FIELD-BY-FIELD EVAPOTRANSPIRATION, CROP TYPE, AND PRECIPITATION – LAND IQ PROPOSAL TO MADERA COUNTY GSA

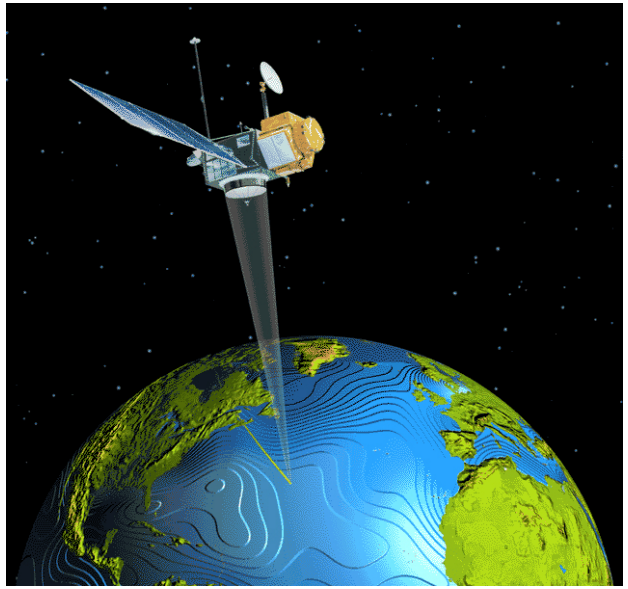
LAND IQ

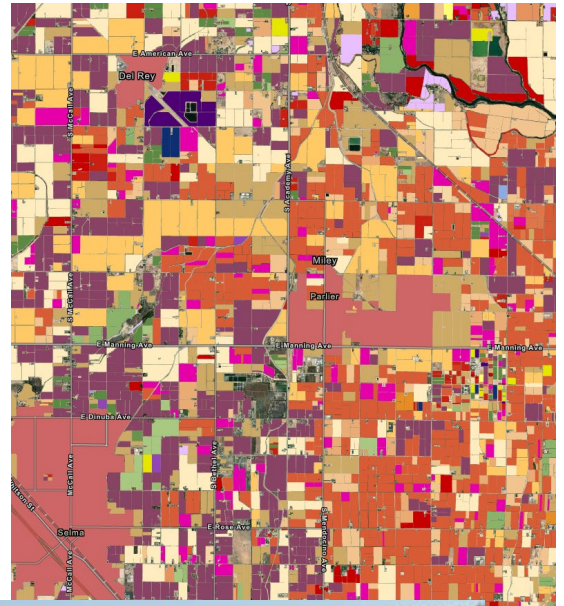
JULY 1, 2025

TEAM - LAND IQ TECHNICAL DISCIPLINES

Land-Based Sciences: Land and Water Resources

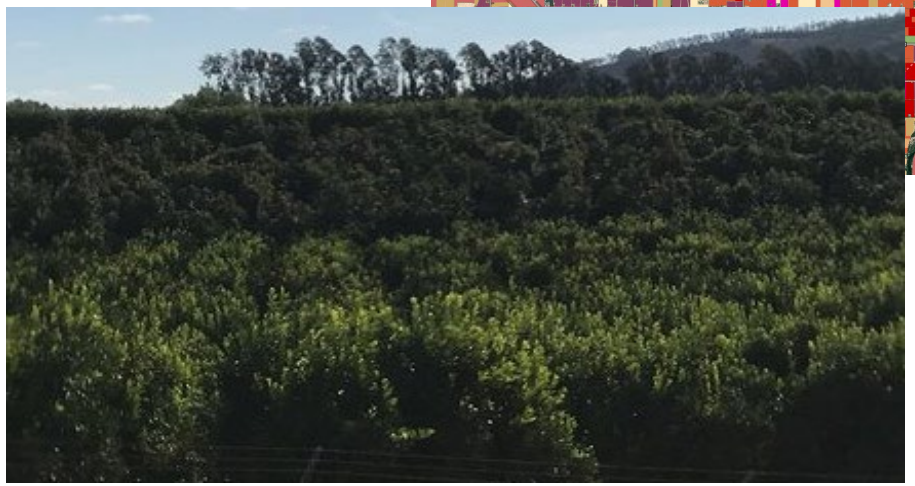
- Agronomic assessments/soil science
- Irrigation and drainage management
- Water quality and supply evaluations
- Salinity and nutrient management
- Agricultural reuse
- Land stabilization and erosion control
- Soil reclamation and irrigation/drainage

