NSJWCD ET Analysis Overview

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ZANJERO
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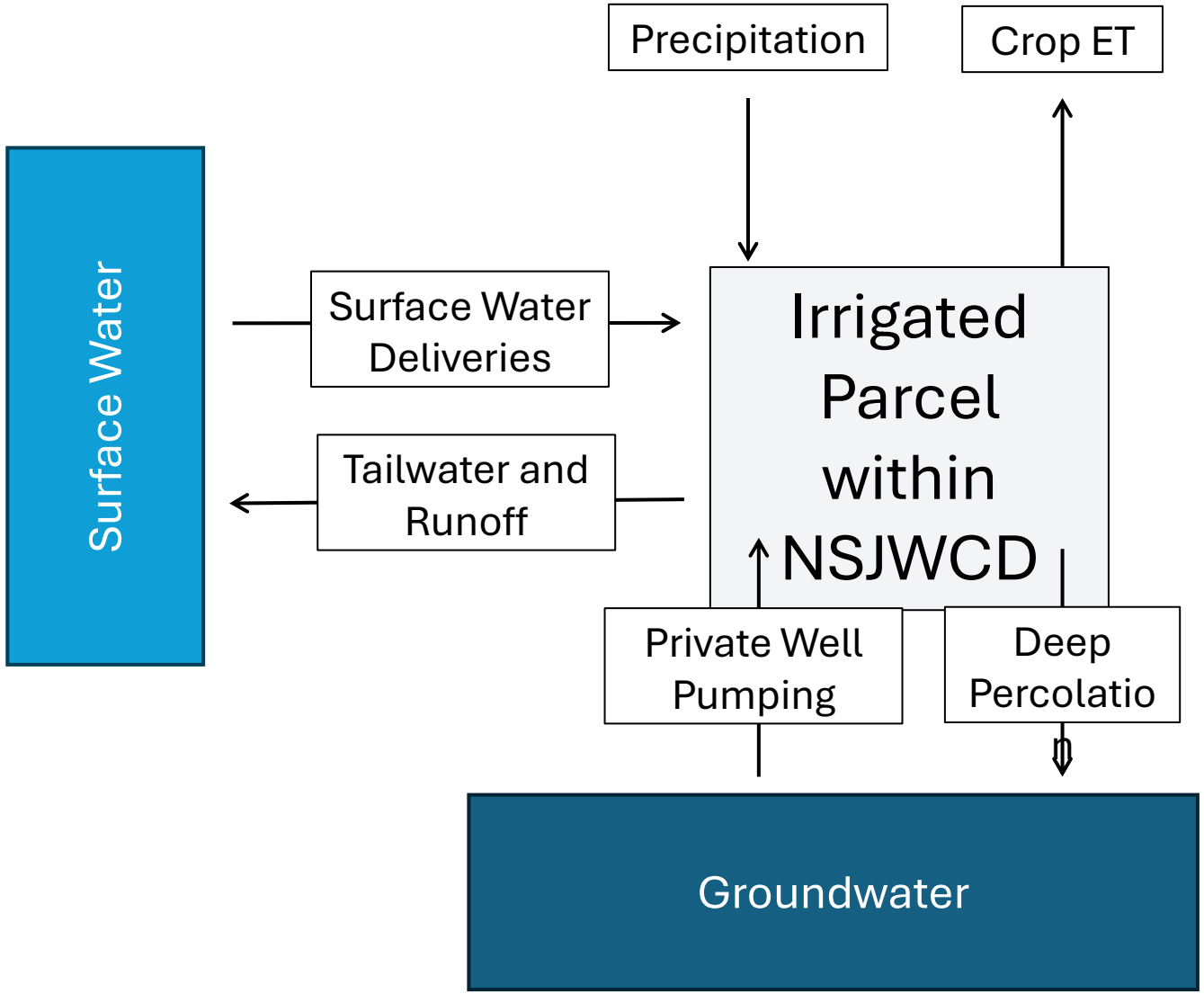
Discussion Items

