 and 2 were developed under WSIP for select locations throughout the Central Valley. Both Methods 1 and 2 use the VIC routing model (Lohmann et al., 1996; 1998) to route streamflow to user selected locations. The difference between Method 1 and Method 2 is that Method 1 uses direct streamflow, and Method 2 uses change factors to perturb historical streamflow conditions. Locations were chosen to represent inflow to the major reservoirs that are part of the CVP/SWP system. For further details about the datasets produced under WSIP, refer to Appendix A of the WSIP Technical Reference Document (California Water Commission, 2016). Methods 1 and 2 were applied for additional locations within the Tulare Lake Region that were not considered as part of WSIP. The applicability of Method 1 versus Method 2 is dependent upon available historical unimpaired data, which is required to correct biases in the VIC routing model. As part of this effort, Method 1 was applied to the Kings River and the Kaweah River watersheds, because extended unimpaired streamflow data are available from the California Data Exchange Center. Method 2 was applied to the Tule River and Kern River watersheds.

A third method was devised using the existing statewide gridded data produced from the VIC model to provide unimpaired streamflow change factors for groundwater basins and subbasins outside of the Central Valley. Runoff and baseflow were aggregated based on an area-weighted sum over CalWater 2.2.1 watersheds throughout California. Change factors were then calculated for each of these watersheds based on the combined runoff and baseflow calculation.

The applicability of Method 2 versus Method 3 is dependent on the size of the watershed and the representation of the physical constraints of the watershed within the VIC model. The resolution of the VIC model's flow direction and flow accumulation raster would also constrain the representative delineation of neighboring watersheds, where one grid cell may overlay multiple watersheds but could only contribute flow to one watershed or the other. This constraint would limit the representation of the potential contributing area of watersheds. Refer to Appendix C for a more detailed comparison of Methods 2 and 3 in the Upper Tule Watershed.

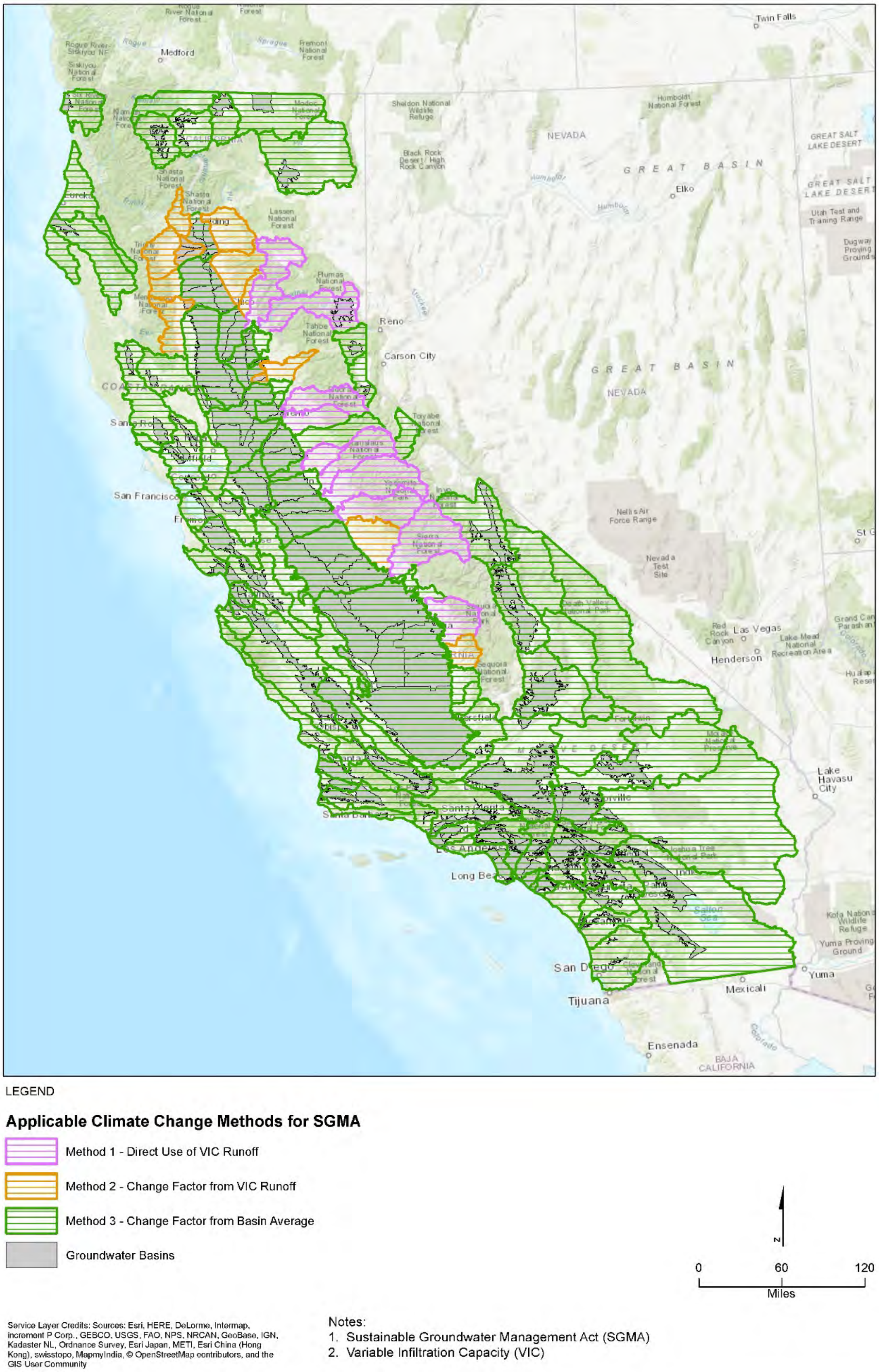


Figure 3-4. Unimpaired Streamflow Data Development Methods

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Application of Climate Change Data for Groundwater Sustainability Plan Development

DWR is providing the necessary and relevant climate change datasets generated from climate modeling and hydrological modeling studies for GSAs to assess projected groundwater conditions and water budgets considering specific groundwater management projects. These datasets should be used as input variables to the appropriate tool to simulate the response to projected water conditions. The climate change data provided for SGMA implementation include the following:

- Climatological data (i.e., precipitation and reference ET) on a state-wide gridded basis
- Hydrological data (i.e., unimpaired streamflow) as point data
- Central Valley project operations data

Table 4-1 summarizes the specific input variable data to be used for projected future water budget development and groundwater modeling. All these datasets are climate transformed according to the method described in Section 3. These datasets are available on DWR's SGMA Data Viewer website,[6] which provides data and information relevant to GSP development and water budget analysis.

Table 4-1. Summary of Data to be Used for Future Water Budget Development and Groundwater Modeling

Gridded Datasets[a]	Selected Flows and Deliveries[b]
• Precipitation • Reference ET	• SWP/CVP imports (Delta exports) • SWP/CVP diversions • SWP/CVP deliveries • SWP/CVP reservoir releases • Routed streamflow for select Central Valley watersheds • Routed streamflow change factor for other watersheds • Non-project reservoir outflows—change factors to modify historical unimpaired flow data into reservoirs

[a] California-wide at 6 km by 6 km resolution in VIC model hydrological analysis, as change factors
[b] CalSim II and VIC model data

4.1 Climate Data Applied at Local Model Scale

The statewide VIC hydrological gridded dataset provides important hydrologic parameters (i.e., precipitation and reference ET) for use in water budget development and groundwater modeling. These datasets are provided as a time series representing monthly change factors over the VIC simulation period of 1915 to 2011. These change factors have been computed for precipitation and reference ET under 2030 and 2070 future conditions.

To use these monthly change factor time-series, GSAs need to multiply their respective historical data with these change factors to obtain a perturbed precipitation and reference ET rate. This rate should then be used in the groundwater model to project future water budgets.

The statewide VIC hydrological dataset is on a 6 km by 6 km resolution. Most of the regional and local groundwater models that will be used by GSAs contain grid cells at a much smaller resolution. Due to inconsistencies in scale, change factors from the VIC model grid cell will need to be mapped spatially to

[6] https://sgma.water.ca.gov/webgis/?appid=SGMADataViewer

the grid cells of the groundwater model. Figure 4-1 illustrates applying climate perturbation factors for groundwater modeling by mapping a VIC model grid with groundwater model grids. The change factor from one VIC model grid cell will be applied to intersecting elements of the groundwater model that fall within the VIC model grid. For elements that fall within two or more VIC model grid cells, an area-weighted average change factor is calculated and applied to the corresponding groundwater model element. A model input file development tool is provided for both integrated water flow model (IWFM) and MODFLOW models to aid in the selection and assigning of appropriate change factors to model grid elements or cells, respectively. This geographic information system (GIS)-based tool can be used to map corresponding cells and apply the appropriate precipitation and evapotranspiration change factor.

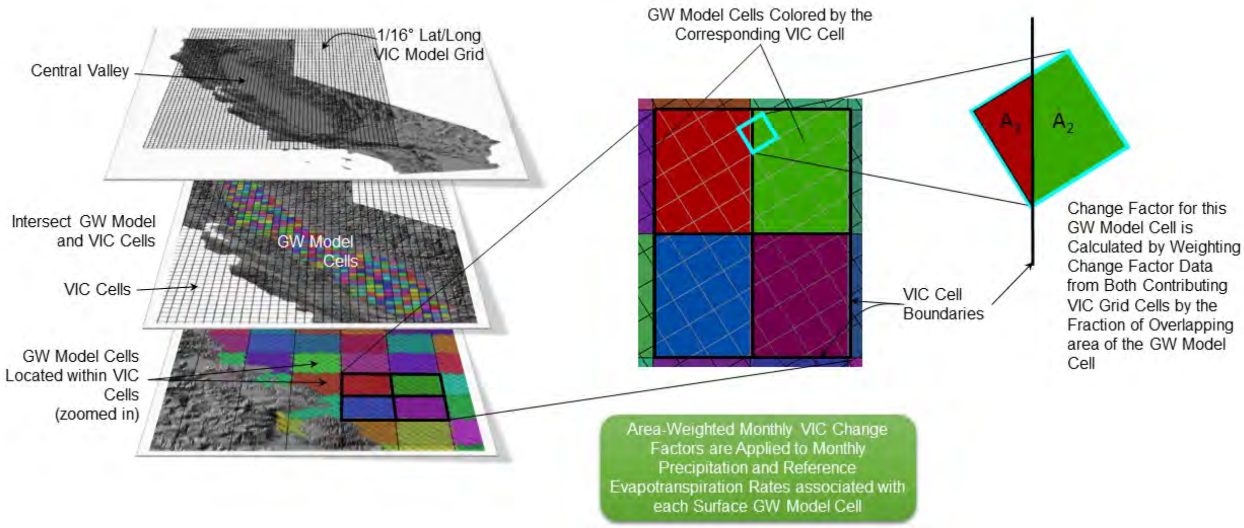


Figure 4-1. Applying Precipitation and ET Change Factors

4.2 Streamflow Data

In addition to precipitation and ET datasets, the calibrated VIC model routing tool processes the individual cell runoff and baseflow terms, and routes flow to simulate unimpaired streamflow at various locations in the modeled watersheds. The hydrology of the Central Valley and operation of the CVP and SWP systems are critical elements toward any assessment of changed conditions throughout the Central Valley. To evaluate the impact of climate change on CVP and SWP operations, the climate-transformed unimpaired streamflows generated from the VIC model were provided as inputs to the CalSim II model, a planning and operational model that simulates the CVP and SWP operations and areas tributary to the Delta. The climate-transformed data were processed within CalSim II to provide modified data on reservoir releases in the Central Valley (impaired flow data). In addition to the generation of perturbed flows, CalSim II also provides datasets on climate-transformed SWP/CVP deliveries, stream diversions and Delta exports for their subsequent application as input variables to the groundwater model. These datasets, provided as monthly time series, can be directly used as inputs to a water budget calculation spreadsheet or a groundwater model.

For watersheds outside of the Central Valley, impaired flow data are not available. Instead, unimpaired streamflow data from Method 3 described in Section 4.4 can be used. Figure 4-2 shows a schematic for applying projected streamflow in a groundwater model or water budget spreadsheet.

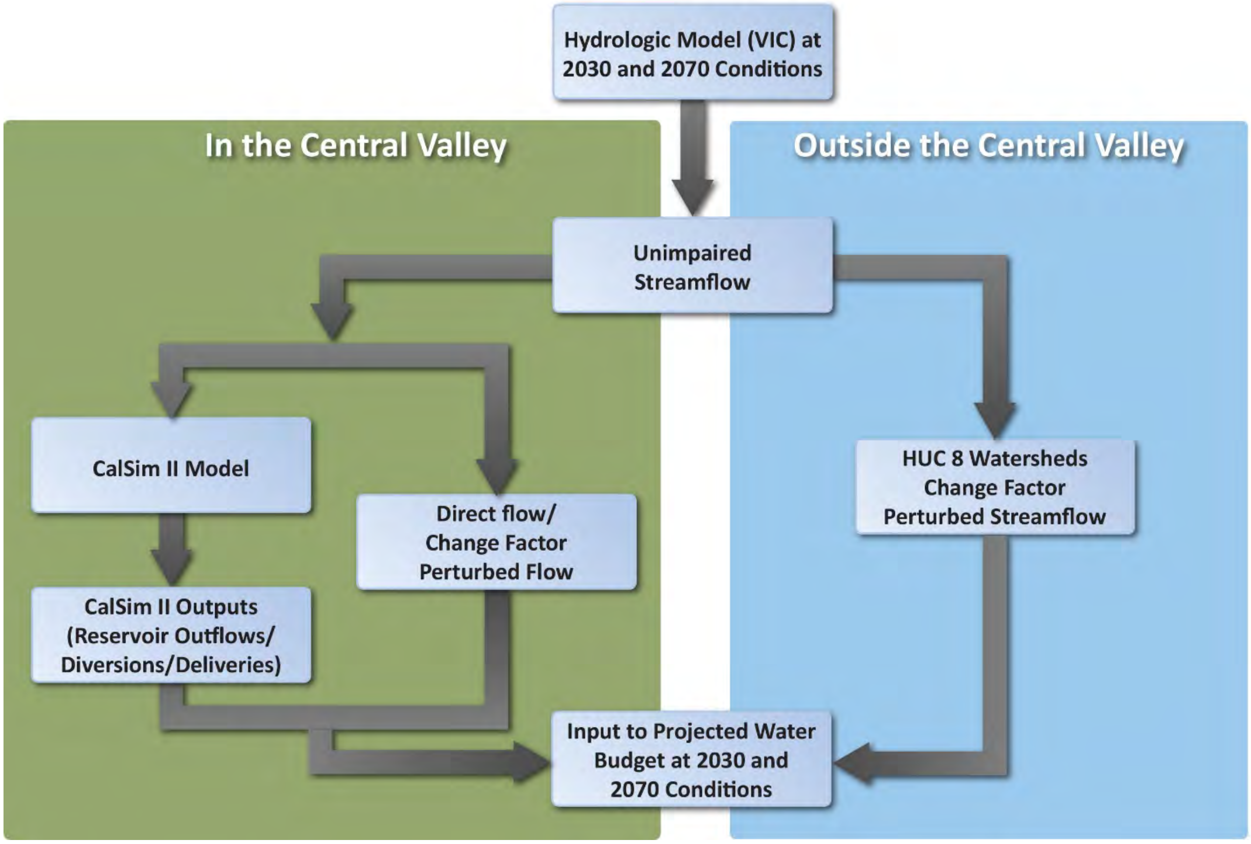


Figure 4-2. Streamflow Data to Use in Projected Water Budget

4.3 Sea-Level Rise Information

As described previously, projections of 15 and 45 centimeters were selected to represent 2030 and 2070 future sea-level rise conditions, respectively, for use in CalSim II and other models. For SGMA implementation, the incorporation of sea-level rise estimates in three-dimensional, physically-based, integrated groundwater/surface-water models can be implemented using one of the following methods, where appropriate:

- Include a specified-head boundary condition in the model cells or elements that are located adjacent to the coast or in the San Francisco Bay, and set the specified-head value at the 2030 projected sea-level rise (i.e., 15 centimeters or 5.9 inches) for the 2030 projected conditions model run. Set the specified-head value at the 2070 projected sea-level rise (i.e., 45 centimeters or 17.7 inches) for the 2070 projected conditions model run.
- A similar method can be used by incorporating a general-head boundary instead of a specified-head boundary.

4.4 Tools for Climate Change Data Integration

DWR developed several tools that are provided to GSAs along with the datasets described in this Guidance Document. These tools can help GSAs perform climate change analysis, and are as follows:

- **SGMA Data Viewer and data portal.** This is an interactive, web-based mapping tool for downloading spatial data and associated time-series data.

- **Model input file development tool(s).** This tool helps map VIC model gridded precipitation and reference ET data to the correct groundwater model cells or elements. One tool will be provided for MODFLOW-OWHM based models, and one will be provided for IWFM-based models.
- **Spreadsheet tool for basin average unimpaired streamflow change factor corrections**. This tool is required whenever unimpaired streamflow is perturbed using monthly change factors. The tool will require unimpaired streamflow and monthly and annual change factors to complete the calculations. The purpose of the tool is to modify monthly change factors to more accurately reflect annual streamflow patterns present in the historical data. Additional information on this method and additional assumptions are included in Appendix C.
- **Contractor deliveries search table.** These tables summarize contractor deliveries within a spreadsheet table that reports the contractor and region of delivery.

Other general modeling tools provided by DWR include the integrated surface-water/groundwater models (IWFM and its Central Valley applications, California Central Valley Simulation Model [C2VSim] and Sacramento Valley Groundwater-Surface Water Simulation Model [SVSim]) to facilitate simulation of current and future groundwater conditions.

4.5 Incorporating Climate Change Analysis Into Water Budgets

As described in the GSP regulations, the Water Budget BMP and earlier in this Guidance Document, the following water budgets are required as part of GSP development:

- Water budget representing historical conditions extending back a minimum of 10 years
- Water budget representing current conditions
- Water budget representing projected conditions over the 50-year SGMA planning and implementation horizon

Based on the available climate change data provided by DWR and described in this Guidance Document, projected water budget could be developed for two future conditions using a climate period analysis as follows:

- Water budget representing conditions at 2030 with uncertainty (using 50 years of historical record representative of the range of inter-annual variability as baseline). Projected 2030 central tendency data will be useful to evaluate projects and actions to achieve sustainability in the early future.
- Water budget representing conditions at 2070 with uncertainty (using 50 years of historical record representative of the range of inter-annual variability as baseline). Projected 2070 central tendency data will be useful to show that sustainability will be maintained into the planning and implementation horizon (i.e., late future), within 50 years after GSP approval.

4.5.1 Projected Water Budget Development Without a Numerical Model

For projected water budgets developed without a numerical groundwater flow model, the datasets described above can be incorporated into a spreadsheet-type water budget where the monthly time series of change factors and direct flow values are used to generate projected future conditions. The 50-year baseline condition timeseries is modified using the change factors from the 2030 projections and 2070 projections, respectively. The resulting timeseries would represent a 50-year projection to understand the uncertainty of what climate and hydrologic conditions could look like in 2030 and the uncertainty of what the climate and hydrologic conditions could look like in 2070. These timeseries include a range of variability in hydrology and temperature as projected for the 2030 and 2070 conditions. The resulting projected water budgets developed for 2030 and for 2070 conditions can be reviewed and interpreted through statistical analysis using water year type averaging and describing ranges in conditions to describe uncertainties in projected water budgets, as further discussed in Section 4.6 below.

When developing a water budget without a numerical model, a few limiting assumptions need to be made, particularly regarding subsurface groundwater inflows from adjacent basins and subsurface groundwater outflow to adjacent basins. For more information on general water budget development, refer to the water budget BMP.[7]

Figure 4-3 illustrates the types of data that would need to be replaced in the historical water budget to develop a projected water budget for 2030 and 2070 conditions including climate change assumptions, to satisfy SGMA requirements.

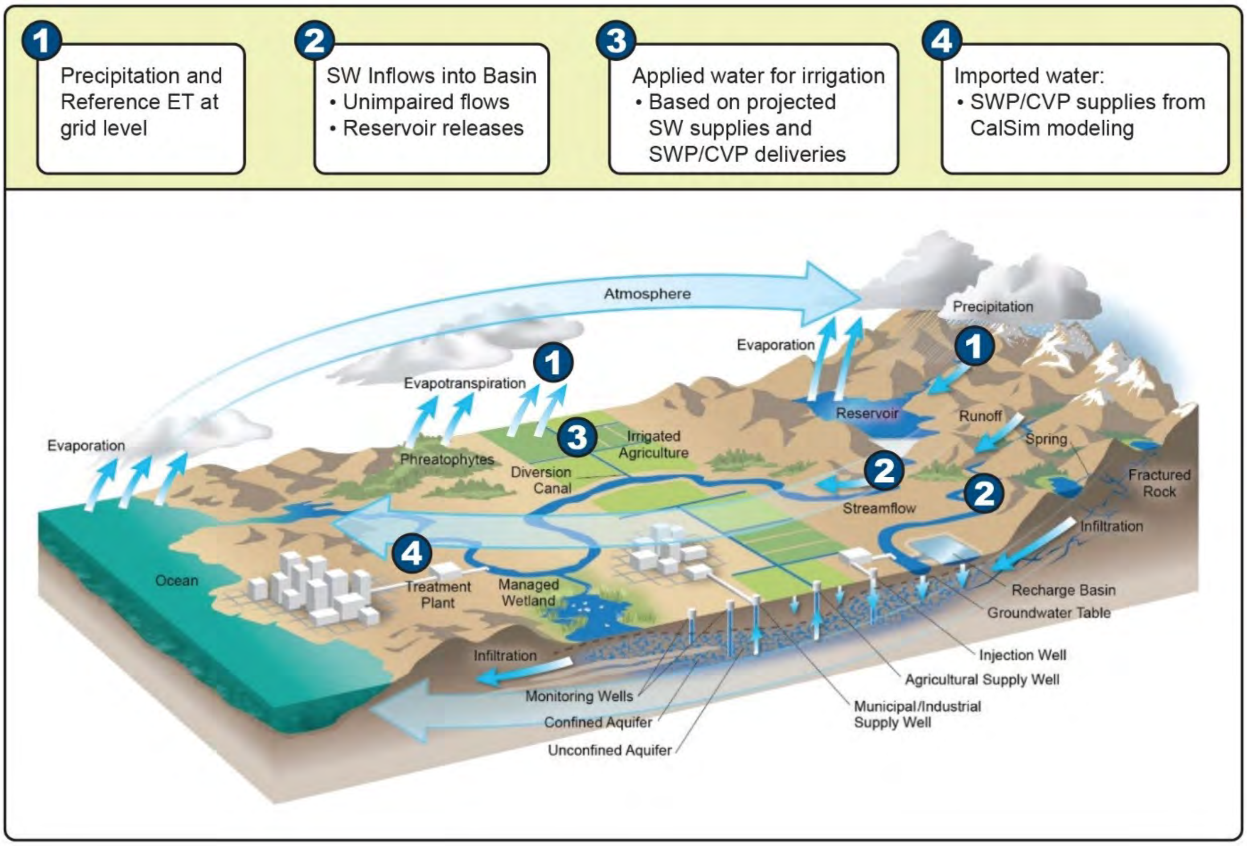


Figure 4-3. Water Budget Components to Modify for Projected Climate Change based Computations

For the precipitation and ET information that is provided at the grid level, an average monthly time series of change factors can be computed for the entire basin and each of the factors can then be applied to the corresponding historical time series to develop the projected time series at 2030 and at 2070. Monthly time series can then be aggregated at the annual level.

7 https://www.water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/Groundwater-Management/Sustainable-Groundwater-Management/Best-Management-Practices-and-Guidance-Documents/Files/BMP-4-Water-Budget.pdf

4.5.2 Projected Water Budget Development Using a Numerical Model

If a numerical groundwater model or integrated hydrologic model is used for water budget development, the initial step in the climate change analysis is to choose an existing local groundwater model or a DWR-provided groundwater model (see Modeling BMP).[8] Alternatively, if no model exists that satisfies the requirements of the groundwater basin GSP, a GSA can develop a new groundwater or integrated hydrologic model following the modeling BMP recommendations.

Gridded VIC model hydrological data can be applied, or mapped as Figures 4-1 and 4-4 illustrate, to the groundwater model cells or elements.

The next step would be to modify the input variables in the overlapping groundwater elements located in the VIC model grid in accordance with the climate-transformed data of the corresponding VIC model element. Gridded precipitation and reference ET data should be applied to the surface layer of the model that accounts for land use and water demands due to varying climate. If an integrated hydrologic model is used, these data can be directly applied to the model input files. The water demand is automatically scaled due to changes in air temperature with the reference ET provided and a crop coefficient assumed in the model. If the groundwater model does not include an integrated module that computes surface-water budgets, a pre-processing tool can be used to compute the net recharge to groundwater.

Land use and water demand projection approaches for groundwater modeling should take into consideration existing projections from state or local planning agencies, modified as needed to represent a specific study area and future conditions in the planning period. Water use projections for municipal and agricultural uses should be consistent with the most current local understanding of the groundwater basin. Information can also be developed or obtained from sources such as DWR land-use surveys, county general plans, and satellite-based estimates of ET rates (e.g., mapping evapotranspiration at high resolution using internal calibration [METRIC] calculations).

Stand-alone models that estimate crop water use are also available from DWR.[9] Another approach uses stand-alone modules that can be used in conjunction with groundwater model codes, or modules built into existing groundwater model codes; examples of such modules are as follows:

- **IDC.** IDC is the stand-alone demand calculator used in many IWFM-based models, including C2VSim, which computes agricultural water demands external to a groundwater model; outputs from IDC can be used as inputs to a groundwater model.
- **FMP.** FMP is the farm process module for MODFLOW-based models (now integrated in MODFLOW-OWHM), including CVHM.

These modules compute crop-consumptive use, which translates into agricultural water demand. They also compute limited urban water demand. Based on the crop water demand, irrigation efficiency, and available supply, these modules estimate the deep percolation of applied water to groundwater past the root zone, which is used by the groundwater flow model simulation. Therefore, these modules provide estimates of important components of the overall water demand and supply projections used in groundwater flow modeling.

[8] https://www.water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/Groundwater-Management/Sustainable-Groundwater-Management/Best-Management-Practices-and-Guidance-Documents/Files/BMP-5-Modeling.pdf

[9] https://www.water.ca.gov/Library/Modeling-and-Analysis/Statewide-models-and-tools

Unimpaired and impaired streamflow data also need to be modified to account for varying flows with climate change conditions. The modified groundwater model is then run for 2030 and 2070 climatic conditions to simulate the projected water budget. Figure 4-4 shows the groundwater model components to modify for future climate change based projections to simulate projected water budgets.

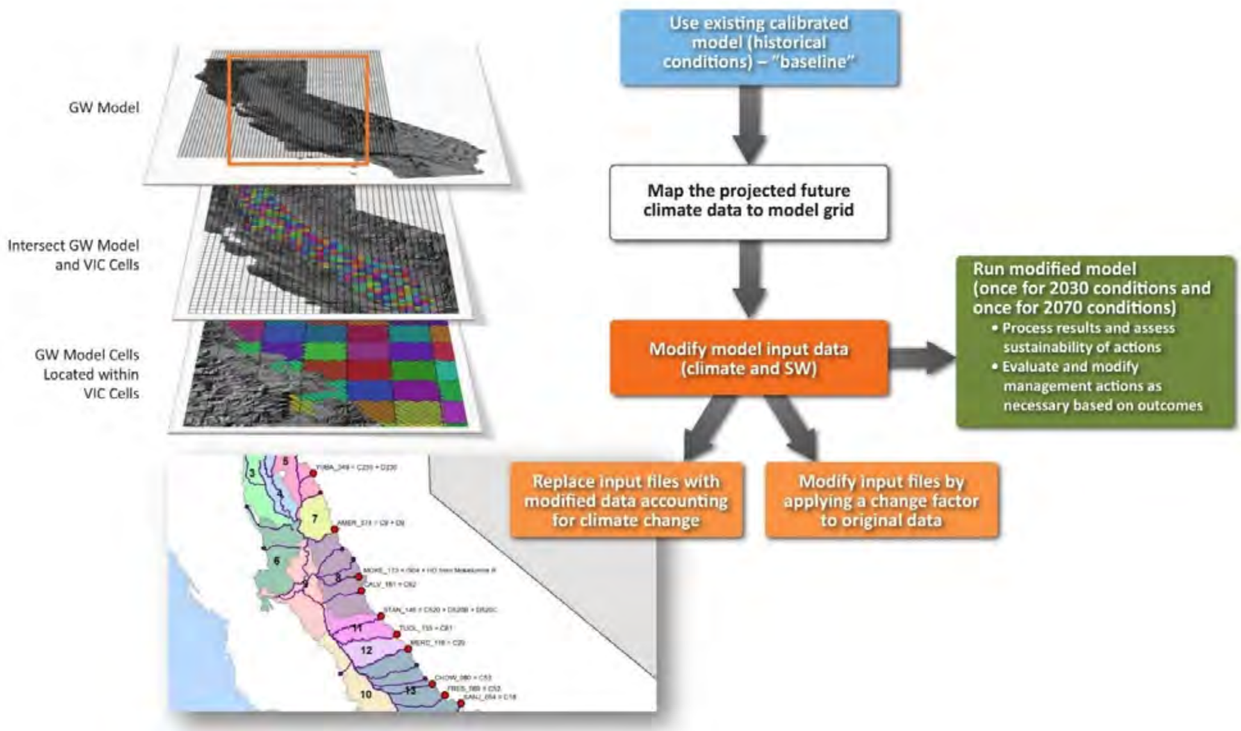


Figure 4-4. Groundwater Model Components to Modify for Future Climate Change-Based Projections

Water budget computation tools are available as noted below for the following integrated hydrologic models:

- DWR's IWFM Z-budget tool[10]
- U.S. Geological Survey's MODFLOW-OWHM zone budget tool[11]

4.5.3 Turning a Calibrated Historical Model into a Projection Model

A historical calibrated model can be applied in a predictive mode to compute projected water budgets with consideration of climate change and assess projects and management actions for long-term sustainability. The climate change datasets described in this Guidance Document represent projected climatologic, hydrologic, and water operations due to climate change for 2030 and 2070 conditions. To apply this dataset to a water budget or model, the 2030 and 2070 climate period condition results from VIC and CalSim II can be used to modify and replace the original historical data as described above.

[10] http://baydeltaoffice.water.ca.gov/modeling/hydrology/IWFM/IWFMv3_02/IWFMv3_02_36/downloadables/ZBudget_Doc.pdf

[11] https://water.usgs.gov/nrp/gwsoftware/zonebud3/zonebudget3.html

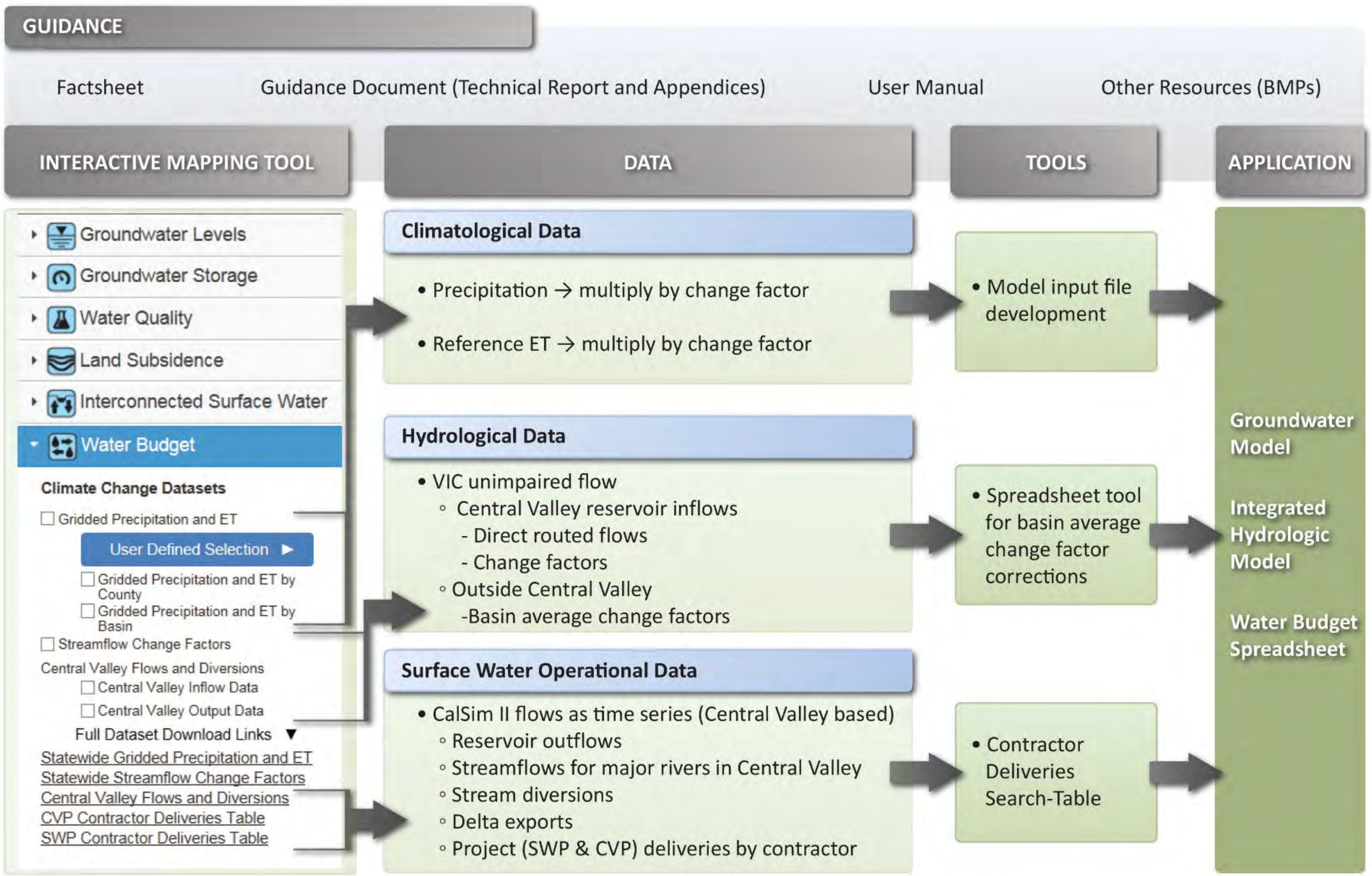
Possible steps to develop projected water budgets using a historical calibrated model are as follows:

1. Use heads at the end of the calibration simulation as the starting heads for the projection model (including subsidence conditions) to start the predictive model at current conditions.
2. Use the most recent available land use data (e.g., provided by DWR) and impose it onto the model for the entire projected simulation period.
3. Impose projected climate, hydrology, water operations, and demands from population and land use onto the existing model.
4. Run for 2030 (baseline and projected actions and projects) and for 2070 (baseline and projected actions and projects) simulations.
5. Aggregate results to develop projected water budgets without and with future projects and management actions.

Figure 4-5 illustrates the process for data download, manipulation and application.

The time series of monthly change factors for the VIC gridded data and the unimpaired streamflow data are from 1915 through 2011. The CalSim II flow time series data are provided over the period from 1921 through 2003. Versions of these time series that account for the effects of climate change are available for each of the 2030 and 2070 future scenarios. To apply these time series to a water budget spreadsheet or numerical model that have to include a minimum 50-year historical dataset, use one of the following methods (dates are shown for illustration purposes only):

- If a groundwater model has a 50-year simulation period between 1965 and 2015, then the common hydrology between these models is 38 years, which is 12 years shy of the required 50-year future planning and implementation horizon. One solution to remedy this issue would be to identify the sequence of water-year types within the historical 12 years and append 12 years of similar future water-year type sequencing to the common type period. DWR will provide a listing of water year types for the historical hydrology, and the 2030 and 2070 hydrology sequences in a separate document.
- If a groundwater model has a simulation period that spans more than 50 years and encompasses the 82 years of common simulation period for VIC and CalSim II, then that sequence can be used for groundwater modeling at 2030 and at 2070 even if it does not encompass the last 12 years of historical hydrology. The projected water budget needs to include a sequence of water-year types, similar to the past, over a 50-year planning horizon.



ET: Evapotranspiration; VIC: Variable Infiltration Capacity; SWP: State Water Project; CVP: Central Valley Project; CalSim: SWP and CVP Operations Model System

Figure 4-5. Summary of Climate Change Data Download, Processing and Application.

Table 4-2 summarizes the various model outputs and respective timelines.

Table 4-2. Model Data Outputs and Related Simulation Periods

Model	Output Data	Simulation Period
VIC	Precipitation, Reference ET, Unimpaired flows	1915–2011
CalSim II	Reservoir outflows, river flows, diversions, deliveries	1921–2003
Common Simulation Period for Models at 2030 and at 2070		1921–2003 (82 years of projected hydrology)

4.6 Data Interpretation and Results

Simulation models that project climate conditions are inherently uncertain in nature. The outputs from these models are best used for sensitivity analysis to better understand the resiliency of a groundwater basin under projected climate change constraints and to assess potential projects and management actions to achieve or maintain sustainability in a groundwater basin over the long term.

The interpretation of results from these models and subsequent integrated surface-water/groundwater models used to generate outputs related to groundwater conditions necessitates caution. As such, outputs from projection models are best aggregated and interpreted using summary statistics rather than specific points in time. Because the future is uncertain when it comes to climate change, population growth and land-use development, statistical post-processing can help analyze data in a broader sense for planning purposes.

For example, from a water management perspective in California, extreme weather conditions are important aspects, because water years are rarely considered “average” or “normal.” When considering a 50-year simulation period, extracting and summarizing results for each water-year type can help reveal tendencies during these different types of water years and an understanding of these tendencies will help inform project planning and management actions. Evaluating data in terms of bookends could also be useful for looking at extreme conditions and analyzing the potential for flexibility based on the range of operating conditions that could be undertaken in a groundwater basin. These bookends could be representative of the average of all critically dry years and the average of all wet years during the simulation period for capturing the range of extreme conditions within the 50-year water budget analysis period.

An additional constraint on data interpretation for projected water budgets is linked to limitations of applying a time-period analysis with a physical transient model. For example, the following considerations apply when using a numerical model:

- Conditions at the end of the simulation and each year in between are not the expected conditions at those years.
- Comparing projected models with historical models to estimate changes is likely more appropriate than interpreting actual simulated physical values of the projected model.
- Time-period analysis is a statistical simplification that provides a range of possible outcomes representative of the historical interannual variability with the expected future climate trend and provides a method to assess uncertainty in future projected outcomes.

4.7 Disclaimer for Climate Change Data Use

4.7.1 Assumptions and Limitations of the Data and Methods

DWR provides climatological and hydrological data for use in GSP water budget development and modeling. It is the GSA's responsibility to use the data and tools appropriately. Using DWR-provided data and tools does not guarantee that a GSA's projected water budget is acceptable; nor does it guarantee that a projected water budget meets GSP requirements.

Although it is not possible to predict future hydrology and water use with certainty, the models, data, and tools provided here are considered current best available science and, when used appropriately should provide GSAs with a reasonable point of reference for future planning.

GSAs should understand the uncertainty involved in projecting future conditions. The recommended 2030 and 2070 central tendency scenarios describe what might be considered most likely future conditions; there is an approximately equal likelihood that actual future conditions will be more stressful or less stressful than those described by the recommended scenarios. Therefore, GSAs are encouraged to plan for future conditions that are more stressful than those evaluated in the recommended scenarios by analyzing the 2070 DEW and 2070 WMW scenarios.

Note that mathematical (or numerical) models can only approximate physical systems and have limitations in how they compute data. Models are inherently inexact because the mathematical depiction of the physical system is imperfect, and the understanding of interrelated physical processes incomplete. However, mathematical (or numerical) models are powerful tools that, when used carefully, can provide useful insight into the processes of the physical system.

Specific assumptions and limitations for particular models described in this document are provided below.

4.7.2 Model Data Limitations

All models have limitations in their interpretation of the physical system and the types of data inputs used and outputs generated, as well as the interpretation of outputs. The climate models used to generate the climate and hydrologic data for use in water budget development were recommended by CCTAG for their applicability to California water resources planning (CCTAG, 2015).

4.7.2.1 VIC Model Outputs and Limitations

The VIC model generates the following key output parameters on a daily and monthly time step:

- Temperature
- Precipitation
- Runoff
- Base flow
- Reference ET
- Soil moisture
- Snow water equivalent on a grid-cell and watershed basis
- Routed streamflow at major flow locations to the Sacramento and San Joaquin valleys

For purposes of projected water budget development, only a subset of these outputs was used to provide water budget data, as described in earlier sections.

The regional hydrologic modeling described using the VIC model is intended to generate changes in inflow magnitude and timing for use in subsequent CalSim II modeling. Although the VIC model contains several subgrid mechanisms, its coarse grid scale should be considered when interpreting results and analysis of local-scale phenomenon. The VIC model is currently best applied for regional-scale hydrologic analyses. Several limitations to long-term gridded meteorology related to spatial-temporal interpolation and bias correction should be considered. In addition, inputs to the VIC model do not include transient trends in the vegetation or water management that may affect streamflows; thus, they should only be analyzed from a naturalized flow (unimpaired flow) change standpoint.

Finally, the VIC model includes three soil zones to capture the vertical movement of soil moisture, but does not explicitly include groundwater. The exclusion of deeper groundwater is not likely a limiting factor in the upper watersheds of the Sacramento and San Joaquin river region that contribute approximately 80 to 90 percent of the runoff to the Delta. However, on the valley floor, groundwater management and surface water regulation is considerable. Water management models such as CalSim II should be used to characterize the heavily managed portions of the system in the Central Valley.

4.7.2.2 CalSim II Model Outputs and Limitations

CalSim II is a monthly model developed for planning level analyses. The model is run for an 82-year historical hydrologic period, at a projected level of hydrology and demands, and under an assumed framework of regulations. Therefore, the 82-year simulation does not provide information about historical conditions, but it does provide information about variability of conditions that would occur at the assumed level demand with the assumed operations, under the same historical hydrologic sequence. Because it is not a physically based model, CalSim II is not calibrated and cannot be used in a predictive manner, rather, in a comparative manner, of projected scenarios.

In CalSim II, operational decisions are made on a monthly basis, based on a set of predefined rules that represent the assumed regulations. The model has no capability to adjust these rules based on a sequence of hydrologic events such as a prolonged drought, or based on statistical performance criteria such as meeting a storage target in an assumed percentage of years.

Although there are certain components in the model that are downscaled to daily time step (simulated or approximated hydrology) such as an air-temperature-based trigger for a fisheries action, the results of those daily conditions are always averaged to a monthly time step (for example, a certain number of days with and without the action is calculated and the monthly result is calculated using a day-weighted average based on the total number of days in that month), and operational decisions based on those components are made on a monthly basis. Therefore, reporting sub-monthly results from CalSim II or from any other subsequent model that uses monthly CalSim II results as an input is not considered an appropriate use of model results.

Appropriate use of model results is important. Despite detailed model inputs and assumptions, the CalSim II results may differ from real-time operations under stressed water supply conditions. Such model results occur due to the inability of the model to make real-time policy decisions under extreme circumstances, as the actual (human) operators must do. Therefore, these results should only be considered an indicator of stressed water supply conditions under projected conditions.

4.7.3 Appropriate Use of Data

While DWR is providing these climate change resources to assist GSAs in their projected water budget calculations, the data and methods described in the Guidance Document are optional. Other local analysis and methods can be used, including existing climate change analysis. If the DWR-provided datasets are used, the Guidance Document describes two paths that may be followed to develop a projected water budget. The intent is to provide guidance on a possible method to assist GSAs with including climate change into their projected water budget calculations, especially if no local climate change analysis has been done before.

GSAs are not required to use DWR-provided climate change data or methods, but they will need to adhere to the requirements in the GSP Regulations. Local considerations and decisions may lead GSAs to use different approaches and methods than the ones provided by DWR for evaluating climate change. For example, the use of a transient climate change analysis approach may be appropriate where local models and data have been developed that include the best available science in that watershed or groundwater basin.

However, if DWR-provided data are used, GSAs should be careful not to mix and match these data with other locally developed climate change data, as the climate change methods could be different. In other words, the data used to represent climate perturbed model information need to be developed using a consistent approach. For example, it is not appropriate to mix data produced by a transient analysis climate change method with data developed using a climate period analysis method.

The use of change factors instead of actual model simulated values for projected conditions are more appropriate for the DWR-provided data because each of the models that were used have slightly different mathematical assumptions. Therefore, comparing these outputs directly can lead to misinterpretation of results.

Using change factors for gridded precipitation and ET data is a more representative method for local scale analyses with the DWR-provided data because of the discretization of the VIC model and the statistical processing associated with the historical temperature detrending.

The use of CalWater 2.2.1 watershed streamflow change factors requires special consideration when applying the data to a groundwater model or general water budget calculation. For example, this method is applicable to small watersheds because runoff likely occurs in less than the one-month time scale. A thorough explanation on the development of this dataset and the use of the dataset including applicability, limitations, and assumptions are included in Appendix C. This appendix also provides a discussion of the differences between the streamflow runoff methods used.

4.7.4 Evolution of Future Climate Change Data

As climate science develops further, it will be important to use the data that reflects the current understanding and best available science at the time of future GSP updates. For example, CMIP models are updated every 8 to 10 years with new climate science. DWR will release new data as deemed appropriate at the time of model updates to help GSAs stay current on their climate change analysis.

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Appendix A
Methods and Approaches for Climate Change Modeling and Analysis, and California Applications

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Methods and Approaches for Climate Change Modeling and Analysis, and California Applications

A.1 Introduction

Climate change is impacting California water resources, as evidenced by reductions in snowpack, altered timing of river flows, rising sea levels, warmer temperatures and altered patterns of precipitation. Figure A-1 illustrates example watershed features that can be impacted by climate change.