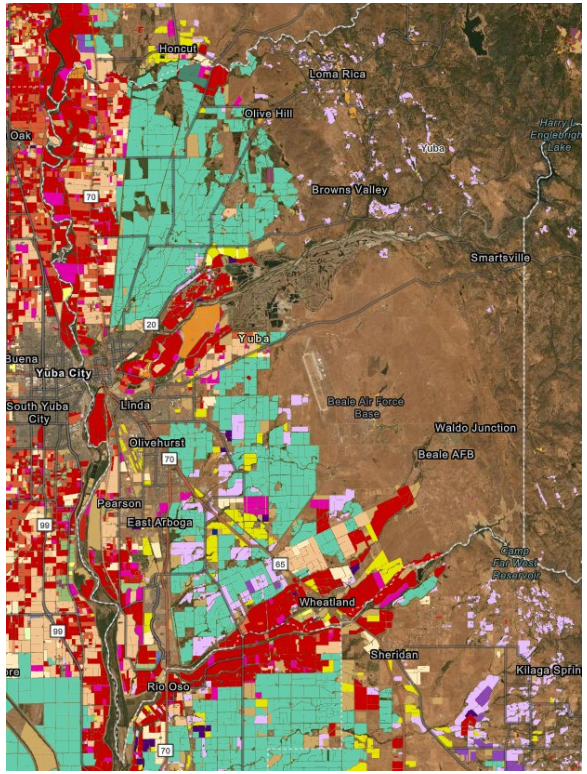




Spatial Sciences: Remote Sensing and GIS

- Consumptive use estimation and crop identification
- Large landscape evaluations
- Irrigation and drainage
- Production agriculture



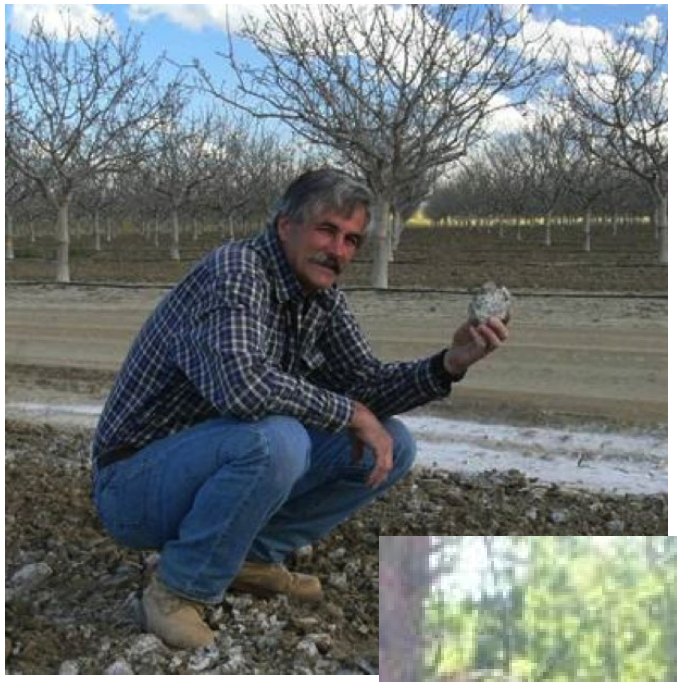


Development

- Data management tools
- Web interface applications

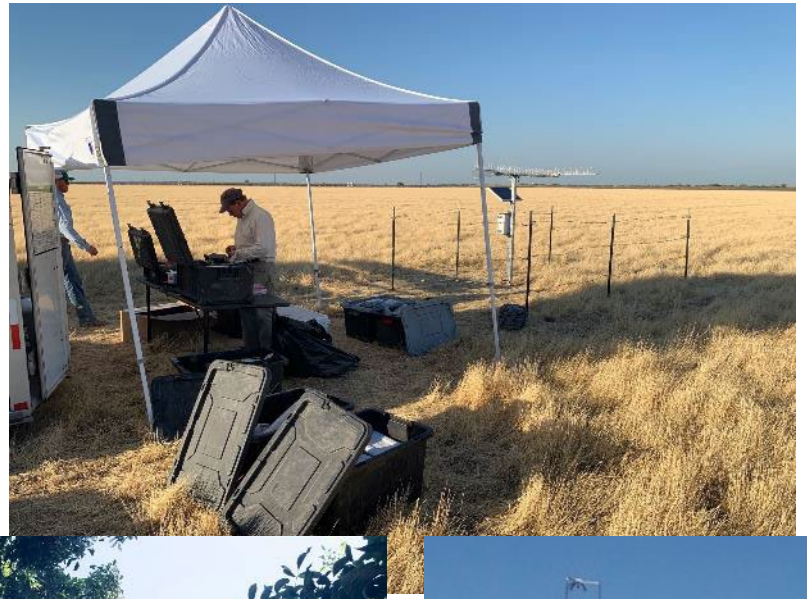
TEAM - INDEPENDENT ET REVIEWERS AND ADVISORS