1. ET Model Framework
2. Approach and examples
3. Value of Methodology
4. Comparing model approaches
5. Example comparison

ET Model Framework

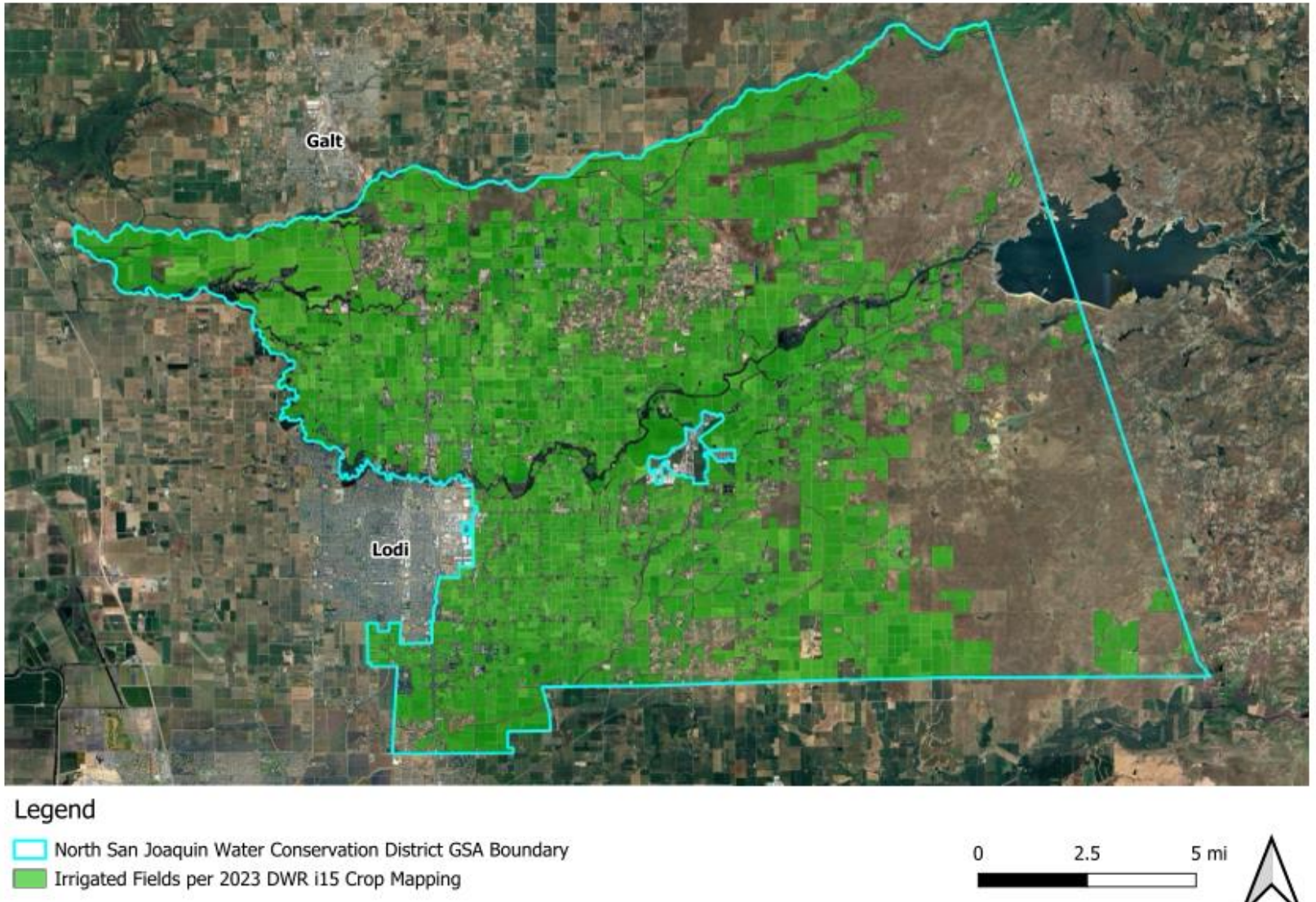


Approach

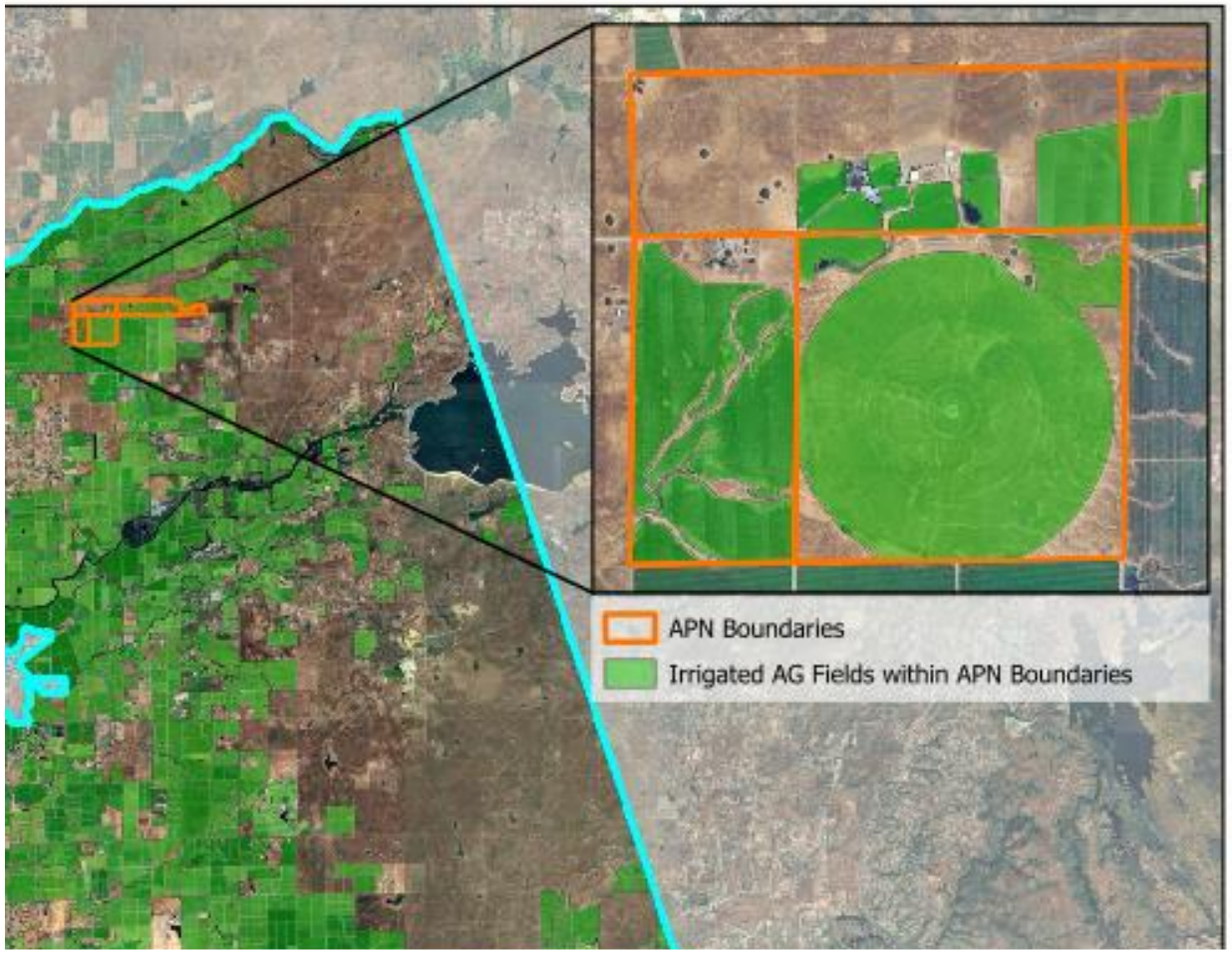
1. Obtain crop layer data
2. Create unique field/parcels
3. Pull OpenET data for unique field/parcel
4. Obtain precip data for period and assess “eff precip” per policy
5. Calculate ETAW (ET of Applied Water)
6. Obtain and parse surface water delivery data
7. Convert surface deliveries to ETAW using irrigation efficiency factor
8. Remainder is ETAW from groundwater
9. Convert the ETAW from groundwater to Applied Groundwater (pumped)