Climate-induced changes pose challenges to long-term water resource sustainability planning and management by increasing the uncertainty associated with future climate conditions. California water planners and managers have been among the first in the nation to consider and study these uncertainties through improvements in scientific research related to global-scale climate downscaling models and the development of other regional hydrological and operations models.

This appendix describes observed changes in California climate over the recent past, the need for climate change analysis for sustainability planning, the approach used by the California Department of Water Resources (DWR) to develop a set of climate change datasets, and provides an overview of the methods and approaches used to project changes in future climate and the resulting effects on hydrology. California-specific examples and applications of these methodologies are also provided.

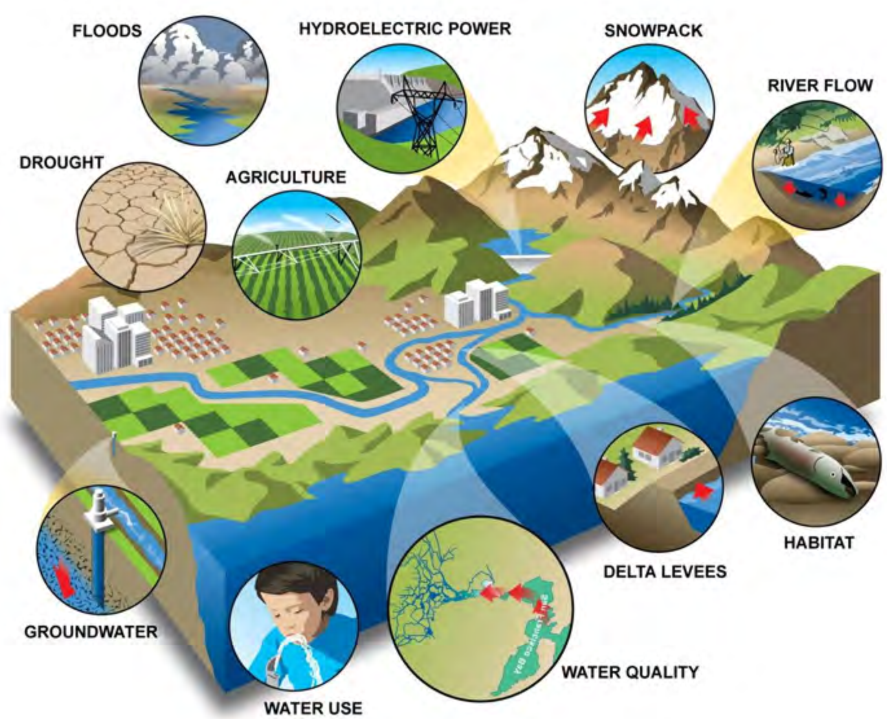


Figure A-1. Example Watershed Features That Can Be Impacted by Climate Change
Source: DWR, 2008

A.2 Observed Changes in California Climate

A.2.1 Precipitation and Temperature

Average annual temperature throughout California is highly variable due to variability in terrain and elevation (Figure A-2). In general, the northern part of the state is often cooler than the southern portion of the state. Cold temperatures down to -1.4 degrees Celsius (°C) can be observed in the Sierra Nevada mountain range due to the high elevation of these peaks. Significant warming can be observed in the Mojave Desert region of the state with temperatures up to 24.8 °C.

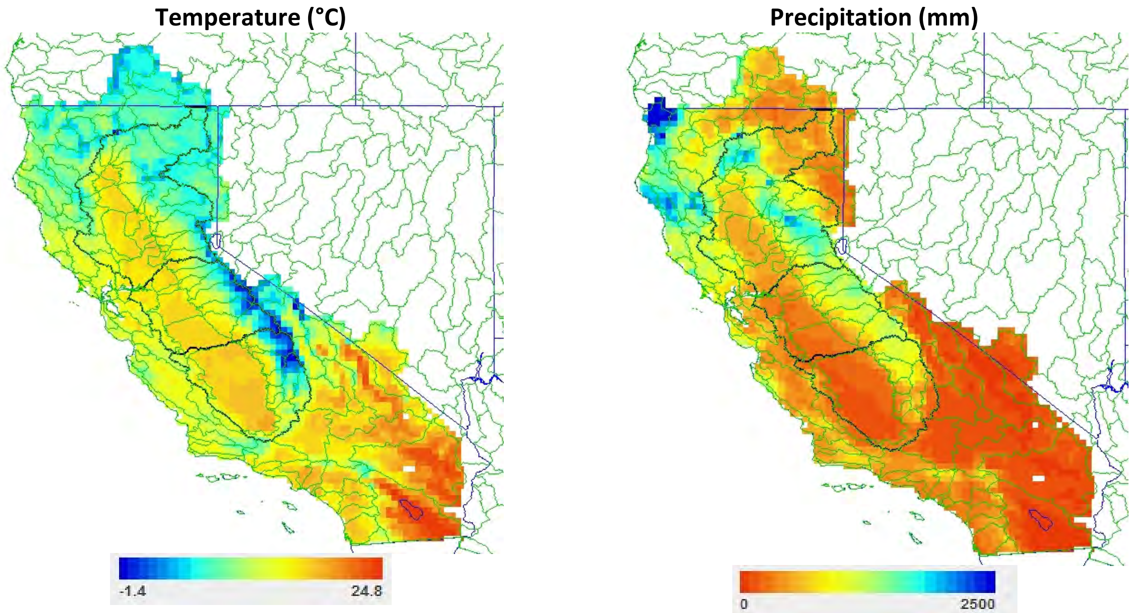


Figure A-2. Average Annual Temperature and Precipitation for 1981 to 2010
Source: Livneh et al., 2013; adapted from Reclamation, 2015

Precipitation in most of California is extremely variable, both spatially and temporally. Higher precipitation can be observed in the North Coast of California while little precipitation is often observed throughout the Mojave Desert and southern portions of California. In general, decreases in precipitation can be observed in moving from north to south through the Central Valley of California. Information from the State's longest observed precipitation records suggest that California's climate can transition from wet to dry or dry to wet within a few decades—well within typical water-resource planning periods (DWR Climate Change Technical Advisory Group [CCTAG], 2015).

California's Office of the State Climatologist provides information about California's climate trends; this office also releases publications related to California climate.[1] The Office of the State Climatologist also publishes an annual *Hydroclimate Report* (Office of the State Climatologist, 2016), which includes key indicators for hydrology and climate in California. This report is updated annually with the newest available data for tracking trends, provides a compilation of indicators, and offers graphical visualization of data trends. Pertinent information from the *Hydroclimate Report* for 2016 is summarized below.

[1] https://www.water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/Flood-Management/Flood-Data/Files/Water-Year-2016-Hydroclimate-Report.pdf

The annual average air temperature departure for California from water year 1896 to water year 2016 is shown in Figure A-3.

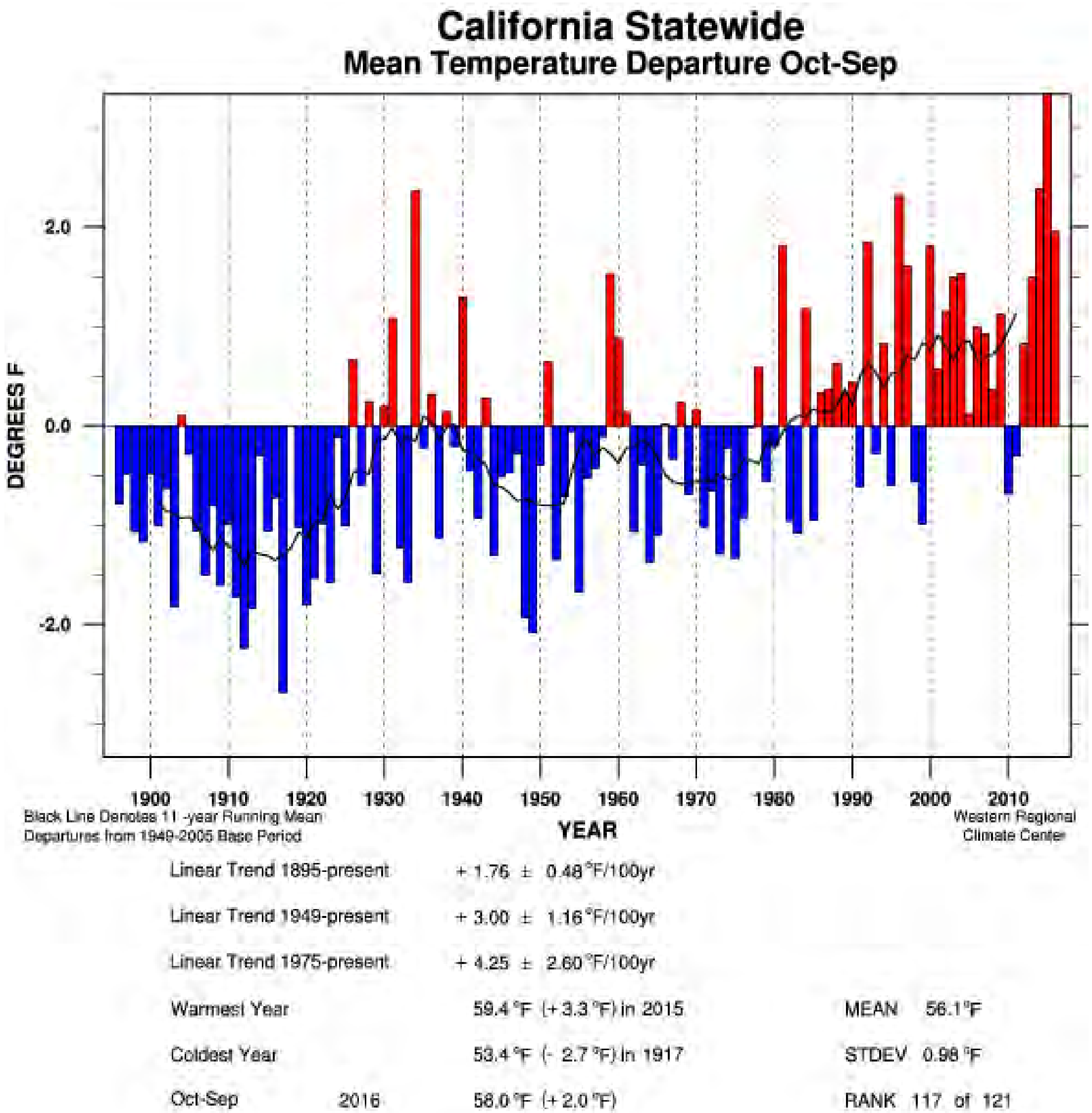


Figure A-3. California Statewide Mean Temperature Departure (October to September)
Source: Western Regional Climate Center, 2016

Notes:
Departure of annual water year average surface air temperature, 1896-2016. Bars: annual values; solid curves: 11-year running mean. Departure for temperature is computed for 1949-2005.

According to the Western Region Climate Center, California has experienced an increase of 1.2 to 2.2 degrees Fahrenheit (°F) in mean air temperature over the past century. Both the minimum and maximum annual air temperatures have increased, but the minimum temperatures (+1.7 to 2.7 °F) have increased more than the maximums (+0.6 to 1.8 °F) (Western Region Climate Center, 2016).

A significant increase in air temperature is apparent beginning from about 1985, although periods of cooling have occurred historically. Most notable is the warming trend that has occurred since the late 1970s. This warming trend has also been observed generally in North America, and follows global trends.

Annual precipitation shows substantial variability and periods of dry and wet conditions (Figure A-4). Most notable in the precipitation record is the lack of a significant long-term annual trend; however, annual variability appears to be increasing. More years with larger than long-term annual precipitation seem to appear in the most recent 30-year record.

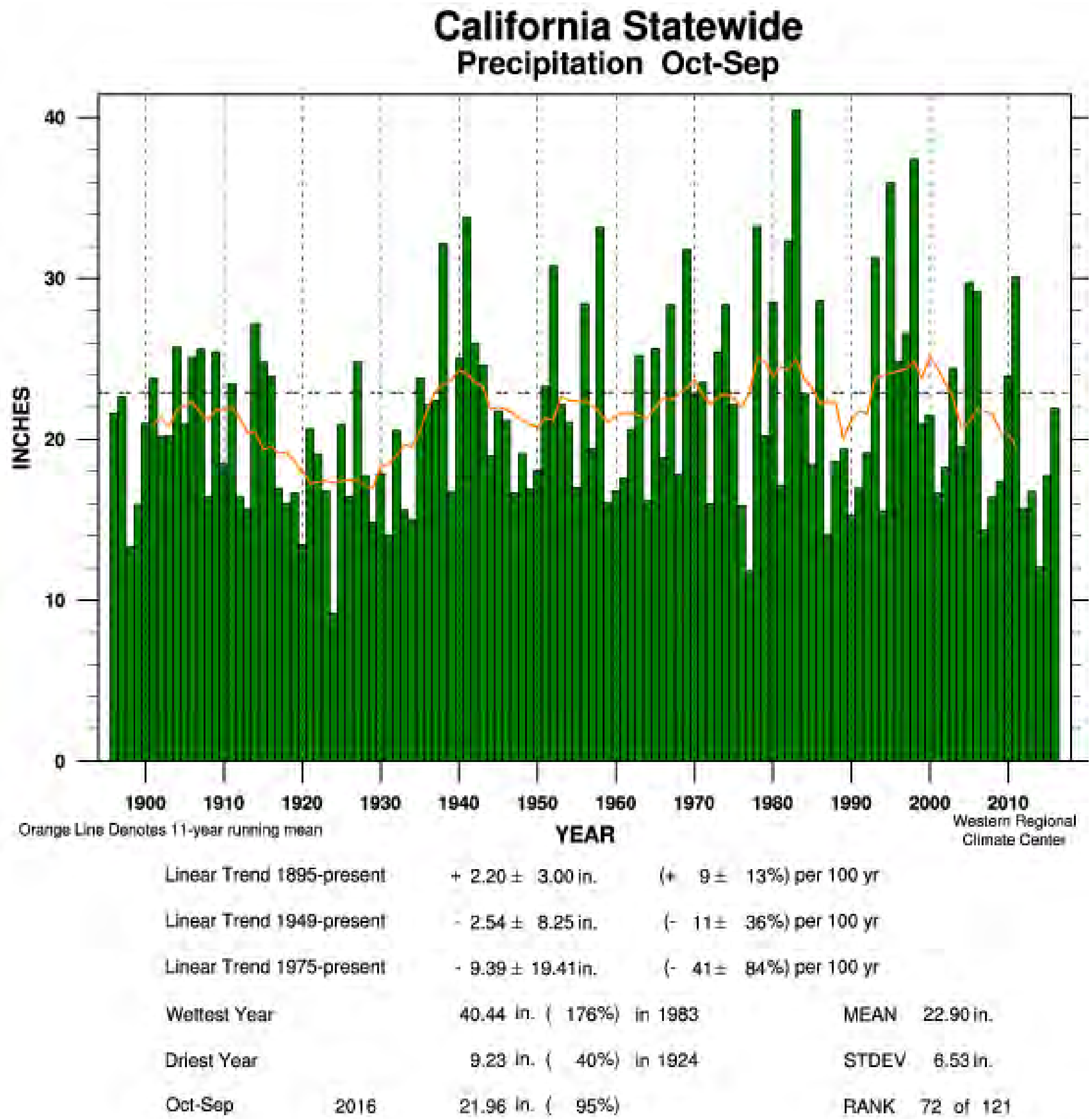


Figure A-4. California Statewide Precipitation (October to September)

Source: Western Regional Climate Center, 2016

Notes:
Annual water year average precipitation for the entire state. Bars: annual values; solid curves: 11-year running mean.

Observed climate and hydrologic records indicate that more substantial warming has occurred since the 1970s and that this is likely a response to the increases in greenhouse gas emissions during this period.

A.2.2 Sierra Snowpack

Snowpack in the Sierra Nevada mountain range is one of the main sources of water supply to streams feeding the Central Valley and California water supply infrastructure. Snowpack is heavily dependent on precipitation and air temperature and has decreased over the past 60 years. Figures A-5 and A-6 show snowpack trends in the Northern and Southern Sierra 13 snow courses. They are measured on April 1 of each year. Data from the 13 northern Sierra snow courses are at a lower elevation and show a steeper snowpack decrease since 1950 as compared to snowpack observed at the 13 southern station snow courses. The northern Sierra Nevada snowpack has decreased by 8.9 inches since 1950 and the southern Sierra Nevada snowpack decreased by 3.6 inches since 1950 (Office of the State Climatologist, 2016).

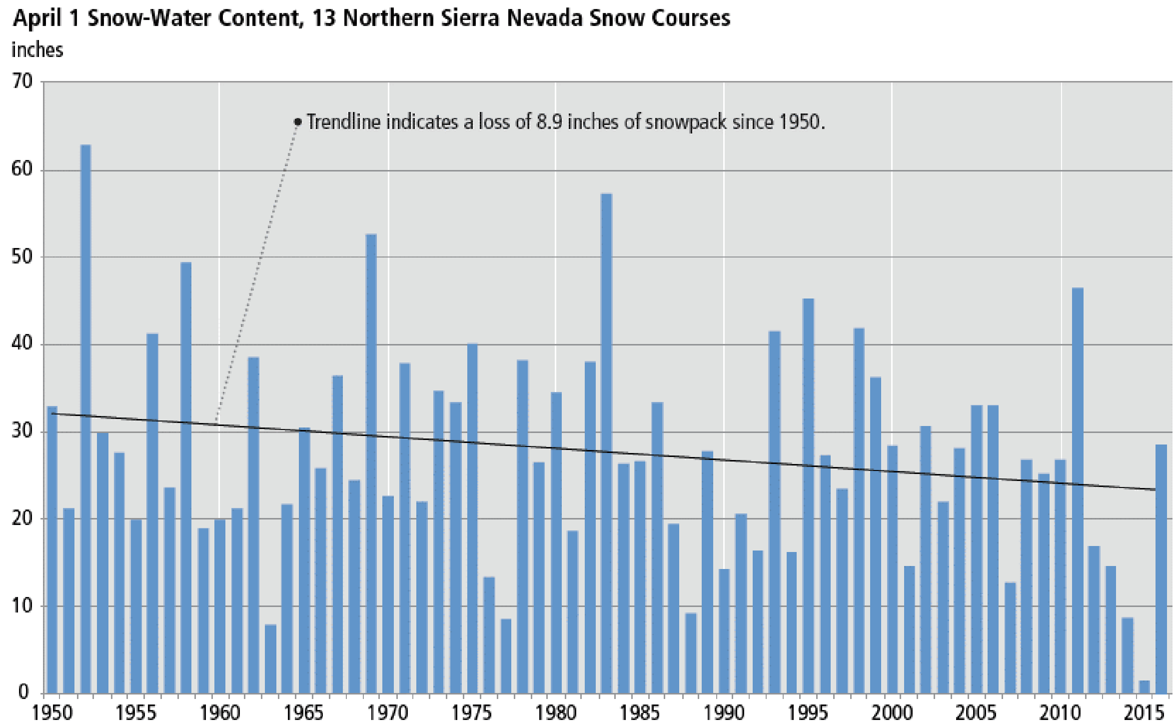


Figure A-5. April 1 Snow-Water Content, 13 Northern Sierra Nevada Snow Courses
Source: Office of the State Climatologist, 2016

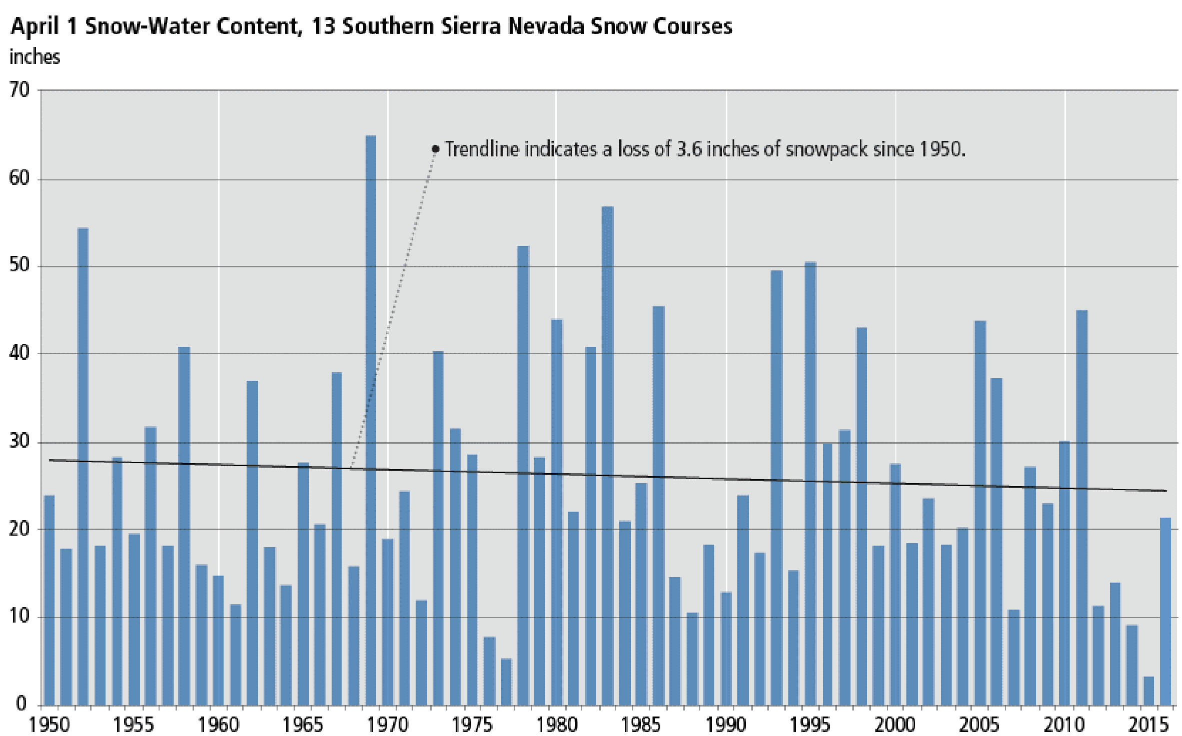


Figure A-6. April 1 Snow-Water Content, 13 Southern Sierra Nevada Snow Courses
Source: Office of the State Climatologist, 2016

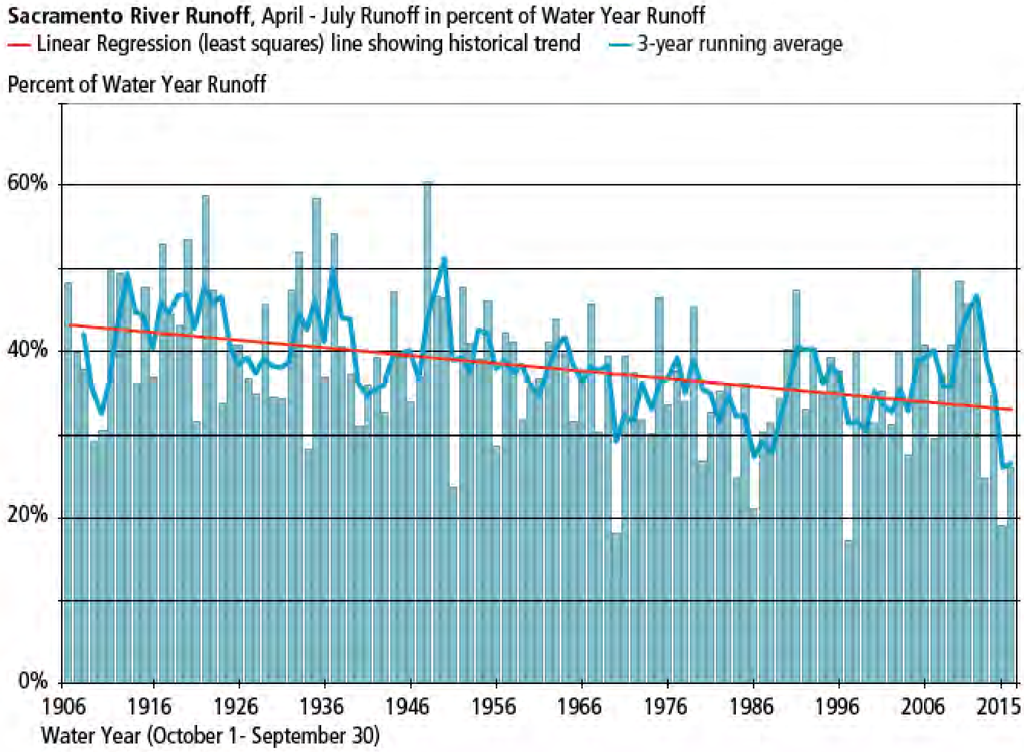
A.2.3 Unimpaired Streamflow: Sacramento and San Joaquin River Systems

Figure A-7 shows a historical comparison of natural hydrology flows or unimpaired flow (i.e., runoff)[2] occurring during the April through July snowmelt season in the Sacramento River from 1906 to 2016, and the San Joaquin River from 1901 to 2016. Unimpaired flows during the snowmelt season show a 9 percent decline per century in the Sacramento River system, whereas the San Joaquin River system shows a decline of 6 percent in unimpaired flow per century. The decline in runoff during this season correlates to the decrease in snowpack in the mountain ranges for watersheds feeding the Sacramento and San Joaquin rivers, as shown in Figures A-5 and A-6.

A.2.4 Effects on Groundwater Resources

Climate variation affects the quantity and timing of groundwater recharge. Increases in air temperature statewide have led to earlier snowmelt and less precipitation falling as snow. This has led to greater rates of direct runoff that likely exceeded soil infiltration capacities in some regions, thereby decreasing groundwater recharge in these regions. Variability in precipitation causing extended dry periods will also lead to less groundwater recharge and therefore less available groundwater for pumping. In addition, changes in the timing of streamflow can affect groundwater/surface-water interaction, which can provide opportunities and risk depending on the magnitude and timing of the change relative to the magnitude and timing of water demand.

[2] Not accounting for the changes in watershed flows due to water development projects such as dams and diversions.



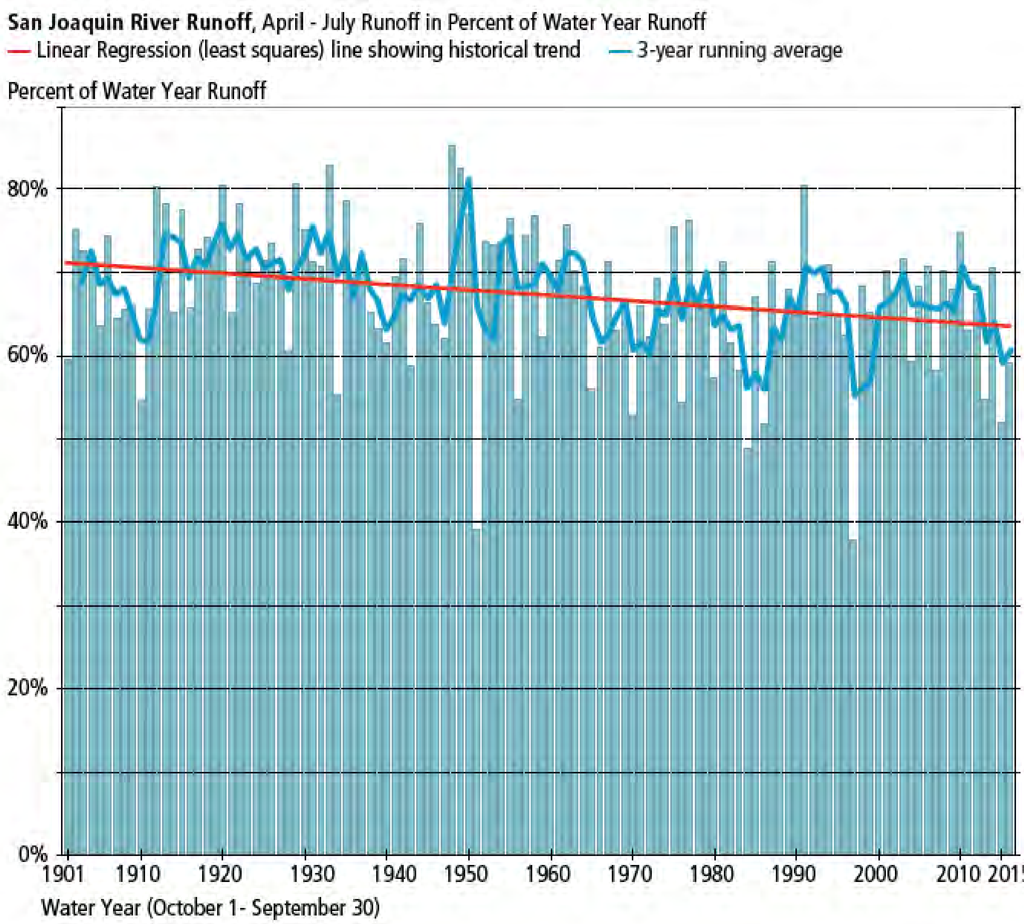


Figure A-7. Unimpaired Streamflow of Sacramento and San Joaquin River Systems

Source: Office of the State Climatologist, 2016

A.2.5 Sea-Level Rise

Global and regional sea levels have been increasing over the past century and are expected to continue to increase throughout this century. Over the past several decades, sea level measured at tide gages along the California coast has risen at a rate of about 17 to 20 centimeters per century (Cayan et al, 2009). There is considerable variability among tide gages along the Pacific Coast, primarily reflecting local differences in vertical movement of the land and the duration of the gage record. Figure A-8 shows the mean sea level trend for three key representative National Oceanic and Atmospheric Administration (NOAA) coastal tide gages in California.

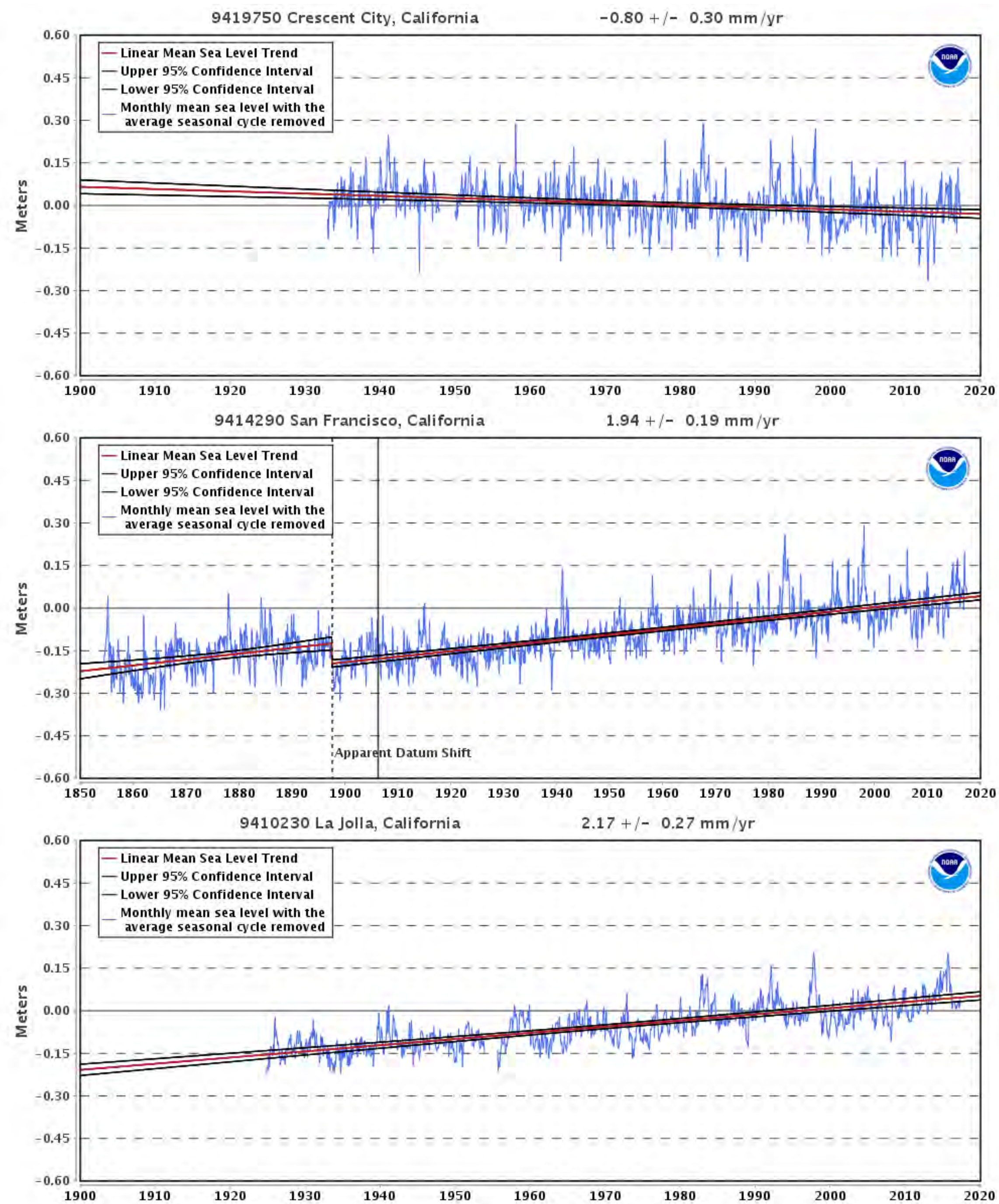


Figure A-8. Mean Sea Level Trend at Three NOAA Coastal Tide Gages on the California Coast
Source: Office of the State Climatologist, 2016

Sea-level rise is an important consideration for coastal groundwater basins that are hydraulically connected to the ocean water. Sea water intrusion along coastal plains is often observed due to increases in reliance on groundwater and pumping's influence on hydraulic gradients. Sea-level rise may exacerbate instances and magnitude of seawater intrusion due to increases in hydraulic gradients from the ocean to the inland groundwater basins. Therefore, sea-level rise is an important consideration for the management of water resources in coastal groundwater basins.

A.3 Using Climate Change Modeling for Groundwater Sustainability Planning

Given the uncertainty about future climate, water demand, and water supply, climate change analysis is a crucial component of long-term water planning activities for ensuring the sustainable management of groundwater resources as mandated by the Sustainable Groundwater Management Act (SGMA). Due to the spatial and temporal complexities associated with evaluating groundwater basin response to changing climate, land use, and proposed projects, it is anticipated that many Groundwater Sustainability Agencies (GSAs) will use hydrologic models to project future groundwater basin conditions. Incorporating climate change analysis in these hydrologic models often requires projections of climate resulting from the simulation of global circulation models.

Global climate change models provide the most scientifically robust information about likely future changes to climate conditions across the globe. Additional information about localized conditions is also typically required to understand how large-scale climate changes could manifest at the smaller watershed or groundwater basin scales. Downscaling of large-scale climate trends is often done by using historical observational data and physically-based regional climate models, or through other techniques. For water resource analysis, information about streamflows, groundwater recharge, and evapotranspiration (ET) is often important, and climate variables like air temperature and precipitation from climate models must be input into a hydrologic model (also known as rainfall-runoff model). Typical steps for developing a scenario for water resources planning are shown in Figure A-9.

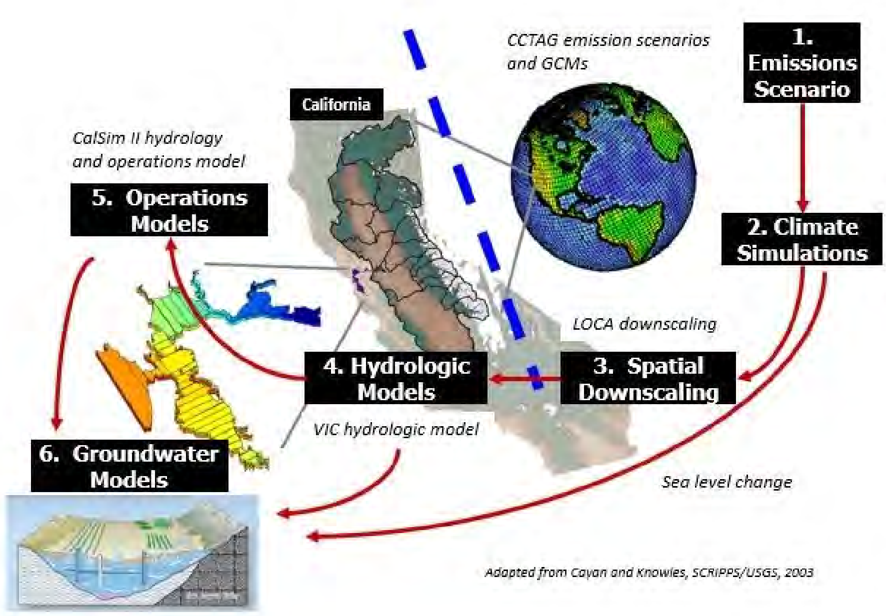


Figure A-9. Climate Change Data Downscaling to Groundwater Model

As shown on Figure A-9, the six steps of climate change modeling for water resources planning are as follows:

1. Select emissions scenario(s)
2. Select global climate model(s) and perform climate simulations using selected emissions scenarios
3. Spatially downscale global climate model results or select already spatially-downscaled data
4. Select hydrologic model and simulate unimpaired flows from downscaled climate model results
5. Select water system operations model(s), include climate change data and use unimpaired flows from the selected hydrologic model to simulate system operations, if applicable
6. Select groundwater/surface water model and use data from downscaled climate model(s), hydrologic model, and operations model(s) to simulate groundwater and surface water response to climate change

A general discussion on the purpose of these steps and the available methodologies are discussed generally in the proceeding sections. Further detail on how each of these climate change modeling steps have been applied to California are described later in Section A.4 of this Appendix.

A.3.1 Climate Simulation Approach

There are two general approaches that can be used to simulate climate change in water resource modeling: transient or climate period analysis. Each approach has advantages and disadvantages, and each may be more or less appropriate depending on the application. More information on this type of analysis is provided in the callout box below. For water resource modeling, particularly in California where inter-annual precipitation variability is extreme, transient analysis can be difficult to interpret. In a transient analysis, inter-annual variability can completely obscure the climate change signal—because each year of the simulation has both inter-annual variability and a climate change signal making it difficult to determine which is causing shifts in precipitation. Climate period analysis provides advantages in this situation because it isolates the climate change signal from the inter-annual variability signal. In a climate period analysis, inter-annual variability is based on the reference period from which change is being measured, meaning that all differences between the future simulation and the reference period are the result of the climate change signal alone.

Transient Climate Simulations versus Climate Period Simulations

Simulation methods are compared below.

Transient Climate Simulations	Climate Period Simulations
• Climate change signal strengthens incrementally over time, similar to the way climate change has been occurring in recent decades. In general, years further in the future are warmer than years closer to the beginning of the simulation, and the most severe changes to climate tend to occur toward the later years of the simulation. • Inter-annual variability can completely obscure the climate change signal—because each year of the simulation has both inter-annual variability and a climate change signal, making it difficult to determine which is causing shifts in precipitation. Climate period analysis provides advantages in this situation because it isolates the climate change signal independent of the inter-annual variability signal.	• Climate change is modeled as a shift from a baseline condition (usually historical observed climate) where every year of the simulation is shifted in a way that represents the climate change signal at a future 30-year climate period. • Inter-annual variability is based on the reference period from which change is being measured, meaning that all differences between the future simulation and the reference period are the result of the climate change signal alone.

One drawback of a climate period analysis is that it provides information about climate impacts at only one future climate period—usually a 30-year window. Therefore, multiple simulations need to be run to understand how climate changes will unfold over time.

A climate period analysis might represent future conditions for 2036 through 2065 or more generally mid-century/2050 future conditions, for example. Therefore, if one needed to evaluate future conditions throughout the 21st century, multiple simulations would have to be run to evaluate conditions at a number of climate periods between current conditions and the end of the century.

Additionally, the climate period analysis that DWR has typically used relies on the perturbation of historical observed climatology (or hydrology) to represent potential future conditions. This approach preserves historical inter-annual variability but also limits the exploration of future changes in inter-annual variability.

The figures below provide a graphical representation of the difference between transient and climate period analysis.

Figure A-10 shows a general conceptual representation of the transient analysis and the climate (or time) period analysis. As shown in the transient analysis, the projected temperature and precipitation follow a historical trend, while land use and other hydrological parameters continue to change over these projected years. A snapshot of climate variables and land use is used to simulate historical hydrological pattern.

Figure A-11 illustrates some of the differences in transient and climate period simulations for both temperature changes and precipitation changes. Figures A-11a (transient analysis) and A-11b (climate period analysis) compare the difference in the ways that these two approaches represent changes in temperature. Figure A-11a (transient analysis) shows the clear increasing trend in temperature over time. Figure A-11b (climate period analysis) shows that a step change in temperature occurs between 2015 conditions and 2030 or 2070 conditions.

Figure A-11c (transient analysis) illustrates how noisy the precipitation data are for transient climate simulations but also how each run explores novel examples of inter-annual variability. Conversely, Figure A-11d (climate period analysis) illustrates how a climate period simulation follows the historical pattern of inter-annual variability and the only differences come from the ways in which climate models project certain year-types will shift to wetter or drier conditions.

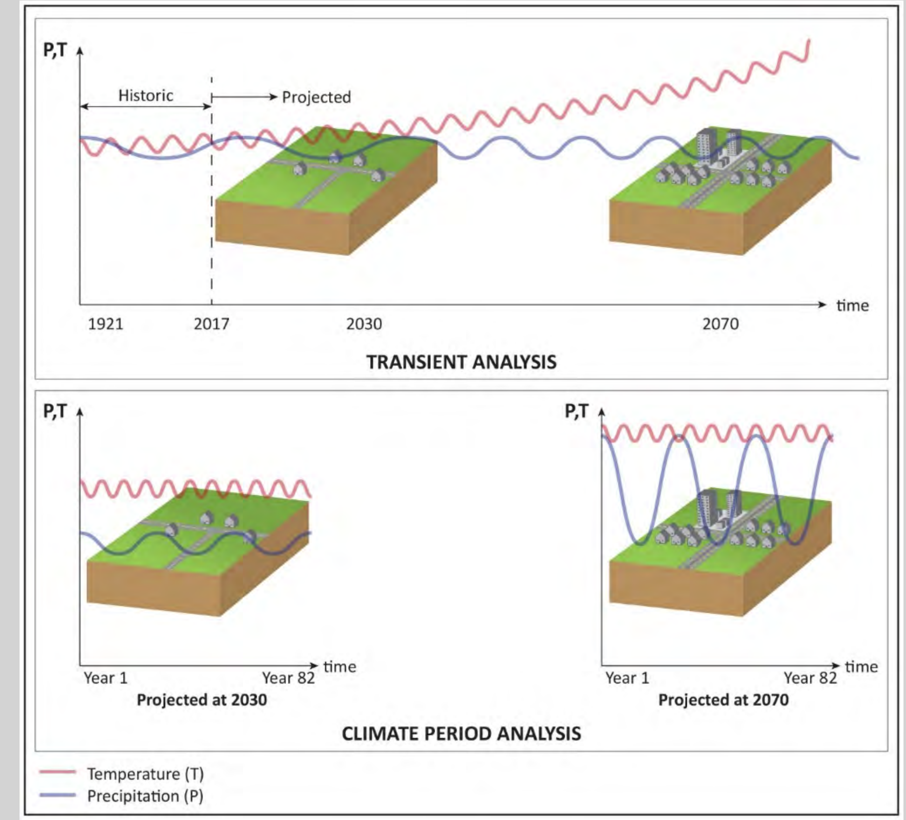


Figure A-10. Conceptual Representation of Transient and Climate Period Analysis

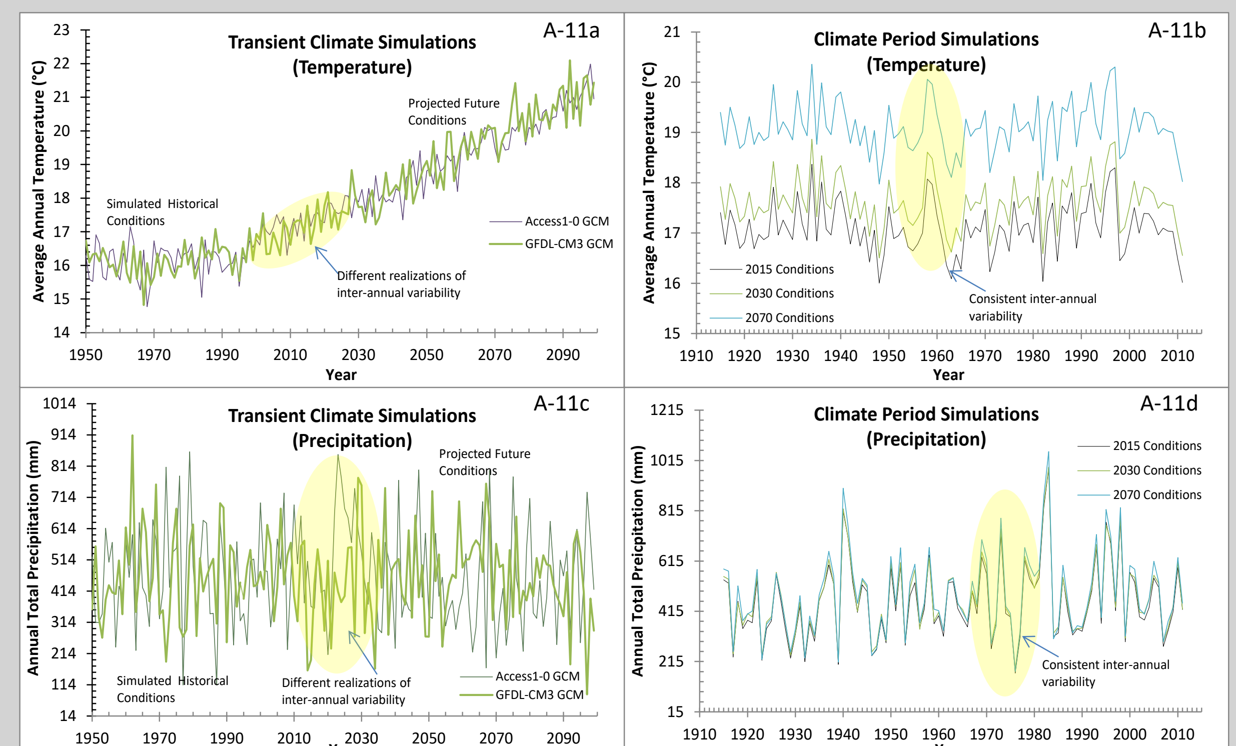


Figure A-11. Transient and Climate Period Simulations of Temperature and Precipitation

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A.3.2 Spatial Downscaling of General Circulation Model Data

A.3.2.1 Purpose and Need

Despite continuing improvements in the development and application of general circulation models (GCMs) and the improvements in computational resources, the spatial resolution of the current suite of GCMs is too coarse for direct use in watershed-scale impact assessments. For example, the spatial resolution of the GCMs that participated in the most recent Coupled Model Intercomparison Project Phase 5 (CMIP5) ranged approximately from 0.5 degree[3] to 4 degrees for the atmosphere component, and ranged approximately from 0.2 degree to 2 degrees for the ocean component (Taylor et al., 2012). To overcome the resolution issues, downscaling is a common approach for translating macro-scale climate changes that are either observed or identified in climate models to changes in meteorological parameters at the regional and local scales.