Use DWR's 2023 Crop Layer for Baseline

Each year, some of these fields will not be irrigated. But the baseline acres remain constant, allowing for comparison across years.



“Field/Parcel” and “Irrigated Field” examples



Legend

- APN 234-567-890
- DWR Irrigated Fields on APN 234-567-890
- Portion of Field 4 Split by APN Boundary

0 0.075 0.15 mi

NSJWCD ET Model: draft results

	units	2020	2021	2022	2023	2024	2025
Total DWR Crop Layer Acres	Acres	81,764	81,764	81,764	81,764	81,764	81,764
Assumed Irrigated	Acres	Not Determined		80,929	80,715	79,481	77,538
Newly Fallowed	Acres			835	436	1,719	2,451
Fallowed from prior year(s)	Acres			-	613	563	1,775
Total Fallowed	Acres			835	1,049	2,283	4,226
Total ET	AF	187,402	221,159	213,611	217,839	233,311	229,078
Total Precipitation	in.	10.23	9.20	14.29	29.34	16.53	12.41
Effective Precipitation	in.	10.17	9.18	14.06	23.16	16.53	12.26
Deep percolation	in.	0.06	0.02	0.23	6.18	-	0.15
Total Precipitation	AF	69,704	62,686	97,367	199,913	112,630	84,557
Effective Precipitation	AF	69,295	62,549	95,800	157,804	112,630	83,535
Deep percolation	AF	409	136	1,567	42,108	-	1,022
Average ET/AC	AF/Acre	2.10	2.48	2.39	2.46	2.65	2.59
Total Applied Water	AF	143,135	191,186	141,900	74,637	145,035	181,628
Total Applied Surface Water	AF	Not Determined		12,517	8,955	8,944	Not Determined
Surface From Rights	AF			12,517	8,797	8,080	
Surface from District	AF			-	158	864	
District recharge	AF			-	2,064	3,633	
Total Applied Groundwater	AF			129,383	65,682	136,091	
Average AW/AC	AF/Acre	1.53	2.07	1.48	0.69	1.54	1.98

*This analysis is on fields larger than 2 acres

*This analysis is done on Water Year

*We do not have 2020 and 2021 SWRCB Surface Water Data or District Surface Water Data before 2023

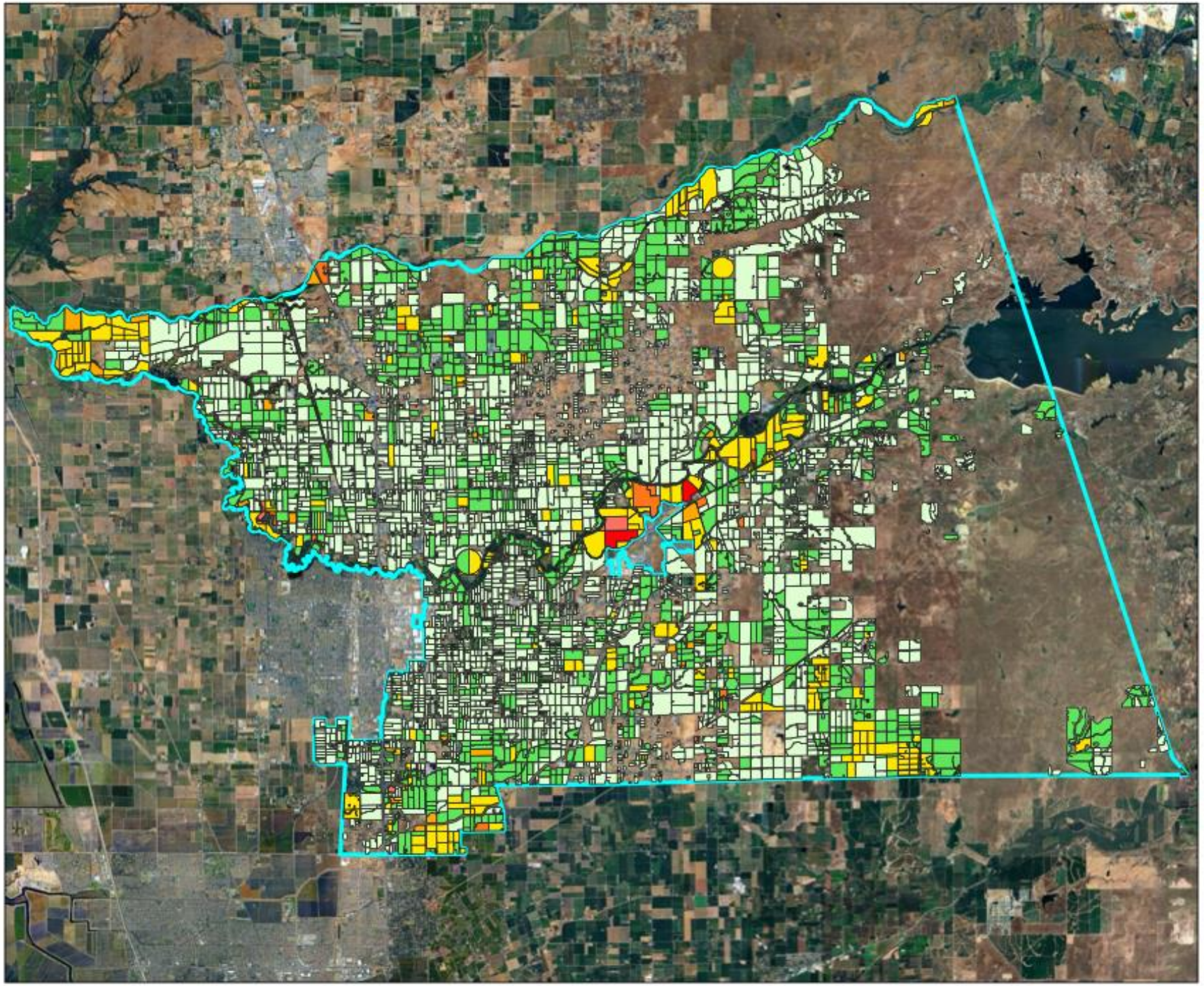
* 2023 and 2024 District surface water data is not fully allocated in this summary table