A.3.2.2 Commonly Used Techniques

Multiple downscaling approaches exist for translating coarse resolution climate model outputs to regional climate patterns. The two broad categories of approaches are statistical downscaling (i.e., using the relationship developed for the observed climate, between the large-scale and smaller-scale to climate model output) and dynamical downscaling (i.e., using physically based regional climate models). In statistical methods, the statistical properties between observed meteorological parameters at various stations or grid locations are related to broader-scale climate parameters at GCM-scale (i.e., a 2-degree grid scale). The relationship, based on historical observations, becomes a mapping-function for use in transferring projected climate conditions. One of the advantages of the statistical downscaling method is that they are computationally inexpensive. However, the major drawback is that the basic assumption in the statistical methods is that the statistical relationship developed for the historical period also holds at the future change conditions is not verifiable.

Dynamical downscaling involves the use of a regional climate model to translate the coarse-scale GCM projections to the regional or local scale (Mearns et al., 2009). Regional climate models use the GCM output as boundary conditions and simulate regional/local projections. This method of downscaling is founded on explicit representations of the laws of thermodynamics and fluid mechanics, so dynamical downscaling output can be seen as a true simulation of high-resolution climate conditions. Some disadvantages of this method are that it is computationally intensive and requires precise calibration of model parameters. Dynamical downscaling has not been widely applied, largely due to the extremely high computing requirements for long-term climate projections. The following summarizes some commonly applied methods used in California for downscaling GCM results*:*

- **Bias Correction Spatial Downscaling (BCSD):** BCSD is a statistical downscaling method. BCSD uses two steps: bias correction and spatial downscaling. The bias correction process uses a quantile-mapping technique to resolve monthly bias in the GCMs at a coarse scale. The spatial downscaling step uses interpolated pattern maps derived from historical climate to downscale climate to the regional or local scale.[4]
- **Localized Constructed Analogs (LOCA):** The LOCA method produces daily downscaled estimates of surface meteorological fields (i.e., minimum temperature, maximum temperature, and precipitation) suitable for hydrological simulations using a multiscale spatial matching scheme to

[3] 1 degree is equivalent to approximately 96 km or 60 mi

[4] http://gdo-dcp.ucllnl.org/downscaled_cmip_projections/dcpInterface.html

pick appropriate analog days from observations. This spatial downscaling method includes a bias-correction process based on frequency-dependent correction of the coarse resolution GCM daily temperature and precipitation fields prior to spatial downscaling.[5]

- **U.S. Geological Survey (USGS) Statistical Downscaling Method and Hydrologic Simulations**: This approach spatially downscales 12-kilometer resolution data from 1950 to 2000 (i.e., current climate) and 2000 to 2100 (i.e., future climate) to 4-kilometer resolution using a method called spatial gradient and inverse distance squared (GIDS) (Flint and Flint, 2012). These 4-kilometer data are designed to match grids from the Parameter-Elevation Regressions on Independent Slopes Model (PRISM) dataset developed by Daly et al. (Daly et al., 1994). Then, bias-correction coefficients (i.e., mean and standard deviation) are developed using the historical monthly 4-kilometer data from both the PRISM and the downscaled GCM data. These historical bias-corrections are then applied to the 2000 to 2100 monthly data to produce bias-corrected 4-kilometer monthly data. These data are further downscaled using GIDS to 270-meter scale for use in the basin characterization model (BCM), a water balance model, to simulate a set of hydrologic variables at a 270-meter scale. The California Basin Characterization Model Downscaled Climate and Hydrology effort (CA-BCM 2014) produced downscaled climate data based on the BCSD statistical downscaling method at an 800-meter spatial resolution, and are further downscaled using the GIDS approach to 270 m[6] for model application.

A comparison of the three major downscaling techniques utilized in California is shown in Figure A-12, summarizing the principal steps for each technique.

All methods result in downscaled climate information for temperature and precipitation for use as input into hydrologic models to assess the local hydrology changes due to climate change as projected by the GCMs. LOCA was used as the downscaling technique for the California Water Commission’s Water Storage Investment Program (WSIP), and the resulting data were used to develop the 2030 and 2070 climate scenarios for use by GSAs during Groundwater Sustainability Plan (GSP) development.

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[5] http://gdo-dcp.ucllnl.org/downscaled_cmip_projections/dcpInterface.html; http://loca.ucsd.edu/

[6] http://climate.calcommons.org/bcm

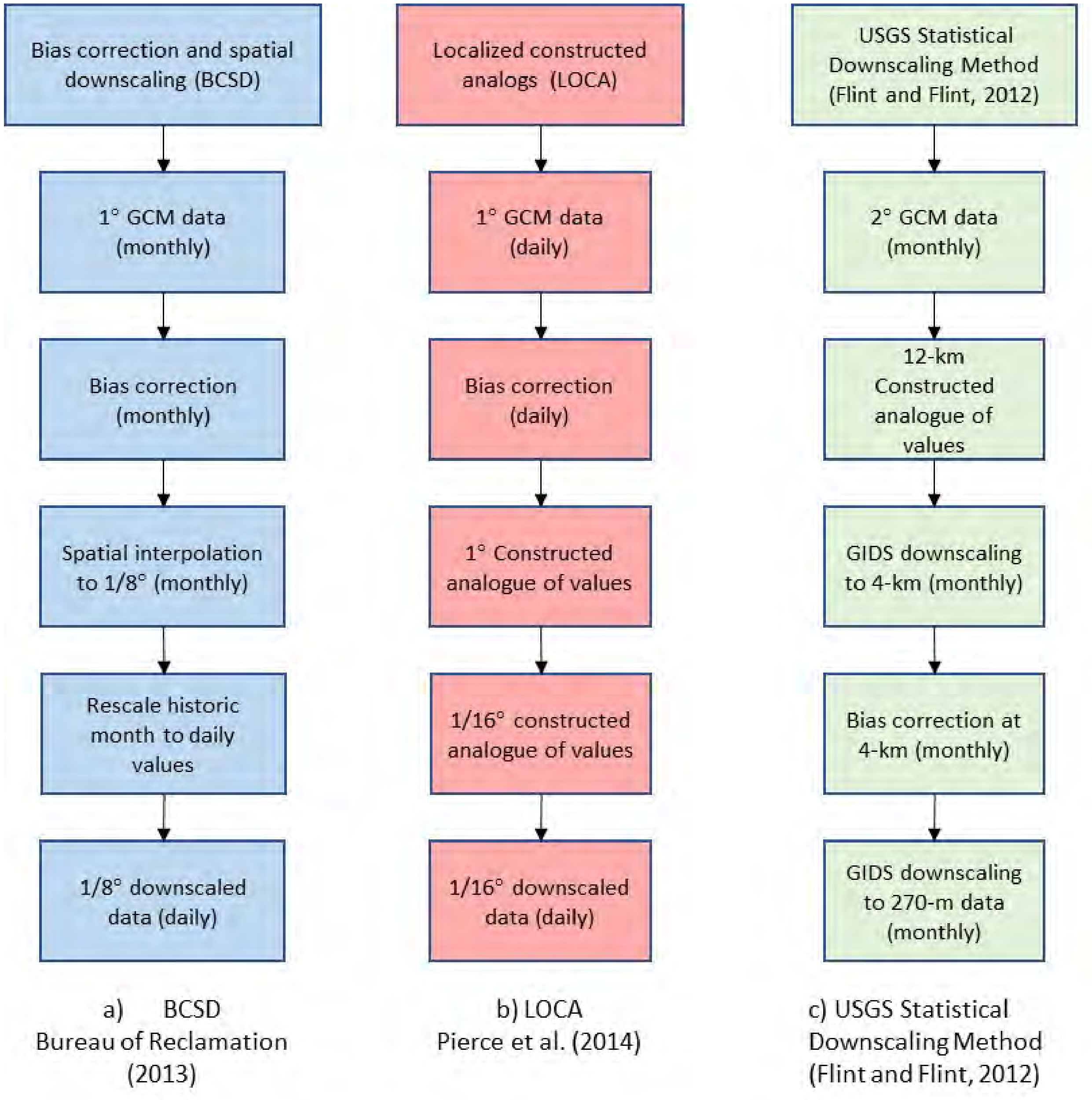


Figure A-12. Different Processing Sequences of BCSD, LOCA, and USGS Downscaling

A.4 Development of DWR-Provided Climate Change Analysis Data

DWR has been at the forefront of developing methods to analyze effects of climate change in California. As climate change science continues to evolve rapidly, DWR has developed methodologies to apply this new and changing information in California water resources planning. With several parallel programs needing to analyze climate change from different perspectives, and to meet the need for consistency across these planning efforts, DWR established the DWR CCTAG in 2012. The CCTAG was empaneled in February 2012 to advise DWR on the scientific aspects of climate change, its impact on water resources, and associated tools for water resources planning. The CCTAG was comprised of scientists, engineers, practitioners, and other water resources experts and was focused on providing guidance on climate data and analysis methods that are best-suited for California. CCTAG members worked collaboratively for

3 years to develop different alternatives for scenarios and approaches in a changing climate before publishing *Perspectives and Guidance for Climate Change Analysis* (Perspectives Document) (CCTAG, 2015). The Perspectives Document consolidates the CCTAG's guidance and perspectives, including its interpretation of scientific information produced by the National Climate Assessment and the Fifth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) (IPCC, 2014).

California's recent and most significant effort toward sustainable management of the State's most vulnerable groundwater resources came through passage and implementation of SGMA. The GSP regulations that were developed by DWR require GSAs to incorporate climate change analysis in their GSPs to assess projected water availability and groundwater conditions through a 50-year planning period. CCTAG recommendations are both supportive of and considered in SGMA-required products.

A.4.1 Projected Climate Scenario Development

The following section discusses the methods and assumptions implemented by DWR to develop 2030 (i.e., near-future climate conditions) and 2070 (i.e., late-future climate conditions) climate change scenarios using various techniques and data available from global circulation models (GCMs).

A.4.1.1 Selection of Emission Scenarios and GCMs

As described in the *Water Storage Investment Program Technical Reference Document* (and its Appendix B), 10 GCMs were selected by the CCTAG as the most appropriate projections for water resources planning and analysis in the state of California. Climate change projections are made primarily on the basis of coupled atmosphere-ocean general circulation model simulations under a range of future emission scenarios. Climate projections used in this climate change analysis are based on climate model simulations from CMIP5. The 10 GCMs selected are combined with two emission scenarios, one optimistic (representative concentration pathway [RCP] 4.5) and one pessimistic (RCP 8.5), as identified by the Intergovernmental Panel on Climate Change (IPCC) for the Fifth Assessment Report (AR5) (IPCC, 2014) for 20 projections that apply to California. Table A-1 presents the 10 GCMs and associated RCPs used to develop ensemble climate projection scenarios for the WSIP.

Table A-1. Climate Model and RCP Combinations Used During Analysis

Model Name	Emissions Scenarios (RCPs) Used
ACCESS-1.0	4.5, 8.5
CanESM2	4.5, 8.5
CCSM4	4.5, 8.5
CESM1-BGC	4.5, 8.5
CMCC-CMS	4.5, 8.5
CNRM-CM5	4.5, 8.5
GFDL-CM3	4.5, 8.5
HadGEM2-CC	4.5, 8.5
HadGEM2-ES	4.5, 8.5
MIROC5	4.5, 8.5

A.4.1.2 Development of Future Climate Sequence

Development of a future climate scenario requires construction of a future climate sequence based on data obtained from the applied downscaling technique. For SGMA planning purposes, climate period analysis is most appropriate and recommended as an application for groundwater modeling with climate change.

To develop the climate scenarios, a technique called quantile mapping is applied, where cumulative distribution functions were produced for monthly temperature and monthly precipitation for the reference historical period (from 1981 to 2010) and each of the future climate periods (from 2016 to 2045 and from 2056 to 2085) for the ensemble of the 20 climate projections at each grid cell across the state. For further details on quantile mapping refer to the WSIP *Technical Reference Document* Appendix A (California Water Commission, 2017).

A.4.2 Projected Changes in California Climate Conditions

Based on the developed climate change scenarios, variations in average air temperature and precipitation at the year 2030 and at 2070 for the nine hydrologic regions of California as compared to 1995 historical data are presented in Figures A-13 and A-14, respectively.

On average, statewide precipitation is projected to increase by 2.9 percent at year 2030, and increase by 5.3 percent at year 2070. Temperature is predicted to increase by 2.4°F on average statewide at year 2030, and increase by 5.4°F at 2070. Figures A-13 and A-14 show that the impacts of climate change are projected to be variable across the state with some areas getting wetter and some getting drier. All areas are projected to experience warming, but the degree of warming varies significantly by hydrologic region.

Figures A-13 and A-14 show that, at both the 2030 and 2070 projected climate conditions, the northern and central regions of California are expected to experience an increase in precipitation, as compared with the southern region. The southernmost regions of California (i.e., along the south coast and Colorado River) may experience much drier periods with decreasing precipitation overall. Air temperature trends for southern California are projected to be larger than those in northern or central California under both 2030 and 2070 future conditions, as compared to 1995 base historical conditions. This increase in air temperature means there could be more snowmelt (and potentially earlier snowmelt) and less snowpack in California in the future.

A.4.3 Simulating California Hydrology and Operations under Climate Change

A.4.3.1 Rainfall-Runoff Modeling

As a macro-scale model, variable infiltration capacity (VIC) modeling is well suited for incorporating climate data from downscaled GCM data to simulate statewide hydrologic responses to climate conditions. VIC modeling has been used for numerous DWR studies due to the availability of model inputs and the spatial coverage of the model, which allows for assessing hydrologic conditions throughout the State. The VIC model has also been applied to many major basins in the United States, including large scale applications to the following:

- California's Central Valley (Liang et al., 1994; Maurer et al., 2002, 2007; Maurer, 2007; Hamlet and Lettenmaier, 2007; Barnett et al., 2008; Cayan et al., 2009; Raff et al., 2009; Dettinger et al., 2011a, 2011b; Das et al., 2011a, 2013; DWR, 2014; Bureau of Reclamation [Reclamation], 2014)
- Colorado River Basin (Christensen and Lettenmaier, 2007; Das et al., 2011b; Vano and Lettenmaier, 2014; Vano et al., 2012, 2014)
- Columbia River Basin (Hamlet and Lettenmaier, 1999; Hamlet et al., 2007)
- Several other basins (Maurer and Lettenmaier, 2003; CH2M HILL, 2008; Livneh et al., 2013)

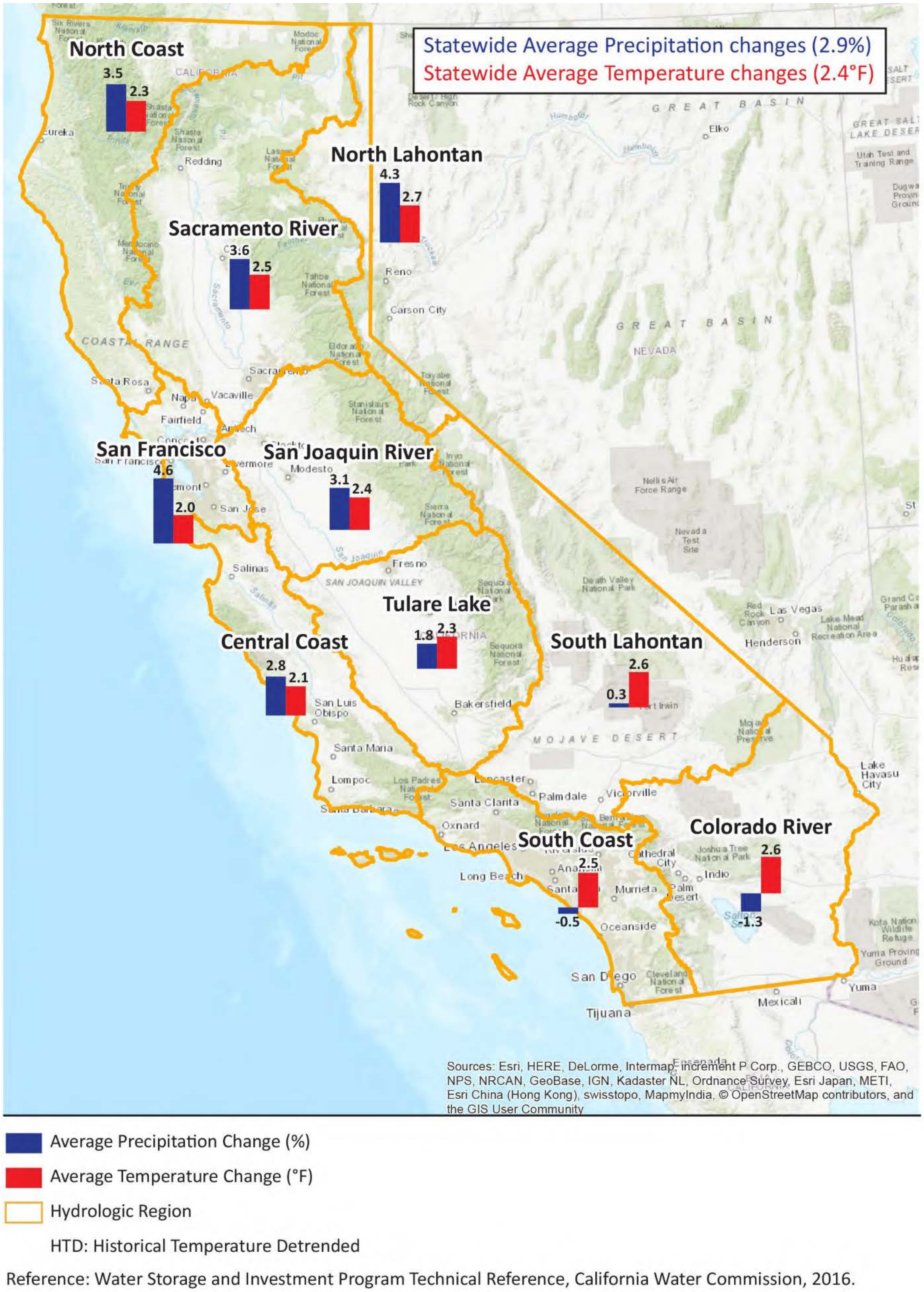
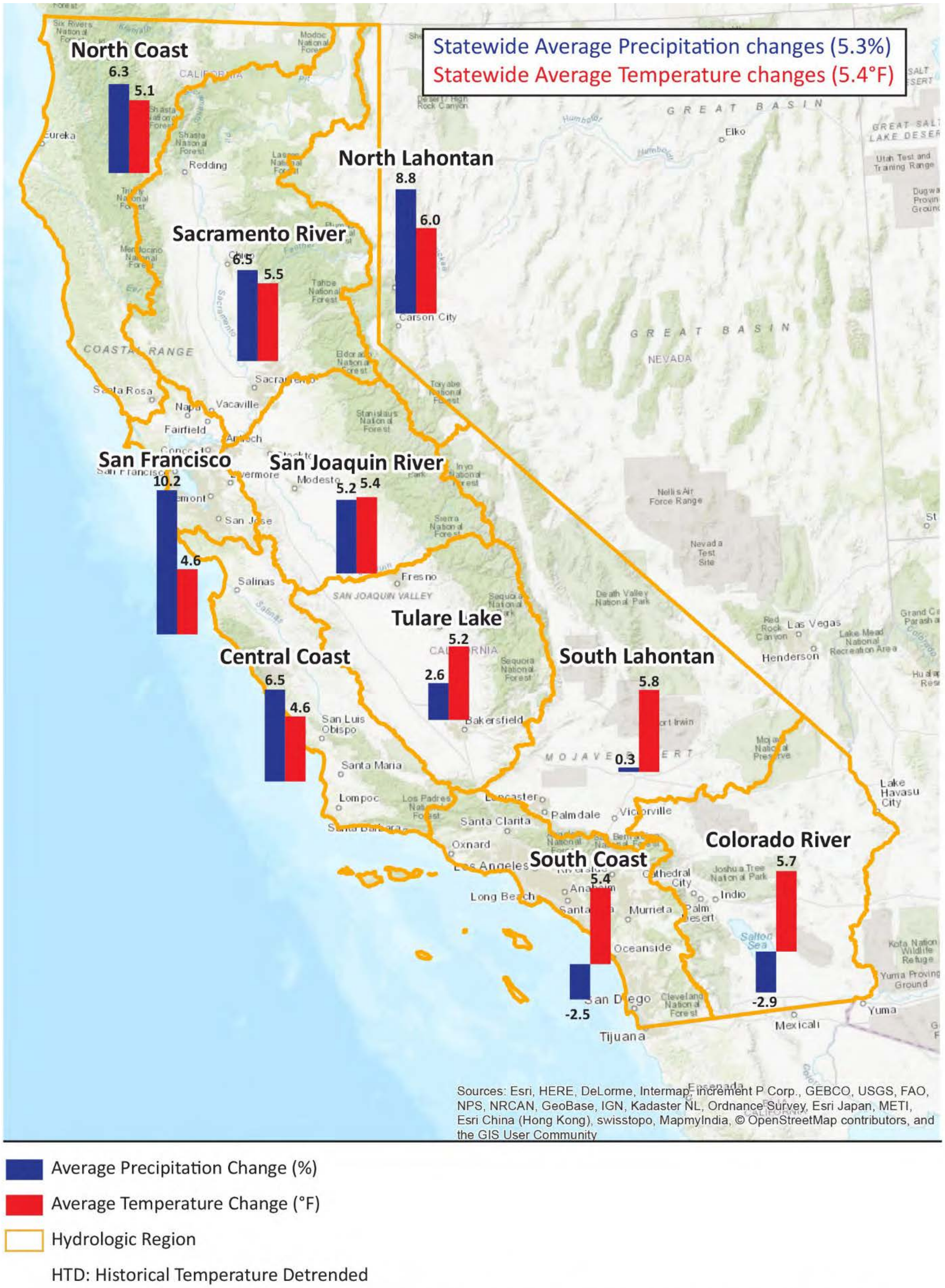


Figure A-13. Projected Changes in Climate Conditions for 2030
Source: California Water Commission, 2016



Reference: Water Storage and Investment Program Technical Reference, California Water Commission, 2016.

Figure A-14. Projected Changes in Climate Conditions for 2070
Source: California Water Commission, 2016

A.4.3.2 Water Operations Modeling

The hydrology of the Central Valley and operation of the Central Valley Project (CVP) and State Water Project (SWP) systems are critical elements in any assessment of changed conditions throughout the Central Valley and in the Delta, such as for future water supply planning under projected climate change conditions. Changes to system characteristics, such as flow patterns, demands, regulations, and Delta configuration will influence the operation of the CVP and SWP reservoirs and export facilities. The operation of these facilities, in turn, influence Delta flows, water quality, river flows, and reservoir storage. The interaction between hydrology, operations, and regulations is not always intuitive, and detailed analysis of this interaction often results in a new understanding of system responses. Modeling tools are required to approximate these complex interactions under projected conditions. CalSim II is a planning model developed by DWR and Reclamation. It simulates the CVP and SWP and areas tributary to the Delta. CalSim II provides quantitative hydrologic-based information to those responsible for planning, managing, and operating the CVP and SWP. As the official model of those projects, CalSim II is typically the system model used for interregional or statewide analysis in California.

CalSim II model simulations based on the SGMP recommended projected hydrologic conditions for 2030 and 2070 timeframes provide potential SWP and CVP operations under climate change conditions, to assess projected water supply changes through the simulated facilities (i.e., reservoirs, canals) under projected climate change conditions.

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Appendix B
Reservoir and Local Inflows,
CalSim II Output Data,
and CVP/SWP Contractor Deliveries

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APPENDIX B

Purpose and Scope

The following appendix provides information regarding CalSim II input and output data provided by the California Department of Water Resources (DWR) for use as part of Sustainable Groundwater Management Act (SGMA) requirements. These datasets represent surface water conditions under 2030 and 2070 projected conditions based on CalSim II model simulations as developed under the California Water Commission's (CWC's) Water Storage Investment Program (WSIP). Time series data corresponding with the information presented in this appendix are available for download via the SGMA Data Viewer.[1] Information presented here provides Groundwater Sustainability Agencies (GSAs) with various water budget components that depend on State Water Project (SWP) and Central Valley Project (CVP) operations under projected future hydrologic conditions. According to the requirements of SGMA, GSAs would incorporate these data into a groundwater model or water budget calculation to assess water budgets under the effects of climate change.

This appendix presents information pertaining to the following datasets:

- Reservoir Inflows and Local Tributary Inflows
- CalSim II Output Data
- SWP Contractor Deliveries
- CVP Contractor Deliveries

B.1 Reservoir Inflows and Local Tributary Inflows

Various reservoir and local tributary inflows have been compiled from the 2030 and 2070 CalSim II model simulations to assist GSAs in development of groundwater sustainability plans (GSPs). Table B-1 presents the locations for reservoir inflows and local tributary inflows that have been produced and the associated CalSim II variable name, where applicable.

Table B-1. List of Reservoir and Local Inflow Data

Description	CalSim II Variable Name
Reservoir Inflows	
Sacramento River Inflow to Shasta Dam	I4
Cosumnes River at Michigan Bar	I501
American River Inflow to Folsom Dam	I300 + I8
Merced River Inflow to Lake McClure	I20
San Joaquin River Inflow to Millerton Lake	I18_SJR + I18_FG
Calaveras River Inflow to New Hogan Lake	I92
Feather River Inflow to Lake Oroville	I6
Trinity River Inflow to Trinity Reservoir	I1
Tuolumne River Inflow to Don Pedro Reservoir	I81
Stanislaus River Inflow to New Melones Lake	I10

[1] https://sgma.water.ca.gov/webgis/?appid=SGMADataViewer

Table B-1. List of Reservoir and Local Inflow Data

Description	CalSim II Variable Name
Yuba River at Smartville	I230
Kings River Inflow to Pine Flat Reservoir	N/A
Kaweah River Inflow to Kaweah Lake	N/A
Local Tributary Inflows	
Butte Creek Local Inflow	I217
Stony Creek Inflow to Black Butte Lake	I42
Cow Creek Local Inflow	I10801
Cottonwood Creek local inflow	I10802
Thomes Creek Local Inflow	I11304
Deer Creek Local Inflow	I11309
Bear River Local Inflow	I285
Fresno River Inflow to Lake Hensley	I52
Inflow to Whiskeytown Lake	I3
Paynes Creek Local Inflow	I11001
Antelope Creek Local Inflow	I11307
Mill Creek Local Inflow	I11308
Elder Creek Local Inflow	I11303
Big Chico Creek Local Inflow	I11501
Stony Creek Inflow to East Park Reservoir	I40
Stony Creek Inflow to Stony Gorge Reservoir	I41
Kelly Ridge Tunnel/Powerhouse	I200
Red Bank Creek Local Inflow	I112
Lewiston Inflow	I100
Chowchilla River Inflow to Eastman Lake	I53

B.2 CalSim II Output Data

Various CalSim II outputs have been compiled from the 2030 and 2070 CalSim II model simulations. Table B-2 presents a compiled list of locations of reservoir outflows, streamflow, and river channel diversions and the associated CalSim II variable name.

Table B-2. List of Reservoir Outflows, River Channel Streamflow, and River Channel Diversions

Description	CalSim II Variable Name
Reservoir Outflows	
Millerton Lake Outflow	C18
Hensley Lake Outflow	C52
Eastman Lake Outflow	C53
Lake McClure Outflow	C20
New Don Pedro Reservoir Outflow	C81
New Melones Reservoir Outflow	C10
New Hogan Reservoir Outflow	C92
Lake Oroville Outflow	C6
Shasta Lake Outflow	C4
Lewiston Lake Outflow	C100
River Channel Streamflow	
Stanislaus River at Goodwin	C520
American River below Nimbus Dam	C9
Sacramento River below Keswick Dam	C5
San Joaquin River below Gravelly Ford	C603
San Joaquin River below Salt Slough	C614
Merced River near Stevinson	C566
Tuolumne River U/S of San Joaquin Confluence	C545
San Joaquin River below Merced River Confluence	C620
San Joaquin River below Tuolumne River Confluence	C630
Stanislaus River near Ripon	C528
Calaveras River Inflow to Delta	C508
American River at Sacramento River Confluence	C303
Sacramento River at Freeport	C169
Feather River below Thermalito Diversion Dam	C203
Delta Outflow	C407
Feather River near Nicolaus	C223
Sacramento River at Red Bluff	C112
Sacramento River at Knights Landing	C134
Sacramento River at Wilkins Slough	C129
Sacramento River at Verona	C160

Table B-2. List of Reservoir Outflows, River Channel Streamflow, and River Channel Diversions

Description	CalSim II Variable Name
San Joaquin River at Vernalis	C639
Clear Creek Tunnel	C3
San Joaquin River below Mendota Pool	C607
River Channel Diversions	
Sacramento River at Red Bluff	D112
Glenn Colusa Canal	D114
Friant-Kern Canal Diversion	D18
Feather River below Thermalito Diversion Dam	C203
Black Butte Outflow	C42

B.3 SWP Contractor Deliveries

SWP contractor delivery data for 2030 and 2070 projected conditions have been compiled for various contractors as represented in the CalSim II model. Table B-3 lists SWP contractors, the associated delivery type, and the associated CalSim II delivery variable name for that contractor. For more information about SWP deliveries and contractor information, refer to the *SWP Delivery Capability Report*.[2]

Table B-3. List of SWP Contractors, Delivery Type, and Associated CalSim II Variable Name

Contractor	Delivery Type	CalSim II Variable Name
Feather River		
Western Canal	FRSA Contractor Delivery	D7A_PAG
Joint Board Canal	FRSA Contractor Delivery	D7B_PAG
Feather WD	FRSA Contractor Delivery	D206A_PAG
Butte County	Table A	SWP_TA_BUTTE
Yuba City	Table A	SWP_TA_YUBA
North Bay		
Napa County FC & WCD	Table A	SWP_TA_NAPA
Solano County WA	Table A	SWP_TA_SOLANO
Napa County FC & WCD	Article 21	SWP_IN_NAPA
South Bay		
Alameda County FC & WCD, Zone 7	Table A & Carryover	SWP_TA_ACFC + SWP_CO_ACFC
Alameda County WD	Table A	SWP_TA_ACWD

[2] http://baydeltaoffice.water.ca.gov/swpreliability/

Table B-3. List of SWP Contractors, Delivery Type, and Associated CalSim II Variable Name

Contractor	Delivery Type	CalSim II Variable Name
Santa Clara Valley WD	Table A	SWP_TA_SCV
Alameda County FC & WCD, Zone 7	Article 21	SWP_IN_ACFC
Alameda County WD	Article 21	SWP_IN_ACWD
Santa Clara Valley WD	Article 21	SWP_IN_SCV
San Joaquin Valley		
Oak Flat WD	Table A	SWP_TA_OAK
Kings County	Table A	SWP_TA_KINGS
Dudley Ridge WD	Table A	SWP_TA_DUDLEY
Empire West Side ID	Table A	SWP_TA_EMPIRE
Kern County WA	Table A	SWP_TA_KERNAG + SWP_TA_KERNMI
Tulare Lake Basin WSD	Table A	SWP_TA_TULARE
Dudley Ridge WD	Article 21	SWP_IN_DUDLEY
Empire West Side ID	Article 21	SWP_IN_EMPIRE
Kern County WA	Article 21	SWP_IN_KERN
Tulare Lake Basin WSD	Article 21	SWP_IN_TULARE
Central Coast		
San Luis Obispo County FC & WCD	Table A	SWP_TA_SLO
Santa Barbara County FC & WD	Table A	SWP_TA_SB
Southern California		
Castaic Lake WA	Table A	SWP_TA_CLWA1 + SWP_TA_CLWA2
Metropolitan WDSC	Table A & Carryover	SWP_TA_MWD + SWP_CO_MWD
San Bernardino Valley MWD	Table A & Carryover	SWP_TA_SBV + SWP_CO_SBV
San Gabriel Valley MWD	Table A	SWP_TA_SGV
San Gorgonio Pass WA	Table A	SWP_TA_SGP
Ventura County FCD	Table A	SWP_TA_VC
Antelope Valley-East Kern WA	Table A	SWP_TA_AVEK
Coachella Valley WD	Table A & Carryover	SWP_TA_CVWD + SWP_CO_CVWD
Crestline-Line Arrowhead WA	Table A	SWP_TA_CLA
Desert WA	Table A & Carryover	SWP_TA_DESERT + SWP_CO_DESERT
Littlerock Creek ID	Table A	SWP_TA_LCID
Mojave WA	Table A	SWP_TA_MWA
Palmdale WD	Table A	SWP_TA_PWD

Table B-3. List of SWP Contractors, Delivery Type, and Associated CalSim II Variable Name

Contractor	Delivery Type	CalSim II Variable Name
Castaic Lake WA	Article 21	SWP_IN_CLWA1
Metropolitan WD of Southern California	Article 21	SWP_IN_MWD
Antelope Valley-East Kern WA	Article 21	SWP_IN_AVEK
Coachella Valley WD	Article 21	SWP_IN_CVWD
Desert WA	Article 21	SWP_IN_DESERT

FC & WCD = flood control and water conservation district

FCD = flood control district

FRSA = Feather River Service Area

ID = irrigation district (ID)

MWD = municipal water district

WA = water agency

WD = water district

Feather River Service Area (FRSA) contractors are grouped into one CalSim II variable. Table B-4 presents the contractors that fall under the FRSA contractor delivery, the associated CalSim II variable name, the annual contract amount, and a ratio that was calculated and applied to the CalSim II time series data. The ratio was calculated as the annual contract amount divided by the total contract amount to determine how to split the CalSim II time series amongst each contractor.

Table B-4. Feather River SWP Contractor Deliveries that Require Disaggregation from CalSim II Variable

Contractor	Delivery Type	CalSim II Variable Name	Annual Contract Amount (AF/year)[a]	Ratio Applied to Timeseries Data
Feather River				
Garden	FRSA Contractor Delivery	D206B_PAG	12.87	0.20
Oswald	FRSA Contractor Delivery	D206B_PAG	2.85	0.04
Joint Board	FRSA Contractor Delivery	D206B_PAG	50	0.76
Plumas	FRSA Contractor Delivery	D206C_PAG	8	0.61
Tudor	FRSA Contractor Delivery	D206C_PAG	5.09	0.39

Notes

[a] Annual Contract Amounts Listed as Modeled in CalSim II

AF =- acre feet

B.4 CVP Contractor Deliveries

CVP contractor delivery information was adapted from the *Coordinated Long-Term Operation of the CVP SWP Environmental Impact Statement*'s Appendix 5A.[3] The information presented here corresponds to the CVP delivery timeseries data available for use under SGMA through the SGMA Data Viewer.[4]

Table B-5 presents the North of Delta CVP contractors, Table B-6 presents American River CVP contractors, Table B-7 presents South of Delta CVP contractors, and Table B-8 presents Sacramento River miscellaneous users. Each table contains the contractor geographic location, CalSim II diversion variable name and service area region, and the contract amount by contract type (i.e., CVP, Settlement/Exchange, or Level 2 Refuges).

Annual contract limits are presented by CVP contractor and contract type (i.e., CVP, Settlement/Exchange, or Refuges). Representation of the deliveries corresponding to these contracts may be aggregated in a way that represents the delivery to multiple contractors. Because of this, annual contract limits can be used to distribute CalSim II data among CVP contractors by using a fraction of annual contract amount per contractor divided by the total annual contract amount.

Table B-5. CVP North-of-the-Delta—Future Conditions

CVP Contractor	Geographic Location	CalSim II Variable Name		CVP Water Service Contracts (TAF/year)		Settlement/ Exchange Contractor (TAF/year)	Level 2 Refuges[a] (TAF/year)
		Diversion	Region	Ag	M&I		
Anderson Cottonwood ID	Sacramento River Redding Subbasin	D104_PSC	DSA 58			128.0	
Clear Creek CSD		D104_PAG	DSA 58	13.8			
		D104_PMI			1.5		
Bella Vista WD		D104_PAG	DSA 58	22.1			
		D104_PMI			2.4		
Shasta CSD		D104_PMI	DSA 58		1.0		
Sac R. Misc. Users		D104_PSC	DSA 58			3.4	
Redding, City of		D104_PSC	DSA 58			21.0	
City of Shasta Lake		D104_PAG	DSA 58	2.5			
		D104_PMI			0.3		
Mountain Gate CSD		D104_PMI	DSA 58		0.4		
Shasta County Water Agency		D104_PAG	DSA 58	0.5			
		D104_PMI			0.5		
Redding, City of/Buckeye		D104_PMI	DSA 58		6.1		
Total				**38.9**	**12.2**	**152.4**	**0.0**
Corning WD	Corning Canal	D171_AG	WBA 4	23.0			
Proberta WD		D171_AG	WBA 4	3.5			
Thomes Creek WD		D171_AG	WBA 4	6.4			
Total				**32.9**	**0.0**	**0.0**	**0.0**

3 https://www.usbr.gov/mp/nepa/nepa_project_details.php?project_id=21883

4 https://sgma.water.ca.gov/webgis/?appid=SGMADataViewer

Table B-5. CVP North-of-the-Delta—Future Conditions

CVP Contractor	Geographic Location	CalSim II Variable Name: Diversion	CalSim II Variable Name: Region	CVP Water Service Contracts (TAF/year): Ag	CVP Water Service Contracts (TAF/year): M&I	Settlement/ Exchange Contractor (TAF/year)	Level 2 Refuges[a] (TAF/year)
Kirkwood WD	Tehama-Colusa Canal [a]	D172_AG	WBA 4	2.1			
Glide WD		D174_AG	WBA 7N	10.5			
Kanawha WD		D174_AG	WBA 7N	45.0			
Orland-Artois WD		D174_AG	WBA 7N	53.0			
Colusa, County of		D178_AG	WBA 7S	20.0			
Colusa County WD		D178_AG	WBA 7S	62.2			
Davis WD		D178_AG	WBA 7S	4.0			
Dunnigan WD		D178_AG	WBA 7S	19.0			
La Grande WD		D178_AG	WBA 7S	5.0			
Westside WD		D178_AG	WBA 7S	65.0			
			Total	**285.8**	**0.0**	**0.0**	**0.0**
Sac. R. Misc. Users [b]	Sacramento River	D113A	WBA 4			1.5	
Glenn Colusa ID	Glenn-Colusa Canal	D143A_PSC	WBA 8NN			441.5	
		D145A_PSC	WBA 8NS			383.5	
Sacramento NWR		D143B_PRF	WBA 8NN				53.4
Delevan NWR		D145B_PRF	WBA 8NS				24.0
Colusa NWR		D145B_PRF	WBA 8NS				28.8
Colusa Drain MWC	Colusa Basin Drain	D180_PSC	WBA 8NN			7.7	
		D182A+D18302	WBA 8NS			62.3	
			Total	**0.0**	**0.0**	**895.0**	**106.2**
Princeton-Cordova-Glenn ID	Sacramento River	D122A_PSC	WBA 8NN			67.8	
Provident ID		D122A_PSC	WBA 8NN			54.7	
Maxwell ID		D122A_PSC	WBA 8NN			1.8	
		D122B_PSC	WBA 8NS			16.2	
Sycamore Family Trust		D122B_PSC	WBA 8NS			31.8	
Roberts Ditch IC		D122B_PSC	WBA 8NS			4.4	
Sac R. Misc. Users [b]		D122A_PSC	WBA 8NN			4.9	
		D122B_PSC	WBA 8NS			9.5	
			Total	**0.0**	**0.0**	**191.2**	**0.0**
Reclamation District 108	Sacramento River	D122B_PSC	WBA 8NS			12.9	
		D129A_PSC	WBA 8S			219.1	
River Garden Farms		D129A_PSC	WBA 8S			29.8	
Meridian Farms WC		D128_PSC	DSA 15			35.0	
Pelger Mutual WC		D128_PSC	DSA 15			8.9	
Reclamation District 1004		D128_PSC	DSA 15			71.4	
Carter MWC		D128_PSC	DSA 15			4.7	
Sutter MWC		D128_PSC	DSA 15			226.0	

Table B-5. CVP North-of-the-Delta—Future Conditions

CVP Contractor	Geographic Location	CalSim II Variable Name		CVP Water Service Contracts (TAF/year)		Settlement/ Exchange Contractor (TAF/year)	Level 2 Refuges[a] (TAF/year)
		Diversion	Region	Ag	M&I		
Tisdale Irrigation & Drainage Company		D128_PSC	DSA 15			9.9	
Sac R. Misc. Users [b]		D128_PSC	DSA 15			103.4	
		D129A_PSC	WBA 8S			0.9	
			Total	**0.0**	**0.0**	**722.1**	**0.0**
Sutter NWR	Sutter Bypass Water for Sutter NWR	C136B	DSA 69				25.9
Gray Lodge WMA	Feather River	C216B	DSA 69				41.4
Butte Sink Duck Clubs		C221	DSA 69				15.9
			Total	**0.0**	**0.0**	**0.0**	**83.2**
Sac. R. Misc. Users [b]	Sacramento River	D163_PSC	DSA 65			56.8	
City of West Sacramento		D165_PSC	DSA 65			23.6	
			Total	**0.0**	**0.0**	**80.4**	**0.0**
Sac R. Misc. Users	Lower Sacramento River	D162A_PSC	DSA 70			4.8	
Natomas Central MWC		D162B_PSC	DSA 70			120.2	
Pleasant Grove-Verona MWC		D162C_PSC	DSA 70			26.3	
			Total	**0.0**	**0.0**	**151.3**	
			Total CVP North-of-Delta	**357.6**	**12.2**	**2193.8**	**189.4**

Notes:

[a] Level 4 Refuge water needs are not included.

[b] Refer to Sac Misc. Users Table for a Breakdown by DSA and River Mile

Ag = agricultural

CSD = community services district

ID = irrigation district

M&I = municipal and industrial

MWC = mutual water company

NWR = national wildlife refuge

TAF = thousand acre-feet

WC = water company

WD = water district

WMA = wildlife management area

Table B-6. CVP for American River—Future Conditions

CVP Contractor	CalSim II Variable Name	CVP Water Service Contracts (TAF/year) M&I[a]
City of Folsom (includes P.L. 101-514)	D8B_PMI	7.0
San Juan Water District (Sac County) (includes P.L. 101-514)	D8E_PMI	24.2
El Dorado Irrigation District	D8F_PMI	7.55
City of Roseville	D8G_PMI	32.0
Placer County Water Agency	D8H_PMI	35.0
El Dorado County (P.L. 101-514)	D8I_PMI	15.0
	Total	**120.8**
California Parks and Recreation	D9AB_PMI	5.0
SMUD (export)	D9B_PMI	30.0
	Total	**35.0**
Sacramento County Water Agency (including SMUD transfer)	D167B_PMI	10.0
	D168C_FRWP_PMI	20.0
Sacramento County Water Agency (P.L. 101-514)	D168C_FRWP_PMI	15.0
Sacramento County Water Agency - assumed Appropriated Water[a]	D168C_FRWP_PMI	
EBMUD (export)[b]	D168B_EBMUD	133.0
	Total	**178.0**
	Total CVP for American River	**333.8**

Notes:

[a] SCWA targets 68 TAF of surface water supplies annually. The portion unmet by CVP contract water is assumed to come from two sources:

1) Delta "excess" water- averages 16.5 TAF annually, but varies according to availability. SCWA is assumed to divert excess flow when it is available, and when there is available pumping capacity.

2) "Other" water- derived from transfers and/or other appropriated water, averaging 14.8 TAF annually but varying according remaining unmet demand.