*Fallowing analysis begins in 2021

*We do not have WY data for Oct, Nov, Dec of WY 2020

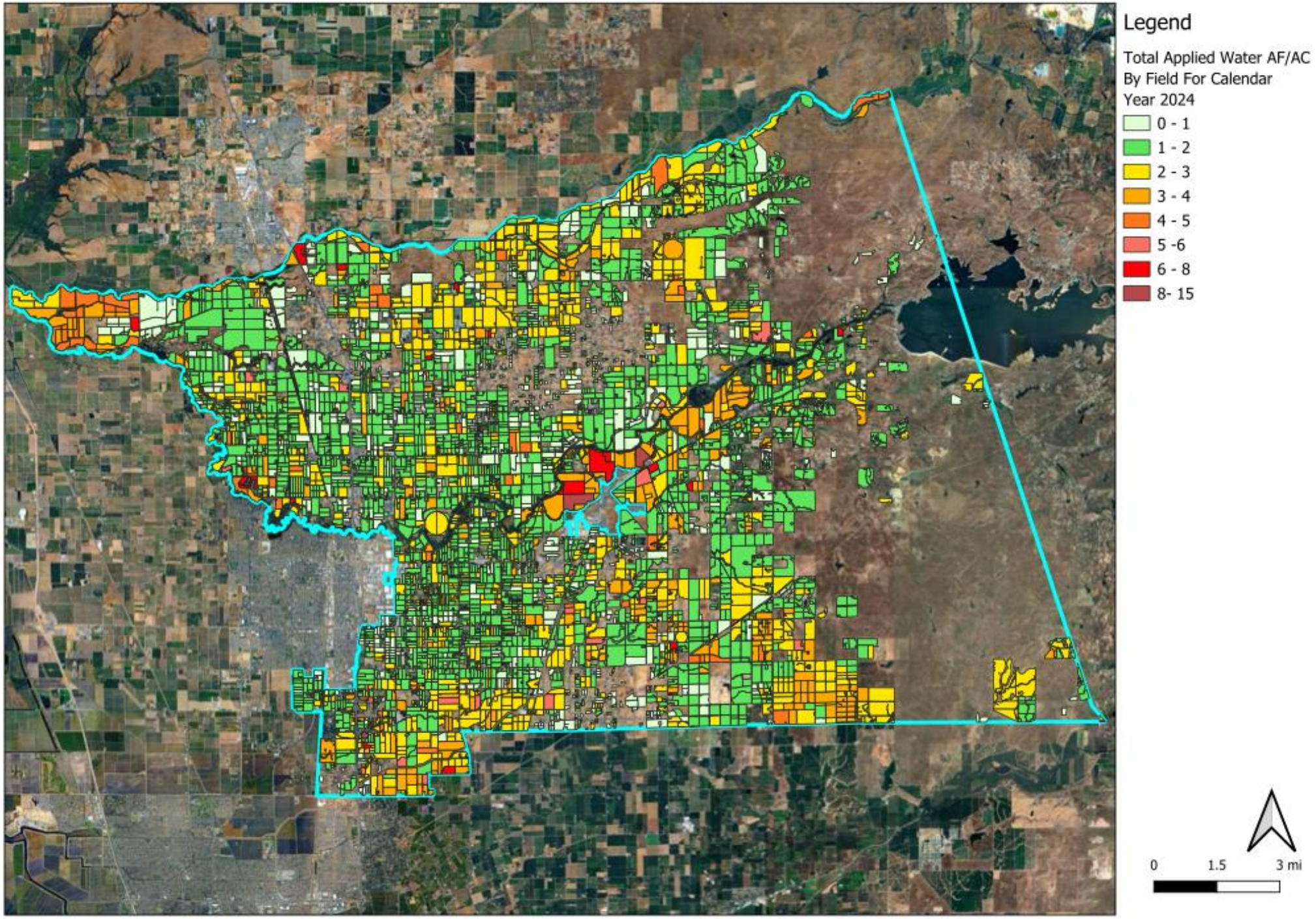
Sample Results

2023



Sample Results

2024

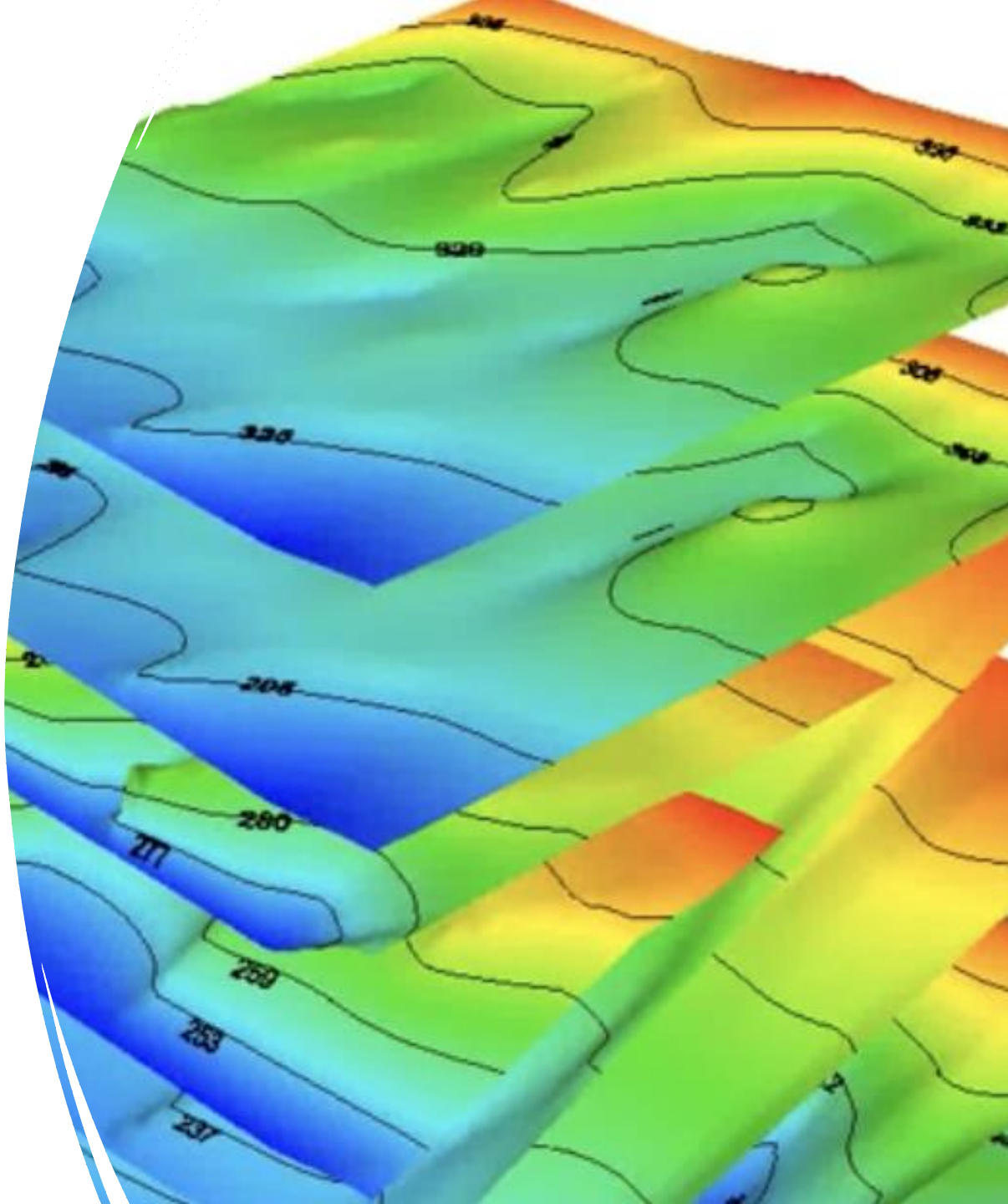


Value of Methodology

Methodology useful for tracking GSA's demand management outcomes

- Effective proxy for evaluating the change in groundwater pumping over time from a static baseline
  - Reflects annual change in land use, rainfall, ET, etc.
- Easy to use and update annually
- Provides field/parcel, parcel, and GSA level data for
  - Discussions among GSA's regarding success/adjustments in basin-wide demand management program
  - Dialogue with growers in a GSA regarding groundwater use and use of any incentives/fees
  - Identifying "hot spots" within the subbasin to focus projects and actions

Comparing ET Model with ESJGWA Subbasin Model



Comparison between GWA Model and Parcel-based approaches

ESJGWA Current Subbasin Model

- Land-use based
  - Multiplies crop acres by a monthly general ET value
  - Treats all similar crops equally
- Data parsed by model grids
- Uses soil moisture model for precip
- Uses 2022 DWR Crop Mapping as the Crop Acreage
- Model parameters routinely updated