[b] EBMUD CVP diversions are governed by the Amendatory Contract, stipulating:

1) 133 TAF maximum diversion in any given year

2) 165 TAF maximum diversion amount over any 3 year period

3) Diversions allowed only when EBMUD total storage drops below 500 TAF

4) 155 cfs maximum diversion rate

EBMUD = East Bay Municipal Utilities District

M&I = municipal and industrial

P.L. = Public Law

SMUD = Sacramento Municipal Utilities District

TAF = thousand acre-feet

Table B-7. CVP South-of-the-Delta—Future Conditions

CVP Contractor	Geographic Location	CalSim II Variable Name	CVP Water Service Contracts (TAF/year)		Exchange Contractor (TAF/year)	Level 2 Refuges[a] (TAF/year)
			Ag	M&I		
Byron-Bethany ID	Upper DMC	D700_AG	20.6			
Banta Carbona ID		D700_AG	20.0			
		Total	**40.6**	**0.0**	**0.0**	**0.0**
Del Puerto WD	Upper DMC	D701_AG	12.1			
Davis WD		D701_AG	5.4			
Foothill WD		D701_AG	10.8			
Hospital WD		D701_AG	34.1			
Kern Canon WD		D701_AG	7.7			
Mustang WD		D701_AG	14.7			
Orestimba WD		D701_AG	15.9			
Quinto WD		D701_AG	8.6			
Romero WD		D701_AG	5.2			
Salado WD		D701_AG	9.1			
Sunflower WD		D701_AG	16.6			
West Stanislaus WD		D701_AG	50.0			
Patterson WD		D701_AG	16.5			
		Total	**206.7**	**0.0**	**0.0**	**0.0**
Panoche WD	Lower DMC Volta	D706_PAG	6.6			
San Luis WD		D706_PAG	65.0			
Laguna WD		D706_PAG	0.8			
Eagle Field WD		D706_PAG	4.6			
Mercy Springs WD		D706_PAG	2.8			
Oro Loma WD		D706_PAG	4.6			
		Total	**84.4**	**0.0**	**0.0**	**0.0**
Central California ID	Lower DMC Volta	D707_PEX			140.0	
Grasslands via CCID		D708_PRF				81.8
Los Banos WMA		D708_PRF				11.2
Kesterson NWR	Lower DMC Volta	D708_PRF				10.5
Freitas - SJBAP		D708_PRF				6.3
Salt Slough - SJBAP		D708_PRF				8.6
China Island - SJBAP		D708_PRF				7.0
Volta WMA		D708_PRF				13.0
Grassland via Volta Wasteway		D708_PRF				23.2
		Total	**0.0**	**0.0**	**140.0**	**161.5**
Fresno Slough WD	San Joaquin River at Mendota Pool	D607A_PAG	4.0			
James ID		D607A_PAG	35.3			
Coelho Family Trust		D607A_PAG	2.1			
Tranquillity ID		D607A_PAG	13.8			
Tranquillity PUD		D607A_PAG	0.1			

Table B-7. CVP South-of-the-Delta—Future Conditions

CVP Contractor	Geographic Location	CalSim II Variable Name	CVP Water Service Contracts (TAF/year) Ag	CVP Water Service Contracts (TAF/year) M&I	Exchange Contractor (TAF/year)	Level 2 Refuges[a] (TAF/year)
Reclamation District 1606		D607A_PAG	0.2			
Central California ID		D607B_PEX			392.4	
Columbia Canal Company		D607B_PEX			59.0	
Firebaugh Canal Company		D607B_PEX			85.0	
San Luis Canal Company		D607B_PEX			23.6	
M.L. Dudley Company		D607B_PEX				
Grasslands WD		D607C_PRF				29.0
Mendota WMA		D607C_PRF				27.6
		Total	**55.5**	**0.0**	**560.0**	**56.6**
San Luis Canal Company		D608B_PRJ			140.0	
Grasslands WD		D608C_PRF				2.3
Los Banos WMA		D608C_PRF				12.4
San Luis NWR		D608C_PRF				19.5
West Bear Creek NWR		D608C_PRF				7.5
East Bear Creek NWR		D608C_PRF				8.9
		Total	**0.0**	**0.0**	**140.0**	**50.6**
San Benito County WD (Ag)	San Felipe	D710_AG	35.6			
Santa Clara Valley WD (Ag)	San Felipe	D710_AG	33.1			
Pajaro Valley WD	San Felipe	D710_AG	6.3			
San Benito County WD (M&I)	San Felipe	D711_PMI		8.3		
Santa Clara Valley WD (M&I)	San Felipe	D711_PMI		119.4		
		Total	**74.9**	**127.7**	**0.0**	**0.0**
San Luis WD	CA reach 3	D833_PAG	60.1			
CA, State Parks and Rec	CA reach 3	D833_PAG	2.3			
Affonso/Los Banos Gravel Company	CA reach 3	D833_PAG	0.3			
		Total	**62.6**	**0.0**	**0.0**	**0.0**
Panoche WD	CVP Dos Amigos PP/CA reach 4	D835_PAG	87.4			
Pacheco WD	CVP Dos Amigos PP/CA reach 4	D835_PAG	10.1			
		Total	**97.5**	**0.0**	**0.0**	**0.0**
Westlands WD (Centinella)	CA reach 4	D836_PAG	2.5			
Westlands WD (Broadview WD)	CA reach 4	D836_PAG	27.0			
Westlands WD (Mercy Springs WD)	CA reach 4	D836_PAG	4.2			
Westlands WD (Widern WD)	CA reach 4	D836_PAG	3.0			
		Total	**36.7**	**0.0**	**0.0**	**0.0**
Westlands WD: CA Joint Reach 4	CA reach 4	D837_PAG	219.0			
Westlands WD: CA Joint Reach 5	CA reach 5	D839_PAG	570.0			
Westlands WD: CA Joint Reach 6	CA reach 6	D841_PAG	219.0			
Westlands WD: CA Joint Reach 7	CA reach 7	D843_PAG	142.0			
		Total	**1150.0**	**0.0**	**0.0**	**0.0**

Table B-7. CVP South-of-the-Delta—Future Conditions

CVP Contractor	Geographic Location	CalSim II Variable Name	CVP Water Service Contracts (TAF/year)		Exchange Contractor (TAF/year)	Level 2 Refuges[a] (TAF/year)
			Ag	M&I		
Avenal, City of	CA reach 7	D844_PMI		3.5		
Coalinga, City of		D844_PMI		10.0		
Huron, City of		D844_PMI		3.0		
		Total	**0.0**	**16.5**	**0.0**	**0.0**
Cross Valley Canal - CVP	CA reach 14					
Fresno, County of		D855_PAG	3.0			
Hills Valley ID-Amendatory		D855_PAG	3.3			
Kern-Tulare WD		D855_PAG	40.0			
Lower Tule River ID		D855_PAG	31.1			
Pixley ID		D855_PAG	31.1			
Rag Gulch WD		D855_PAG	13.3			
Tri-Valley WD		D855_PAG	1.1			
Tulare, County of		D855_PAG	5.3			
Kern NWR		D856_PRJ				11.0
Pixley NWR		D856_PRJ				1.3
		Total	**128.3**	**0.0**	**0.0**	**12.3**
		Total CVP South-of-Delta	**1937.1**	**144.2**	**840.0**	**281.0**

Notes:

[a] Level 4 Refuge water needs are not included

Ag = agricultural

CA = California

CCID = Central California Irrigation District

DMC = Delta-Mendota Canal

ID = irrigation district

M&I = municipal and industrial

NWR = national wildlife refuge

PUD = public utility district

SJBAP = San Joaquin Basin Action Plan

TAF = thousand acre-feet

WD = water district

WMA = wildlife management area

Table B-8. Sacramento River Miscellaneous Users Breakdown by CalSim II Variable Name Location—Future Conditions

CalSim II Variable Name		Geographic Location		Supply Total (AF/year)
Diversion	**DSA**	**River Mile**	**Bank (Left, Right)**	
D104F	58	240.8	L	280
		240.3	L	20
		240.2	L	205
		221	R	780
		221	R	700
		207.5	L	820
		197	L	510
		196.6	L	100
		196.55	L	12
			Total	**3,427**
D113A	58	191.5	R	425
	10	168.85	R	780
		166.8	R	16
		156.8	R	180
		156.1	R	30
		155.6	R	40
		155.6	R	22
			Total	**1,493**
D122A	15	106	R	890
		106	R	880
		103.9	R	390
		103.7	R	180
		99.3	R	460
		93.15	R	2,070
			Total	**4,870**
D122B	15	89.2	R	19
		89.2	R	26
		88	R	35
		87.7	R	180
		83	R	1,310
		70.4	R	190
		70.4	R	210
		70.4	R	300
		69.2	R	30

Table B-8. Sacramento River Miscellaneous Users Breakdown by CalSim II Variable Name Location—Future Conditions

CalSim II Variable Name		Geographic Location		Supply Total (AF/year)
Diversion	DSA	River Mile	Bank (Left, Right)	
D122B	65	30.6	R	120
		29.7	R	3,640
		29.2, 30.3	R	430
		28.1	R	3,020
			Total	**9,510**
D128	15	140.8, 141.5	L	17,956
		104.8	L	730
		102.5	L	490
		99.8	L	2,285
		98.9	L	1,815
		98.6	L	1,560
		95.8	L	2,760
		95.6	L	6,260
		95.25	L	2,804
		92.5	L	164
		92.5	L	246
		89.26	L	36
		89.24	L	95
		88.7	L	204
		88.7	L	640
		88.7	L	76
		88.2	L	150
		86.8	L	380
		82.7	L	210
		82.5	L	450
		82.5	L	90
		81.5	L	2,700
		79.5	L	130
		79	L	65
		79	L	130
		79	L	75
		77.9	L	280
		76.2	L	85
		76.15	L	700
		72.1	L	3,620
		72	L	650

Table B-8. Sacramento River Miscellaneous Users Breakdown by CalSim II Variable Name Location—Future Conditions

CalSim II Variable Name		Geographic Location		Supply Total (AF/year)
Diversion	DSA	River Mile	Bank (Left, Right)	
		67.5	L	7,110
		67.1	L	237
D128	15	67.1	L	1,155
		63.9	L	3,200
		63.3	L	10
		62.3	L	820
		60.5, 61.8	L	460
		60.4	L	2,760
		59.8	L	1,000
		58.9	L	355
		58.3	L	417
		58.3	L	839
		57.75	L	520
		55.1	L	10,070
		53.9	L	325
		52.3	L	160
		52	L	136
		50	L	3,160
		49, 49.7	L	1,485
		49	L	584
		48.7	L	4,740
		46.5	L	935
		44.2, 45.6, 46.45	L	4,040
		38.8	L	200
		37.75	L	155
		37.2	L	170
		36.45	L	230
		36.45	L	16
		36.2	L	500
		36.2	L	1,610
		35.85	L	36
				870
				255
		33.75	L	560
		33.75	L	60
		33.75	L	1,470

Table B-8. Sacramento River Miscellaneous Users Breakdown by CalSim II Variable Name Location—Future Conditions

CalSim II Variable Name		Geographic Location		Supply Total (AF/year)
Diversion	DSA	River Mile	Bank (Left, Right)	
		33.2	L	2,780
		32.5, 33.2	L	920
		26.8, 30.5	L	1,255
			Total	**103,441**
D129A_PSC	65	33.85	R	104
		32.5	R	160
		32.5	R	160
		31.5	R	520
			Total	**944**
D162A_PSC	70	19.6	L	630
		18.7	L	300
		18.45	L	950
		18.2	L	490
		18.2	L	40
		18.2	L	350
		10.75	L	130
		10.75	L	95
		10.25	L	1,060
		9.3	L	750
			Total	**4,795**
D163	65	16.6, 17.0, 22.5	R	4,000
		16.1	R	630
		12	R	50,862
		11.1	R	370
		9.35	R	404
		5.25	R	500
			Total	**56,766**

AF = acre feet

DSA = depletion study area

Appendix C
Basin Average Streamflow Change Factor Method

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Introduction

This appendix provides further detail about the methodology used to develop streamflow change factors throughout the watersheds of the State of California. Additional discussion is provided to inform Groundwater Sustainability Agencies (GSAs) on how to implement provided data and the considerations required for incorporating streamflow change factors into a groundwater model or general water budget calculation.

Streamflow change factors are available for download from the Sustainable Groundwater Management Program (SGMP) Data Viewer.[1] Users can select individual hydrologic unit code (HUC) 8 watersheds that are of interest to their area and download the associated change factor data.

This appendix also discusses the following information to help GSAs implement streamflow change factor data:

- Methodology for developing streamflow change factors
- Comparison of streamflow change factor methods
- Resulting statewide change factor data
- Application of streamflow change factors and limitations of this methodology

Data Development Methodology

Background

Under the California Water Commission's Water Storage Investment Program (WSIP), the primary focus of climate change analysis and modeling efforts were on California's Central Valley through the application of the CalSim II model. The CalSim II model simulates Central Valley Project (CVP)/State Water Project (SWP) operations that operate within the Central Valley. For Groundwater Sustainability Plan (GSP) development, as required by the Sustainable Groundwater Management Act (SGMA), additional information needs to be developed for the groundwater basins that fall outside of the Central Valley and are unable to leverage streamflow information available from CalSim II. Using the statewide variable infiltration capacity (VIC) dataset, runoff and baseflow were aggregated for WSIP at the 8-digit HUC 8 level watersheds. The HUC 8 dataset was obtained through the U.S. Geological Survey (USGS) as a means of delineating watersheds throughout California.

The intent of the basin average streamflow change factors is to provide Groundwater Sustainability Agencies (GSAs) with a streamlined product that can be used to assess changes in streamflow conditions at the 2030 and 2070 timeframes for watersheds outside of the Central Valley. Many streams outside of the Central Valley, in remote areas, are not gaged and do not have sufficient resolution of streamflow records for appropriate calibration of the VIC model to accurately represent the hydrologic response of these watersheds. An additional limitation to using the VIC model for streamflow routing methods is due to the relatively coarse resolution of the VIC grids, which may not be able to accurately represent the physical characteristic and size of the watershed. Due to these limitations, an alternative method was devised to develop streamflow change factors that could be applied to tributaries within the HUC 8 watershed boundary.

[1] https://sgma.water.ca.gov/webgis/?appid=SGMADataViewer

2.1 Statewide HUC 8 Methodology

After downloading HUC 8 watershed data, geoprocessing techniques were used to develop streamflow change factors for select HUC 8 watersheds. HUC 8 watershed boundaries were overlaid with the VIC grid. Analysts performed a grid and a clip function to determine the contributing area of each VIC grid cell within each of the HUC 8 boundaries (Figure C-1). Area fractions for each VIC grid were then calculated as the clipped VIC grid area divided by the area of the full VIC grid cell. These area fractions were then used to calculate a weighted average runoff plus baseflow to produce an estimate of streamflow for each HUC 8 watershed. Weighted average runoff plus baseflow was calculated for the 1995 historical temperature detrended (1995 HTD), the 2030, and the 2070 climate scenarios as developed for the WSIP. Streamflow change factors were then calculated as a future climate scenario (2030, 2070) divided by the 1995 HTD scenario.

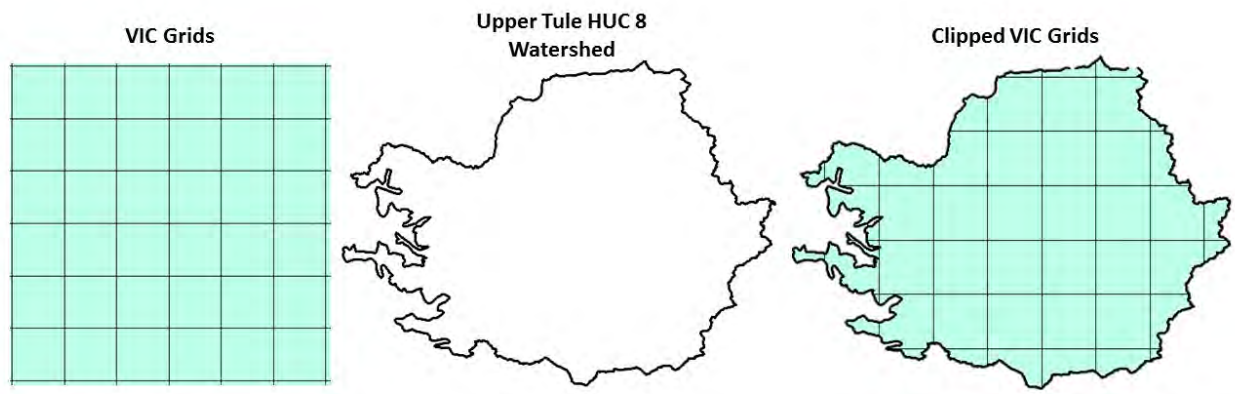

Figure C-1. Example of Clipping the VIC Grids to a HUC 8 Watershed Boundary

2.2 Comparison with VIC Routing Method

As a validation for the basin average streamflow change factor methodology, the basin average streamflow change factors for the Upper Tule Watershed were compared to streamflow change factors produced by the VIC routed streamflow method. Figure C-2 is a representation of the two methods compared for the Upper Tule watershed. Using the VIC routing model, streamflow was routed approximately to the location of the California Data Exchange Center (CDEC) station at Success Dam, with the watershed area roughly coinciding to the reported drainage area at the gaging station. The black/red points presented in Figure C-2 represent the VIC grid cells that contribute flow to the routed streamflow location based on VIC's representation of the watershed delineation.

Figure C-2. Map Comparing Application of VIC Routing Method and Basin Average Method for the Upper Tule Watershed

Table C-1 presents a comparison of results from the basin average method and the VIC routing method. When comparing results from the two methods, the difference in change factors statistics are within 10 percent. Based on these results, the methodology applied to calculate change factors for all HUC 8 watersheds is deemed appropriate for use in the other watersheds of the state.

Watershed delineation using the VIC routing model is limited by the resolution of the VIC grid cells and the associated physical parameterization that dictate watershed response. Delineation of neighboring watersheds needs to be considered as the VIC grid cell may overlap multiple watersheds and can cause calibration issues. Also presented in Figure C-6 are the clipped VIC grids for the Upper Tule watershed, as previously discussed, to estimate basin average streamflow change factors. Based on the delineation capabilities of the VIC routing model and the basin average method, the two methods can produce different estimates of the contributing area for that watershed. This result is likely due to the relative nature of the change factor calculation, where large differences may be observed in the absolute streamflow values between the two methods. Change factors represent the relative change in climate, and the hydrologic response, that is observed between the 1995 HTD climate scenario and the two future climate scenarios.

Table C-1. Comparison of Streamflow Change Factor Results from Basin Average and VIC Routing Methods

Change Factor/ Contributing Area	2030		2070	
	Basin Average Method	VIC Routing Method	Basin Average Method	VIC Routing Method
Monthly Minimum Change Factor	0.16	0.14	0.06	0.16
Monthly Maximum Change Factor	1.65	1.75	2.88	2.94
Monthly Average Change Factor	0.96	0.96	0.91	0.90
Contributing Area (Acres)	285,786	204,603	285,786	204,603

Figure C-3 presents a comparison of projected streamflow at Success Dam based on the basin average and VIC routing methods of calculating change factors. As discussed previously, small discrepancies have been observed when comparing change factor data from each method. When applying these change factors to the historical timeseries, the result produces projected streamflow conditions that are similar.

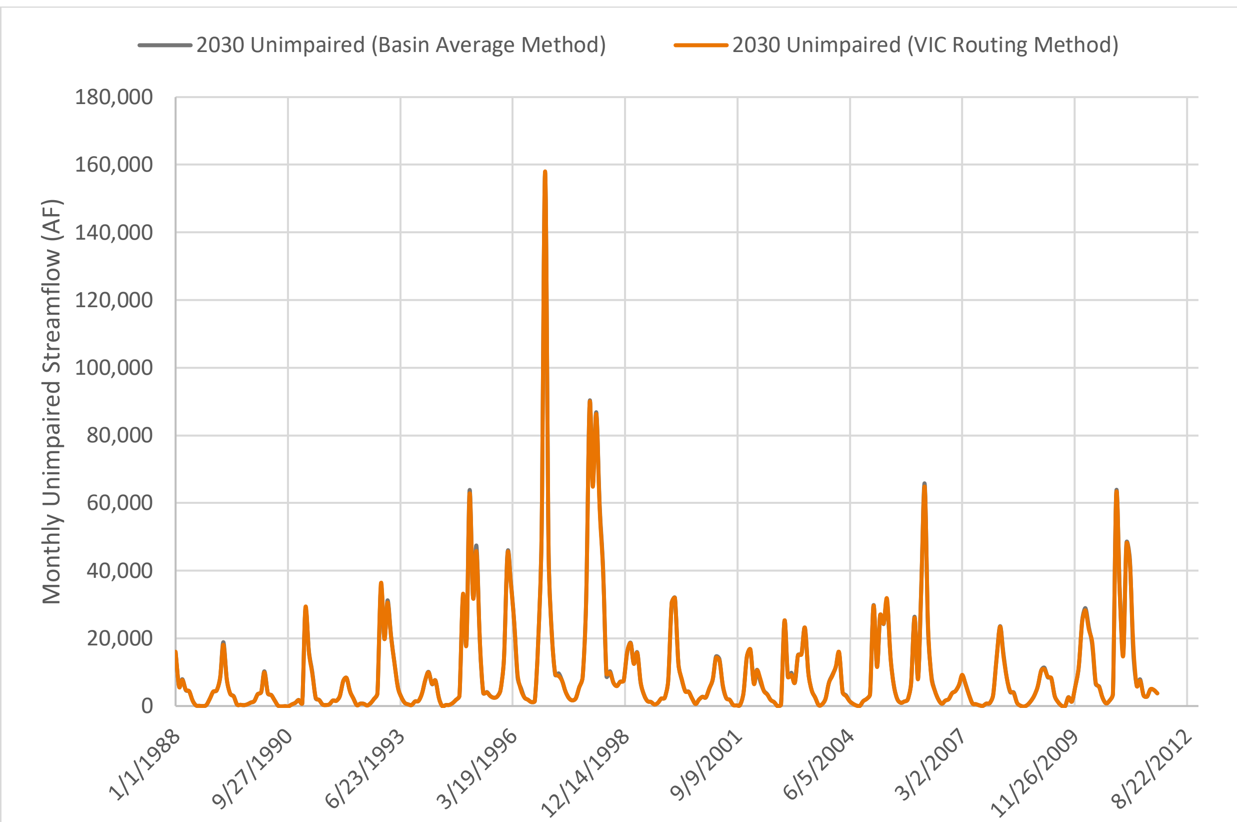

Figure C-3. Comparison of Projected Unimpaired Streamflow Using Change Factors from the Basin Average Method and the VIC Routing Method

Statewide Change Factor Results and Discussion

Streamflow change factor data were calculated for all HUC 8 watersheds in California for 2030 and 2070 future conditions. Statistics (i.e., monthly minimum, monthly maximum, and annual average) for each HUC 8 watershed were calculated to assess spatial trends of the change factor data throughout the state.

On an annual average basis, under 2030 future conditions (compared to 1995 HTD conditions), streamflow change factors in the South Coast, South Lahontan, and Tulare Lake regions show slight decreases (less than 4 percent) in some of the watersheds, and slight increases (less than 5 percent) in others (Figure C-4). All other regions show a less than 10 percent increase in streamflow with a few exceptions along the coast, where watersheds are experiencing up to an 11 percent increase in streamflow. Under 2070 conditions, annual average change in streamflow is larger with a decrease of 14 percent in the South Coast region (Figure C-5). Larger increases are observed in the San Francisco Bay and portions of the North Coast and Sacramento River regions (up to 27 percent). Otherwise, most of the North Coast and Sacramento River regions portray changes in streamflow that are less than 10 percent.

Table C-2 presents the range in monthly streamflow change factor values for 2030 and 2070 future conditions, summarized by hydrologic region. The values presented in Table C-2 reflect the minimum and maximum change factor of the watersheds that fall in that region over the entire VIC simulation period. Monthly minimum and maximum values give an understanding of the range in change that is projected to occur in any given month in HUC 8 watersheds throughout the state. Large change factors are observed in the North Lahontan Region under 2030 and 2070 future conditions. The watersheds in this region are snowmelt dominated watersheds and the maximum change factor result portrayed in these areas is a result of the shift in timing of the snowmelt hydrograph, where more runoff is observed earlier in the year under projected future conditions. Due to this shift in timing, the application of these change factors needs to be scrutinized based on the limitations of the methodology, as discussed in the following sections.

Table C-2. Monthly Minimum and Maximum Streamflow Change Factors by Hydrologic Region for 2030 and 2070 Projected Conditions

Hydrologic Region	2030		2070	
	Min	Max	Min	Max
North Coast	0.2	3.4	0.1	6.7
Sacramento River	0.1	3.1	0.0	4.77
North Lahontan	0.1	9.1	0.0	27.1
San Francisco Bay	0.7	1.6	0.6	4.05
San Joaquin River	0.2	2.4	0.0	5.76
Central Coast	0.7	2.2	0.5	6.39
Tulare Lake	0.2	3.1	0.1	6.17
South Lahontan	0.4	3	0.1	9.38
South Coast	0.5	2.3	0.2	9.28
Colorado River	0.6	1.8	0.2	2.17

Considerations for Change Factor Data Application

Due to the significant variability of watersheds throughout the state of California, no one approach of applying change factor data is appropriate for all watersheds. Analysts should consider the following when determining an appropriate methodology:

- Purpose and key metrics of the analysis being performed (i.e, quantifying surface water and groundwater interactions along a river reach)
- Scope and spatial/temporal resolution of model used
  - Does the modeling effort require operations modeling, streamflow routing, streamflow diversion or depletion estimates?
  - Does the model work on a time scale other than monthly?
- Specific input that drives results
  - Does the streamflow dataset being projected drive the results being analyzed?
- Comparability of VIC baseline versus historical baseline flows
  - Hydrologic process and context similarity
  - Numerical similarity (relatively similar in volume from month-to-month and range of annual volumes)

4.1 Application of Timeseries Change Factor Data

Streamflow change factors are provided as a monthly timeseries format for 2030 and 2070 projected climate conditions. Monthly timeseries values are calculated as the ratio of the month-by-month VIC result with climate change divided by the VIC result without climate change. Application of streamflow change factor timeseries data includes various assumptions and limitations. Analysts should apply these with careful scrutiny of the baseline dataset for which the ratios are being applied.

When applying monthly timeseries change factors, there is the assumptions that an aspect of climate change will have an effect on the timing of the hydrograph. Using a monthly timeseries allows this shift in timing and the sequence of events to be preserved from month to month, as well as being sensitive to variations between years and months in sequence. One limitation of applying the monthly change factors is that this method presumes that the calculated change factors are based upon a similar baseline condition as to which they are applied. Due to this limitation, the applicability of the timeseries method requires that there should be a similarity in the flow pattern and the source of flows (i.e., rain or snow-melt) between the baseline data used for ratio calculations (Livneh, 2013) and the baseline data for which ratios are applied (local observational data). For example, the response of a snow-melt dominated watershed versus a rain dominated watershed is very different in pattern.

Annual streamflow change factors are being provided through SGMA in addition to the monthly change factors. When applying the timeseries method, a second order correction of the monthly change factors is required. This correction uses annual change factors to ensure that the annual change in volume is preserved based on the results of the VIC modeling. A spreadsheet tool has been developed and is provided by the SGMP to assist GSAs in applying the second order correction for their watersheds of interest.

The first step in applying monthly change factors is concerned with the shift in the monthly timing of the hydrograph as observed in the simulated VIC results. Applying a monthly change factor distributes the change due to climate to the pattern of the hydrograph and results in a change in the annual volume of the hydrograph. The second step is concerned with the shift in annual volume of the hydrograph as observed in the VIC results. Applying an annual adjustment factor based on the second order correction methodology ensures that the annual volume change is consistent with the simulated VIC results.

Figure C-3 below presents an example application of the monthly timeseries, for an example water year, before and after the second order correction. A shift in timing can be observed by applying the monthly change factors to the historic dataset (i.e., Historical → Perturbed Before Correction). Implementing the second order correction with the annual adjustment a shift in the volume of the hydrograph can be observed (i.e., Perturbed Before Correction → Perturbed After Correction). This additional step is important to ensure that the response of the watershed due to projected changes in climate are reflected in hydrologic analysis.

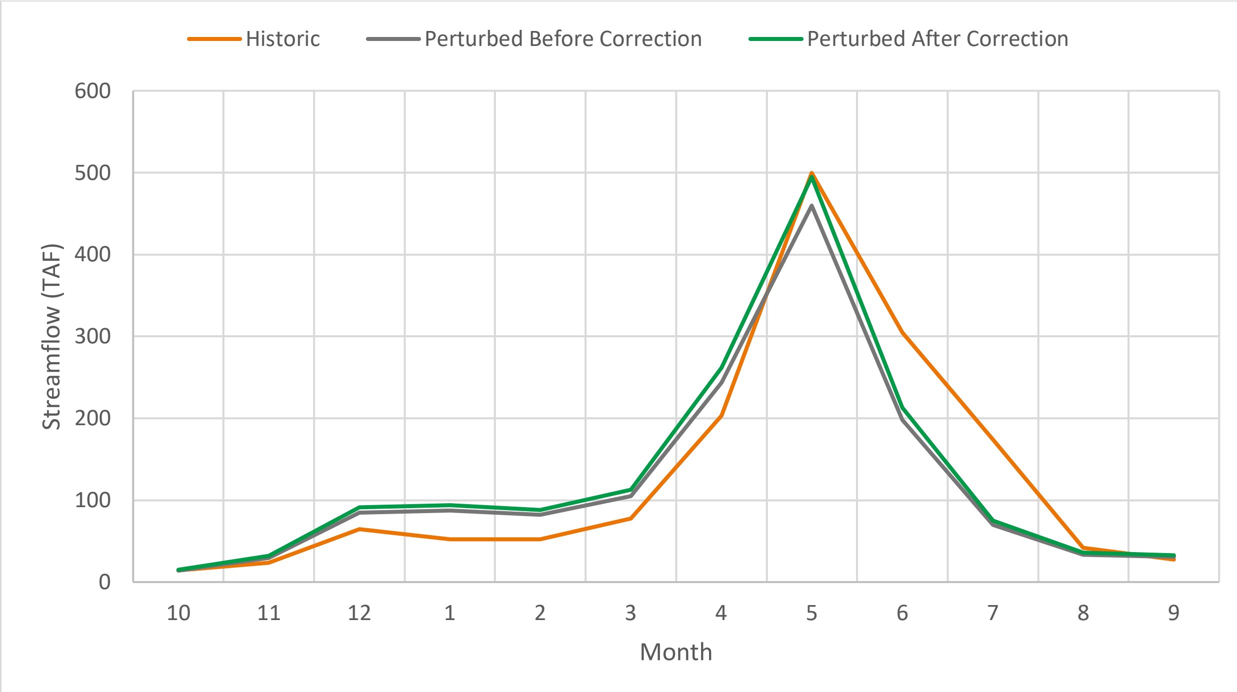

Figure C-7. Comparison of Applying Monthly Timeseries Change Factors Before and After Second Order Correction

While the timeseries application provides a robust methodology to project changes in streamflow due to climate change, there are special considerations that may require a separate approach. As previously discussed, the limitation of the timeseries methodology presumes that the calculated ratios are based upon a similar baseline condition as to which they are applied. In some circumstances, such as in a smaller tributary watershed, the application of the timeseries method may not suffice.

4.2 Alternative Methodology Using Monthly Average Change Factors

If the limitations of the timeseries methods suggest that the method may not be applicable, alternative methodologies should be considered.

An alternative methodology that may be useful is through the use of average monthly change factors. Average monthly change factors are calculated as the ratio of monthly average VIC results under climate change divided by monthly average VIC results without climate change. This methodology implies that seasonality is an important indicator of the relative impact due to climate change where climate change has a similar impact on the hydrograph each year. The timing of runoff events under this methodology is assumed to be similar each year. As a limitation, this method presumes that the change for each month is relatively independent of what happened the month before and varies in the same way from year to year.

4.3 Change Factor Application Summary

In summary, careful consideration should be taken when applying change factor data, depending on the watershed being analyzed. Table C-2 summarizes the proposed and alternative change factor application methodologies, and highlights the implications, limitations, and specific applicability of each of these methods. The methodology presented in Table C-2 serve as bookends of possible methods that could be considered in developing projected streamflow conditions.

Table C-2. Considerations in Determining the Appropriate Implementation of Streamflow Change Factors

Method[1]	Calculation	Implications	Limitations	Applicability
Timeseries (provided)	Monthly timeseries of the ratio of the month-by-month VIC result under climate change divided by the VIC result without climate change.	There is an aspect of climate change impact on a hydrograph that depends upon the timing of the hydrograph. Through this method the sequence of events is preserved from month to month. This method is sensitive to variations between years and months in sequence.	This presumes that the ratios are based upon a similar baseline condition as to which they are applied.	There should be a similarity in the flow pattern between the baseline data used for ratio calculations and the baseline data for which ratios are applied. For example, snow-melt versus rain fed runoff is not similar in pattern.
Monthly Averages	Average monthly values calculated as the ratio of monthly average VIC results under climate change divided by monthly average VIC results without climate change.	Season is an important indicator of the relative impact of climate change. Climate change has similar impact on the hydrograph each year and the timing of events in the hydrograph is similar for each year. This method is not sensitive to variations between years and months in sequence.	This presumes that the change for each month is relatively independent of what happened the month before and varies little from year to year.	Dissimilarity in pattern in the hydrograph is acceptable between the baseline data used for ratio calculations and the baseline data for which ratios are applied. For example, in a watershed where the response of the watershed is similar from year-to-year in terms of timing of the hydrograph.

[1]All methods rely on a timeseries of VIC results under climate change and a companion timeseries of VIC results without climate change.

Some watersheds in California that exhibit more extreme climate phenomena, such as monsoonal events or large changes in snowpack, can produce large spikes in change factors. Significant changes in pattern due to climate change as compared to historical conditions can cause challenges in developing projected conditions. Therefore, these types of watersheds need higher scrutiny when developing the appropriate method for applying projected streamflow changes.

EXHIBIT 9

Sustainable Groundwater Management Act 2019 Basin Prioritization

Process and Results

State of California

California Natural Resources Agency

Department of Water Resources

Sustainable Groundwater Management Program

May 2020

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Figures

Tables

Acronyms and Abbreviations

Cal-SIMETAW	California Simulation of Evapotranspiration of Applied Water
CASGEM	California Statewide Groundwater Elevation Monitoring
DOF	California Department of Finance
DWR	California Department of Water Resources
GAMA	Groundwater Ambient Monitoring and Assessment
GSA	Groundwater Sustainability Agency
GSP	Groundwater Sustainability Plan
MCL	Maximum Contaminant Level
NHD	National Hydrography Dataset
OSWCR	Online System for Well Completion Reports
PLSS	Public Land Survey System
PWSS	Public Water System Statistics
SGMA	Sustainable Groundwater Management Act
SWRCB	State Water Resources Control Board
USGS	United States Geological Survey
WCR	Well Completion Report (DWR Form 188)

I. Purpose of Report

This report describes the background, process, and results of the Sustainable Groundwater Management Act (SGMA) 2019 Basin Prioritization. The California Department of Water Resources (DWR) is required to update California's groundwater basin prioritization in accordance with the requirements of SGMA and related laws[1].

II. Introduction

Bulletin 118 – Interim Update 2016 (California Department of Water Resources 2016a) defined 517 groundwater basins and subbasins in California. DWR is required to prioritize these 517 groundwater basins and subbasins as either high, medium, low, or very low. For the purposes of groundwater basin prioritization, basins and subbasins are processed equally and are referred to as basins in this report.

It is the policy of the State through SGMA that groundwater resources be managed sustainably for long-term reliability and multiple benefits for current and future beneficial uses. The State also recognizes that sustainable groundwater management is best achieved locally through the development, implementation, and updating of plans and programs based on the best available science.

DWR plays a key role in providing the framework for sustainable groundwater management in accordance with the statutory requirements of SGMA and other provisions within the California Water Code (Water Code). Other State agencies, including the State Water Resources Control Board (SWRCB) and California Department of Fish and Wildlife, play a role in SGMA implementation and are required to consider SGMA when adopting policies, regulations, or criteria, or when issuing orders or determinations, where pertinent[2].

III. Background

Groundwater basin prioritization was initially completed by DWR in response to legislation enacted in [California's 2009 Comprehensive Water Package]

[1] Water Code sections 10722.4 and 10933.
[2] Water Code Section 10720.9.

(California Department of Water Resources 2009), which established Part 2.11 of the Water Code requiring groundwater elevations be monitored seasonally in all groundwater basins identified in the *Bulletin 118 - 2003 Update*[3] (California Department of Water Resources 2003a). Part 2.11 added general provisions to the Water Code that required DWR to identify the extent of groundwater elevation monitoring undertaken within each basin and directed DWR to prioritize basins for that purpose. In response to the new requirements of Part 2.11, DWR established the California Statewide Groundwater Elevation Monitoring (CASGEM) Program. In June 2014, the CASGEM Program released its prioritization for the groundwater basins identified in *Bulletin 118 - 2003 Update*. The CASGEM 2014 Basin Prioritization classified basins as high, medium, low, or very low based on the consideration of the eight components required in Water Code Section 10933(b).

In September 2014, Governor Brown signed into law three bills that formed SGMA.[4] SGMA required DWR to update basin priority for each groundwater basin no later than January 31, 2015 and reassess the prioritization anytime DWR updates Bulletin 118 basin boundaries.[5] DWR applied the CASGEM 2014 Basin Prioritization as the initial SGMA 2015 Basin Prioritization under SGMA, resulting in the designation of 127 high and medium priority basins (California Department of Water Resources 2014a).

In the fall of 2016, DWR completed and released groundwater basin boundary modifications. *Bulletin 118 – Interim Update 2016*, which included the final boundary modifications, was published on December 22, 2016. As a result of these modifications, updated basin prioritizations were required for the 517 groundwater basins identified in Bulletin 118. In May of 2018, DWR released the draft basin prioritization results for the 517 basins and held a 94-day public comment period. Simultaneously, local agencies requested a subsequent round of basin boundary modifications. This required DWR to prioritize the basins in two phases (referred to as SGMA 2019 Basin Prioritization Phase 1 and 2).

The SGMA 2019 Basin Prioritization Phase 1 focused on the basins that used the *Bulletin 118 – Interim Update 2016* basin boundary shapefile (California Department of Water Resources 2016b) and not affected by the 2018 basin boundary modifications. This phase allowed DWR to finalize in January 2019

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[3] Stats. 2009-2010, 7th Ex. Sess., c. 1 (S.B.6), § 1, eff. Feb. 3, 2010.
[4] Stats.2014, c. 346 (S.B.1168), § 3, c. 347 (A.B.1739), § 18, c. 348 (S.B.1319), § 2, eff. Jan. 1, 2015.
[5] Water Code sections 10722.4(b) and 10722.4(c)

the SGMA 2019 Basin Prioritization Phase 1 priorities that included 458 basins.

SGMA 2019 Basin Prioritization Phase 2 covers the remaining 57 basins that include the 53 basins that were modified and approved, as well as two that were not approved by DWR as part of the 2018 basin boundary modifications, plus two basins whose boundary modifications were from Assembly Bill 1944. All 57 basins of SGMA 2019 Basin Prioritization Phase 2 used the *Bulletin 118 – Update 2019* basin boundary shapefile (California Department of Water Resources 2019).

SGMA applies to all California groundwater basins and requires that high- and medium-priority groundwater basins form Groundwater Sustainability Agencies (GSAs) and be managed in accordance with locally-developed Groundwater Sustainability Plans (GSPs) or Alternatives to GSPs (Alternatives). High- and medium-priority basins that are identified in *Bulletin 118 – Interim Update 2016* as a critically overdrafted basin are required to submit a GSP by January 31, 2020. The remaining high- and medium-priority basins identified in January 2015 are required to submit a GSP by January 31, 2022. Basins newly identified as high- or medium-priority in the SGMA 2019 Basin Prioritization are required to form a GSA or submit an Alternative within two years from the date the basin's priority is finalized and are required to submit a GSP five years from the same finalization date.

IV. SGMA 2019 Basin Prioritization

The SGMA 2019 Basin Prioritization process was conducted to reassess the priority of the groundwater basins following the 2016 basin boundary modification, as required by the Water Code.[6] For the SGMA 2019 Basin Prioritization, DWR followed the process and methodology developed for the CASGEM 2014 Basin Prioritization, adjusted as required by SGMA and related legislation. DWR is required to prioritize basins for the purposes of SGMA,[7] which was enacted, among other things, to provide for the sustainable management of groundwater basins. This entailed a reassessment of factors that had been utilized in the CASGEM program to prioritize basins based on groundwater elevation monitoring. SGMA also required DWR to continue to prioritize basins based on a consideration of the components specified in

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[6] Water Code Section 10722.4(c)
[7] Water Code Section 10722.4(a)

Water Code Section 10933(b), but the list of components had been amended to include the italicized language:

1. The population overlying the basin or subbasin.
2. The rate of current and projected growth of the population overlying the basin or subbasin.
3. The number of public supply wells that draw from the basin or subbasin.
4. The total number of wells that draw from the basin or subbasin.
5. The irrigated acreage overlying the basin or subbasin.
6. The degree to which persons overlying the basin or subbasin rely on groundwater as their primary source of water.
7. Any documented impacts on the groundwater within the basin or subbasin, including overdraft, subsidence, saline intrusion, and other water quality degradation.
8. Any other information determined to be relevant by the department, **including adverse impacts on local habitat and local streamflows** [emphasis added].

DWR incorporated new data, to the extent data are available[8], and the amended language of Water Code Section 10933(b)(8) (component 8) to include an analysis of adverse impacts on local habitat and local streamflows as part of the SGMA 2019 Basin Prioritization. Evaluation of groundwater basins at a statewide scale does not necessarily capture the local importance of groundwater resources within the smaller-size or lower-use groundwater basins. For many of California's low-use basins, groundwater provides close to 100 percent of the local beneficial uses. Thus, when reviewing the SGMA 2019 Basin Prioritization results, it is important to recognize the findings are not intended to characterize groundwater management practices or diminish the local importance of the smaller-size or lower-use groundwater basins; rather, the results are presented as a statewide assessment of the overall importance of groundwater resources in meeting beneficial uses.

The following information was deemed relevant and considered as part of component 8 for the SGMA 2019 Basin Prioritization based on SGMA:

- Adverse impacts on local habitat and local streamflows.
- Adjudicated areas.
- Critically overdrafted basins.
- Groundwater-related transfers.

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[8] Water Code Section 10933(b)

Additional information about how each of these components were analyzed can be found in the process section of this document.

V. Process

The CASGEM 2014 and SGMA 2019 Basin Prioritization used the basin's total priority points assigned to each of the eight components to determine the priority. Based on the total accumulated priority points, the basin was assigned a very low, low, medium, or high priority. Both prioritization processes included additional evaluations of the basins that could alter the points assigned and thus the priority.

The data sources, processes, and steps used to evaluate each of the eight components of Water Code Section 10933(b) for the SGMA 2019 Basin Prioritization are described below. Supplemental data submitted during the May 2018 Draft Basin Prioritization comment period was also considered before finalization.

Component 1: The population overlying the basin or subbasin[9]

Data Source

- 2010 United States Census population block data (California)

Process

Population density was analyzed for the SGMA 2019 Basin Prioritization using the same methods and data relative to the CASGEM 2014 Basin Prioritization. The 2010 United States Census population block data (United States Census Bureau 2010a and 2010b) was used to calculate the population overlying each groundwater basin using the following methods:

- For population blocks contained wholly within a basin boundary, all population in the block was included in the basin population total.
- For population blocks located partially within the basin, the proportion of the population included was equal to the proportion of the area of the block contained within the basin and was applied to the basin population total. For example, if 60% of the population block was

[9] Water Code Section 10933(b)(1)

within basin boundaries, then 60% of the reporting block total population was attributed to the total population of the basin.

Step 1 – Calculate Basin's Total Population: The basin's total population was calculated by summing all the included population blocks per the two methods described above.

Step 2 – Calculate the Population Density: The basin's 2010 population density was calculated by dividing the basin's total population (Step 1) by the basin's area (square miles – Appendix 1).

Table 1 lists the priority points and associated ranges of population density.

Table 1 Component 1: Priority Points and Ranges for Population Density

Priority Points	Population Density (people/square mile) 'x' = population density
0	$x < 7$
1	$7 \leq x < 250$
2	$250 \leq x < 1{,}000$
3	$1{,}000 \leq x < 2{,}500$
4	$2{,}500 \leq x < 4{,}000$
5	$x \geq 4{,}000$

Component 2: The rate of current and projected growth of the population overlying the basin or subbasin[10]

Data Source

- 2000 and 2010 United States Census population block data (California)
- California Department of Finance (DOF) current trend 2030 county population projections
- 2000 and 2010 county population estimates developed for the California Water Plan Update 2018 (California Department of Water Resources 2018a)

[10] Water Code Section 10933(b)(2).

Process

Population growth was analyzed for the SGMA 2019 Basin Prioritization using the same methods and data relative to the CASGEM 2014 Basin Prioritization.

Part A: Estimating Basin and Non-Basin Population within each County

Step 1 – Calculate the 2000 and 2010 Basin Population: The 2000 (United States Census Bureau 2000a and 2000b) and 2010 population were estimated for all basins and portions of basins within each county using the methods described for component 1.

Step 2 – Calculate the 2000 and 2010 Non-Basin Area Population by County: For each county, the 2000 United States Census population block data (United States Census Bureau 2000a and b) and 2010 United States Census population block data were used to calculate the population overlying the non-basin area in each county:

- For population blocks contained wholly outside of a basin boundary and within the county, all population in the block was included in the non-basin population total for the county.
- For population blocks located partially outside of a basin boundary and within the county, the proportion of the population block contained outside of a basin was applied to the non-basin population total for the county. For example, if 40 percent of the reporting block total population was located outside of a basin boundary, 40 percent of the population was attributed to the total population of the non-basin area.
- For population blocks located outside of a basin boundary and partially outside of the county, the proportion of the population block contained within the county was applied to the non-basin population total. For example, if 60 percent of the population block was within county boundaries, then 60 percent of the reporting block total population was attributed to the total population of the non-basin area.