Parcel-based ET Model

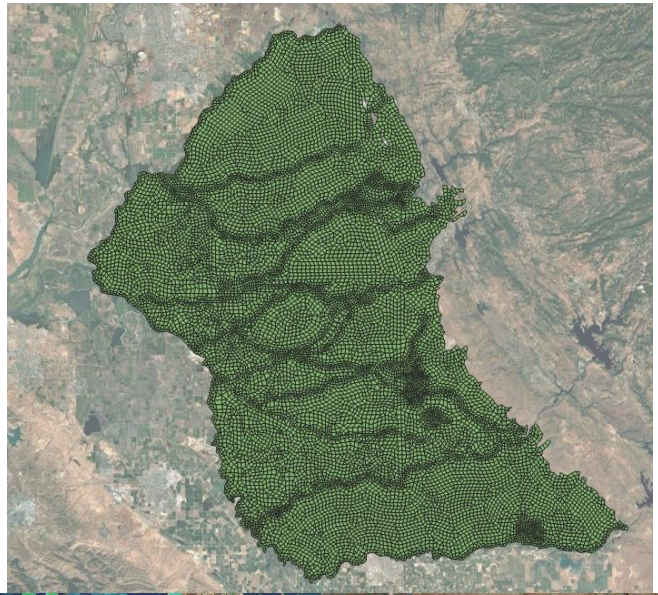
- Remote Sensing based
  - Field-by-Field unique ET values for each month
  - Reflects unique field conditions
- Data parsed to field/parcel
- Uses selected policy for effective precipitation
- Uses 2023 DWR Crop Mapping for Crop Acreage to create static baseline

Agricultural Lands

1. ESJGWA Model
   a. 2022 DWR Crop Layer
   b. ET is “crop type” multiplied by crop coefficient and ETo
   c. Grids do not coincide with parcels

2. ET Model
   a. 2023 DWR Crop Layer
   b. ET is field specific from remote sensing
   c. Fields relate to one parcel

3. Example of ET Variance for Vineyards



Comparing Vineyard ET values

For 2024		From OpenET for All Parcels				From GWA Modeel
Crop	Month	Average ET (AF/AC)	ET Standard Deviation (AF/AC)	Minimum ET (AF/AC)	Maximum ET (AF/AC)	
Vineyards	1	0.07	0.01	0.02	0.11	0.07
	2	0.12	0.01	0.05	0.16	0.07
	3	0.20	0.02	0.12	0.25	0.10
	4	0.28	0.04	0.17	0.42	0.10
	5	0.34	0.06	0.14	0.57	0.29
	6	0.38	0.08	0.11	0.61	0.45
	7	0.40	0.09	0.11	0.66	0.53
	8	0.32	0.07	0.07	0.55	0.50
	9	0.24	0.07	0.04	0.44	0.36
	10	0.15	0.04	0.02	0.27	0.21
	11	0.09	0.01	0.01	0.14	0.05
	12	0.05	0.01	0.02	0.08	0.07
			Total	0.88	4.26	2.79

Effective Precipitation

1. ESJGWA Model
   a. Uses a DWR developed soil moisture balance model that uses PRISM
   b. Model may result in varied rain by "grid"
   c. Example for WY 2024: Vines
      i. Total Precip = 16.5 in.
      ii. ET = 2.8 af/ac
      iii. Eff Precip = 0.4 af/ac *
      iv. ETAW = 2.4 af/ac

2. ET Model
   a. Uses policy that applies % of rain to all crops based on total rainfall Oct to Mar from chosen CIMIS station
   b. Uniform for all parcels in GSA
   c. Example for WY 2024: Vines
      i. Total Precip = 16.5 in.
      ii. ET = 2.8 af/ac
      iii. Eff Precip = 1.3 af/ac
      iv. ETAW = 1.5 af/ac

* The "Eff Precip" value from the GWA's model is an averaged value that results from the soil moisture budget from DWR. The value specific to vines is not clear.

Comparing Outputs (WY 2024)

	ESJGWA Model	ET Model	Difference
Agricultural Acres	78,041	81,765	+3,724
ET (AF)	222,075	233,311	+11,236
Effective Precipitation (in/ac)	4.2	16.53	+12.33
Applied Groundwater (AF)	168,653	136,091	(32,562)