Step 3 – Calculate the Difference Between the 2000 and 2010 Population: The difference between the 2000 and 2010 population estimates for each of the basins, portions of basins, and non-basin areas was calculated within each county.

Step 4 – Calculate the Share of the Basin's Population Growth: The total population difference for the county was determined by summing the values from Step 3. The share (percentage) of the basin's population growth over the 2000 to 2010 decade was calculated by dividing the total basin population difference by the total county population difference.

Step 5 – Calculate the Projected Population Change from 2010 to 2030: The DOF current trend 2030 population projection for the county was used to determine the total change in county population between 2010 estimates and 2030 population projections.

Step 6 – Calculate the 2030 Population Projection: Each basin and non-basin share percentage (Step 4) was multiplied by the total 2030 projected change (Step 5) to produce a 2030 population projection for each basin and non-basin area within the 58 counties. For most basins located within a single county, the 2030 population projection was considered complete. Some low-population basins required minor adjustments when the projected population resulted in a negative value. In these situations, the population was adjusted to zero and the initial basin's results were redistributed to the other basin and non-basin areas in the county. For basins located in more than one county, the 2030 population projections for each portion of a basin that crossed a county boundary were summed to produce a 2030 population projection for the entire basin.

Estimates of population growth obtained using the methods described above were evaluated and adjusted, as necessary, to conform with DOF current trend 2030 county projections per California Government Code Section 13073(c).

Part B: Determining the 2030 Population Growth (Percentage)

The projected percent growth within each basin was determined by subtracting the 2010 population estimate (component 1) from the 2030 population projection (Step 6 of Part A) and dividing the result by the 2010 populations estimate:

$$\text{Percent Growth} = \left(\left(\text{Projected 2030 Basin Population} - \text{2010 Basin Population}\right) / \text{2010 Basin Population}\right) \times 100$$

Part C: Determining the Priority Points for Population Growth

Using the percent growth calculated in Step 4 of Part A, the basin was assigned the preliminary priority points identified in Table 2. Before determining the priority points, additional analysis was completed to determine if the basin met the minimum requirements for population growth as defined in the CASGEM 2014 Basin Prioritization process (California Department of Water Resources 2014b):

- Does the basin have zero 2010 population?
- Does the basin have less than or equal to zero percent growth?
- Is the basin's 2010 population (component 1) less than 1,000 people and does the basin have growth greater than zero?
- Is the basin's 2010 basin population less than or equal to 25,000 and is the basin's 2010 population density less than 50 people per square mile?

If the answer was 'yes' to any of the four questions above, the priority points for component 2 were recorded as zero. If the answer was 'no' to all four questions above, the priority points were applied to each basin based on the percentage of population growth. Table 2 lists the priority points and associated ranges of population growth percentage.

Table 2 Component 2: Priority Points and Ranges for Population Growth

Priority Points	Population Growth (percent) 'x' = Population growth percentage
0	$x \leq 0$
1	$0 < x < 6$
2	$6 \leq x < 15$
3	$15 \leq x < 25$
4	$25 \leq x < 40$
5	$x \geq 40$

Component 3: The number of public supply wells that draw from the basin or subbasin[11]

Data Source

- SWRCB, Division of Drinking Water - Public Supply Database, March 2016
- Verified local public supply well location and use information received through public comment process

[11] Water Code Section 10933(b)(3).

Process

Public supply wells were analyzed for the SGMA 2019 Basin Prioritization using the same methods and updated data relative to the CASGEM 2014 Basin Prioritization.

The SWRCB public supply well database (State Water Resources Control Board 2016) was used to calculate the number of public supply wells that draw from the basin, as it is the only statewide dataset that includes records associated with supply water for the public. The SWRCB public supply well database was accessed during March 2016 for the SGMA 2019 Basin Prioritization process. Each record in the database contains fields for active and inactive systems, water source (groundwater or surface water), and testing location. Different records for the same public supply system can exist due to separate testing locations for water quality. In most cases, the only distinction is in the location name.

The public supply data was processed by taking the following steps:

Step 1 – Query the Public Supply Well Database for Active Wells: The individual public supply wells that draw from each basin were determined by querying the public supply well database for entries classified as ‘active,’ and ‘groundwater,’ and that contained the word ‘well’ in the location name. Only wells active as of the time the data was extracted (March 2016) were included in this analysis. The number of individual public supply wells determined in this manner is not intended to establish an absolute value for any given basin, but to provide a relative measure of such wells between basins.

Step 2 – Perform Quality Control of Public Supply Well Coordinates: Each record from Step 1 was reviewed to identify incomplete or blank coordinates. Incomplete coordinates did not include enough decimal places in the coordinates to reliably map. They were corrected, when possible, using available attributes provided with public supply data. Records with blank coordinates were also corrected, when possible, using available attributes provided with public supply data. Wells with corrected coordinates were identified as modified with a “DWR” tag.

Step 3 – Compare Coordinates to County Codes: Public supply well locations were compared to the two-digit County Code included in the Public Water System Identification Number. If the well location did not fall within the proper county and location information was not readily available in the public supply well attributes, the public supply well was not included in the dataset.

Step 4 – Sum of Wells in Basin: Using Geographic Information System (GIS) software, the number of wells in each basin were counted based on the reconciled information from Steps 2 and 3.

Step 5 – Calculate the Public Supply Well Density: To calculate the public supply well density, the number of public supply wells (Step 4) was divided by the basin area (square miles).

Priority points were applied to each basin based on the calculated public supply well density. Table 3 lists the priority points and associated ranges of public supply well density.

Table 3 Component 3: Priority Points and Ranges for Public Supply Well Density

Priority Points	Public Supply Well Density (x = wells per square mile)
0	$x = 0$
1	$0 < x < 0.1$
2	$0.1 \leq x < 0.25$
3	$0.25 \leq x < 0.5$
4	$0.5 \leq x < 1.0$
5	$x \geq 1.0$

Component 4: The total number of wells that draw from the basin or subbasin[12]

Data Source

- Online System for Well Completion Reports (OSWCR) (California Department of Water Resources 2017)
- Verified local well location and use information received through public comment process

Process

Production wells were analyzed for the SGMA 2019 Basin Prioritization using updated methods and data relative to the CASGEM 2014 Basin Prioritization. Updated methods included defining production wells and improving the well location process. Both updated methods are further described below.

[12] Water Code Section 10933(b)(4).

DWR's new OSWCR database, which was not available at the time of the CASGEM 2014 Basin Prioritization, was used for the SGMA 2019 Basin Prioritization. The OSWCR database is a statewide dataset of well completion reports (WCRs). Each WCR contains useful information including well type, location, construction details, time of drilling, well performance, and aquifer characteristics.

Part A – Identifying Production Wells

The OSWCR database was used to identify production wells whose well use type within the WCR is listed as agriculture, domestic, irrigation, municipal, commercial, stock, industrial, or other extraction. If the well use type was not provided on the WCR, the following information, if present, was evaluated to determine if the WCR would be used for component 4.

- Many WCRs with an 'unknown' well type provide information about the well casing size and total depth. Criteria for separating production from non-production wells based on well casing size and total depth was established by reviewing domestic and water quality monitoring WCRs. It was determined that screening for a well casing greater than or equal to 4 inches and a total depth greater than or equal to 22 feet to identify production wells would provide the best balance between the urban and rural well characteristics. If the criteria of a well casing greater than or equal to 4 inches and a total depth greater than or equal to 22 feet were met, the WCR was considered to represent a production well.
- In some cases, the WCR only provided information on either well casing diameter or well depth information. For WCRs that only provided well casing size, the casing had to be greater than or equal to 4 inches to be considered a production well. For WCRs that only provided well depth, the well depth had to be greater than or equal to 22 feet to be considered a production well.

Part B – Determining the Location of Production Wells to the Highest Resolution

Well locations were determined using information included on the WCRs. For WCRs that included latitude and longitude, the coordinates were used to determine well locations. The spatial resolution in these cases was assumed to be absolute.

For WCRs that provided a spatial reference location based on Public Land Survey System (PLSS) data, a centroid location was assigned. The spatial reference location for a well gives a general well location within a known area rather than the actual well location. The process for assigning a well location to a spatial reference location based on information provided in the WCRs is discussed below:

- **WCRs with township-range-section, baseline meridian, and county information:** For WCRs that included township-range-section, baseline meridian, and county information, a section centroid was used as the well location. If the given section was split by a county line, a county-section was created for each portion of the section, and WCRs that identified the county and PLSS location were assigned to that county-section. WCRs were assigned coordinates representing their respective county-section centroid. The spatial resolution in these cases was less than or equal to one square mile.
- **WCRs with incorrect or without baseline meridian:** For WCRs that either did not provide a baseline meridian or provided an incorrect baseline meridian, the county location information was relied upon to locate the well to a county-section and assign a respective centroid. The spatial resolution in these cases was less than or equal to one square mile.
- **WCRs with incorrect or without county:** For WCRs that either did not provide a county or provided an incorrect county, the township-range-section and baseline meridian information was relied on to locate the well to a section and assign a respective centroid. The spatial resolution in these cases was less than or equal to one square mile.
- **WCRs without township-range-section, baseline meridian, and county information:** All WCRs that did not provide township-range-section, baseline meridian, and county information were discarded from the analysis.

Part C – Estimating Number of Production Wells within a Basin

The total number of production wells in a basin was estimated by considering all the wells actually and potentially located in the basin. Wells assigned a centroid location were proportionally counted because the exact location of the wells was unknown. The process for proportionally counting wells is described below:

Step 1 – Map Wells using GIS Software: All wells with coordinates (absolute or section centroid coordinates) were mapped using Geographic Information System (GIS) software.

Step 2 – Sum Wells Wholly in Basin: Based on results from Step 1, if a well's absolute location or entire section's area associated with the centroid was wholly within a basin boundary, it was counted as one well.

Step 3 – Sum Wells Partially in Basin: Based on results from Step 1, if a section's area associated with the centroid was only partially located in a basin, all the wells within the section were proportionally counted based on the proportion of the spatial reference area located in the basin. For example, if only 50 percent of a section's spatial reference area was located in a basin, then all the wells in the section's spatial reference area were given a weighted value of 0.50 for that basin.

Step 4 – Calculate Total Number of Production Wells: The total number of production wells (Steps 2 and 3) in each basin was summed and then rounded down to the nearest whole number.

Part D – Determining the Basin Production Well Density

Once production well totals were calculated for each basin (Part C), the production well density was calculated by dividing the basin's total number of production wells by the basin's area (square mile).

Table 4 lists the priority points and associated ranges of production well density.

Table 4 Component 4: Priority Points and Ranges for Total Production Well Density

Priority Points	Production Well Density (x = production wells per square mile)
0	$x = 0$
1	$0 < x < 2$
2	$2 \leq x < 5$
3	$5 \leq x < 10$
4	$10 \leq x < 20$
5	$x \geq 20$

Component 5: The irrigated acreage overlying the basin or subbasin[13]

Data Source

- Statewide Crop Mapping 2014 (California Department of Water Resources 2014c)
- Verified local land use information received through public comment process

Process

The consideration of irrigated acreage as a component of the SGMA 2019 Basin Prioritization used the same methods with updated data relative to the CASGEM 2014 Basin Prioritization. The CASGEM 2014 Basin Prioritization used DWR Land Use mapping data to determine irrigated acres. However, the land use data represented multiple years of survey efforts throughout the State. For the SGMA 2019 Basin Prioritization, the Statewide Crop Mapping 2014 dataset was used to provide statewide coverage for a single year. The Statewide Crop Mapping 2014 dataset is a statewide, comprehensive field-level assessment of summer-season agriculture, managed wetlands, and urban boundaries for the 2014 year.

For the purposes of basin prioritization, all agriculture identified in the Statewide Crop Mapping 2014 dataset was identified as irrigated unless an agricultural field had been previously identified by DWR as dry-farmed. Only irrigated acreage inside the basin boundaries was included in the calculation and analysis. This was accomplished by overlying the spatial crop mapping data on groundwater basin boundaries to determine total agricultural field acreage overlying the basin.

The basin's irrigated acreage density was calculated by dividing the basin's total irrigated acreage by the basin's area (square mile).

Table 5 lists the priority points and associated ranges of density of irrigated acres.

[13] Water Code Section 10933(b)(5).

Table 5 Component 5: Priority Points and Ranges for Density of Irrigated Acres

Priority Points	Density of Irrigated Acres (x = acres of irrigation per square mile)
0	$x < 1$
1	$1 \leq x < 25$
2	$25 \leq x < 100$
3	$100 \leq x < 200$
4	$200 \leq x < 350$
5	$x \geq 350$

Component 6: The degree to which persons overlying the basin or subbasin rely on groundwater as their primary source of water[14]

The groundwater reliance component in basin prioritization is comprised of two elements: total estimated groundwater use in the basin, referred to as Groundwater Use (sub-component 6.a), and the overall percent groundwater represents of the estimated total water use in the basin, referred to as Groundwater Reliance (sub-component 6.b).

Sub-component 6.a: Evaluating Volume of Groundwater Use

The consideration of groundwater use as a sub-component of the SGMA 2019 Basin Prioritization groundwater reliance component used updated methods and data relative to the CASGEM 2014 Basin Prioritization. The CASGEM 2014 Basin Prioritization used the DWR Agricultural model. For the SGMA 2019 Basin Prioritization, agricultural groundwater use was calculated by incorporating the crop types and total acreage from component 5 (above) into the California Simulation of Evapotranspiration of Applied Water (Cal-SIMETAW) v3.2 model (Morteza et al. 2013). The Cal-SIMETAW model was used for the SGMA 2019 Basin Prioritization to be consistent with the California Water Plan Update 2018. The model results were represented by evapotranspiration of applied water for each crop in the basin, representing total water demand not met by precipitation in Water Year 2014.

[14] Water Code Section 10933(b)(6).

The updated process for this sub-component also included the use of Water Year 2014 (October 1, 2013 to September 30, 2014) data for both agricultural applied water and urban water used. Water Year 2014 was used because the Statewide Crop Mapping 2014 dataset was the best statewide land use information available at the time of analysis. The 2014 land use information also serves as a bench mark of water use prior to the enactment of SGMA.

The updated process for calculating urban groundwater use (Part B, below) included the use of local agency data provided in the SWRCB Public Water System Statistics (PWSS) database (California Department of Water Resources 2014d) and water purveyor boundaries.

Part A: Estimating Agricultural Groundwater Use

Data Source

- California Simulation of Evapotranspiration of Applied Water v3.2
- Statewide Crop Mapping 2014 (California Department of Water Resources 2014c)
- Irrigated Acres (component 5)
- Water balance data developed to support the California Water Plan
- Verified local agricultural information received through public comment process

Process

Agricultural groundwater use was estimated using the most recent Statewide Crop Mapping 2014 survey for land use acreages and the Cal-SIMETAW model, which incorporates local soil information, growth dates, crop coefficients, and evapotranspiration data from the Spatial California Irrigation Management Information System for water use demand estimates. Estimates were calculated using the following steps:

Step 1 – Determine Total Acres of Each Major Crop: The DWR Statewide Crop Mapping 2014 acreage data were overlaid on groundwater basin boundaries to determine the total acres of each DWR-defined major crop class (see Appendix 2) within the groundwater basins.

Step 2 – Determine Applied Water per Acre per Major Crop: The Cal-SIMETAW model was used to determine the volume of applied water for the DWR-defined major crop classes within the groundwater basins. Applied water per single acre of each DWR-defined major crop class was then estimated within each basin.

Step 3 – Calculate Total Applied Water for Each Crop: The estimates of applied water per single acre for each major crop class (Step 2) were multiplied by the total acres of DWR-defined major crop classes (Step 1) to estimate the total applied water for each crop class. The total applied water for each crop class was added to determine the total applied water for agriculture in the basin. The total applied water for each crop represents the combination of surface water and groundwater.

Step 4 – Calculate Total Groundwater Use: The total groundwater use (acre-feet) for the basin was estimated by multiplying the total applied water (Step 3) by the groundwater percentage of total applied water provided in the California Water Plan Update 2018.

Part B: Estimating Urban Groundwater Use

Data Source

- Public Water System Statistics (PWSS) database (California Department of Water Resources 2014d)
- Water purveyor boundaries (multiple sources)
- United States Department of Agriculture (USDA) National Agricultural Statistics Service CropScape and Cropland data layers (Urban portion) 2014
- Land Use surveys (Urban portion) (2000 through 2014)
- Groundwater Basin population data (2014)
- Verified local urban water use information received through public comment process

Process

Urban groundwater use was estimated within each groundwater basin using the data sources listed above. The data sources were processed using the following methods:

Step 1 - Determine Groundwater Basin Population: Actual census population block data and DOF population estimates are only available for years ending in a zero. DWR required 2014 population data to process the urban groundwater volumes. DWR accessed a third-party demographics software (Nielsen Claritas 2014) that estimated the population based on groundwater basin boundaries to determine the 2014 population.

Step 2 - Refine Water Purveyor Service Area: Service area boundaries were compiled using multiple sources including a DWR database, direct inquiries, and information included in Urban Water Management Plans. The service area boundaries were then refined based on the urban land use data

(U.S. Department of Agriculture 2014; California Department of Water Resources 2000 through 2014) and overlaid on groundwater basin boundaries. The basin fraction value of the boundary that overlies each basin was used in subsequent steps.

Step 3 – Determine Population Served Within Groundwater Basin: Urban water purveyors' PWSS water use and population served data (California Department of Water Resources 2014d) were linked to their respective service area boundaries as refined in Step 2. The basin fraction value (Step 2) of the water purveyor boundary was applied to the total population served to determine the population served within the basin.

Step 4 - Determine Self-Supplied Population: The self-supplied population was determined by calculating the difference between population served in the basin (Step 3) and the basin population (Step 1).

Step 5 – Determine Water Purveyor Per-Capita Water Use: The water purveyors' PWSS water use and population served data were used to develop their respective per-capita water use.

Step 6 – Determine Groundwater Basin Per-Capita Water Use: The water purveyors that were identified as having all or part of their service area within a basin were used in this calculation. Each water purveyors' per-capita water use was averaged together using their respective population served and basin fraction value (Step 2).

Step 7 – Calculate Population-Based Water Use: Groundwater basin per-capita estimates (Step 6) were multiplied by the corresponding groundwater basin 2014 population (Step 1) to produce an estimated population-based urban water use. If the groundwater basin did not have any organized water purveyors, DWR provided an estimated average per-capita use to be used in the calculation.

Step 8a – Calculate Groundwater Use for Population Served by Water Purveyor: The urban water purveyors' PWSS data also reports the source of water used in their systems. DWR used this information along with the basin fraction value (Step 2) to calculate the basin's surface water and groundwater volume and the respective percent of total water supplied.

Step 8b – Calculate Groundwater Use for Self-Supplied Population: Self-supplied groundwater use was calculated by multiplying the per-capita value determined in Step 6 by the self-supplied population. DWR determined the source of supply for the self-supplied population to be groundwater in most cases.

Step 9 – Estimate Additional Groundwater Use: Additional urban water uses (such as golf courses, parks, and self-supplied industrial) were calculated if data were available from local sources such as Urban Water Management Plans.

Step 10 – Calculate Total Urban Groundwater Use: The groundwater amounts calculated in Steps 8a, 8b, and 9 were combined to obtain the total urban groundwater use.

Part C: Calculating Total Groundwater Use

Total groundwater use was calculated by adding agricultural groundwater use (Part A, Step 4) and urban groundwater use (Part B, Step 10). Basin groundwater use per acre was calculated for each basin by dividing the total acre-feet of groundwater use by the basin area (acres). Table 6 lists the points and associated ranges of groundwater use per acre.

Total groundwater use was calculated by adding agricultural groundwater use (Part A, Step 4) and urban groundwater use (Part B, Step 10). Basin groundwater use per acre was calculated for each basin by dividing the total acre-feet of groundwater use by the basin area (acres). Table 6 lists the points and associated ranges of groundwater use per acre.

Table 6 Component 6.a: Points and Ranges for Groundwater Use per Acre

Priority Points	Groundwater Use per Acre (x = acre-ft / acre)
0	$x < 0.03$
1	$0.03 \le x < 0.1$
2	$0.1 \le x < 0.25$
3	$0.25 \le x < 0.5$
4	$0.5 \le x < 0.75$
5	$x \ge 0.75$

Sub-component 6.b: Evaluating Overall Supply Met by Groundwater

Data Source

- Sub-component 6.a

Process

The consideration of overall supply met by groundwater (percent) as a component of the SGMA 2019 Basin Prioritization used the same methods and updated data relative to the CASGEM 2014 Basin Prioritization.

After developing the total groundwater volume for the groundwater basin (see sub-component 6.a – Evaluation of Volume of Groundwater Use), the percentage of groundwater supply was derived as the ratio of total groundwater volume to total water use.

Step 1 – Calculate Total Groundwater Use: Agricultural groundwater use was added to urban groundwater use to determine the total groundwater use for each basin (sub-component 6.a, Part C).

Step 2 – Calculate Total Water Use: Agricultural applied water (surface water and groundwater) was added to urban total supply (surface water and groundwater) to determine total water used within each basin.

Step 3 – Calculate Percent of Total Water Supply Met by Groundwater: Total groundwater used (Step 1) was divided by total water used (Step 2) to calculate the groundwater portion of the total water supply.

Table 7 lists the points and associated ranges of percent of total water supply met by groundwater.

Table 7 Component 6.b: Points and Ranges for Percent of Total Water Supply Met by Groundwater

Priority Points	Total Supply Met by Groundwater (x = Groundwater Percent)
0	x = 0
1	0 < x < 20
2	20 ≤ x < 40
3	40 ≤ x < 60
4	60 ≤ x < 80
5	x ≥ 80

Calculating the Total Priority Points for Groundwater Reliance

Priority Points for the degree to which persons overlying the basin rely on groundwater as their primary source of water was calculated by averaging the points for groundwater volume density (6.a) and percent of total water supply met by groundwater (6.b).

$$\textit{Average (6.a Points + 6.b Points) = Priority Points}$$

Component 7: Any documented impacts on the groundwater within the basin or subbasin, including overdraft, subsidence, saline intrusion, and other water quality degradation[15]

Documented impacts on groundwater were analyzed for the SGMA 2019 Basin Prioritization using updated data and methods relative to the CASGEM 2014 Basin Prioritization. The CASGEM 2014 Basin Prioritization treated all four of the sub-components (overdraft, subsidence, saline intrusion, and other water quality degradation) as a single impact and assigned up to five priority points to the basin based on the effect of the combined documented impacts. The SGMA 2019 Basin Prioritization included separate evaluation of documented groundwater impacts for each of the four sub-components. Points were assigned based on the presence or absence of documented impacts for each sub-category, with the exception of water quality degradation for which points were assigned based on the magnitude and extent of the reported contaminant levels. The updated process is summarized below and described in detail in the following sections.

Each of the four sub-components of component 7 were assigned different maximum points based on the nature of the impact, and whether the impact was susceptible to avoidance or remediation through sustainable groundwater management practices, as follows:

- Basins with declining groundwater levels were assigned 7.5 points.
- Basins with current inelastic subsidence were assigned 10.0 points; basins with only historical inelastic subsidence were assigned 3.0 points.
- Basins with saline intrusion were assigned 5.0 points.

[15] Water Code Section 10933(b)(7).

- Basins with water quality measurements that exceed maximum contaminant levels (MCLs) were assigned 1.0 to 3.0 points.

Sub-component 7.a: Documented Overdraft or Groundwater Level Decline

Data Source

Declining groundwater levels were evaluated by reviewing groundwater level data published over the last 20 years. Evaluation also consisted of reviewing available hydrographs; groundwater management plans; annual reports, such as from watermasters and urban water districts; grant applications submitted to DWR; professional studies; Bulletin 118 – Update 2003; California Water Plan Update 2013 (California Department of Water Resources 2015); Alternatives submitted pursuant to SGMA; and published environmental documents.

Process

Based on available groundwater level data, hydrographs, or similar data for each basin, groundwater levels were classified as being stable, rising, or declining. To make this determination, each piece of data was viewed back in time as far as possible. In many cases, data limited the review time frames to six to ten years, while other data extended back 20 years or more. The entire basin did not have to show declining groundwater levels to be classified as having declining groundwater levels. In most cases, multiple hydrographs were used to support the overall basin determination concerning the status of groundwater levels.

Basins that exhibited declining groundwater levels were assigned 7.5 points.

Sub-component 7.b: Documented Subsidence

Data Source

Evaluation of inelastic subsidence consisted of reviewing hydrographs, extensometer data, and land use data; groundwater management plans submitted to DWR; annual reports, such as from watermasters and urban water districts; grant applications submitted to DWR; professional studies, including those from the NASA Jet Propulsion Laboratory and United State Geological Survey (USGS); Interferometric synthetic aperture radar via Sentinel-1A satellite maps; University NAVSTAR Consortium (UNAVCO) Plate Boundary Observatory graphs; Bulletin 118 – Update 2003; California Water Plan Update 2013; and environmental documents.

Process

Water Code Section 10933(b)(7) identifies inelastic subsidence as one of the four documented impacts DWR needs to consider under SGMA 2019 Basin Prioritization, to the extent data are available. Inelastic subsidence data related to groundwater extractions were evaluated to determine if inelastic subsidence was current or historical. To reach one of these determinations, data was viewed back in time as far as possible. In many cases the time frames were six to ten years for current conditions, while historical analyses required going back 20 years or more. When both historical and current inelastic subsidence was identified, only the current inelastic subsidence was considered for this sub-component.

Points were assigned based on the status of inelastic subsidence found in the basin:

- Basins with no observed inelastic subsidence were assigned 0 points.
- Basins with current inelastic subsidence were assigned 10 points.
- Basins with only historical inelastic subsidence were assigned 3 points.

Sub-component 7.c: Documented Saline Intrusion

Data Source

Saline intrusion was evaluated by reviewing available data published over the last 20 years. Evaluation consisted of reviewing hydrographs; groundwater management plans; annual reports, such as from watermasters and urban water districts; grant applications submitted to DWR; professional studies; *Bulletin 118 – Update 2003*; *California Water Plan Update 2013*; Alternatives submitted pursuant to SGMA; county hazards reports; and environmental documents.

Process

Saline intrusion in the coastal and Sacramento-San Joaquin Delta groundwater basins, as defined in *Bulletin 118 – Interim Update 2016*, was determined by researching available documents for references of past or current excess salinity problems.

The primary source of information used was local reports and studies that focused on the challenges of saline intrusion within individual basins. The reports and studies directed at managing or preventing saline intrusion were related to:

- Water quality analyses.

- Projects designed to stop or reverse current or past intrusions.
- Groundwater management re-operation that reduced or shifted current operations to other parts of the basin or invested in enhanced groundwater and surface water conjunctive management.

Basins with documented evidence of saline intrusion were assigned 5 points.

Sub-component 7.d: Documented Water Quality Degradation

Data Source

- SWRCB, Division of Drinking Water – Public Supply Database, all active wells (March 2016)
- SWRCB – GeoTracker Groundwater Ambient Monitoring and Assessment (GAMA) secure database (Division of Drinking Water, reported Water Quality results (as of April 4, 2017)
- SWRCB – Maximum Contaminant Level (MCL) list (as of November 2017)

Process

The SGMA 2019 Basin Prioritization followed a multi-part process to analyze water quality degradation in a basin. Initially, the water quality data maintained by the SWRCB Division of Drinking Water was used to conduct a statewide assessment of a range of water quality constituents. Data were analyzed using the following methods:

- Water quality testing data were queried statewide in the GeoTracker GAMA secure database (State Water Resources Control Board 2017) for each constituent with a MCL (Appendix 3).
- Data with a sample date between January 1, 2000 and April 4, 2017 and a recorded constituent concentration were included in the evaluation.
- Each water quality sample record was assigned to a groundwater basin as defined in *Bulletin 118 – Interim Update 2016* using the well location data associated with each sample record in the GeoTracker GAMA database.
- Constituent concentrations were compared to MCLs, secondary MCLs, and Public Health Goals as defined in the California Code of Regulations Title 22 Division 4 Chapter 15. Records with instances of constituent concentrations that exceeded water quality criteria were retained for further evaluation.

Data were evaluated for both the magnitude of documented groundwater contamination and prevalence of impact to public drinking water and assigned points as described in sub-components 7.d.1 and 7.d.2, below. The next step in the analysis was to determine whether the basin had one or more of the documented impacts identified in component 7 (i.e. subsidence, declining groundwater levels, and saline intrusion), which are relevant because of the potential to exacerbate water quality degradation in the basin. The purpose of this analysis was to only include water quality impacts that are redressable through sustainable groundwater management practices.

Sub-component 7.d.1: Evaluating the Magnitude of Documented Groundwater Contamination

To compare the magnitude of groundwater contamination across multiple constituents with varying MCL values, the relative MCL exceedance was calculated for each sample record that exceeded the MCL value.

Step 1 – Calculate Relative MCL Exceedance for Each Constituent: The relative MCL exceedance was calculated by dividing the measured constituent concentration by the regulatory MCL value. For example, a data value that exceeded the regulatory MCL value by twice the limit would have a relative MCL exceedance of two.

Step 2 – Calculate Average Relative MCL Exceedance for Each Basin: For each basin, relative MCL exceedances for all constituents were averaged to generate an average relative MCL exceedance for the entire basin.

Table 8 lists the points and associated ranges of average relative MCL exceedance values for sub-component 7.d.1.

Table 8 **Sub-component 7.d.1: Points and Ranges for Documented Impacts – Water Quality Degradation – Average Relative MCL Exceedance**

Priority Points	Average Relative MCL Exceedance X = Average Exceedance
0	$x \leq 1$
1	$1 < x < 2$
2	$2 \leq x < 3$
3	$3 \leq x < 4$
4	$4 \leq x < 6$
5	$x \geq 6$

Sub-component 7.d.2: Evaluating the Prevalence of Documented Groundwater Contamination

The prevalence of contamination in groundwater used as public drinking water in each basin was evaluated by dividing the number of unique wells with MCL exceedances within each basin by the number of public water supply wells in the basin (component 3). Because the selected water quality data set spanned the years 2000 to 2017, the actual number of public water supply wells in a basin would likely have varied as new wells went into service and other wells went offline, but this is common to all basins and not expected to skew the results. The number of public water supply wells calculated for component 3 was determined to most accurately represent the number of public water supply wells for the purposes of this evaluation.

An exception to this method was made if the water quality data indicated an MCL was exceeded, but no active public water supply wells were indicated from the component 3 assessment. In these cases, it was assumed that one public water supply well was present, or had been reactivated, in the basin, and the calculation of groundwater quality contamination proceeded as previously described.

The calculated value for the basin was then assigned points. Table 9 lists the points and associated ranges of values for sub-component 7.d.2.

Table 9 Sub-component 7.d.2: Points and Ranges for Documented Impacts – Water Quality Degradation – Prevalence of Groundwater Contamination

Priority Points	Prevalence of Groundwater Contamination X = Value
0	x = 0
1	0 < x < 0.5
2	0.5 ≤ x < 0.75
3	0.75 ≤ x < 1
4	x = 1
5	x > 1

Sub-component 7.d: Calculating Total Points for Documented Water Quality Degradation

To obtain the points for documented water quality degradation, the points for average relative MCL exceedance (7.d.1) and points for prevalence of groundwater contamination (7.d.2) were combined; the total was then assigned points. Table 10 lists the points and associated range of water quality degradation values.

Table 10 Sub-component 7.d: Points and Ranges for Documented Impacts – Water Quality Degradation

Priority Points	Documented Impacts – Water Quality Degradation X = Water Quality Points
0	x < 3
1	3 ≤ x < 6
2	6 ≤ x < 8
3	x ≥ 8

Calculating the Total Priority Points for Documented Impacts

After each of the four types of documented impacts were assigned a value, the cumulative total of points was calculated. Based on the cumulative total of points assigned for all categories of documented impacts, the basin was assigned priority points as indicated in Table 11.

Table 11 **Component 7: Priority Points and Ranges for Documented Impacts – Cumulative Total**

Priority Points	Cumulative Total – Documented Impacts
0	x ≤ 3
1	3 < x < 7
2	7 ≤ x < 11
3	11 ≤ x < 15
4	15 ≤ x < 19
5	x ≥ 19

Component 8: Any other information determined to be relevant by the department, including adverse impacts on local habitat and local streamflows[16]

Sub-component 8.a: Adverse Impacts on Local Habitat and Local Streamflows

Adverse impacts on local habitat and local streamflows were not evaluated or required to be evaluated for the CASGEM 2014 Basin Prioritization. The SGMA 2019 Basin Prioritization used the methods and sources described below.

Data Source

- Natural Communities Commonly Associated with Groundwater (Natural Communities) Dataset
- USGS National Hydrography Dataset (NHD)
- Basin Prioritization 2018 Volume of Groundwater Use (sub-component 6.a)
- Basin Prioritization 2018 Documented Impacts (sub-component 7.a)

Adverse impacts on local habitat and local streamflows were identified by the legislature as an example of information relevant to basin prioritization.[17] Impacts to habitat and streamflow are significant factors in the prioritization of basins for the purposes of sustainable groundwater management because such impacts could indicate the depletion of interconnected surface waters,

[16] Water Code Section 10933(b)(8).
[17] Water Code Section 10933(b)(8).

which has significant and unreasonable adverse impacts on beneficial uses of the surface water.[18] In the case of adverse impacts on local habitat and local streamflows, DWR determined that there was not sufficient consistent, reliable, statewide information available for the initial SGMA 2015 Basin Prioritization. After the initial SGMA 2015 Basin Prioritization, DWR developed a statewide Natural Communities dataset that assembled information on the location of seeps, springs, wetlands, rivers, vegetation alliances, and habitat from multiple data sources. Utilizing that dataset, DWR determined sufficient data are available to include impacts to local habitat and local streamflows as a prioritization sub-component.

The following process was used to determine if there is a possibility of adverse impacts on local habitat and local streamflow occurring within the basin.

Process

For the SGMA 2019 Basin Prioritization, DWR evaluated if habitat or streams exist in the basin. To do so, DWR used the Natural Communities and NHD datasets (California Department of Water Resources 2018b; United States Geological Survey 2016) to determine if one or more habitats commonly associated with groundwater or perennial or permanent streams exist within a groundwater basin. Habitat and streams were identified within the basins using the following method:

Method	Points
After consulting the Natural Communities dataset, are there one or more polygons representing vegetation, wetland, seep, or spring habitat in the basin?	No = 0 points Yes = 1 Habitat point
After consulting the NHD dataset, was it determined that one or more perennial or permanent streams are located within or adjacent to the basin?	No = 0 points Yes = 1 Streamflow point

If there was no habitat or streamflow identified in the basin, then zero priority points were assigned to subcomponent 8.a.

Part B: Determining if Potential Adverse Impacts on Habitat and Streamflow are Occurring in the Basin

[18] Water Code Section 10721(x)(6).

The habitat and/or streamflow point(s) were not applied to basin prioritization until it was determined that one or more of the habitats and/or streams were potentially being adversely impacted. No statewide measure of adverse impacts to habitat or streamflow exists that would allow DWR to rank the severity of those impacts. Potential adverse impacts to habitat and streamflow resulting from groundwater activities were determined by evaluating the amount of groundwater pumping and groundwater level monitoring occurring in each basin.

- **Groundwater Monitoring Occurs in the Basin:** If the basin's groundwater use (acre-feet/acre) (sub-component 6.a) exceeded 0.16 acre-feet/acre and groundwater level monitoring indicated that groundwater levels were declining (sub-component 7.a), then the habitat and streamflow points assigned in Part A were applied to the basin's priority points.

Or

- **Groundwater Monitoring Does Not Occur in the Basin:** If the basin's groundwater use (acre-feet/acre) (sub-component 6.a) exceeded 0.16 acre-feet/acre and groundwater level monitoring was not being performed in the basin, the habitat and streamflow point(s) assigned in Part A were applied to the basin's priority points.

Part C: Documenting Adverse Habitat and Streamflow Impacts

If the results from Part B indicated that there were no potential adverse impacts to habitat or streamflow in the basin, but documentation indicated that habitat and/or streamflow were being adversely impacted by groundwater activities in the basin, the habitat and/or streamflow priority point(s) assigned in Part A were applied to the basin's priority points. Documentation reviewed included, but was not limited to, groundwater levels, hydrologic models, hydrologic studies, and court judgements.

Sub-component 8.b – Basin-level Evaluation of "other information determined to be relevant by the department"

The basin-level evaluation of "other information determined to be relevant by the department" as an element of the SGMA 2019 Basin Prioritization used the same analysis method and updated data relative to the CASGEM 2014 Basin Prioritization.

Each basin was reviewed based on the individual basin's hydrology, geology, land use, and challenges to determine if there are groundwater-related actual or potential impacts to unique features or actual or potential challenges for groundwater management within the basin. Basins with actual or potential impacts to unique features that could result in an unrecoverable loss, and basins facing groundwater management challenges that could be serious enough to impact the sustainability of the basin if the necessary groundwater management is not applied to the basin, were assigned three priority points. If these conditions did not apply, the basin was assigned zero priority points.

Sub-components 8.c and 8.d: Statewide-level Evaluation of "other information determined to be relevant by the department"

Sub-components 8.c and 8.d evaluations were applied uniformly to all basins during the prioritization process and included additional analysis of conditions that, if present, caused basin priority points to be adjusted, regardless of the accumulated priority points from components 1 through 8.b. The sections below (sub-components 8.c.1 through 8.d.2) describe the conditions analyzed prior to the prioritization. The purpose of this analysis was to evaluate other information that was determined to be relevant by DWR. Beginning with sub-component 8.c.1, the analyses were performed in the order listed in Table 12 until a condition was met. After the result was applied, the additional conditions analysis stopped, and the processing continued to section VI – Basin Priority below. Table 12 describes the basin to which the analysis was applied, the condition that was analyzed, and the resulting priority points.

Table 12 Sub-components 8.c and 8.d: Additional Conditions Analyzed Prior to Priority Determination

Sub-Component	Basin Applicability	Condition	If True, Result
8.c.1	All	Less than or equal to 2,000 acre-feet of groundwater use for water year 2014	Total Priority Points = 0
8.c.2	All	Greater than 2,000 and less than or equal to 9,500 acre-feet of groundwater use for water year 2014 with no documented impacts	Total Priority Points = 0
8.c.3	Basins with Adjudications	Basin's non-adjudicated portion extracts less than or equal to 9,500 acre-feet of groundwater for water year 2014	Total Priority Points = 0
8.d.1	Critically Overdrafted basins	Basin considered to be in Critical Overdraft per Bulletin 118 – Interim Update 2016	Total Priority Points = 40
8.d.2	All	Groundwater-related transfers (groundwater substitution transfers, out-of-basin groundwater transfers not part of adjudicated activities) are greater than 2,000 acre-feet in any given year since 2009	Add 2 Priority Points

The analyses above were performed in the order listed in Table 12 and only continued until they reached a condition where the result was true. When the true condition was reached, the remaining analysis steps listed in Table 12 were bypassed and the processing for the basin proceeded to Basin Priority with the adjusted priority points. The points accumulated during analysis of components 1 through 8.b were retained.

If a basin that did not meet a true condition for sub-components 8.c or 8.d listed in Table 12, the basin was prioritized based on the accumulated priority points from components 1 through 8.b.

Sub-component 8.c.1: Does the Basin or Subbasin Use Less Than or Equal to 2,000-acre feet of Groundwater?

Data Source

- Basin Prioritization 2018 Volume of Groundwater Use (sub-component 6.a)

Process

The consideration of “Does the basin use less than or equal to 2,000-acre feet of groundwater?” as an element of the SGMA 2019 Basin Prioritization used the same method and updated data relative to the CASGEM 2014 Basin Prioritization.

Using an approach similar to the GAMA Program, DWR selected the groundwater volume portion of the groundwater reliance component data (sub-component 6.a) as the primary component for the initial review and screening in the groundwater basin prioritization process. DWR considers any basin that uses less than or equal to 2,000 acre-feet of groundwater per year to be low priority with respect to sustainable groundwater management. Total priority points were adjusted to zero for basins that pump less than or equal to 2,000 acre-feet of groundwater per year.

Sub-component 8.c.2: Does the Basin Use Greater Than 2,000-acre feet and Less Than or Equal to 9,500-acre feet AND Have No Documented Impacts (component 7 and 8)?

Data Source

- Basin Prioritization 2018 Volume of Groundwater Use (sub-component 6.a)
- Basin Prioritization 2018 Documented Impacts (component 7)
- Basin Prioritization 2018 Any other information determined to be relevant by the department, including adverse impacts on local habitat and local streamflows (sub-components 8.a and 8.b)

Process

The consideration of “Does the basin use greater than 2,000-acre feet and less than or equal to 9,500-acre feet and have no documented impacts?” in water year 2014 as an element of the SGMA 2019 Basin Prioritization used the same method and updated data relative to the CASGEM 2014 Basin Prioritization.

Step 1 – Check How Much Groundwater is Pumped: If the basin’s groundwater use volume (6.a) was greater than 2,000 and less than or equal to 9,500 acre-feet in water year 2014, the analysis proceeded to Step 2. Otherwise, sub-component 8.c.2 did not apply to the basin.

Step 2 – Check if Documented Impacts Exist: If the basin did not have any of the documented impacts listed below, the analysis proceeded to Step 3. Otherwise, sub-component 8.c.2 did not apply to the basin.

1. Documented impacts (component 7)
2. Documented adverse impacts to habitat and streamflow (sub-component 8.a, Part C)
3. Other basin-specific impacts or challenges (sub-component 8.b)

Step 3 – Assign Priority Points: If the basin met the criteria of Step 1 and Step 2, the basin's priority points were adjusted to zero.

Sub-component 8.c.3: For Basins That Have Adjudicated Area Within the Basin, Does the Basin's Non-Adjudicated Portion Pump Less Than or Equal To 9,500-acre feet of Groundwater?

Data Source

- California Department of Water Resources2018 Adjudicated Areas (shapefile)
- Basin Prioritization Groundwater Volume for non- adjudicated area or areas of basin, 2018 (Appendix 4)
- Basin Prioritization 2010 Population for non-adjudicated area or areas, 2018

With the exception of an annual reporting requirement, SGMA does not apply to the adjudicated areas identified in the Act. Because these adjudicated areas are not required to develop and adopt a GSP or Alternative, DWR determined that SGMA prioritization should evaluate those portions of the basin that are non-adjudicated. The non-adjudicated areas remain subject to SGMA, but DWR evaluated the non-adjudicated portion of the basin to determine the extent that these areas are independently significant based on the prioritization criteria developed for an entire basin, or to determine the potential to affect groundwater management in the entire basin, in accordance with the consideration of components 1 through 8 of Water Code Section 10933(b).

Process

The results of the SGMA 2019 Basin Prioritization were based on the analysis of the entire basin, including the adjudicated area. If the basin was determined to be medium or high priority under the SGMA 2019 Basin Prioritization, the full requirements of SGMA only applies to the non-adjudicated portion of the basin. Appendix 5 provides a complete listing of the 37 basins that are covered completely or partially by adjudicated areas.

The adjudication analysis was only performed on basins with adjudicated areas (Appendix 5) and was only applied to the portion or combined portions of the basin that are not covered by a groundwater adjudication. The following steps were applied when evaluating sub-component 8.c.3:

Step 1 – Create Shapefile: A shapefile was created to represent the non-adjudicated portion or portions of the basins listed in Appendix 5 by cutting out the portion(s) of the basin that are adjudicated.

Step 2 – Calculate Urban Groundwater Use: Using the shapefile from Step 1, the 2010 population in the non-adjudicated portion or portions was determined, and the urban water demands and ultimately the urban groundwater volume was processed, as calculated for sub-component 6.a.

Step 3 – Calculate Agricultural Groundwater Use: Using the shapefile from Step 1, the 2014 land use in the non-adjudicated portion or portions was determined and the agricultural water demand and groundwater volume were processed, as calculated for sub-component 6.a.

Step 4 – Calculate Total Groundwater Use: The urban (Step 2) and agricultural (Step 3) groundwater use amounts were combined to establish the total groundwater used in the non-adjudicated portion of the basin (see Appendix 4).

Step 5 – Determine Priority Points: If the groundwater volume computed in Step 4 was less than or equal to 9,500-acre feet per year, the basin total priority points were adjusted to zero.

Sub-component 8.d.1: Is the Basin Considered to be in Critical Overdraft?

Data Source

- Bulletin 118 - Interim Update 2016, Table 2

Critically overdrafted basins were analyzed for the SGMA 2019 Basin Prioritization using updated methods and data relative to the CASGEM 2014 Basin Prioritization. Critical conditions of overdraft have been identified in 21 groundwater basins as described in *Bulletin 118 – Interim Update 2016*.[19] A basin is subject to critical conditions of overdraft when continuation of

[19] Water Code Section 12924.

current water management practices would probably result in significant adverse overdraft-related environmental, social, or economic impacts.[20] Additionally, chronic lowering of groundwater levels (indicating a significant and unreasonable depletion of supply if continued over the planning and implementation horizon) is an undesirable result.[21] For these reasons, DWR has determined that critical overdraft of a basin is a relevant factor in the prioritization of basins for the purposes of achieving sustainable groundwater management.

The SGMA 2019 Basin Prioritization process flagged each of the 21 basins in critical overdraft, as determined in *Bulletin 118 – Interim Update 2016*, and adjusted the overall basin priority points for these basins by assigning the maximum total priority points of 40.

Sub-component 8.d.2: Does the Basin Participate in Groundwater-Related Transfers?

Data Source

- Bulletin 132 - Management of the California State Water Project

Groundwater-related transfers (groundwater substitution transfers and out-of-basin groundwater transfers) were not evaluated as part of the CASGEM 2014 Basin Prioritization. Groundwater-related transfers were deemed relevant to basin prioritization for the purposes of achieving sustainable groundwater management and were analyzed for the SGMA 2019 Basin Prioritization. Groundwater-related transfers, if unmanaged, could lead to impacts to groundwater levels and interconnected surface water, and subsidence, among others. Groundwater-related transfers were considered significant if they exceeded 2,000 acre-feet of groundwater-related transfers or exports from a basin in a single year, which was the threshold utilized in the CASGEM 2014 Basin Prioritization for a basin to be classified as very low priority.

The consideration of groundwater-related transfers (groundwater substitution transfers or out-of-basin groundwater transfers) included reviewing groundwater substitution records since 2009. Data from the most recent (10) years is consistent with the Water Budget requirements within the GSP regulation.[22]

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[20] Bulletin 118 – Update 2003.
[21] Water Code Section 10721(x)(1).
[22] California Code of Regulations 354.18.

The two types of groundwater transfer are described as follows:

- *Groundwater substitution transfers* occur when surface water is made available for transfer by reducing surface water diversions and replacing that water with groundwater pumping. The rationale is that surface water demands are reduced because a like amount of groundwater is used to meet the demands. The resulting increase in available surface water supplies can be transferred to other users. DWR only considered those groundwater substitution transfers that are out-of-basin. The SGMA 2019 Basin Prioritization refers to these transfers as Type A.
- *Out-of-basin groundwater transfers* are transfers that pump percolating groundwater from a source basin and convey the pumped water to a location outside the source basin. DWR only considered groundwater transfers that are or would be under the decision-making authority of a GSA. Transfers pursuant to a groundwater adjudication were not considered. The SGMA 2019 Basin Prioritization refers to these transfers as Type B.

Groundwater-related transfers were evaluated by reviewing available data published annually from 2009 through 2015 in DWR *Bulletin 132: Management of the California State Water Project* (California Department of Water Resources 2009 through 2015). Additionally, SGMA watermaster annual reports, basin annual reports, and hydrologic studies were consulted to determine if groundwater-related transfers occurred.

Appendix 6 identifies the basins that participate in Type A or Type B groundwater transfers and volume of groundwater pumped in years with transfers.

Basins shown in Appendix 6 were evaluated using the following steps for sub-component 8.d.2:

Step 1 – Determine Maximum Groundwater Pumped: Using Appendix 6, the maximum groundwater volume pumped to meet the requirements of groundwater substitution transfers or groundwater exports out of basin in any year since 2009 was determined.

Step 2 – Check Groundwater Pumped: If the groundwater pumped was greater than 2,000 acre-feet, the analysis proceeded to Step 3. Otherwise, sub-component 8.d.2 did not apply to the basin.

Step 3 – Assign Priority Points: The basin was assigned two priority points for sub-component 8.d.2.

Step 4 – Adjust Sub-Component 6.a: Volume of groundwater pumped in 2014 for groundwater substitution transfers or out-of-basin groundwater transfers was added to the overall groundwater (“other” groundwater) in sub-component 6a. For groundwater substitution transfers, the equal volume was subtracted from the overall surface water (“other” surface water).

VI. Basin Priority

All basins were processed for all eight components. Prior to determining the basins' priority, adjustments were made, as described above (see sub-components 8c and 8d), that would automatically result in a very low or high priority determination. In cases where basins were automatically assigned very low or high priority, the calculation of priority points was completed and retained.

The basin priority determination for each basin as an element of the SGMA 2019 Basin Prioritization used the same data and an updated method relative to the CASGEM 2014 Basin Prioritization. For the CASGEM 2014 Basin Prioritization, the threshold value between low and medium priority was set at 13.42 and was based on a maximum of 40 points. For the SGMA 2019 Basin Prioritization, DWR adjusted the threshold value to account for the two additional points added for the adverse impacts on local habitat and local streamflow (sub-component 8.a). The approach was a simple ratio calculation that increased the medium priority threshold value to 14.1.

The total possible points for the SGMA 2019 Basin Prioritization range from zero to 40 in increments of 0.5 points. The new priority threshold value for medium priority was set to greater than 14. The other threshold values were evenly distributed from the 14-point value in multiples of 7. The basin priority ranks were determined using the value ranges listed in Table 13, including basins that had their total priority points adjusted to zero (very low) or 40 (high).

Table 13 SGMA 2019 Basin Prioritization Priority Based on Total Priority Points

Priority	Total Priority Point Ranges X = Cumulative Priority Points
Very Low	$0 \leq x \leq 7$
Low	$7 < x \leq 14$
Medium	$14 < x \leq 21$
High	$21 < x \leq 40$

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Appendix 1 – Summary of SGMA 2019 Basin Prioritization Results

Final September 2019: 515 basins (Figure A-1 and Table A-1)

- High priority – 46 basins
- Medium priority – 48 basins
- Low priority – 11 basins
- Very Low priority – 410 basins

Basins newly identified as high- or medium-priority in the SGMA 2019 Basin Prioritization are required to form a GSA within two years from the date the basin's priority is finalized and are required to submit a GSP five years from the same finalization date.

DWR created a web application that spatially and graphically presents the SGMA 2019 Basin Prioritization data and results for each basin. This application can be accessed at https://gis.water.ca.gov/app/bp2018-dashboard. Additional information related to SGMA 2019 Basin Prioritization can be accessed at: https://www.water.ca.gov/Programs/Groundwater-Management/Basin-Prioritization.

Figure A-1 Statewide Map of SGMA 2019 Basin Prioritization Results

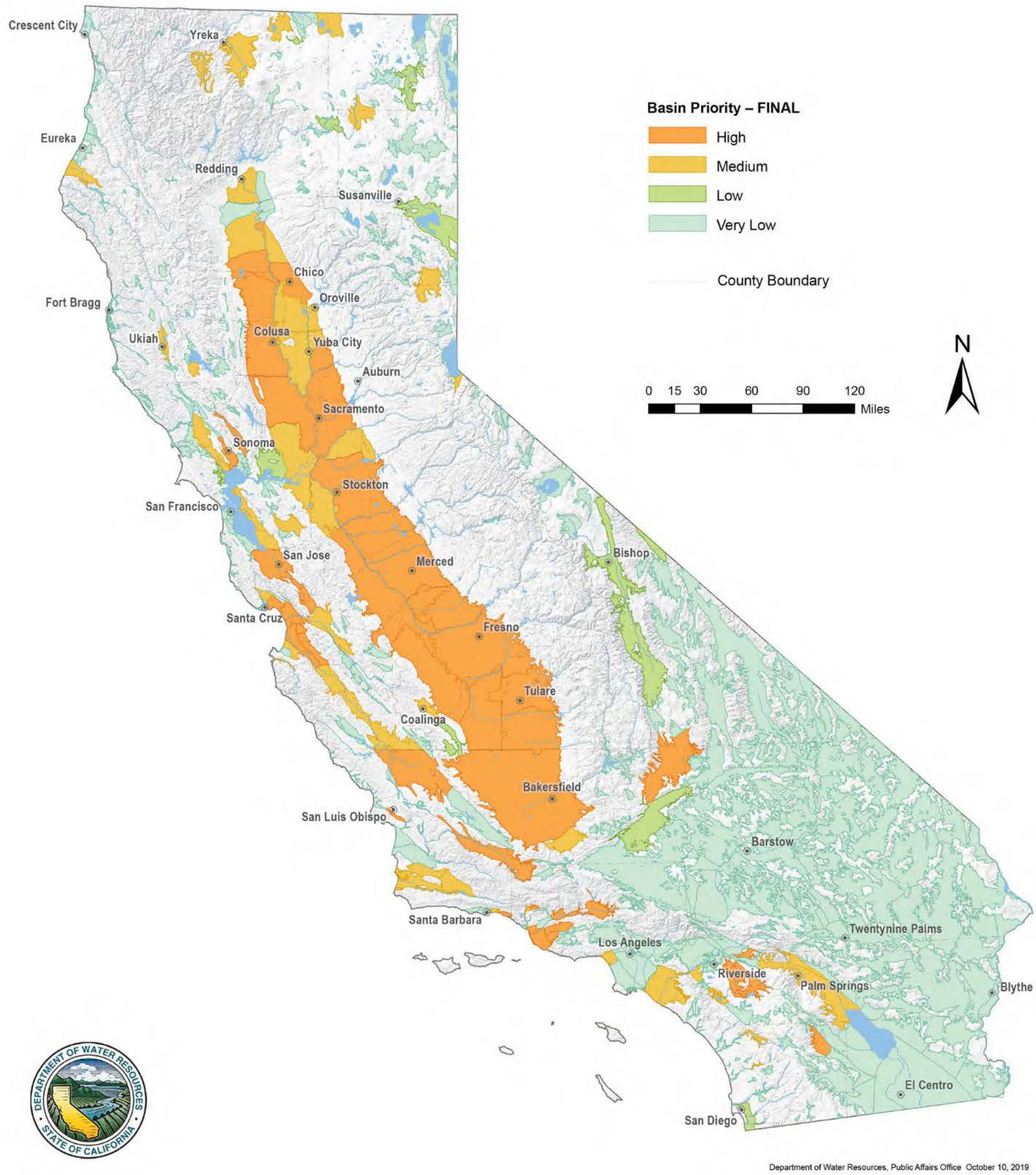


Table A-1 **SGMA 2019 Basin Prioritization – Statewide Results**

Basin Number	Basin / Subbasin Name	Area (Acres)	Area (Square Miles)	Priority	Phase
1-001	Smith River Plain	40,434.50	63.2	Very Low	1
1-002.01	Tulelake	110,521.40	172.7	Medium	1
1-002.02	Lower Klamath	75,330.30	117.7	Very Low	1
1-003	Butte Valley	79,739.00	124.6	Medium	1
1-004	Shasta Valley	218,215.03	340.96	Medium	2
1-005	Scott River Valley	63,831.40	99.7	Medium	1
1-006	Hayfork Valley	3,297.50	5.2	Very Low	1
1-007	Hoopa Valley	3,897.20	6.1	Very Low	1
1-008.01	Mad River Lowland	24,663.20	38.5	Very Low	1
1-008.02	Dows Prairie School Area	15,416.10	24.1	Very Low	1
1-009	Eureka Plain	38,795.40	60.6	Very Low	1
1-010	Eel River Valley	72,956.70	114	Medium	1
1-011	Covelo Round Valley	16,408.90	25.6	Very Low	1
1-012	Laytonville Valley	5,023.70	7.8	Very Low	1
1-013	Little Lake Valley	10,025.50	15.7	Very Low	1
1-014	Lower Klamath River Valley	7,022.10	11	Very Low	1
1-015	Happy Camp Town Area	2,773.30	4.3	Very Low	1
1-016	Seiad Valley	2,245.10	3.5	Very Low	1
1-017	Bray Town Area	8,032.40	12.6	Very Low	1
1-018	Red Rock Valley	9,000.70	14.1	Low	1

Basin Number	Basin / Subbasin Name	Area (Acres)	Area (Square Miles)	Priority	Phase
1-019	Anderson Valley	4,972.80	7.8	Very Low	1
1-020	Garcia River Valley	2,199.50	3.4	Very Low	1
1-021	Fort Bragg Terrace Area	23,897.80	37.3	Very Low	1
1-022	Fairchild Swamp Valley	3,277.90	5.1	Very Low	1
1-025	Prairie Creek Area	20,848.80	32.6	Very Low	1
1-026	Redwood Creek Area	2,009.40	3.1	Very Low	1
1-027	Big Lagoon Area	13,217.00	20.7	Very Low	1
1-028	Mattole River Valley	3,160.00	4.9	Very Low	1
1-029	Honeydew Town Area	2,369.90	3.7	Very Low	1
1-030	Pepperwood Town Area	6,292.00	9.8	Very Low	1
1-031	Weott Town Area	3,655.20	5.7	Very Low	1
1-032	Garberville Town Area	2,113.20	3.3	Very Low	1
1-033	Larabee Valley	967.2	1.5	Very Low	1
1-034	Dinsmores Town Area	2,277.90	3.6	Very Low	1
1-035	Hyampom Valley	1,354.80	2.1	Very Low	1
1-036	Hettenshaw Valley	847	1.3	Very Low	1
1-037	Cottoneva Creek Valley	762.1	1.2	Very Low	1
1-038	Lower Laytonville Valley	2,153.10	3.4	Very Low	1

Basin Number	Basin/Subbasin Name	Area (Acres)	Area (Square Miles)	Priority	Phase
1-039	Branscomb Town Area	1,382.10	2.2	Very Low	1
1-040	Ten Mile River Valley	1,491.30	2.3	Very Low	1
1-041	Little Valley	812.5	1.3	Very Low	1
1-042	Sherwood Valley	1,150.70	1.8	Very Low	1
1-043	Williams Valley	1,643.40	2.6	Very Low	1
1-044	Eden Valley	1,377.50	2.2	Very Low	1
1-045	Big River Valley	1,685.90	2.6	Very Low	1
1-046	Navarro River Valley	768.5	1.2	Very Low	1
1-048	Gravelly Valley	2,976.30	4.7	Very Low	1
1-049	Annapolis Ohlson Ranch Fm Highlands	8,653.00	13.5	Very Low	1
1-050	Knights Valley	4,089.50	6.4	Very Low	1
1-051	Potter Valley	8,243.00	12.9	Very Low	1
1-052	Ukiah Valley	37,537.40	58.7	Medium	1
1-053	Sanel Valley	5,572.40	8.7	Very Low	1
1-054.01	Alexander Area	24,484.40	38.3	Very Low	1
1-054.02	Cloverdale Area	6,530.10	10.2	Very Low	1
1-055.01	Santa Rosa Plain	81,284.31	127.01	Medium	2
1-055.02	Healdsburg Area	15,412.70	24.1	Very Low	1
1-055.03	Rincon Valley	5,553.20	8.7	Very Low	1

Basin Number	Basin / Subbasin Name	Area (Acres)	Area (Square Miles)	Priority	Phase
1-056	Mcdowell Valley	1,487.60	2.3	Very Low	1
1-057	Bodega Bay Area	2,668.70	4.2	Very Low	1
1-059	Wilson Grove Formation Highlands	63,836.66	99.74	Very Low	2
1-060	Lower Russian River Valley	6,645.00	10.4	Very Low	1
1-061	Fort Ross Terrace Deposits	8,360.90	13.1	Very Low	1
1-062	Wilson Point Area	710	1.1	Very Low	1
2-001	Petaluma Valley	46,661.32	72.91	Medium	2
2-002.01	Napa Valley	45,928.20	71.8	High	1
2-002.02	Sonoma Valley	44,846.18	70.07	High	2
2-002.03	Napa-Sonoma Lowlands	40,297.45	62.96	Very Low	2
2-003	Suisun-Fairfield Valley	133,586.20	208.7	Low	1
2-004	Pittsburg Plain	11,613.30	18.1	Very Low	1
2-005	Clayton Valley	17,846.60	27.9	Very Low	1
2-006	Ygnacio Valley	15,469.00	24.2	Very Low	1
2-007	San Ramon Valley	7,057.40	11	Very Low	1
2-008	Castro Valley	1,821.70	2.8	Very Low	1
2-009.01	Niles Cone	65,214.50	101.9	Medium	1
2-009.02	Santa Clara	189,581.00	296.2	High	1
2-009.03	San Mateo Plain	37,865.00	59.2	Very Low	1
2-009.04	East Bay Plain	71,315.10	111.4	Medium	1
2-010	Livermore Valley	69,567.10	108.7	Medium	1
2-011	Sunol Valley	16,632.00	26	Very Low	1

Basin Number	Basin / Subbasin Name	Area (Acres)	Area (Square Miles)	Priority	Phase
2-019	Kenwood Valley	5,139.00	8	Very Low	1
2-022	Half Moon Bay Terrace	9,155.90	14.3	Very Low	1
2-024	San Gregorio Valley	1,074.90	1.7	Very Low	1
2-026	Pescadero Valley	2,912.40	4.6	Very Low	1
2-027	Sand Point Area	22,342.21	34.91	Very Low	2
2-028	Ross Valley	1,764.70	2.8	Very Low	1
2-029	San Rafael Valley	874.8	1.4	Very Low	1
2-030	Novato Valley	20,535.10	32.1	Low	1
2-031	Arroyo Del Hambre Valley	786.3	1.2	Very Low	1
2-032	Visitacion Valley	5,831.10	9.1	Very Low	1
2-033	Islais Valley	5,941.30	9.3	Very Low	1
2-035	Westside	25,392.40	39.7	Very Low	1
2-036	San Pedro Valley	710.4	1.1	Very Low	1
2-037	South San Francisco	2,176.50	3.4	Very Low	1
2-038	Lobos	2,360.80	3.7	Very Low	1
2-039	Marina	2,187.70	3.4	Very Low	1
2-040	Downtown	7,640.10	11.9	Very Low	1
3-001	Santa Cruz Mid-County	36,289.70	56.7	High	1
3-002.01	Pajaro Valley	75,055.10	117.3	High	1
3-002.02	Purisima Highlands	12,932.00	20.2	Very Low	1

Basin Number	Basin/Subbasin Name	Area (Acres)	Area (Square Miles)	Priority	Phase
3-003.01	Llagas Area	47,370.90	74	High	1
3-003.05	North San Benito	131,030.03	204.73	Medium	2
3-004.01	180/400 Foot Aquifer	89,706.30	140.2	High	1
3-004.02	East Side Aquifer	57,474.30	89.8	High	1
3-004.04	Forebay Aquifer	94,052.20	147	Medium	1
3-004.05	Upper Valley Aquifer	238,020.54	371.91	Medium	2
3-004.06	Paso Robles Area	436,157.09	681.5	High	2
3-004.08	Seaside Area	14,488.70	22.6	Very Low	1
3-004.09	Langley Area	17,618.50	27.5	High	1
3-004.10	Corral De Tierra Area	30,854.90	48.2	Medium	1
3-004.11	Atascadero Area	19,734.90	30.8	Very Low	1
3-005	Cholame Valley	39,824.60	62.2	Very Low	1
3-006	Lockwood Valley	59,941.00	93.7	Very Low	1
3-007	Carmel Valley	4,321.70	6.8	Medium	1
3-008.01	Los Osos	4,232.03	6.61	Very Low	2
3-008.02	Warden Creek	1,762.94	2.75	Very Low	2
3-009	San Luis Obispo Valley	12,720.60	19.9	High	1
3-012.01	Santa Maria	170,212.68	265.96	Very Low	2
3-012.02	Arroyo Grande	2,901.22	4.53	Very Low	2
3-013	Cuyama Valley	241,729.90	377.7	High	1
3-014	San Antonio Creek Valley	67,437.40	105.4	Medium	1
3-015	Santa Ynez River Valley	203,050.60	317.3	Medium	1
3-016	Goleta	9,217.10	14.4	Very Low	1
3-017	Santa Barbara	6,183.10	9.7	Very Low	1
3-018	Carpinteria	7,977.71	12.47	High	2

Basin Number	Basin/Subbasin Name	Area (Acres)	Area (Square Miles)	Priority	Phase
3-019	Carrizo Plain	210,627.50	329.1	Very Low	1
3-020	Ano Nuevo Area	1,995.20	3.1	Very Low	1
3-022	Santa Ana Valley	2,724.30	4.3	Very Low	1
3-023	Upper Santa Ana Valley	1,430.90	2.2	Very Low	1
3-024	Quien Sabe Valley	4,707.00	7.4	Very Low	1
3-026	West Santa Cruz Terrace	7,306.40	11.4	Very Low	1
3-027	Santa Margarita	22,249.00	34.8	Medium	1
3-028	San Benito River Valley	24,227.00	37.9	Very Low	1
3-029	Dry Lake Valley	1,416.30	2.2	Very Low	1
3-030	Bitter Water Valley	32,224.80	50.4	Very Low	1
3-031	Hernandez Valley	2,864.50	4.5	Very Low	1
3-032	Peach Tree Valley	9,790.00	15.3	Very Low	1
3-033	San Carpoforo Valley	1,042.60	1.6	Very Low	1
3-034	Arroyo De La Cruz Valley	1,015.90	1.6	Very Low	1
3-035	San Simeon Valley	547	0.9	Very Low	1
3-036	Santa Rosa Valley	3,507.50	5.5	Very Low	1
3-037	Villa Valley	1,355.90	2.1	Very Low	1
3-038	Cayucos Valley	333.5	0.5	Very Low	1
3-039	Old Valley	1,178.40	1.8	Very Low	1

Basin Number	Basin/Subbasin Name	Area (Acres)	Area (Square Miles)	Priority	Phase
3-040	Toro Valley	720	1.1	Very Low	1
3-041	Morro Valley	644.1	1	Very Low	1
3-042	Chorro Valley	1,549.60	2.4	Very Low	1
3-043	Rinconada Valley	2,577.80	4	Very Low	1
3-044	Pozo Valley	6,848.60	10.7	Very Low	1
3-045	Huasna Valley	4,703.00	7.3	Very Low	1
3-046	Rafael Valley	2,993.20	4.7	Very Low	1
3-047	Big Spring Area	7,324.10	11.4	Very Low	1
3-049	Montecito	6,144.71	9.6	Medium	2
3-051	Majors Creek	478.7	0.7	Very Low	1
3-052	Needle Rock Point	839.9	1.3	Very Low	1
3-053	Foothill	3,282.30	5.1	Very Low	1
4-001	Upper Ojai Valley	3,806.30	5.9	Very Low	1
4-002	Ojai Valley	5,913.40	9.2	High	1
4-003.01	Upper Ventura River	5,278.10	8.2	Medium	1
4-003.02	Lower Ventura River	5,262.10	8.2	Very Low	1
4-004.02	Oxnard	57,887.91	90.45	High	2
4-004.03	Mound	13,865.83	21.67	High	2
4-004.04	Santa Paula	22,112.00	34.55	Very Low	2
4-004.05	Fillmore	22,585.84	35.29	High	2
4-004.06	Piru	10,896.87	17.03	High	2

Basin Number	Basin/Subbasin Name	Area (Acres)	Area (Square Miles)	Priority	Phase
4-004.07	Santa Clara River Valley East	67,687.60	105.8	High	1
4-005	Acton Valley	8,268.40	12.9	Very Low	1
4-006	Pleasant Valley	19,840.00	31	High	1
4-007	Arroyo Santa Rosa Valley	3,924.27	6.13	Very Low	2
4-008	Las Posas Valley	44,622.00	69.7	High	1
4-009	Simi Valley	12,155.20	19	Very Low	1
4-010	Conejo	18,796.00	29.4	Very Low	1
4-011.01	Santa Monica	31,779.20	49.7	Medium	1
4-011.02	Hollywood	10,070.20	15.7	Very Low	1
4-011.03	West Coast	92,996.70	145.3	Very Low	1
4-011.04	Central	177,770.30	277.8	Very Low	1
4-012	San Fernando Valley	144,837.10	226.3	Very Low	1
4-013	San Gabriel Valley	126,379.00	197.5	Very Low	1
4-015	Tierra Rejada	4,597.80	7.2	Very Low	1
4-016	Hidden Valley	2,210.70	3.5	Very Low	1
4-017	Lockwood Valley	21,789.50	34	Very Low	1
4-018	Hungry Valley	5,309.20	8.3	Very Low	1
4-019	Thousand Oaks Area	3,106.00	4.9	Very Low	1
4-020	Russell Valley	3,078.30	4.8	Very Low	1
4-022	Malibu Valley	610.8	1	Very Low	1

Basin Number	Basin / Subbasin Name	Area (Acres)	Area (Square Miles)	Priority	Phase
4-023	Raymond	26,048.80	40.7	Very Low	1
5-001.01	Goose Valley	35,954.40	56.2	Very Low	1
5-001.02	Fandango Valley	18,443.00	28.8	Very Low	1
5-002.01	South Fork Pitt River	114,136.70	178.3	Low	1
5-002.02	Warm Springs Valley	68,007.90	106.3	Very Low	1
5-003	Jess Valley	6,705.40	10.5	Very Low	1
5-004	Big Valley	92,067.10	143.9	Medium	1
5-005	Fall River Valley	54,824.60	85.7	Low	1
5-006.01	Bowman	122,533.80	191.46	Very Low	2
5-006.03	Anderson	98,704.60	154.2	Medium	1
5-006.04	Enterprise	61,288.30	95.8	Medium	1
5-006.05	Millville	65,616.02	102.53	Very Low	2
5-006.06	South Battle Creek	33,716.35	52.68	Very Low	2
5-007	Lake Almanor Valley	7,154.10	11.2	Very Low	1
5-008	Mountain Meadows Valley	8,145.90	12.7	Very Low	1
5-009	Indian Valley	29,413.20	46	Very Low	1
5-010	American Valley	6,799.30	10.6	Very Low	1
5-011	Mohawk Valley	18,983.10	29.7	Very Low	1
5-012.01	Sierra Valley	117,292.42	183.27	Medium	2
5-012.02	Chilcoot	7,545.70	11.8	Very Low	1
5-013	Upper Lake Valley	7,265.90	11.4	Very Low	1

Basin Number	Basin / Subbasin Name	Area (Acres)	Area (Square Miles)	Priority	Phase
5-014	Scotts Valley	7,326.10	11.4	Very Low	1
5-015	Big Valley	24,231.30	37.9	Medium	1
5-016	High Valley	2,357.90	3.7	Very Low	1
5-017	Burns Valley	2,875.10	4.5	Very Low	1
5-018	Coyote Valley	6,533.20	10.2	Very Low	1
5-019	Collayomi Valley	6,501.60	10.2	Very Low	1
5-020	Berryessa Valley	1,376.10	2.2	Very Low	1
5-021.50	Red Bluff	271,793.90	424.7	Medium	1
5-021.51	Corning	207,342.76	323.97	High	2
5-021.52	Colusa	723,823.74	1,130.97	High	2
5-021.53	Bend	22,676.40	35.4	Very Low	1
5-021.54	Antelope	19,090.80	29.8	High	1
5-021.56	Los Molinos	99,422.40	155.35	Medium	2
5-021.57	Vina	184,917.61	288.93	High	2
5-021.60	North Yuba	60,838.08	95.06	Medium	2
5-021.61	South Yuba	109,020.31	170.34	High	2
5-021.62	Sutter	285,809.87	446.58	Medium	2
5-021.64	North American	342,241.43	534.75	High	2
5-021.65	South American	248,403.37	388.13	High	2
5-021.66	Solano	354,672.90	554.18	High	2
5-021.67	Yolo	540,693.50	844.83	High	2
5-021.69	Wyandotte Creek	59,382.18	92.78	Medium	2
5-021.70	Butte	265,500.00	414.84	Medium	2
5-022.01	Eastern San Joaquin	764,802.78	1,195.00	High	2
5-022.02	Modesto	245,252.70	383.2	High	1
5-022.03	Turlock	348,187.10	544	High	1
5-022.04	Merced	512,959.10	801.5	High	1

Basin Number	Basin / Subbasin Name	Area (Acres)	Area (Square Miles)	Priority	Phase
5-022.05	Chowchilla	145,574.30	227.46	High	2
5-022.06	Madera	347,667.39	543.23	High	2
5-022.07	Delta-Mendota	764,964.86	1,195.26	High	2
5-022.08	Kings	981,324.82	1,533.32	High	2
5-022.09	Westside	621,823.20	971.6	High	1
5-022.10	Pleasant Valley	48,195.60	75.3	Medium	1
5-022.11	Kaweah	441,003.90	689.1	High	1
5-022.12	Tulare Lake	535,869.10	837.3	High	1
5-022.13	Tule	477,646.40	746.3	High	1
5-022.14	Kern County	1,782,320.81	2,784.88	High	2
5-022.15	Tracy	238,428.97	372.55	Medium	2
5-022.16	Cosumnes	210,275.92	328.56	Medium	2
5-022.17	Kettleman Plain	63,754.60	99.6	Low	1
5-022.18	White Wolf	107,546.30	168	Medium	1
5-022.19	East Contra Costa	107,596.40	168.12	Medium	2
5-023	Panoche Valley	33,086.60	51.7	Very Low	1
5-025	Kern River Valley	79,388.90	124	Very Low	1
5-026	Walker Basin Creek Valley	7,667.60	12	Very Low	1
5-027	Cummings Valley	10,019.30	15.7	Very Low	1
5-028	Tehachapi Valley West	14,803.10	23.1	Very Low	1
5-029	Castac Lake Valley	3,563.60	5.6	Very Low	1
5-030	Lower Lake Valley	2,405.80	3.8	Very Low	1
5-031	Long Valley	2,801.50	4.4	Very Low	1
5-035	Mccloud Area	21,334.50	33.3	Very Low	1
5-036	Round Valley	7,266.30	11.4	Very Low	1

Basin Number	Basin/Subbasin Name	Area (Acres)	Area (Square Miles)	Priority	Phase
5-037	Toad Well Area	3,357.50	5.2	Very Low	1
5-038	Pondosa Town Area	2,082.90	3.3	Very Low	1
5-040	Hot Springs Valley	2,405.10	3.8	Very Low	1
5-041	Egg Lake Valley	4,102.30	6.4	Very Low	1
5-043	Rock Prairie Valley	5,739.10	9	Very Low	1
5-044	Long Valley	1,087.00	1.7	Very Low	1
5-045	Cayton Valley	1,306.70	2	Very Low	1
5-046	Lake Britton Area	14,061.20	22	Very Low	1
5-047	Goose Valley	4,210.40	6.6	Very Low	1
5-048	Burney Creek Valley	2,352.90	3.7	Very Low	1
5-049	Dry Burney Creek Valley	3,076.00	4.8	Very Low	1
5-050	North Fork Battle Creek	12,761.90	19.9	Very Low	1
5-051	Butte Creek Valley	3,227.60	5	Very Low	1
5-052	Grays Valley	5,440.80	8.5	Very Low	1
5-053	Dixie Valley	4,867.00	7.6	Very Low	1
5-054	Ash Valley	6,007.10	9.4	Very Low	1
5-056	Yellow Creek Valley	2,311.70	3.6	Very Low	1
5-057	Last Chance Creek Valley	4,657.10	7.3	Very Low	1

Basin Number	Basin / Subbasin Name	Area (Acres)	Area (Square Miles)	Priority	Phase
5-058	Clover Valley	16,778.00	26.2	Very Low	1
5-059	Grizzly Valley	13,438.00	21	Very Low	1
5-060	Humbug Valley	9,976.20	15.6	Very Low	1
5-061	Chrome Town Area	1,409.20	2.2	Very Low	1
5-062	Elk Creek Area	1,439.40	2.2	Very Low	1
5-063	Stonyford Town Area	6,441.60	10.1	Very Low	1
5-064	Bear Valley	9,110.80	14.2	Very Low	1
5-065	Little Indian Valley	1,269.50	2	Very Low	1
5-066	Clear Lake Cache Formation	29,740.40	46.5	Very Low	1
5-068	Pope Valley	7,182.50	11.2	Very Low	1
5-069	Yosemite Valley	7,454.90	11.6	Very Low	1
5-070	Los Banos Creek Valley	4,835.40	7.6	Very Low	1
5-071	Vallecitos Creek Valley	15,107.40	23.6	Very Low	1
5-080	Brite Valley	3,170.20	5	Very Low	1
5-082	Cuddy Canyon Valley	3,299.30	5.2	Very Low	1
5-083	Cuddy Ranch Area	4,202.60	6.6	Very Low	1
5-084	Cuddy Valley	3,465.30	5.4	Very Low	1
5-085	Mil Potrero Area	2,308.90	3.6	Very Low	1

Basin Number	Basin/Subbasin Name	Area (Acres)	Area (Square Miles)	Priority	Phase
5-086	Joseph Creek	4,456.40	7	Very Low	1
5-087	Middle Fork Feather River	4,341.30	6.8	Very Low	1
5-088	Stony Gorge Reservoir	1,065.60	1.7	Very Low	1
5-089	Squaw Flat	1,294.40	2	Very Low	1
5-090	Funks Creek	3,014.10	4.7	Very Low	1
5-091	Antelope Creek	2,040.90	3.2	Very Low	1
5-092	Blanchard Valley	2,222.90	3.5	Very Low	1
5-094	Middle Creek	705.2	1.1	Very Low	1
5-095	Meadow Valley	5,734.90	9	Very Low	1
6-001	Surprise Valley	228,661.50	357.3	Very Low	1
6-002	Madeline Plains	156,097.30	243.9	Very Low	1
6-003	Willow Creek Valley	11,695.90	18.3	Very Low	1
6-004	Honey Lake Valley	311,716.00	487.1	Low	1
6-005.01	Tahoe South	14,800.30	23.1	Medium	1
6-005.02	Tahoe West	6,168.40	9.6	Very Low	1
6-005.03	Tahoe North	1,929.70	3	Very Low	1
6-006	Carson Valley	10,721.50	16.8	Very Low	1
6-007	Antelope Valley	20,078.10	31.4	Very Low	1
6-008	Bridgeport Valley	32,485.60	50.8	Very Low	1

Basin Number	Basin/Subbasin Name	Area (Acres)	Area (Square Miles)	Priority	Phase
6-009	Mono Valley	172,843.20	270.1	Very Low	1
6-010	Adobe Lake Valley	39,866.20	62.3	Very Low	1
6-011	Long Valley	71,843.80	112.3	Very Low	1
6-012.01	Owens Valley	660,648.16	1,032.26	Low	2
6-012.02	Fish Slough	3,221.60	5	Very Low	1
6-013	Black Springs Valley	30,766.90	48.1	Very Low	1
6-014	Fish Lake Valley	48,003.90	75	Low	1
6-015	Deep Springs Valley	29,930.40	46.8	Very Low	1
6-016	Eureka Valley	128,759.70	201.2	Very Low	1
6-017	Saline Valley	146,182.80	228.4	Very Low	1
6-018	Death Valley	920,379.90	1,438.10	Very Low	1
6-019	Wingate Valley	71,285.40	111.4	Very Low	1
6-020	Middle Amargosa Valley	389,763.40	609	Very Low	1
6-021	Lower Kingston Valley	239,740.30	374.6	Very Low	1
6-022	Upper Kingston Valley	176,749.20	276.2	Very Low	1
6-023	Riggs Valley	87,515.10	136.7	Very Low	1
6-024	Red Pass Valley	96,315.40	150.5	Very Low	1
6-025	Bicycle Valley	89,458.50	139.8	Very Low	1
6-026	Avawatz Valley	27,612.10	43.1	Very Low	1

Basin Number	Basin / Subbasin Name	Area (Acres)	Area (Square Miles)	Priority	Phase
6-027	Leach Valley	61,175.50	95.6	Very Low	1
6-028	Pahrump Valley	92,926.70	145.2	Very Low	1
6-029	Mesquite Valley	88,157.10	137.7	Very Low	1
6-030	Ivanpah Valley	198,129.10	309.6	Very Low	1
6-031	Kelso Valley	254,686.60	397.9	Very Low	1
6-032	Broadwell Valley	91,878.20	143.6	Very Low	1
6-033	Soda Lake Valley	380,056.30	593.8	Very Low	1
6-034	Silver Lake Valley	35,202.10	55	Very Low	1
6-035	Cronise Valley	126,299.90	197.3	Very Low	1
6-036.01	Langford Well Lake	19,312.10	30.2	Very Low	1
6-036.02	Irwin	10,480.30	16.4	Very Low	1
6-037	Coyote Lake Valley	88,101.80	137.7	Very Low	1
6-038	Caves Canyon Valley	72,962.30	114	Very Low	1
6-040	Lower Mojave River Valley	285,485.50	446.1	Very Low	1
6-041	Middle Mojave River Valley	211,320.70	330.2	Very Low	1
6-042	Upper Mojave River Valley	412,841.00	645.1	Very Low	1
6-043	El Mirage Valley	75,896.10	118.6	Very Low	1
6-044	Antelope Valley	1,010,268.8	1,578.50	Very Low	1

Basin Number	Basin / Subbasin Name	Area (Acres)	Area (Square Miles)	Priority	Phase
6-045	Tehachapi Valley East	23,967.30	37.4	Very Low	1
6-046	Fremont Valley	335,234.10	523.8	Low	1
6-047	Harper Valley	409,501.80	639.8	Very Low	1
6-048	Goldstone Valley	28,090.50	43.9	Very Low	1
6-049	Superior Valley	120,319.70	188	Very Low	1
6-050	Cuddeback Valley	94,901.90	148.3	Very Low	1
6-051	Pilot Knob Valley	138,605.10	216.6	Very Low	1
6-052	Searles Valley	197,011.40	307.8	Very Low	1
6-053	Salt Wells Valley	29,473.90	46.1	Very Low	1
6-054	Indian Wells Valley	381,708.60	596.4	High	1
6-055	Coso Valley	25,561.60	39.9	Very Low	1
6-056	Rose Valley	42,524.80	66.4	Very Low	1
6-057	Darwin Valley	44,160.90	69	Very Low	1
6-058	Panamint Valley	259,290.70	405.1	Very Low	1
6-061	Cameo Area	9,303.40	14.5	Very Low	1
6-062	Race Track Valley	14,113.30	22.1	Very Low	1
6-063	Hidden Valley	17,943.30	28	Very Low	1
6-064	Marble Canyon Area	10,363.50	16.2	Very Low	1
6-065	Cottonwood Spring Area	3,896.70	6.1	Very Low	1

Basin Number	Basin / Subbasin Name	Area (Acres)	Area (Square Miles)	Priority	Phase
6-066	Lee Flat	20,282.80	31.7	Very Low	1
6-067	Martis Valley	36,357.00	56.8	Very Low	1
6-068	Santa Rosa Flat	16,779.90	26.2	Very Low	1
6-069	Kelso Lander Valley	11,164.70	17.4	Very Low	1
6-070	Cactus Flat	7,025.10	11	Very Low	1
6-071	Lost Lake Valley	23,253.60	36.3	Very Low	1
6-072	Coles Flat	2,946.00	4.6	Very Low	1
6-073	Wild Horse Mesa Area	3,320.50	5.2	Very Low	1
6-074	Harrisburg Flats	24,928.30	39	Very Low	1
6-075	Wildrose Canyon	5,151.30	8	Very Low	1
6-076	Brown Mountain Valley	21,726.60	33.9	Very Low	1
6-077	Grass Valley	9,974.80	15.6	Very Low	1
6-078	Denning Spring Valley	7,231.60	11.3	Very Low	1
6-079	California Valley	58,111.70	90.8	Very Low	1
6-080	Middle Park Canyon	1,741.40	2.7	Very Low	1
6-081	Butte Valley	8,797.60	13.7	Very Low	1
6-082	Spring Canyon Valley	4,800.40	7.5	Very Low	1
6-084	Greenwater Valley	59,813.80	93.5	Very Low	1

Basin Number	Basin/Subbasin Name	Area (Acres)	Area (Square Miles)	Priority	Phase
6-085	Gold Valley	3,210.70	5	Very Low	1
6-086	Rhodes Hill Area	15,578.50	24.3	Very Low	1
6-088	Owl Lake Valley	22,242.30	34.8	Very Low	1
6-089	Kane Wash Area	5,954.10	9.3	Very Low	1
6-090	Cady Fault Area	7,949.20	12.4	Very Low	1
6-091	Cow Head Lake Valley	5,617.40	8.8	Very Low	1
6-092	Pine Creek Valley	9,526.90	14.9	Very Low	1
6-093	Harvey Valley	4,503.20	7	Very Low	1
6-094	Grasshopper Valley	17,663.80	27.6	Very Low	1
6-095	Dry Valley	6,497.50	10.2	Very Low	1
6-096	Eagle Lake Area	12,699.50	19.8	Very Low	1
6-097	Horse Lake Valley	3,826.30	6	Very Low	1
6-098	Tuledad Canyon Valley	5,149.90	8	Very Low	1
6-099	Painters Flat	6,374.20	10	Very Low	1
6-100	Secret Valley	33,663.70	52.6	Very Low	1
6-101	Bull Flat	18,117.10	28.3	Very Low	1
6-104	Long Valley	46,846.20	73.2	Very Low	1
6-105	Slinkard Valley	4,511.20	7	Very Low	1

Basin Number	Basin / Subbasin Name	Area (Acres)	Area (Square Miles)	Priority	Phase
6-106	Little Antelope Valley	2,487.70	3.9	Very Low	1
6-107	Sweetwater Flat	4,719.80	7.4	Very Low	1
6-108	Olympic Valley	702	1.1	Very Low	1
7-001	Lanfair Valley	156,540.30	244.6	Very Low	1
7-002	Fenner Valley	452,482.50	707	Very Low	1
7-003	Ward Valley	557,586.40	871.2	Very Low	1
7-004	Rice Valley	188,094.10	293.9	Very Low	1
7-005	Chuckwalla Valley	601,573.10	940	Very Low	1
7-006	Pinto Valley	182,439.40	285.1	Very Low	1
7-007	Cadiz Valley	269,847.90	421.6	Very Low	1
7-008	Bristol Valley	496,816.20	776.3	Very Low	1
7-009	Dale Valley	212,533.30	332.1	Very Low	1
7-010	Twentynine Palms Valley	62,260.00	97.3	Very Low	1
7-011	Copper Mountain Valley	30,279.70	47.3	Very Low	1
7-012	Warren Valley	17,475.73	27.31	Very Low	2
7-013.01	Deadman Lake	89,012.40	139.1	Very Low	1
7-013.02	Surprise Spring	29,253.20	45.7	Very Low	1
7-014	Lavic Valley	102,278.30	159.8	Very Low	1

Basin Number	Basin / Subbasin Name	Area (Acres)	Area (Square Miles)	Priority	Phase
7-015	Bessemer Valley	39,067.70	61	Very Low	1
7-016	Ames Valley	108,438.10	169.4	Very Low	1
7-017	Means Valley	14,941.50	23.3	Very Low	1
7-018.01	Soggy Lake	77,277.40	120.7	Very Low	1
7-018.02	Upper Johnson Valley	34,782.10	54.3	Very Low	1
7-019	Lucerne Valley	147,431.50	230.4	Very Low	1
7-020	Morongo Valley	7,228.10	11.3	Very Low	1
7-021.01	Indio	297,156.40	464.3	Medium	1
7-021.02	Mission Creek	48,571.70	75.9	Medium	1
7-021.03	Desert Hot Springs	100,947.60	157.7	Very Low	1
7-021.04	San Gorgonio Pass	38,545.10	60.2	Medium	1
7-022	West Salton Sea	105,382.30	164.7	Very Low	1
7-024.01	Borrego Springs	62,749.20	98	High	1
7-024.02	Ocotillo Wells	90,086.80	140.8	Very Low	1
7-025	Ocotillo-Clark Valley	222,280.20	347.3	Very Low	1
7-026	Terwilliger Valley	8,017.40	12.5	Very Low	1
7-027	San Felipe Valley	23,376.40	36.5	Very Low	1
7-028	Vallecito-Carrizo Valley	121,816.00	190.3	Very Low	1
7-029	Coyote Wells Valley	145,659.90	227.6	Very Low	1
7-030	Imperial Valley	957,774.40	1,496.50	Very Low	1

Basin Number	Basin / Subbasin Name	Area (Acres)	Area (Square Miles)	Priority	Phase
7-031	Orocopia Valley	96,223.50	150.3	Very Low	1
7-032	Chocolate Valley	129,107.20	201.7	Very Low	1
7-033	East Salton Sea	194,844.20	304.4	Very Low	1
7-034	Amos Valley	129,920.80	203	Very Low	1
7-035	Ogilby Valley	133,170.10	208.1	Very Low	1
7-036	Yuma Valley	123,880.60	193.6	Very Low	1
7-037	Arroyo Seco Valley	256,477.90	400.7	Very Low	1
7-038	Palo Verde Valley	72,934.10	114	Very Low	1
7-039	Palo Verde Mesa	224,910.80	351.4	Very Low	1
7-040	Quien Sabe Point Valley	25,173.30	39.3	Very Low	1
7-041	Calzona Valley	80,545.60	125.9	Very Low	1
7-042	Vidal Valley	137,660.10	215.1	Very Low	1
7-043	Chemehuevi Valley	272,014.50	425	Very Low	1
7-044	Needles Valley	88,053.90	137.6	Very Low	1
7-045	Piute Valley	175,192.40	273.7	Very Low	1
7-046	Canebrake Valley	5,411.50	8.5	Very Low	1
7-047	Jacumba Valley	2,475.70	3.9	Very Low	1
7-048	Helendale Fault Valley	2,617.20	4.1	Very Low	1

Basin Number	Basin/Subbasin Name	Area (Acres)	Area (Square Miles)	Priority	Phase
7-049	Pipes Canyon Fault Valley	3,382.00	5.3	Very Low	1
7-050	Iron Ridge Area	5,243.00	8.2	Very Low	1
7-051	Lost Horse Valley	17,299.60	27	Very Low	1
7-052	Pleasant Valley	9,642.60	15.1	Very Low	1
7-053	Hexie Mountain Area	11,131.90	17.4	Very Low	1
7-054	Buck Ridge Fault Valley	6,914.50	10.8	Very Low	1
7-055	Collins Valley	7,062.20	11	Very Low	1
7-056	Yaqui Well Area	14,966.60	23.4	Very Low	1
7-059	Mason Valley	5,520.50	8.6	Very Low	1
7-061	Davies Valley	3,570.90	5.6	Very Low	1
7-062	Joshua Tree	33,448.78	52.26	Very Low	2
7-063	Vandeventer Flat	6,732.00	10.5	Very Low	1
8-001	Coastal Plain Of Orange County	224,226.30	350.4	Medium	1
8-002.01	Chino	153,762.30	240.3	Very Low	1
8-002.02	Cucamonga	9,028.00	14.1	Very Low	1
8-002.03	Riverside-Arlington	56,563.10	88.4	Very Low	1
8-002.04	Rialto-Colton	24,794.10	38.7	Very Low	1
8-002.05	Cajon	23,134.60	36.1	Very Low	1

Basin Number	Basin / Subbasin Name	Area (Acres)	Area (Square Miles)	Priority	Phase
8-002.06	San Bernardino	92,488.20	144.5	Very Low	1
8-002.07	Yucaipa	22,218.80	34.7	High	1
8-002.08	San Timoteo	32,287.65	50.45	Very Low	2
8-002.09	Temescal	22,963.60	35.9	Medium	1
8-004.01	Elsinore Valley	23,601.20	36.9	Medium	1
8-004.02	Bedford-Coldwater	7,025.70	11	Very Low	1
8-005	San Jacinto	158,534.44	247.71	High	2
8-006	Hemet Lake Valley	16,679.90	26.1	Very Low	1
8-007	Big Meadows Valley	14,162.10	22.1	Very Low	1
8-008	Seven Oaks Valley	4,075.20	6.4	Very Low	1
8-009	Bear Valley	19,170.10	30	Very Low	1
9-001	San Juan Valley	16,712.40	26.1	Very Low	1
9-002	San Mateo Valley	2,993.50	4.7	Very Low	1
9-003	San Onofre Valley	1,238.10	1.9	Very Low	1
9-004	Santa Margarita Valley	5,214.70	8.1	Very Low	1
9-005	Temecula Valley	87,752.60	137.1	Very Low	1
9-006	Cahuilla Valley	18,201.60	28.4	Very Low	1
9-007.01	Upper San Luis Rey Valley	19,254.35	30.08	Medium	2
9-007.02	Lower San Luis Rey Valley	10,411.92	16.27	Very Low	2
9-008	Warner Valley	23,963.50	37.4	Very Low	1
9-009	Escondido Valley	2,886.90	4.5	Very Low	1

Basin Number	Basin / Subbasin Name	Area (Acres)	Area (Square Miles)	Priority	Phase
9-010	San Pasqual Valley	3,498.40	5.5	Medium	1
9-011	Santa Maria Valley	12,289.90	19.2	Very Low	1
9-012	San Dieguito Creek	3,547.90	5.5	Very Low	1
9-013	Poway Valley	2,467.90	3.9	Very Low	1
9-014	Mission Valley	7,302.50	11.4	Very Low	1
9-015	San Diego River Valley	9,873.37	15.43	Very Low	2
9-016	El Cajon Valley	7,152.10	11.2	Very Low	1
9-022	Batiquitos Lagoon Valley	740.8	1.2	Very Low	1
9-023	San Elijo Valley	882.3	1.4	Very Low	1
9-024	Pamo Valley	1,502.50	2.3	Very Low	1
9-025	Ranchita Town Area	3,119.90	4.9	Very Low	1
9-027	Cottonwood Valley	3,838.50	6	Very Low	1
9-028	Campo Valley	3,538.50	5.5	Very Low	1
9-029	Potrero Valley	2,018.90	3.2	Very Low	1
9-032	San Marcos Area	2,129.80	3.3	Very Low	1
9-033	Coastal Plain of San Diego	54,980.89	85.91	Low	2

Appendix 2 – DWR standard land use legend (adapted for remote sensing crop mapping) (component 6.a)

Crop Category	DWR 20 Crop (CalSIMETAW Input)	Crop
G – GRAIN & HAY	Miscellaneous Grain and Hay	Wheat, Miscellaneous grain and hay
R – RICE	Rice	Rice, Wild rice
F – FIELD CROPS	Cotton	Cotton
F – FIELD CROPS	Safflower	Safflower
F – FIELD CROPS	Other Field	Sunflowers
F – FIELD CROPS	Dry Beans	Beans (dry)
F – FIELD CROPS	Corn	Corn (field & sweet), sorghum and Sudan
P - PASTURE	Alfalfa	Alfalfa & alfalfa mixtures
P - PASTURE	Pasture	Mixed pasture Miscellaneous grasses (includes Bermuda grass, ryegrass, turf grass, etc.)
T – TRUCK, NURSERY, AND BERRY CROPS	Onions & Garlic	Onions and garlic
T – TRUCK, NURSERY, AND BERRY CROPS	Tomato Processing	Tomatoes (processing and fresh)
T – TRUCK, NURSERY, AND BERRY CROPS	Potatoes	Potatoes and sweet potatoes
T – TRUCK, NURSERY, AND BERRY CROPS	Cucurbits	Melons, squash, and cucumbers (all types)

Crop Category	DWR 20 Crop (CalSIMETAW Input)	Crop
T – TRUCK, NURSERY, AND BERRY CROPS	Truck Crops	Cole crops (includes broccoli, cauliflower, cabbage, brussel sprouts, mixed cole crops or cole crops not specifically listed in the legend) Carrots Lettuce/leafy greens Flowers, nursery & Christmas tree farms Bush berries (includes blueberries, blackberries, raspberries, and other bush berries) Strawberries Peppers (chili, bell, etc.) Miscellaneous truck (a truck crop not specifically listed in the legend)
D – DECIDUOUS FRUITS AND NUTS	Almonds & Pistachios	Almonds, Pistachios
D – DECIDUOUS FRUITS AND NUTS	Other Deciduous	Apples Cherries Peaches/nectarines Pears Plums, prunes, and apricots Walnuts Pomegranates Miscellaneous deciduous (a type of deciduous orchard not specifically listed in the legend) Young perennial fruits and nuts (includes young orchards and vineyards)
C – CITRUS AND SUBTROPICAL	Citrus Subtropical	Citrus Dates Avocados Olives Kiwis

Crop Category	DWR 20 Crop (CalSIMETAW Input)	Crop
		Miscellaneous subtropical fruits
V – VINEYARDS	Vineyard	Grapes

Table Note: Crop categories not in included in DWR 20 Crop categories are Sugar Beets (none reported in the state during 2014) and Fresh tomatoes (combined with Tomato Processing). Non-crop categories, Urban, Native Riparian, Idle and Water Surface, are not used in basin prioritization.

Appendix 3 – List of chemicals used in the evaluation of documented water quality degradation (component 7.d)

Table with Primary MCLs

GAMA Storenum	Units	MCL	Chemical Name	GAMA Storenum	Units	MCL	Chemical Name
TCA111	UG/L	200	1,1,1-Trichloroethane	ENDOTHAL	UG/L	100	Endothal
PCA	UG/L	1	1,1,2,2-Tetrachloroethane	ENDRIN	UG/L	2	Endrin
FC113	MG/L	1.2	1,1,2-Trichloro-1,2,2-Trifluoroethane	EBZ	UG/L	300	Ethylbenzene
TCA112	UG/L	5	1,1,2-Trichloroethane	F	MG/L	2	Fluoride (F)
DCA11	UG/L	5	1,1-Dichloroethane	ALPHA	pCi/L	15	Gross Alpha
DCE11	UG/L	6	1,1-Dichloroethylene	HEPTACHLOR	UG/L	0.01	Heptachlor
TCB124	UG/L	5	1,2,4-Trichlorobenzene	HCLBZ	UG/L	1	Hexachlorobenzene
DCBZ12	UG/L	600	1,2-Dichlorobenzene	HCCP	UG/L	50	Hexachlorocyclopentadiene
DCA12	UG/L	0.5	1,2-Dichloroethane	PB	UG/L	15	Lead
DCPA12	UG/L	5	1,2-Dichloropropane	BHCGAMMA	UG/L	0.2	Lindane
DCP13	UG/L	0.5	1,3-Dichloropropene (Total)	HG	UG/L	2	Mercury
DCBZ14	UG/L	5	1,4-Dichlorobenzene	MTXYCL	UG/L	30	Methoxychlor

GAMA Storenum	Units	MCL	Chemical Name	GAMA Storenum	Units	MCL	Chemical Name
SILVEX	UG/L	50	2,4,5-Tp (Silvex)	MTBE	UG/L	13	Methyl-Tert-Butyl-Ether (Mtbe)
24D	UG/L	70	2,4-D	MOLINATE	UG/L	20	Molinate
ALACL	UG/L	2	Alachlor	NI	UG/L	100	Nickel
AL	UG/L	1000	Aluminum	NO3N	MG/L	10	Nitrate (As N)
SB	UG/L	6	Antimony	OXAMYL	UG/L	50	Oxamyl
AS	UG/L	10	Arsenic	PCP	UG/L	1	Pentachlorophe nol
ATRAZINE	UG/L	1	Atrazine	PCATE	UG/L	6	Perchlorate
BA	MG/L	1	Barium	PICLORAM	MG/L	0.5	Picloram
BTZ	UG/L	18	Bentazon	PCB1016	UG/L	0.5	Polychlorinated Biphenyls
BZ	UG/L	1	Benzene	SE	UG/L	50	Selenium
BZAP	UG/L	0.2	Benzo (A) Pyrene	SIMAZINE	UG/L	4	Simazine
BE	UG/L	4	Beryllium	SR-90	pCi/L	8	Strontium-90
BRO3	UG/L	10	Bromate	STY	UG/L	100	Styrene
CD	UG/L	5	Cadmium	PCE	UG/L	5	Tetrachloroethy lene
CTCL	UG/L	0.5	Carbon Tetrachloride	TL	UG/L	2	Thallium
CHLORITE	MG/L	1	Chlorite	THIOBENCA RB	UG/L	70	Thiobencarb
CLBZ	UG/L	70	Chlorobenzene (Monochlorobenzene)	BZME	UG/L	150	Toluene
CR	UG/L	50	Chromium (Total)	THM	UG/L	80	Total Trihalomethane s
DCE12C	UG/L	6	Cis-1,2-Dichloroethylene	DCE12T	UG/L	10	Trans-1,2-Dichloroethylen e
CN	UG/L	150	Cyanide	TCE	UG/L	5	Trichloroethylen e

GAMA Storenum	Units	MCL	Chemical Name	GAMA Storenum	Units	MCL	Chemical Name
DALAPON	UG/L	200	Dalapon	FC11	UG/L	150	Trichlorofluoro methane
DOA	MG/L	0.4	Di(2-Ethylhexyl)Adipate	H-3	pCi/L	2000 0	Tritium
BIS2EHP	UG/L	4	Di(2-Ethylhexyl)Phthalate	U	pCi/L	20	Uranium
DCMA	UG/L	5	Dichloromethane	VC	UG/L	0.5	Vinyl Chloride
DINOSEB	UG/L	7	Dinoseb	XYLENES	UG/L	1750	Xylenes (Total)

Table with Secondary MCLs

GAMA Storenum	Units	MCL	Chemical Name	GAMA Storenum	Units	MCL	Chemical Name
CU	MG/L	1	Copper	ZN	MG/L	5	Zinc
FOAMAGENT S	MG/L	0.5	Foaming Agents (Mbas)	CL	MG/L	500	Chloride
FE	UG/L	300	Iron	SO4	MG/L	500	Sulfate
MN	UG/L	50	Manganese	TDS	MG/L	1000	Total Dissolved Solids
AG	UG/L	100	Silver				

Table Source: State Water Resources Control Board 2017

Key: GAMA = groundwater ambient monitoring and assessment; MCL = maximum contaminant level; UG/L = microgram per liter; MG/L = milligram per liter; pCi/L = picocuries per liter

Note: The water quality data query of the SWRCB GAMA database and the initial basin prioritization water quality analysis was performed on and soon after April 4, 2017. Hexavalent chromium (CR6) was included on the above list as a Primary MCL and used in the initial analysis. In September 2017, CR6 was removed from the MCL Primary list on court order. The water quality analysis for basin prioritization was corrected to reflect this change and consequently does not include any CR6 records.

Appendix 4 – Computed groundwater volume for non-adjudicated portion(s) of basins with adjudicated area used during evaluation (component 8.c.3)

Basin Number	Basin / Subbasin Name	Groundwater volume (acre-feet) of non-adjudicated portion of basin*
1-005	Scott River Valley	27,496
3-004.08	Salinas Valley/Seaside	0
3-008.01	Los Osos Valley/ Los Osos Area	2
3-012.01	Santa Maria/ Santa Maria	2,316
3-016	Goleta	557
4-004.04	Santa Clara River Valley/ Santa Paula	668
4-011.03	Coastal Plain of Los Angeles/ West Coast	60
4-011.04	Coastal Plain of Los Angeles/ Central	0
4-012	San Fernando Valley	1,025
4-013	San Gabriel Valley	7,000
4-023	Raymond	1
5-027	Cummings Valley	63
5-028	Tehachapi Valley West	222
5-080	Brite Valley	8
6-012.01	Owens Valley/Owens Valley	24,346
6-037	Coyote Lake Valley	1
6-038	Caves Canyon Valley	2
6-040	Lower Mojave River Valley	0
6-041	Middle Mojave River Valley	0
6-042	Upper Mojave River Valley	5
6-043	El Mirage Valley	526

Basin Number	Basin / Subbasin Name	Groundwater volume (acre-feet) of non-adjudicated portion of basin*
6-044	Antelope Valley	2,631
6-045	Tehachapi Valley East	55
6-047	Harper Valley	7
6-089	Kane Wash Area	0
7-012	Warren Valley	69
7-019	Lucerne Valley	0
8-002.01	Upper Santa Ana Valley/ Chino	2,553
8-002.02	Upper Santa Ana Valley/ Cucamonga	1
8-002.03	Upper Santa Ana Valley/ Riverside-Arlington	7,778
8-002.04	Upper Santa Ana Valley/ Rialto-Colton	2,349
8-002.06	Upper Santa Ana Valley/ Bunker Hill	216
8-002.08	Upper Santa Ana Valley/ San Timoteo	3,806
8-005	San Jacinto	32,508
9-004	Santa Margarita Valley	0
9-005	Temecula Valley	29
9-006	Cahuilla Valley	10

Table Note: *From Step 4 of Component # 8.c.3

Appendix 5 – Breakdown of area in basins with adjudications used during evaluation (component 8.c.3)

Basin	Basin / Subbasin Name	Basin Area (Acres)	Adjudicated Acres	Percent Adjudicated	Non-Adjudicated Acres	Percent Non-Adjudicated
1-005	Scott River Valley	63,831	10,015	15.69%	53,816	84.31%
3-004.08	Salinas Valley/Seaside	14,489	14,489	100.00%	0	0.00%
3-008.01	Los Osos Valley/ Los Osos Area	4,232	4,226	99.87%	6	0.13%
3-012.01	Santa Maria/ Santa Maria	170,213	162,277	95.34%	7,936	4.66%
3-016	Goleta	9,217	8,034	87.16%	1,183	12.84%
4-004.04	Santa Clara River Valley/ Santa Paula	22,112	20,646	93.37%	1,466	6.63%
4-011.03	Coastal Plain of Los Angeles/ West Coast	92,997	92,532	99.50%	465	0.50%
4-011.04	Coastal Plain of Los Angeles/ Central	177,770	149,067	83.85%	28,703	16.15%
4-012	San Fernando Valley	144,837	143,363	98.98%	1,474	1.02%
4-013	San Gabriel Valley	126,379	122,603	97.01%	3,776	2.99%
4-023	Raymond	26,049	26,047	99.99%	2	0.01%
5-027	Cummings Valley	10,019	9,213	91.95%	807	8.05%
5-028	Tehachapi Valley West	14,803	13,085	88.40%	1,718	11.60%
5-080	Brite Valley	3,170	2,845	89.73%	326	10.27%

Basin	Basin /Subbasin Name	Basin Area (Acres)	Adjudicated Acres	Percent Adjudicated	Non-Adjudicated Acres	Percent Non-Adjudicated
6-012.01	Owens Valley/ Owens Valley	660,648	231,276	35.01%	429,372	64.99%
6-037	Coyote Lake Valley	88,102	80,890	91.81%	7,212	8.19%
6-038	Caves Canyon Valley	72,962	27,201	37.28%	45,761	62.72%
6-040	Lower Mojave River Valley	285,486	260,561	91.27%	24,925	8.73%
6-041	Middle Mojave River Valley	211,321	206,613	97.77%	4,707	2.23%
6-042	Upper Mojave River Valley	412,841	405,091	98.12%	7,750	1.88%
6-043	El Mirage Valley	75,896	70,298	92.62%	5,598	7.38%
6-044	Antelope Valley	1,010,269	904,447	89.53%	105,822	10.47%
6-045	Tehachapi Valley East	23,967	11,658	48.64%	12,310	51.36%
6-047	Harper Valley	409,502	351,094	85.74%	58,408	14.26%
6-089	Kane Wash Area	5,954	5,954	100.00%	0	0.00%
7-012	Warren Valley	17,476	13,035	74.59%	4,441	25.41%
7-019	Lucerne Valley	147,432	145,964	99.00%	1,468	1.00%
8-002.01	Upper Santa Ana Valley/ Chino	153,762	146,652	95.38%	7,110	4.62%
8-002.02	Upper Santa Ana Valley/ Cucamonga	9,028	8,232	91.18%	796	8.82%
8-002.03	Upper Santa Ana Valley/ Riverside-Arlington	56,563	37,217	65.80%	19,346	34.20%
8-002.04	Upper Santa Ana Valley/ Rialto-Colton	24,794	23,636	95.33%	1,158	4.67%
8-002.06	Upper Santa Ana Valley/	92,488	87,594	94.71%	4,894	5.29%

Basin	Basin /Subbasin Name	Basin Area (Acres)	Adjudicated Acres	Percent Adjudicated	Non-Adjudicated Acres	Percent Non-Adjudicated
	San Bernardino					
8-002.08	Upper Santa Ana Valley/ San Timoteo	32,288	14,138	43.79%	18,150	56.21%
8-005	San Jacinto	158,534	59,939	37.81%	98,596	62.19%
9-004	Santa Margarita Valley	5,215	5,191	99.54%	24	0.46%
9-005	Temecula Valley	87,753	87,386	99.58%	367	0.42%
9-006	Cahuilla Valley	18,202	17,850	98.07%	351	1.93%

Appendix 6 – Groundwater Basins Identified with Groundwater-Related Transfers (component 8.d.2)

Groundwater Basin ID	Groundwater Basin / Subbasin Name	Type of Groundwater-Related Transfer	Year	Total Groundwater Pumped (AF)
4-003.01	Ventura River Valley / Upper Ventura River	B	2015	1,314
5-006.03	Redding Area / Anderson	A	2013	2,314
5-006.03	Redding Area / Anderson	A	2014	3,526
5-006.03	Redding Area / Anderson	A	2015	3,785
5-021.51	Sacramento Valley / Corning	A	2013	2,030
5-021.52	Sacramento Valley / Colusa	A	2009	1,447
5-021.52	Sacramento Valley / Colusa	A	2013	2,970
5-021.52	Sacramento Valley / Colusa	A	2014	6,838
5-021.52	Sacramento Valley / Colusa	A	2015	13,969
5-021.60	Sacramento Valley / North Yuba	A	2009	8,262
5-021.60	Sacramento Valley / North Yuba	A	2013	8,270
5-021.60	Sacramento Valley / North Yuba	A	2014	2,102
5-021.60	Sacramento Valley / North Yuba	A	2018	9,080
5-021.61	Sacramento Valley / South Yuba	A	2014	3,637
5-021.61	Sacramento Valley / South Yuba	A	2015	2,000

Groundwater Basin ID	Groundwater Basin / Subbasin Name	Type of Groundwater-Related Transfer	Year	Total Groundwater Pumped (AF)
5-021.61	Sacramento Valley / South Yuba	A	2018	5,998
5-021.62	Sacramento Valley / Sutter	A	2009	14,841
5-021.62	Sacramento Valley / Sutter	A	2010	14,317
5-021.62	Sacramento Valley / Sutter	A	2013	15,264
5-021.62	Sacramento Valley / Sutter	A	2014	17,400
5-021.62	Sacramento Valley / Sutter	A	2015	8,659
5-021.62	Sacramento Valley / Sutter	A	2018	15,352
5-021.64	Sacramento Valley / North American	A	2009	24,630
5-021.64	Sacramento Valley / North American	A	2010	13,045
5-021.64	Sacramento Valley / North American	A	2013	8,903
5-021.64	Sacramento Valley / North American	A	2014	27,334
5-021.64	Sacramento Valley / North American	A	2015	28,358
5-021.64	Sacramento Valley / North American	A	2018	21,551
5-021.66	Sacramento Valley/Solano	A	2011	409
5-021.67	Sacramento Valley / Yolo	A	2009	4,873
5-021.67	Sacramento Valley / Yolo	A	2013	7,155
5-021.67	Sacramento Valley / Yolo	A	2014	16,995
5-021.67	Sacramento Valley / Yolo	A	2015	14,668

Groundwater Basin ID	Groundwater Basin / Subbasin Name	Type of Groundwater-Related Transfer	Year	Total Groundwater Pumped (AF)
5-021.67	Sacramento Valley / Yolo	A	2018	1,149
5-021.70	Sacramento Valley / Butte	A	2009	5,501
5-021.70	Sacramento Valley / Butte	A	2013	7,175

Basin Prioritization – Upper and Lower San Luis Rey Basins

State of California

California Natural Resources Agency

Department of Water Resources

Sustainable Groundwater Management Program

May 2020

Purpose of Document

This document describes the basin prioritization project that occurred in early 2020 for the two subbasins of the San Luis Rey Valley groundwater basin. The Sustainable Groundwater Management Act (SGMA) requires that basin prioritization be reassessed whenever the Department updates Bulletin 118 boundaries.[1] The legislative (Senate Bill 779) subdivision of the San Luis Rey Valley groundwater basin prompted the need to update Bulletin 118 boundaries, triggering the need for a reassessment of the basin prioritization.

This document includes a summary of:

- History of the impacts of Senate Bill 779 on the Basin Prioritization of the San Luis Rey Valley groundwater basins
- Results from the current basin prioritization of the Upper and Lower San Luis Rey Basins (SLR Basin Prioritization)
- Information on the public comment period for this prioritization
- Senate Bill 779

I. History of the effects of Senate Bill 779 on Basin Prioritization

DWR Bulletin 118 – Update 2003 defined the San Luis Rey Valley Basin as a single, contiguous groundwater basin. In 2018, legislation amended SGMA with the addition of Water Code Section 10722.5 which divided the San Luis Rey basin into two subbasins named the Upper San Luis Rey and Lower San Luis Rey Valley Groundwater Subbasins (Basins 9-007.01 and 9-007.02, respectively), and declared that each subbasin would be designated as medium priority until the Department reassessed prioritization.[2]

Water Code Section 10722.5 became effective on January 1, 2019, requiring the Department to release new basin boundaries for the Upper and Lower San Luis Rey subbasins and establishing each subbasin as medium priority pending reassessment.

The Department undertook basin prioritization in early 2019, referred to as SGMA 2019 Basin Prioritization – Phase 2 (Phase 2). Phase 2 reassessed the prioritization of 57 basins including the Upper San Luis Rey and Lower San Luis Rey subbasins. The draft results of Phase 2 Prioritization, which were

[1] Water Code § 10722.4(c)
[2] AB 1944 (2018)

released in April 2019, identified the Upper San Luis Rey Subbasin as medium priority and the Lower San Luis Rey Subbasin as very low priority.

The Department held a 30-day public comment period for Phase 2 Prioritization in May 2019. The Department did not receive any comments about the draft prioritization results for the Upper or Lower San Luis Rey subbasins.

On December 17, 2019, the Department finalized the results of the Phase 2 Prioritization for 57 basins including the Upper San Luis Rey and Lower San Luis Rey subbasins. The final basin prioritization of Phase 2 remained unchanged from the draft results, with the Upper San Luis Rey Subbasin medium priority and the Lower San Luis Rey Subbasin very low priority.

During the Phase 2 basin prioritization process, Water Code Section 10722.5 was amended.[3] The amended version of Section 10722.5 became effective on January 1, 2020, causing a minor revision to the boundary between the Upper and Lower Subbasins. The amended language also declared that each subbasin would be designated as medium priority until the Department reassessed prioritization.

The 2019 legislation required the Department to release new basin boundaries for the Upper and Lower San Luis Rey subbasins and reassess the basin prioritization of each subbasin.[4]

II. Results of Basin Prioritization – Upper and Lower San Luis Rey

The Department completed the reassessment of the basin prioritization of the Upper and Lower San Luis Rey subasins in May 2020. The reassessment has been named Basin Prioritization – Upper and Lower San Luis Rey Basins (SLR Prioritization). SLR Prioritization utilized the same technical process and datasets as the Phase 2 Prioritization. For more information on the technical process that was used for the SLR and Phase 2 Prioritizations please see the SGMA 2019 Basin Prioritization Process and Results Document.

The 2019 amendment to Water Code Section 10722.5 resulted in a minor change to the San Luis Rey subbasins, shifting approximately 28 acres from the Upper San Luis Rey Subbasin to the Lower San Luis Rey Subbasin,

[3] SB 779 (2019)
[4] Water Code § 10722.4(c)

representing a 0.27% increase in the basin area of the Lower and 0.15% decrease in the basin area of the Upper.

The new boundaries did not cause a significant change to any prioritization category, with the result that the SLR Prioritization remains the same as the Phase 2 Prioritization, with the Upper Subbasin medium priority and the Lower Subbasin very low priority

The priority point scores for each of the eight components of basin prioritization, total priority point score and basin priority for the Upper San Luis Rey and Lower San Luis Rey subbasins for the Phase 2 and SLR Prioritizations are shown in Table 1 and Table 2 below.

Table 1 Basin Prioritization Scores for Upper San Luis Rey Basin for the Phase 2 and SLR Prioritizations

Basin Prioritization Component	Phase 2 (Final)	SLR (Final)
1 – Population	1	1
2 – Population Growth	3	3
3 – Public Supply Wells	5	5
4 – Production Wells	3	3
5 – Irrigated Acres	3	3
6 – Groundwater Reliance	4	4
7 – Documented Impacts	0	0
8 – Other Information	0	0
Component 1-8 Interim Points	19	19
8.c.1 – Less than 2,000AF Groundwater	Not Applicable	Not Applicable
Final Priority Points	19	19
Basin Priority	Medium	Medium

Table 2 Basin Prioritization Scores for Lower San Luis Rey Basin for the Phase 2 and SLR Prioritizations

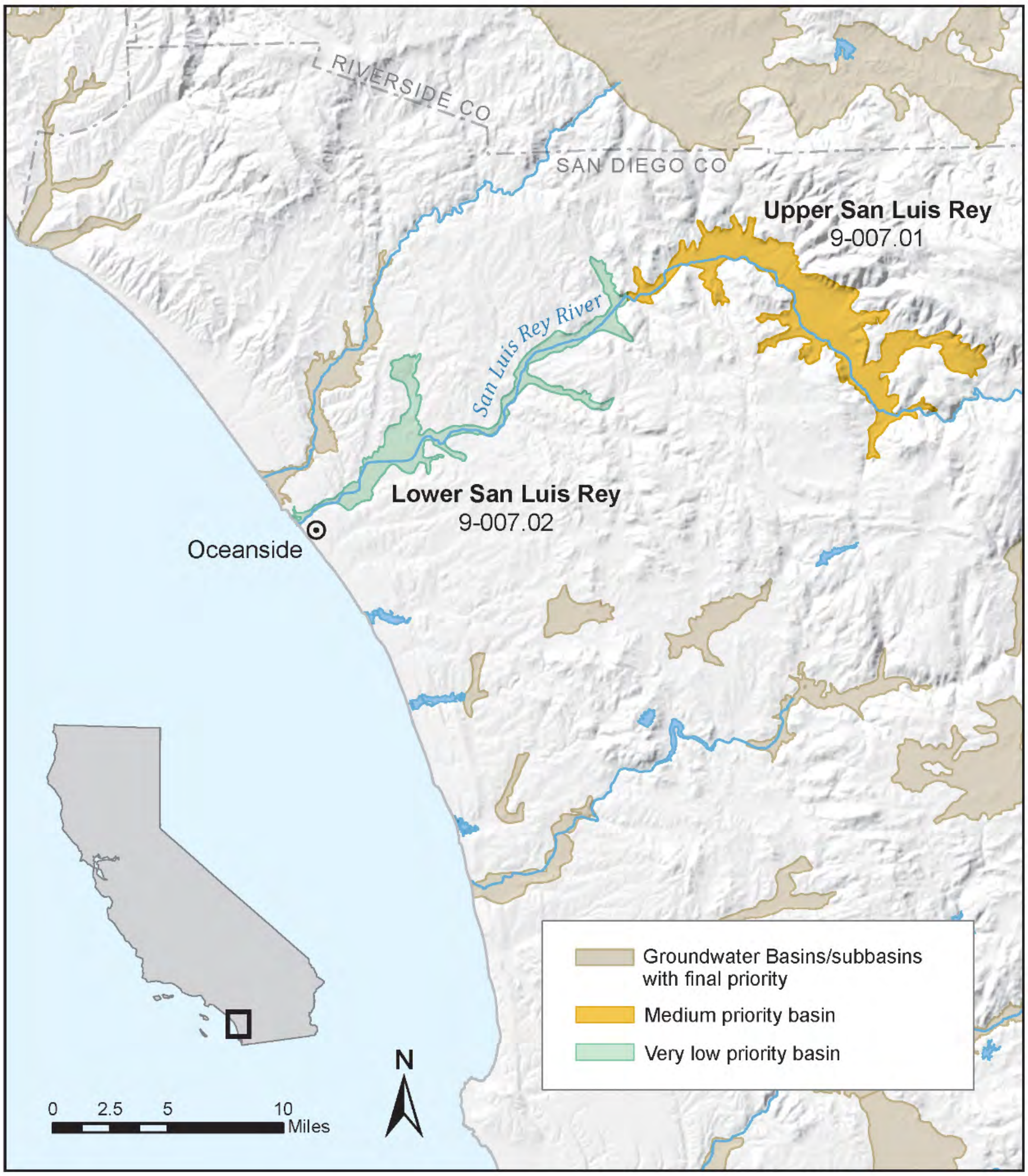
Basin Prioritization Component	Phase 2 (Final)	SLR (Final)
1 – Population	3	3
2 – Population Growth	2	2
3 – Public Supply Wells	3	3
4 – Production Wells	3	3
5 – Irrigated Acres	1	1
6 – Groundwater Reliance	0	0
7 – Documented Impacts	2	2
8 – Other Information	0	0
Component 1-8 Interim Points	14	14
8.c.1 – Less than 2,000AF Groundwater	Automatic Score of Zero*	Automatic Score of Zero*
Final Priority Points	0	0
Basin Priority	Very Low	Very Low

*The Lower San Luis Rey basin has been classified by the State Water Resources Control Board (Decision 1645, 10/17/02) as a subterranean stream resulting in the total groundwater use in the basin being 0AF.

The results for Basin Prioritization – Upper and Lower San Luis Rey Basins are shown in Figure 1 and below:

- Upper San Luis Rey (9-007.01) – Medium Priority (FINAL)
- Lower San Luis Rey (9-007.02) – Very Low Priority (FINAL)

Figure 1: Results of Basin Prioritization – Upper and Lower San Luis Rey Basins



For more information on the data that was used for each component of basin prioritization please view the [SGMA Basin Prioritization Dataset] posted on the [California Natural Resources Agency Open Data Platform].

III. Public Comments on the Basin Prioritization – Upper and Lower San Luis Rey Basins

The Department held a 30-day comment period on the draft results of the Upper and Lower San Luis Rey Basins Prioritization beginning on March 24th and ending on April 23th. Public comments that were received are available upon request.

For more information on Basin Prioritization please visit the [Basin Prioritization website].

EXHIBIT 10

SGMA Basin Prioritization Dashboard

Search...

Groundwater Basin Prioritization

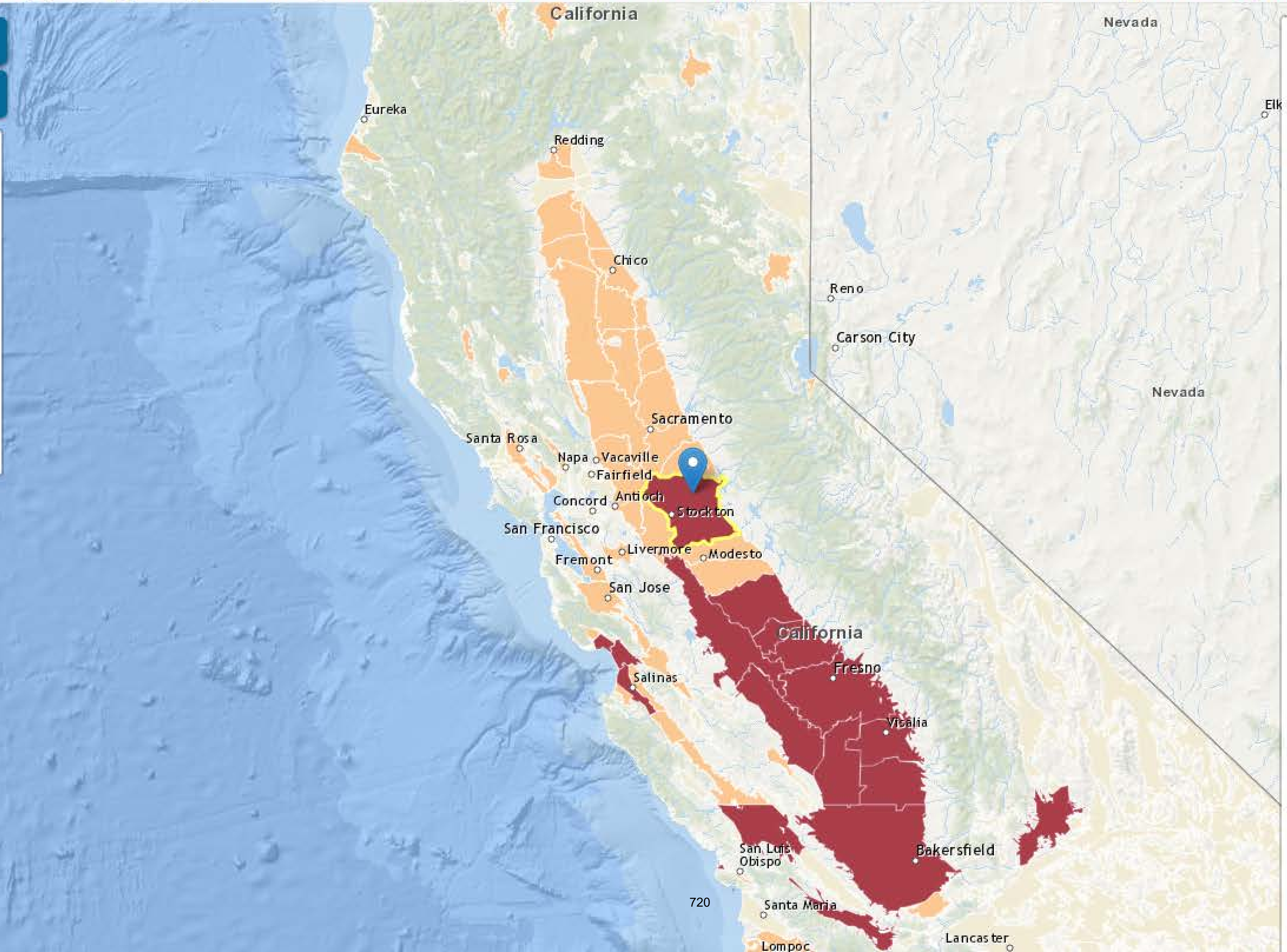
☑ SGMA Basin Prioritization

Prioritization

Low & Very Low (<= 14 points)
Medium & High (> 14 points)

Reference Layers

☑ Critically Overdrafted Basins
☐ Adjudicated Areas
☐ Hydrologic Regions
☐ Groundwater Basins 2003
☐ Groundwater Basins 2016
☐ CA Counties
☐ DWR Region Offices



SAN JOAQUIN VALLEY - EASTERN SAN JOAQUIN (5-022.01)

Phase 2 (FINAL)

Subsidence Points	10
	PORT_2016.pdf
	1
Impacts Total Points	23.5
C7 Priority Points	5
Component 8 - Habitat and Other Information	
Component 8a - Habitat and Streamflow	
Streamflow Points	1
Habitat Points	1
C8a Priority Points	
Groundwater Levels Monitored GW Use > 0.16 AF/Basin-Acre Declining GW Levels	2
C8a Comment	No comment
Component 8b - Other Information	
C8b Priority Points	0
C8b Comment	No comment
Component 8c&d - Statewide Other Information	
Critical Overdraft (B-118)	
C8c&d Priority Points	0
Total Priority Points Components 1-8	40*

*Note: The priority for this basin has been set to high (40 total priority points) as a result of conditions being met under sub-component 8d (see above).

EXHIBIT 11

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May 14, 2020

Mr. Tom Lippe, Law Office of Thomas N. Lippe, APC
201 Mission Street, 12th Floor
San Francisco, CA 94105

Subject: Review of Final Groundwater Sustainability Plan
For the Eastern San Joaquin Groundwater Subbasin

Dear Mr. Lippe:

I have been retained by your practice to review the Final Groundwater Sustainability Plan (GSP) for the Eastern San Joaquin Groundwater Subbasin. I submitted comments on the Public Draft GSP to the Eastern San Joaquin Groundwater Authority (ESJGWA) on August 23, 2019. The first section of this letter presents an evaluation of responses to my comments numbered 6 and 7 on the Draft GSP. The second section of this letter presents new comments on the Final GSP.

1. Response to Comments on Draft GSP

<u>Comment 6:</u> The response to comment and more careful review GSP Sections 2.3.4.3 through 2.6 provided me with a better understanding of the "sustainable conditions scenario" and approach at quantifying sustainable yield. Sustainable yield was estimated through development and simulation of the sustainable conditions scenario water budget. The sustainable conditions scenario is based on the projected conditions scenario modified by lower groundwater production across the model domain. However, the Final GSP identifies two areas of uncertainty associated with assumptions used in the ESJWRM (modeling) scenarios and estimate of sustainable yield that, "*will be honed over time in updates to this Plan and refinements to the ESJWRM as described in Section 7.4.1*." We will want to monitor these areas of uncertainty and associated potential changes to sustainable yield estimate over time. The two areas of uncertainty include the following.

- The second paragraph on page 2-142 of the Final GSP is as follows. *"There are uncertainties associated with projections in the ESJWRM scenarios due to the sequence of the hydrologic period, population projections, future cropping patterns, and irrigation practices and technologies, as well as uncertainties inherent in the representation of the physical groundwater and surface water system by the model. Therefore, to account for these uncertainties, a range of assumptions (from high-end estimates to low-end estimates) are used in running model scenarios to estimate the sustainable yield and an initial estimate of the adjustment that would be required to achieve the sustainable yield over the 50-*

year planning period. These assumptions will be honed over time in updates to this Plan and refinements to the ESJWRM as described in Section 7.4.1."

It is not clear from the GSP what "range of assumptions" were used in running model scenarios to estimate sustainable yield. The GSP states (top of page 2-142), "*In practice, Subbasin overdraft could be addressed through reduced groundwater production, increased recharge, or a combination of the two; focusing on groundwater production is just for simulation purposes to calculate the Subbasin sustainable yield*." However, the final average annual water budget parameters used in the "sustainable conditions scenario" are not presented or summarized as was done for the historic, current conditions and projected conditions water budgets as presented in Tables 2-13 through 2-17. Thus, the GSP provides no information on: where and how much groundwater pumping was reduced; how these changes effect stream flow interactions; or how these changes affect any other water budget component. This lack of transparency in how the sustainable yield estimate is derived precludes any meaningful evaluation of the results and is inconsistent with the level of detail provided for other water budget simulations.

- The ESJGWA response to my comment on the lack of considering climate change in the sustainable yield estimate includes the following. "*The ESJGWA Board determined the projected conditions scenario was most appropriate for analyzing sustainable yield in the GSP implementation time period beginning in 2040. Consistent with regulations, the 2070 climate change sensitivity analysis on the projected conditions scenario was used to better understand trends and inform planning. Therefore, the sustainable yield analysis did not include climate change.*" The rationale for not including climate change in the estimate of sustainable yield is provided in the first paragraph on page 2-141, which states, "*Due to the uncertainty around DWR's climate projections for a 2070 timeframe, the ESJGWA Board determined the projected conditions scenario was most appropriate for analyzing sustainable yield in the GSP implementation time period beginning in 2040*."

  The projected conditions scenario water budget estimates an annual overdraft of 34,000 AF/year in the Eastern San Joaquin groundwater subbasin. The Final GSP states (page 2-142), "*In order to achieve a net-zero change in groundwater storage over a 50-year planning period, approximately 78,000 AF/year of direct or in lieu groundwater recharge and/or reduction in agricultural and urban groundwater pumping would need to be implemented in the Eastern San Joaquin Subbasin to reduce the projected groundwater pumping to the sustainable yield. This number (78,000 AF/year) is larger than the estimated annual overdraft of the projected conditions scenario (34,000 AF/year) due to the integrated nature of a groundwater subbasin. As efforts are made to reach sustainability in a subbasin, flows to and from neighboring basins and flows to and from streams may vary due to proposed management actions resulting in increased groundwater levels,* *creating the need for additional recharge or pumping reduction greater than the overdrafted amount."*

Pages 2-142 through 2-162 of the Final GSP present the Climate Change Analysis required under Section 354.18 (c)(3)(A), "*to evaluate future scenarios of hydrologic uncertainty associated with projections of climate change and sea level rise*." The results of this water budget under climate change is described as follows (page 2-157). "*With a similar surface water supply and increased water demands under the climate change scenario, private groundwater production is simulated to increase approximately 11 percent, from 801,000 AF/year to 887,000 AF/year. Under climate change conditions, the depletion in aquifer storage is expected to increase by about 68 percent to an average annual storage change of 57,000 AF/year, from 34,000 AF/year in the projected conditions scenario.*" As indicated above, the ESJGWA Board chose not to use the climate change figures in final calculation of the sustainable yield estimate. However, when applying the same escalation factor used to derive the 78,000 AF/yr overdraft estimate, the depletion in aquifer storage under the climate change scenario could translate to 130,800 AF/yr of direct or in lieu groundwater recharge and/or reduction in groundwater pumping.

Comment 7: The GSP has identified 23 projects to reduce overdraft conditions to meet the long-term groundwater sustainability goals. My comment expressed concern that the GSP does not evaluate the feasibility and potential environmental impacts of these projects. My concerns about the lack of analyses of feasibility and impacts of individual projects is discussed under Master Responses 5 in Appendix 1-J. In essence, the response indicates that GSA's are deferring analysis of project impacts outside of the umbrella of the GSP.

2. Comments on Final GSP

Based on my review of the Final GSP and comment letters submitted by the National Marine Fisheries Service (NMFS)[1] and California Department of Fish and Wildlife (CDFW)[2], I'm providing the following additional comments and opinion pertaining to additional deficiencies with the document.

A. I agree with NMFS and CDFW's critique that the use of groundwater levels alone are not a meaningful or reliable indicator for quantifying and/or monitoring depletions of interconnected surface water (ISW). As recommended by NMFS and CDFW, and required under SGMA {Section 354.28(c)(6)}, the GSP must identify a way to quantify

[1] Strange, E., 2020, NOAA's National Marin Fisheries Service comments on the final Groundwater Sustainability Plan for the Eastern San Joaquin Sub-basin. Letter to California Department of Water Resources, NMFS, West Coast Region, March 17, 7p.
[2] Vance, J., 2020, Comments on the San Joaquin River Exchange Contractors GSP Group Final Groundwater Sustainability Plan. Letter to California Department of Water Resources and San Joaquin River Exchange Contractors Water Authority, California Department of Fish and Wildlife, Central Region, April 15, 18p.

how historic, current and future changes in groundwater levels have/will affect the timing and rate of surface water depletions and impacts on stream flow levels/rates, water quality and the associated aquatic habitats sustained by stream hydrology. This requires understanding the interrelated set of hydrologic and ecological processes that occur on spatial and temporal scales much finer than the coarse scales represented by the proposed monitoring network and typical of groundwater basin model grids. In order to quantify just the hydrologic processes at a single point, one would ideally need to: construct, screen and continuously monitor a well within suitable distance and depths of the stream channel; measure and record well pumping rates; measure water levels and flow rates in the stream channel adjacent to well; characterize the hydraulic properties of the intervening aquifer sediments and stream bed material; and analyze the data over a suitable period that captures seasonal changes in groundwater and surface water levels and flow rates. Through analytical or modeling methods, the concomitant changes in stream flow depletions, stream water levels, pumping rates and stream flow rates could be correlated and quantified. These empirically-based correlations could then be incorporated into an integrated surface water-groundwater model for areas displaying similar geologic and hydrologic conditions. The monitoring data would also be used to calibrate the surface water-groundwater interaction solutions performed by a numerical model.

However, this only covers the physical processes. Additional monitoring and analyses of the benefits and impacts of varying stream flow and water levels on ecological conditions would need to be developed in order to determine how changes in stream flow depletions impact aquatic habitats, including salmonids. This analysis would need to consider all life stages of target species, which means understanding seasonal habitat requirements. Bridging the cause and effect relationships between physical and biological processes in an ISW system can't be done by monitoring water levels alone. Nor monitoring only water levels and stream levels – the full spectrum of interrelated physical and biological processes need to be correlated.

B. The core of the monitoring network proposed for ISW is the same as the Representative Monitoring Network (20 wells) and Broad Monitoring Network (107 wells) proposed to monitor for chronic lowering of groundwater levels throughout the subbasin (Chapter 4.1). Although the number of wells appears impressive, there are very few that are in close proximity to streams or screened within the shallow alluvium of stream corridors. Water levels in wells are proposed to be monitored semi-annually in March and October. Stream flow information is similarly sparse and includes existing gauges at notable distances from wells that will severely limit the correlation between groundwater levels and surface water levels and flow rates. The spatial distribution of monitoring locations and low frequency of proposed monitoring events from these wells will be of very little use to assessing stream depletions by wells (i.e., the coarse spacing and lack of paired stream and groundwater monitoring sites limit, if not preclude, the collection of data necessary to identify undesirable effects).

Section 4.7.5 of the GSP indicates that up to 10 new wells will be located in GDE areas and near streams to further understanding of groundwater-surface water connectivity and to refine GDE data gaps. However, there is no discussion or recommendation of the other necessary components for identifying and quantifying undesirable impacts to ISW as described in item A. above. For example, there is no recommendation for: pairing the ISW monitoring wells with surface water monitoring gauges (flow and water level); the frequency of field measurements; measuring groundwater pumping rates; or assessing how ecological conditions are effected by variable stream flow rates and water levels. It is also disheartening to see that a description of the monitoring network used to fill data gaps won't be provided until submission of the 5-year report (Section 7.6.4).

C. A good example of the failure of using groundwater level minimum thresholds as a proxy for the depletions of ISW sustainability indicator can be found in the GSP. As you are aware, Section 3.2.6.2 (Minimum Thresholds) of the GSP states that historical conditions are protective of beneficial uses related to ISW. This claim is refuted by NMFS in their comment letter. This claim is also not substantiated in the GSP in any manner. Section 3.2.6.2 of the GSP makes the following statements about stream flow depletions in the subbasin.

> *The ESJWRM was used to estimate the volume of additional depletions associated with groundwater levels that would be classified as undesirable results (non-dry year pairings where 25 percent or more wells fall below their minimum thresholds). The sustainable conditions scenario (see Section 2.3.6) does not result in groundwater level undesirable results, but the projected conditions scenario (see Section 2.3.4.3) does result in groundwater level undesirable results. The additional stream losses that occurred in the projected conditions scenario compared to the historical calibration are estimates of additional depletions as they can be linked directly to simulated increases in groundwater pumping. The additional depletions in the projected conditions scenario are 50,000 acre-feet per year (AF/year), which is approximately 1 percent of total stream outflows from the Eastern San Joaquin Subbasin. As the reduction in total stream flows is small, no impact is expected to the beneficial users of interconnected surface water in the Subbasin. Depletions greater than an increase of 50,000 AF/year would not occur because at this point the sustainability indicators for groundwater levels would be triggered and would be protective of any further depletions. Therefore, groundwater level thresholds are protective of the depletions of interconnected surface water.*

For clarification, the 50,000 AF/yr of depletions cited above represent the net total added depletions from the major drainage attributable to increased groundwater pumping under the projected conditions scenario (as compared to historical conditions) within the East San Joaquin subbasin, including depletions from: Dry Creek; Mokelumne River; Calaveras River; Stanislaus River; San Joaquin River; and "local tributaries." The ESJWRM model used to quantify the stream flow depletions incorporates portions of other groundwater subbasins boarding the Eastern San Joaquin subbasin and the GSP presents total added depletions from rivers due to combined pumping from adjoining subbasins, including stream flow depletions from: Dry Creek, Mokelumne River; Stanislaus River; and San Joaquin River.

Using the water budget data provided in Table 2-13, I was able to quantify the total added stream flow depletions from the Stanislaus River under the projected scenario condition. Total annual added depletions from the Stanislaus River due to groundwater pumping from both the Eastern San Joaquin and Modesto subbasins are 65,000 AF/yr of which, 38,000 AF/yr is attributable solely to Eastern San Joaquin subbasin. These annual average added depletions translate to a daily average reduction in stream flow of 90 cubic feet per second (cfs) and 52.5 cfs, respectively. When compared to the average summer base flow rates for the USGS gauge on the Stanislaus River below Goodwin Dam near Knights Ferry in mid-November (280 cfs; see Attachment A), the stream flow depletions from both subbasins would lead to a 32% reduction in flow with over half of that reduction attributable to groundwater pumping from the Eastern San Joaquin subbasin.

It is my opinion that a 32% reduction of flow in the Stanislaus River would constitute an undesirable impact on beneficial uses of the river, especially since this would occur during the fall-run and late-fall run chinook migration and spawning periods. However, pursuant to the GSP, sustainability indicators for groundwater level were not triggered and no undesirable effects assumed. However, impacts to the Stanislaus River are likely, thus the use of groundwater levels as sustainability indicators for undesirable stream flow depletions have failed.

Please feel free to contact me with any questions regarding the material and conclusions contained in this letter.

Sincerely,

Gregory R. Kamman

Greg Kamman, PG, CHG
Principal Hydrologist

REGISTERED GEOLOGIST
GREGORY R. KAMMAN
NO. 360
CERTIFIED HYDROGEOLOGIST
12/31/20
STATE OF CALIFORNIA

FIGURES & ATTACHMENTS

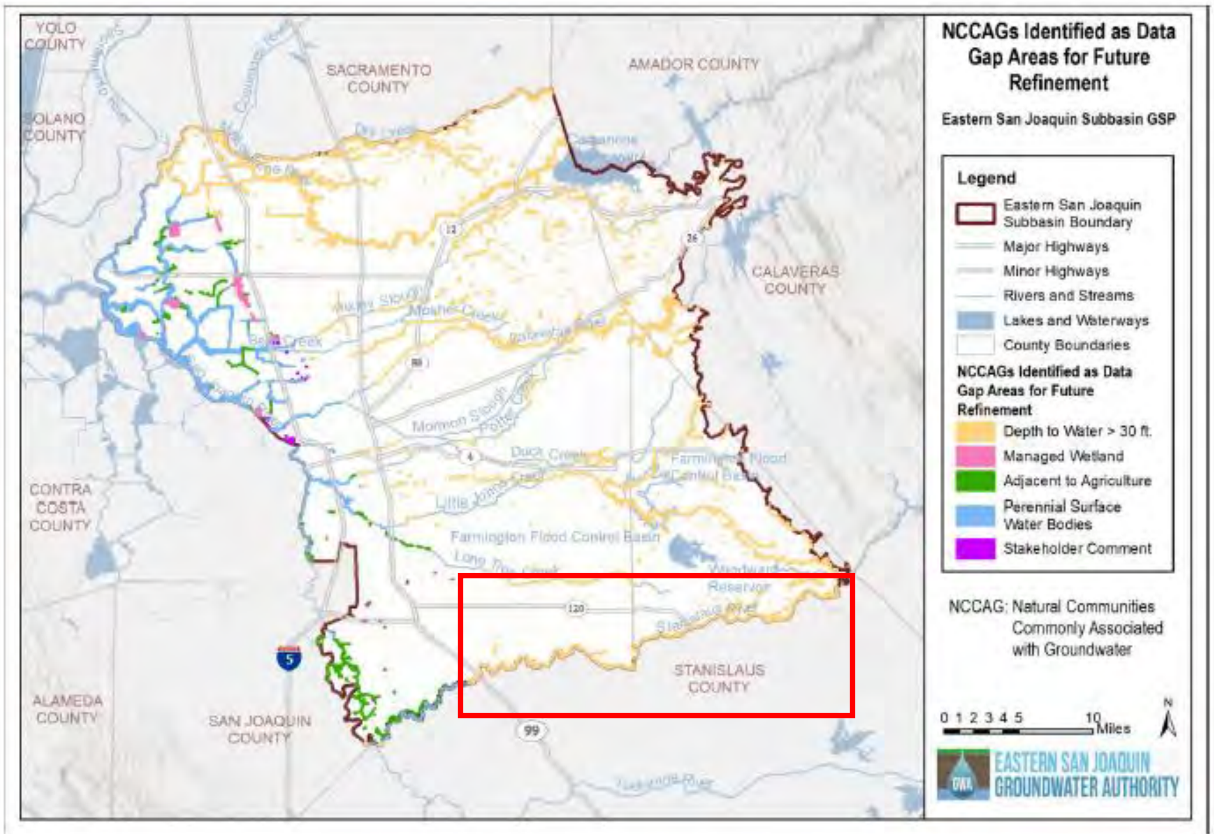

FIGURE 1a: Depth-to-water designation along Stanislaus River (boxed area) from Figure 2-74 of Final GSP. Note majority of NCCAG areas along Stanislaus River are identified as data gap area with depth to water greater than 30 feet.

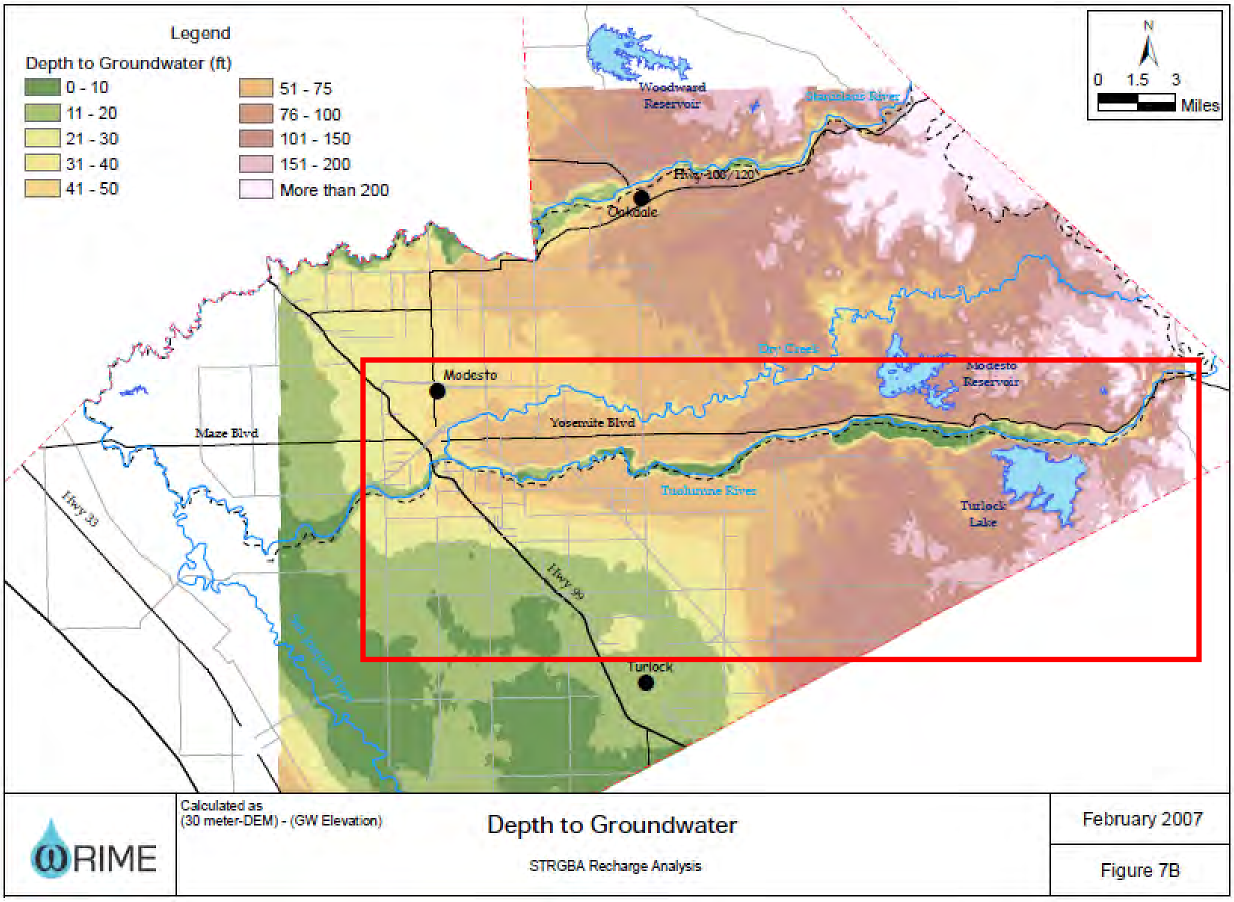

FIGURE 1b: Depth-to-water estimates along Stanislaus River (boxed area) from Figure 7B of WRIME study. Note depth to water is less than 30 feet along majority of Stanislaus River corridor within boxed area.

Attachment A: Mean Daily Flow Rate – Stanislaus River

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- **Notice** - The USGS Water Resources Mission Area's priority is to maintain the safety and well-being of our communities, including providing critical situational awareness in times of flooding in all 50 U.S. states and additional territories. Our hydrologic monitoring stations continue to send data in near real-time to NWISWeb, and we are continuing critical water monitoring activities to protect life and property on a case-by-case basis. The health and safety of the public and our employees are our highest priorities, and we continue to follow guidance from the White House, the CDC, and state and local authorities.

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USGS 11302000 STANISLAUS R BL GOODWIN DAM NR KNIGHTS FERRY CA

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	Output formats
Calaveras County, California Hydrologic Unit Code 18040010 Latitude 37°51'06", Longitude 120°38'13" NAD27 Drainage area 986 square miles	HTML table of all data Tab-separated data Reselect output format

Day of month	00060, Discharge, cubic feet per second, Mean of daily mean values for each day for water year of record in, ft3/s (Calculation Period 1968-10-01 -> 2018-09-30) Period-of-record for statistical calculation restricted by user											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	793	934	1,180	1,080	1,350	1,380	583	438	334	346	383	491
2	739	875	1,180	1,080	1,400	1,350	574	444	337	345	360	481
3	766	916	1,160	1,070	1,400	1,290	576	445	339	342	369	488
4	773	960	1,100	1,050	1,370	1,270	582	447	343	343	366	501
5	819	950	1,090	1,090	1,360	1,270	571	441	335	344	349	528
6	791	937	1,120	1,130	1,360	1,200	556	424	314	372	355	544
7	780	962	1,120	1,150	1,380	1,170	558	436	311	365	341	552
8	795	1,050	1,150	1,120	1,380	1,130	563	435	300	399	337	546
9	817	1,050	1,180	1,090	1,410	1,120	551	435	284	405	313	529
10	835	1,060	1,180	1,070	1,430	1,050	537	437	283	413	308	535
11	907	1,040	1,220	1,100	1,480	900	536	437	299	416	285	525
12	906	1,040	1,200	1,150	1,470	829	541	436	328	415	278	522
13	925	1,040	1,120	1,180	1,460	822	539	435	353	443	280	528
14	941	1,060	1,060	1,210	1,460	852	534	435	349	507	281	548
15	957	1,090	1,080	1,240	1,470	889	535	435	351	541	286	574
16	1,030	1,100	1,130	1,230	1,530	913	524	438	350	566	296	577
17	1,190	1,170	1,190	1,250	1,560	909	525	440	346	584	316	569
18	1,140	1,220	1,230	1,260	1,540	873	516	441	344	610	338	584
19	1,110	1,210	1,230	1,320	1,530	798	509	441	343	614	345	592
20	1,120	1,210	1,230	1,320	1,510	741	506	439	338	601	354	601
21	1,550	1,240	1,240	1,300	1,440	722	498	429	336	598	365	590
22	1,510	1,210	1,240	1,290	1,370	723	490	437	334	580	384	617
23	1,240	1,180	1,210	1,280	1,370	730	480	434	339	597	402	600
24	1,160	1,180	1,150	1,290	1,360	734	460	433	352	612	413	642
25	1,200	1,160	1,140	1,350	1,330	718	454	427	355	599	426	648
26	1,310	1,150	1,160	1,410	1,340	668	453	425	366	567	449	669
27	1,260	1,140	1,160	1,410	1,370	695	453	415	368	546	457	733
28	1,170	1,130	1,160	1,410	1,390	681	449	403	360	525	462	801
29	1,100	918	1,110	1,390	1,420	631	445	382	354	486	463	829
30	1,050		1,100	1,370	1,430	598	441	366	348	422	472	829
31	995		1,080		1,360		439	345		403		803

Questions about sites/data?

Exhibit 4

Law Offices of
THOMAS N. LIPPE, APC

201 Mission Street
12th Floor
San Francisco, California 94105

Telephone: 415-777-5604
Facsimile: 415-777-5606
Email: Lippelaw@sonic.net

May 14, 2020

Craig Altare
Supervising Engineering Geologist
California Department of Water Resources
901 P Street, Room 213
Sacramento, California 94236

Re: California Sportfishing Protection Alliance's Comments on the Groundwater Sustainability Plan for the Eastern San Joaquin Subbasin

Dear Mr. Altare:

This office represents the California Sportfishing Protection Alliance (CSPA) regarding the Groundwater Sustainability Plan for the Eastern San Joaquin Subbasin (Plan).

I write now to attach a May 15, 2020, letter from Greg Kamman, consulting geologist and hydrologist, Re: Addendum to Review of Final Groundwater Sustainability Plan For the Eastern San Joaquin Groundwater Subbasin. This letter is attached as Exhibit 12.

Thank you for your attention to this matter.

Very Truly Yours,

Tom Lippe

Thomas N. Lippe

Exhibits

12. Letter dated May 15, 2020, from Greg Kamman, Re Addendum to Review of Final Groundwater Sustainability Plan For the Eastern San Joaquin Groundwater Subbasin.

T:\TL\Stan Groundwater\Administrative Proceedings\LOTNL Docs\ESJ\DWR101 ESJGSP Com 2.wpd

EXHIBIT 12

Kamman Hydrology & Engineering, Inc.
539 Bret Harte Road, San Rafael, CA 94901
Telephone: (415) 491-9600
Facsimile: (415) 680-1538
E-mail: greg@KHE-Inc.com

May 15, 2020

Mr. Tom Lippe, Law Office of Thomas N. Lippe, APC
201 Mission Street, 12th Floor
San Francisco, CA 94105

Subject: **Addendum** to Review of Final Groundwater Sustainability Plan For the Eastern San Joaquin Groundwater Subbasin

Dear Mr. Lippe:

This letter serves as an addendum to my comment letter dated May 14, 2020 on the Final Groundwater Sustainability Plan for the Eastern San Joaquin Groundwater Subbasin. This addendum presents additional information pertaining to the response to Comment #5 of my original comment letter to the Public Draft GSP. This addendum applies to the first section of my May 14, 2020 letter.

1. Response to Comments on Draft GSP

Comment 5: Acknowledging that GDEs are considered data gaps for future refinement, Figure 2-74 of the Final GSP has identified NCCAG areas (starting point for delineation of GDEs) where water depths are greater than 30 feet. The Final GSP considers these as data gap areas. However, it is my opinion that when adhering to the The Nature Conservancy (TNC) GDE identification guidelines (2019)[1] for developing depth-to-groundwater contours, it will be found that many of these data gap areas will have groundwater depths much less than 30 feet. This conclusion is based on the depth-to-water mapping along the Stanislaus River completed by WRIMES in 2007[2], which indicates values much less than 30-feet in contrast to the greater than 30 feet designation assigned to Figure 2-74 in the Final GSP (see Figures 1a and 1b in May 14, 2020 letter).

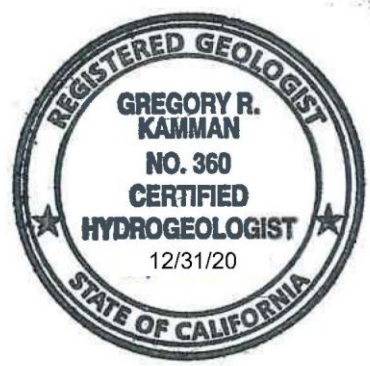
[1] See Appendix C of The Nature Conservancy comment letter (page 883 of Final GSP).
[2] WRIME, 2007, Recharge characterization for Stanislaus and Tuolumne Rivers Groundwater Basin Association. Memorandum prepared for MID and DWR, May 2, 31p.

Please feel free to contact me with any questions regarding the material and conclusions contained in this letter.

Sincerely,

Gregory R. Kamman

Greg Kamman, PG, CHG
Principal Hydrologist



Delta-Mendota Subbasin Coordination Committee

P.O. Box 2157
Los Banos, CA 93635
Phone: (209) 826-9696
Fax: (209) 826-9698

April 28, 2025

VIA SGMA PORTAL

Fritz Buchman
San Joaquin County Public Works
1810 E. Hazelton Ave.
P.O. Box 1810
Stockton, CA 95205

RE: Review of the 2024 Draft of Eastern San Joaquin Subbasin GSP

Dear Mr. Buchman:

On behalf of the 23 Groundwater Sustainability Agencies (GSAs) of the Delta-Mendota Subbasin, thank you for the opportunity to review and comment on the *Eastern San Joaquin Groundwater Subbasin Groundwater Sustainability Plan November 2024* (2024 GSP). We have reviewed the GSP with emphasis on selected elements related to Sustainable Management Criteria (SMC), water budget, plan implementation, and mitigation. Per 23 CCR § 355.4 (b)(7), our review focused on "Whether the [Eastern San Joaquin] Plan will adversely affect the ability of [the Delta-Mendota Subbasin] to implement its Plan or impede achievement of its sustainability goal." Results of this review are summarized herein, organized by sustainability indicator where relevant. Excerpts from the 2024 GSP and relevant appendices are presented in *blue italicized text*.

As you review our comments, recognize that under the state intervention process, we have rewritten the Delta-Mendota Subbasin GSP (DM GSP) and revised our SMCs in the revised and adopted DM GSP to be more protective of beneficial users.

We appreciate your consideration of our comments and cooperation in achieving our mutual goals of managing groundwater sustainability within our respective and adjoining subbasins. We also welcome any discussions to begin an inter-basin dialogue as we both implement our respective GSPs.

Sincerely,

Joseph Hopkins
Chair

Groundwater Levels

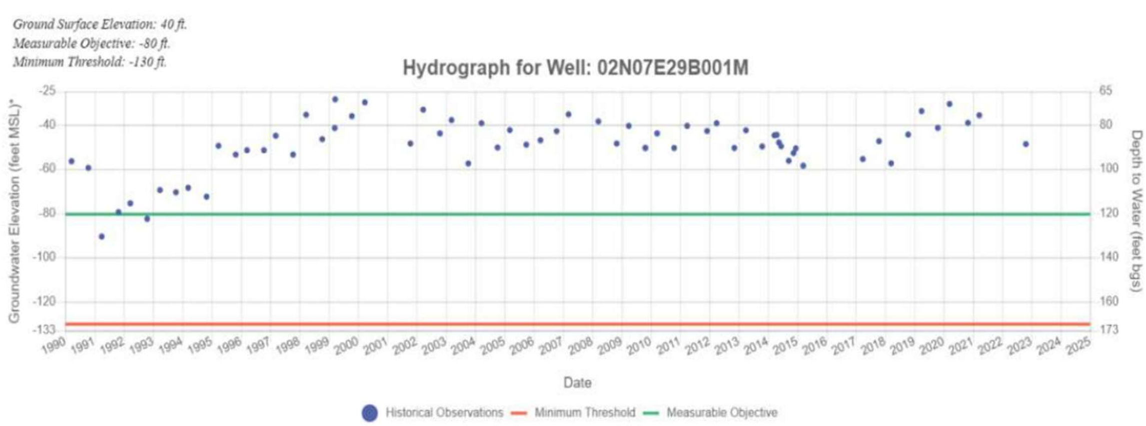
Sustainable Management Criteria Methodology

2024 GSP Page ES-6 (Section ES-6): "Minimum thresholds were established based on the historical (2015) drought low plus a buffer of the historical fluctuation or the 10th percentile domestic well depth, whichever is shallower, setting levels that protect 90 percent of domestic wells and wells that community water systems may rely on. In municipalities with ordinances requiring the use of City water from municipal wells, the 10th percentile municipal well depth is used instead of the 10th percentile domestic well depth criteria… Measurable objectives for groundwater levels were established based on the historical (2015) drought low and provide a buffer above the minimum threshold."

Measurable Objectives (MOs) within the Eastern San Joaquin (ESJ) Subbasin were established for the Chronic Lowering of Groundwater Levels Sustainability Indicator based on the historical (2015) low water levels at each Representative Monitoring Well (RMW).

The Minimum Thresholds (MTs) for the Chronic Lowering of Groundwater Levels allow water levels at certain RMWs to fall significantly below historically observed water levels, as well as current groundwater levels, as illustrated in the hydrograph shown below. As such, the selection and descriptions of the groundwater level SMCs in the 2024 GSP do not clearly demonstrate how these SMCs, per 23 CCR § 354.28(b)(3):

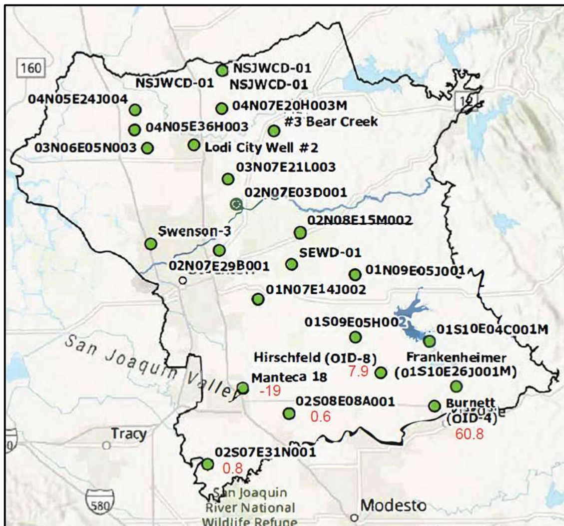
> "*[…] have been selected to avoid causing undesirable results in adjacent basins or affecting the ability of adjacent basins to achieve sustainability goals […]*"

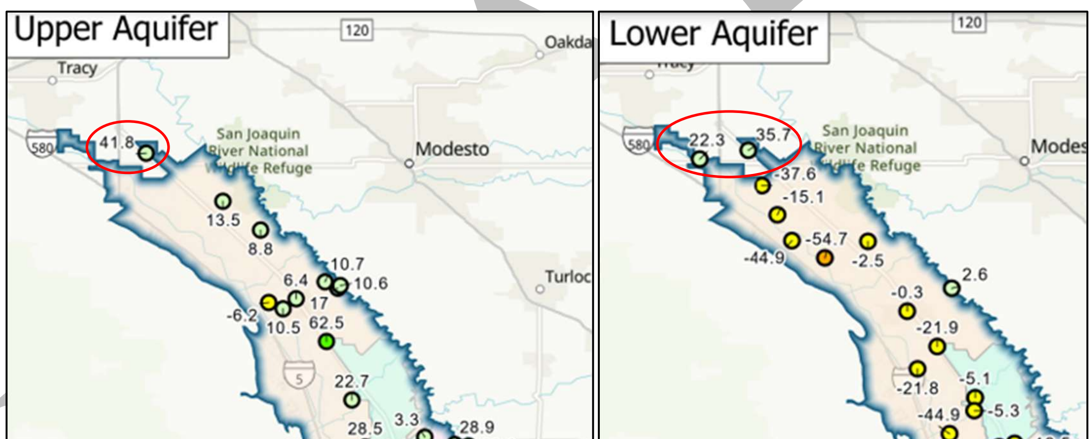


2024 GSP Appendix 3-I

SMCs Along ESJ/Delta Mendota (DM) Subbasin Boundary

2024 GSP Page 3-8 (Section 3.3.1.2): Figure 3-2: Location of Representative Monitoring Wells for Groundwater Levels (Please note that MT labels in feet above mean sea level [ft msl] were added in red to RMWs near the ESJ/DM boundary in Figure 3-2 for comparison to DM Subbasin MTs).

ESJ: 

DM: 

Per the 2024 GSP Assessment Staff Report, which was prepared by the California Department of Water Resources (DWR) in July 2023 and is included in the 2024 GSP as Appendix 3-B, *"The Plan does not include a discussion of its potential impacts to the adjacent subbasins; however, the GSP does indicate that various inter-basin coordination meetings have taken place with the Consumnes, Tracy, Modesto, South American, Solano, and East Contra Costa subbasins."* The 2024 GSP does not include a discussion of the potential impacts of the ESJ Subbasin's SMCs to adjacent subbasins due to Chronic Lowering of Groundwater SMCs; however, comparing the ESJ Subbasin's MTs for the Principal Aquifer to those established in the DM Subbasin for both the Lower and Upper Aquifers indicates that the MTs established near the boundary between the two subbasins in the ESJ Subbasin are less protective than those established near the boundary in the DM Subbasin for both the Lower and Upper Aquifers. If both subbasins' MTs were reached, this could steepen the historic hydraulic gradient between the DM and ESJ Subbasins. This would result in increased groundwater outflows from the DM Subbasin, impeding the ability of the DM Subbasin to achieve its sustainability goals.

Specifically, the MT of the ESJ RMW nearest the border between subbasins, "02S07E31N001", is set at 0.8 ft msl, which is approximately 35 ft lower than the MT of the nearest DM Subbasin RMW for the Lower Aquifer and 41 ft lower than the MT of the nearest RMW for the Upper Aquifer. Well 02S07E31N001 is also noted in 2024 GSP Table 4-1 as having an unknown depth, so it is unclear what zone of the Principal Aquifer it is monitoring, making it difficult to meaningfully assess conditions at this site.

The GSP Regulations state that MTs defined in each GSP should be designed to avoid causing Undesirable Results (URs) in adjacent basins and to avoid affecting adjacent basins' ability to achieve their established sustainability goals.

Given this and the fact that the MTs for the Chronic Lowering of Groundwater Levels in the ESJ Subbasin nearest the DM Subbasin allow for substantially lower groundwater elevations than those established in the DM Subbasin, our GSPs should be coordinated to make the SMCs consistent or the ESJ Subbasin 2024 GSP should more clearly demonstrate how its SMCs, as currently set per 23 CCR § 354.28(b)(3):

> "*[…]have been selected to avoid causing undesirable results in adjacent basins or affecting the ability of adjacent basins to achieve sustainability goals […]*"

<u>Demand Management Framework</u>

2024 GSP Page 6-56 (Section 6.4): "Although the ESJGWA does not provide direct authority to require GSAs to implement projects, the GWA will be working on GSA-level water budgets and will be requesting annual or biannual reports to evaluate progress. It was stated in the 2020 GSP that if the projects do not progress, or if monitoring efforts demonstrate that the projects are not effective in achieving stated recharge and/or offset targets, the GWA will convene a working group to evaluate supply-side and demand-side management actions such as the implementation of groundwater pumping curtailments, land fallowing, etc. In the 2024 GSP Amendment, a new management action is being added to the GSP to formalize the development of a Demand Management Program that can be used as a backstop, if necessary, to ensure the recovery of the principal aquifer if the Subbasin falls short on project implementation and groundwater offset targets. It is the still the overall theme and goal of the ESJ GSP to first implement PMAs to manage overdraft and reach basin sustainability. However, this management action is intended to respond to direction provided by DWR and to outline the demand side action that would be taken if supply side actions are not effective in meeting overall basin sustainability goals."

2024 GSP Appendix 6-B, Page 6 (Section 3.1): Each GSA with allocated responsibility must adopt an enforceable demand management program within their GSA by December 31, 2027 and begin implementation by December 31, 2028.

Per the 2024 GSP, the Eastern San Joaquin Groundwater Authority (ESJGWA) may pursue groundwater allocations and curtailments if the development of water supply projects cannot solely offset the current groundwater demands and demand reduction targets. We appreciate the ESJGWA's stated intent to develop a demand management program. We note that 23 CCR § 354.44 requires that GSPs include:

> *A description of the circumstances under which projects or management actions shall be implemented, the criteria that would trigger implementation and termination of projects or management actions, and the process by which the Agency shall determine that conditions requiring the implementation of particular projects or management actions have occurred.*

And

> *A description of the management of groundwater extractions and recharge to ensure that chronic lowering of groundwater levels or depletion of supply during periods of drought is offset by increases in groundwater levels or storage during other periods.*

Successful implementation of the DM GSP will require an understanding of the paths that the surrounding subbasins are taking towards sustainability, including a detailed description of pumping reductions, groundwater allocations, or other demand management actions to address any chronic lowering of groundwater levels.

Land Subsidence

Undesirable Result for Land Subsidence Should Be Further Clarified

2024 GSP Section 3.3.5.1.1: There are no historical records of significant and unreasonable impacts from subsidence in the Eastern San Joaquin Subbasin (see Figure 2-78). Per InSAR data currently available, 2015-2016 maximum subsidence rates in the Eastern San Joaquin Subbasin ranged from -1.2 inches per year (in/yr) to -2.4 in/yr, and there has been a maximum average subsidence rate of 0.93 in/yr over the last approximately 8 years (2015-2023). Given that approximately 10 years have lapsed since the implementation of SGMA commenced in 2015, and assuming an additional 10 years for achieving significant progress towards the Subbasin's sustainability goal, it has been assumed that an additional 24 inches of subsidence (-1.2 in/yr times 20 years) can occur until 2040 without experiencing undesirable results relating to inelastic land subsidence.

Additional clarification is requested regarding the definition of a UR for Land Subsidence. Per 23 CCR § 354.26:

> *The description of undesirable results shall include the following: […] 2. The criteria used to define when and where the effects of the groundwater conditions cause undesirable results for each applicable sustainability indicator. The criteria shall be based on a quantitative description of the combination of minimum threshold exceedances that cause significant and unreasonable effects in the basin.*

The definition of a UR in the 2024 GSP does not clearly identify the specific thresholds at which subsidence becomes significant and unreasonable, rather as written it describes conditions prior to an UR. Section 3.3.5.1.1 of the 2024 GSP implies that the occurrence of greater than 24 inches of subsidence between 2020 and 2040 would be an UR. However, it is not clear whether subsidence occurring after 2040 would be considered a UR. Section 3.3.5.3 of the 2024 GSP defines the MO for land subsidence as "0 ft/year, on a long-term average" with an IM of "After 2040: 0 ft/yr (0 in/yr)." This implies that subsidence after 2040 is undesirable, but that some could be allowed during brief intervals. Clarification of the duration or extent of subsidence that would be considered a UR after 2040 would be appreciated.

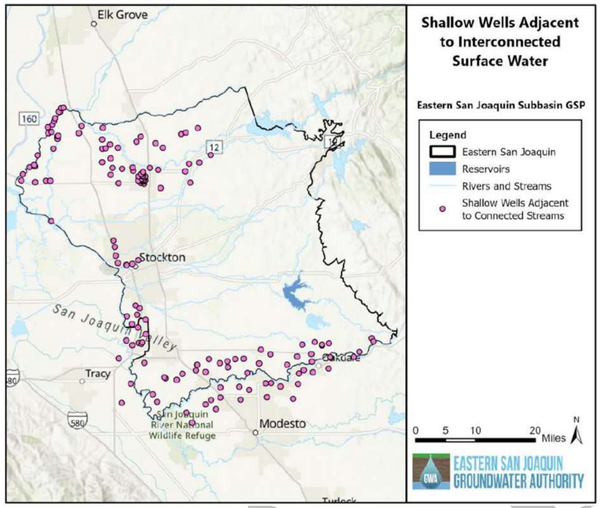
Depletion of Interconnected Surface Water (ISW)

Identification of Interconnected Reaches

*2024 GSP Appendix 3-G: Stream connectivity was analyzed by comparing monthly groundwater elevations from the historical calibration of the ESJWRM to streambed elevations along the streams represented in ESJWRM, displayed in **Figure 1**. Layer 1 groundwater levels were used since the new model Layer 1 in ESJWRM represents the shallow, generally unconsolidated sediments where stream-aquifer interaction is occurring. Connected streams were defined as Layer 1 groundwater levels at or above the streambed elevation at least 75 percent of the time.*

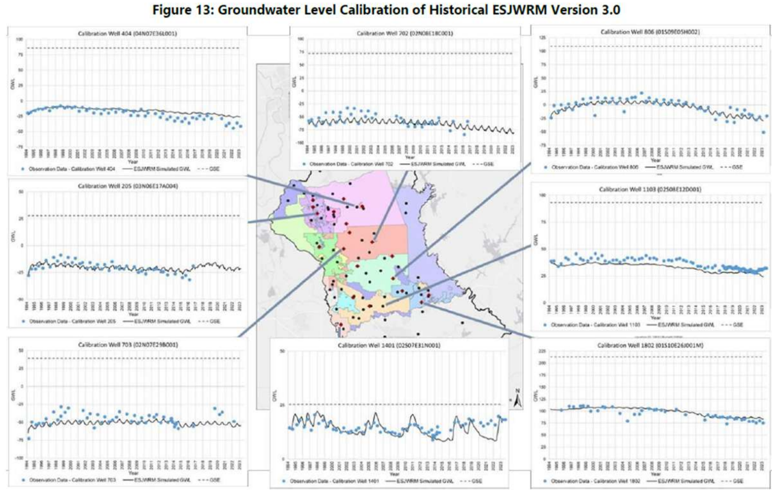
2024 GSPS Appendix 3-G: In addition to stream gages, the GSAs are utilizing data that are being collected elsewhere to help the understanding of ISW conditions and stream depletions. Figure 21 depicts wells that are within three miles of a connected river, are monitoring wells, have shallow wells depths (100 feet or less), and have recent groundwater level observations (at least one observation since the start of Water Year 2015).

Figure 21: Supplemental Groundwater Level Monitoring Wells for ISW Analysis



Appendix 3-C, Figure 21

Figure 13: Groundwater Level Calibration of Historical ESJWRM Version 3.0



Appendix 2-C, Figure 13

The 2024 GSP states that surface water is interconnected when modeled groundwater elevations are at or above the elevation of the streambed represented in the ESJWRM. However, as shown in Figure 21 of Appendix 3-C and Figure 13 of Appendix 2-C, the nearest well used for the ISW Analysis and/or calibration of the ESJWRM is more than approximately two miles away from the ESJ and DM subbasin boundary formed by the San Joaquin River. As stated on page 9 of DWR's guidance document, Depletions of Interconnected Surface Water - An Introduction:

> *Shallow groundwater elevations close to the elevation of the streambed may suggest connectivity through a saturated zone (Figures 5a-c). Shallow wells are most suited for analyzing connectivity as the surface water bodies directly interact with these shallow groundwater levels.*
>
> *Consideration should be given to the distance between the well and the surface water body and to the screen depth of the well. Although more distant wells may show groundwater elevations below streambed elevation, the surface water body may still be hydraulically connected and thus an ISW, as shown in Figure 5d.*

> *While water levels in wells provide evidence or possible indications of interconnection (or disconnection), the certainty with which the data can be used to determine interconnection depends on the well's distance from the stream and the difference between stream levels and groundwater levels.*

2024 GSP Section 4.7.3: The ESJGWA recognizes the depletions of interconnected surface water as a data gap area. The ESJGWA has completed some refinements to the representative monitoring network, but a future study and additional refinement of interconnected surface water representative monitoring network will be needed, along with continued coordination efforts with neighboring subbasins to better inform Subbasin conditions and interconnected rivers that serve as boundaries for the Subbasin.

We agree with the need for further investigation of ISW and emphasize the importance of collaboration in this effort, specifically along the San Joaquin River. Given the limited information on ISWs in the ESJ Subbasin, coordinated assessments will be essential to address uncertainty introduced by the distance and construction of RMWs in ISW determinations. A common approach is to use depth-to-groundwater thresholds to indicate likely connectivity through a continuous saturated zone. For example, The Nature Conservancy's ICONS database considers streams likely connected to groundwater when groundwater levels are within 0-20 feet of the stream and uncertain when levels are 20-50 feet below the stream. Collaboratively applying a similar approach across the subbasin boundaries could help with characterizing potential ISW until more data are available.

<u>Establishment of SMCs (URs, MTs, MOs, and IMs)</u>

2024 GSP Section 3.3.6.1.2: The undesirable result for depletions of interconnected surface water in the Eastern San Joaquin Subbasin is depletions that result in reductions in flow or levels of major rivers and streams that are hydrologically connected to the basin such that the reduced surface water flow or levels have a significant and unreasonable adverse impact on beneficial uses and users of the surface water within the Subbasin over the planning and implementation horizon of this GSP.

2024 GSP Section 3.3.6.2: Minimum thresholds were established for ISW representative monitoring wells using groundwater levels as a metric. Groundwater level data are used to calculate water table gradients and, therefore, the volume of water gained and lost. Without additional DWR guidance at the time of this Amended GSP or more certainty around stream depletions due to pumping with the existing modeling toolset, the SMCs rely on the best available information at the time of analysis. The ISW SMCs using groundwater levels as a metric aim to be "sufficiently protective to ensure significant and unreasonable occurrences of [stream depletions] will be prevented," as prescribed in the DWR's Best Management Practices for the Sustainable Management of Groundwater: Sustainable Management Criteria (DWR, 2017). […] The ISW minimum thresholds for wells with historical groundwater level observations are the same as for the chronic lowering of groundwater levels minimum thresholds.

2024 GSP 3.3.6.3: Similar to minimum thresholds, measurable objectives and interim milestones were established for ISW representative monitoring wells using groundwater levels as a metric, and as with the minimum thresholds for wells with historical groundwater level observations, the measurable objectives and interim milestones are the same as for the chronic lowering of groundwater levels measurable objectives and interim milestones.

Table 3-8: Measurable Objectives and Interim Milestones for Interconnected Surface Water

Well ID	Measurable Objective (ft msl)	Interim Milestone (ft msl)		
		2025	2030	2035
Well A	New well – need to collect data			
Well B	New well – need to collect data			
Well C	New well – need to collect data			
Well E	New well – need to collect data			
Well G	New well – need to collect data			
Delta Well	New well – need to collect data			
04N05E36H003	-5.1	-5.1	-5.1	-5.1
Swenson-3	-19.3	-19.3	-19.3	-19.3
Frankenheimer (01S10E26J001M)	81.7	81.7	81.7	81.7
Burnett (OID-4)	79.7	79.7	79.7	79.7
02S07E31N001	12.3	13.8	13.8	13.1
02S08E08A001	24	22.2	22.2	23.1

Table 3-8: Measurable Objectives and Interim Milestones for Interconnected Surface Water (Pg. 3-35).

The ESJ Subbasin has established SMCs for ISW. The ISW MTs, MOs, and IMs were established using the same metrics as for the Chronic Lowering of Groundwater Levels. Furthermore, groundwater level data were used to calculate water table gradients, and therefore, the volume of water gained and lost; however, the volumes were not presented for the MTs, MOs, or IMs in the SMC section of the 2024 GSP. According to 23 CCR § 354.28:

> *The minimum threshold for depletions of interconnected surface water shall be the rate or volume of surface water depletions caused by groundwater use that has adverse impacts on beneficial uses of the surface water and may lead to undesirable results*

Additionally, the MT must be supported by the:

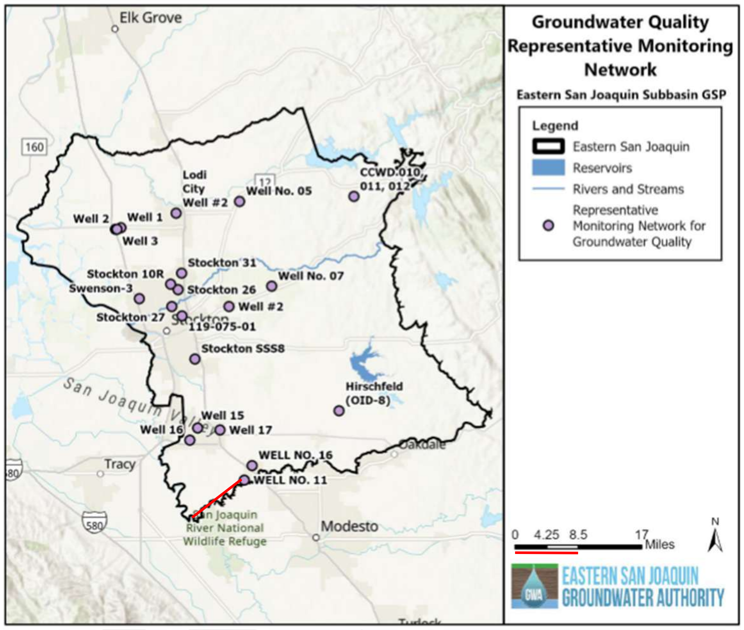
> *[…] location, quantity, and timing of depletions of interconnected surface water." While the current monitoring well locations and analysis of connected and disconnected reaches satisfy the requirement of location, it does not provide information on rate, volume, or timing.*

Although the current approach outlined in the 2024 GSP followed the best available information at the time, it does not appear to consider the latest DWR guidance on ISW and therefore there remains uncertainty in defining SMCs that are sufficiently protective of streamflows. Moving forward, it will be beneficial to align the SMC development processes, ensuring adequate protection of streamflows and reducing uncertainty. Continued inter-basin coordination will allow for a more comprehensive and adaptive strategy to ensure coordinated and sustainable groundwater management.

Water Quality

<u>Consider Increasing Spatial Density of Representative Monitoring Wells for Water Quality</u>

Figure 3-3: Location of Representative Monitoring Wells for Water Quality



2024 GSP Page 3-21 (Section 3.3.3.2): Figure 3-3: Location of Representative Monitoring Wells for Water Quality [Approximate Distance between closest ESJ Subbasin Well and the DM Subbasin is 8.5 miles as shown with the red lines above]

2024 GSP Section 4.3.4: The spatial density of the groundwater quality monitoring network was calculated for the representative monitoring network, as summarized in Table 4-6. The representative monitoring network consists of a total of 21 monitoring wells, a density of 1.2 wells per 100 square miles.

Although, as stated in the 2024 GSP Section 4.3.4, *DWR's Monitoring Networks and Identification of Data Gaps BMP states "The spatial distribution must be adequate to map or supplement mapping of known contaminants" (CA DWR, 2016b). The goal of the groundwater quality monitoring network is to adequately cover the Subbasin to accurately characterize salinity concentrations and trends. This includes both spatial coverage and temporal coverage in order to identify changes in groundwater quality overtime*, according to Best Management Practices (BMP) #2 Monitoring Networks and Identification of Data Gaps, the recommended minimum monitoring well density for any Basin producing more than 10,000 acre-feet per year (AFY) pumping per 100 square miles is four wells per 100 square miles. Per the 2023 Annual Report, the ESJ Subbasin groundwater production reports over 800,000 AFY (Table 5, page 3-21), thus it is advisable that the ESJ Subbasin increase its monitoring density, particularly in the south where there are fewer monitoring wells. As shown on the Figure above, the closest RMW for Water Quality is approximately 8.5 miles from the DM Subbasin boundary. Given this corner's proximity to the San Joaquin River and to multiple other groundwater subbasins, we feel that it would be advantageous to add an additional well to the monitoring network in this location.