- Monthly Result Reviewers (since 2021): Retired UC Cooperative Extension Agents and Farm Advisors:
  - Blake Sanden, MS – 26 years in Kern County
  - Allan Fulton, MS – 35 years in Kings, Butte, Tehama, and Glenn counties
- Larger Advisory Group:
  - Daniele Zaccaria, PhD – UC Davis
  - Rick Snyder, PhD – UC Davis, Emeritus
  - Dan Howes, PhD – Cal Poly ITRC
  - Khaled Bali, PhD – UC ANR
  - Pasquale Steduto, PhD – UN-FAO
  - Morteza Orang, PhD - DWR
  - Blake Sanden, MS – UCCE, Emeritus
  - Allan Fulton, MS – UCCE, Emeritus



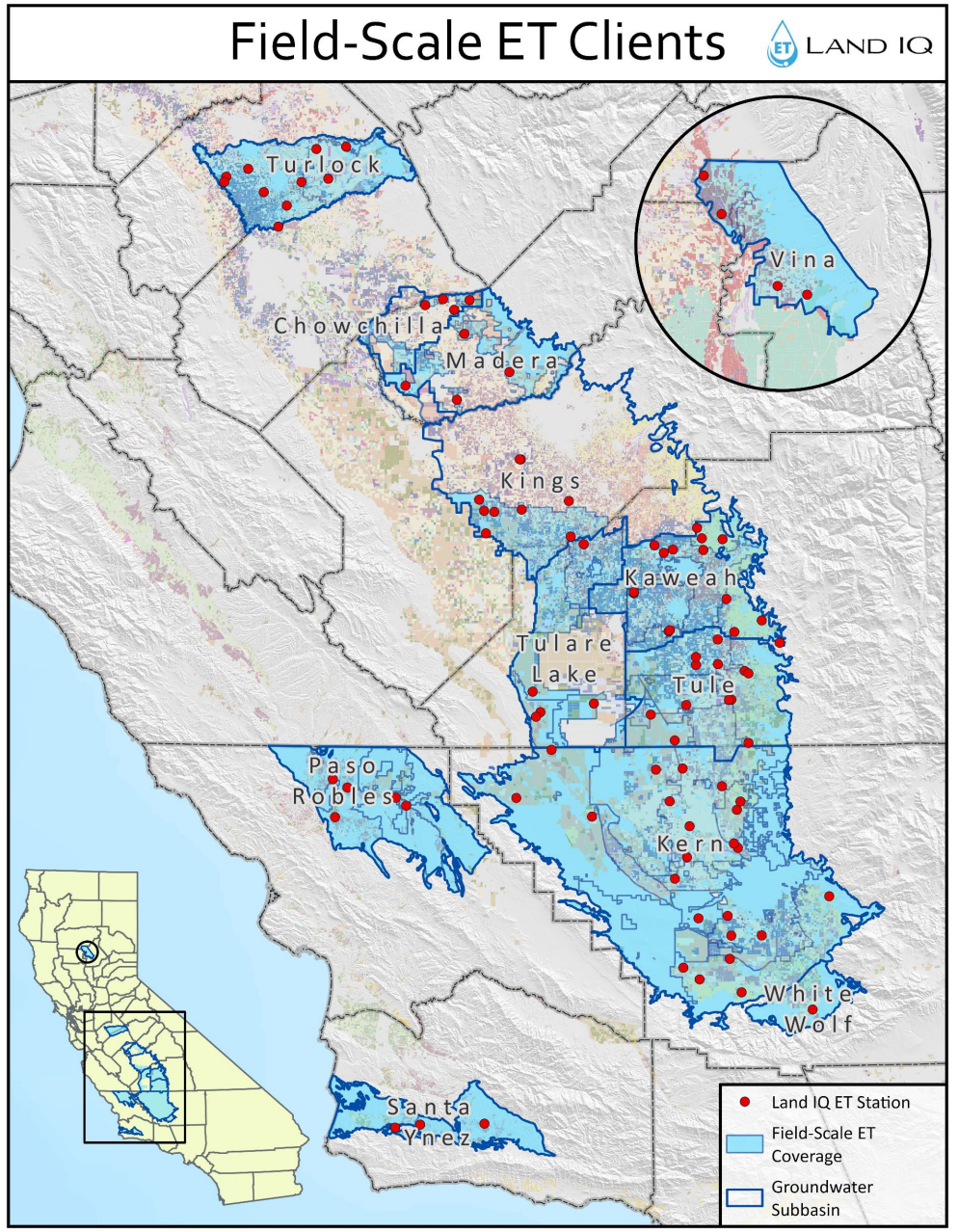
APPROACH - GROUND TRUTHING FOR CALIBRATION

- Defensible
- Independent validation
- Calibration to actual conditions
- Avoiding interpolation during lengthy cloud and smoke cover
- Understanding specific field conditions and management
- Allows for crop-specific modeling
- Stations used are a combination of eddy covariance and surface renewal approaches developed through collaboration with DWR (Delta) and UC Davis researchers
- A “ground up” approach
- Team of 12-14 agronomic and spatial scientists



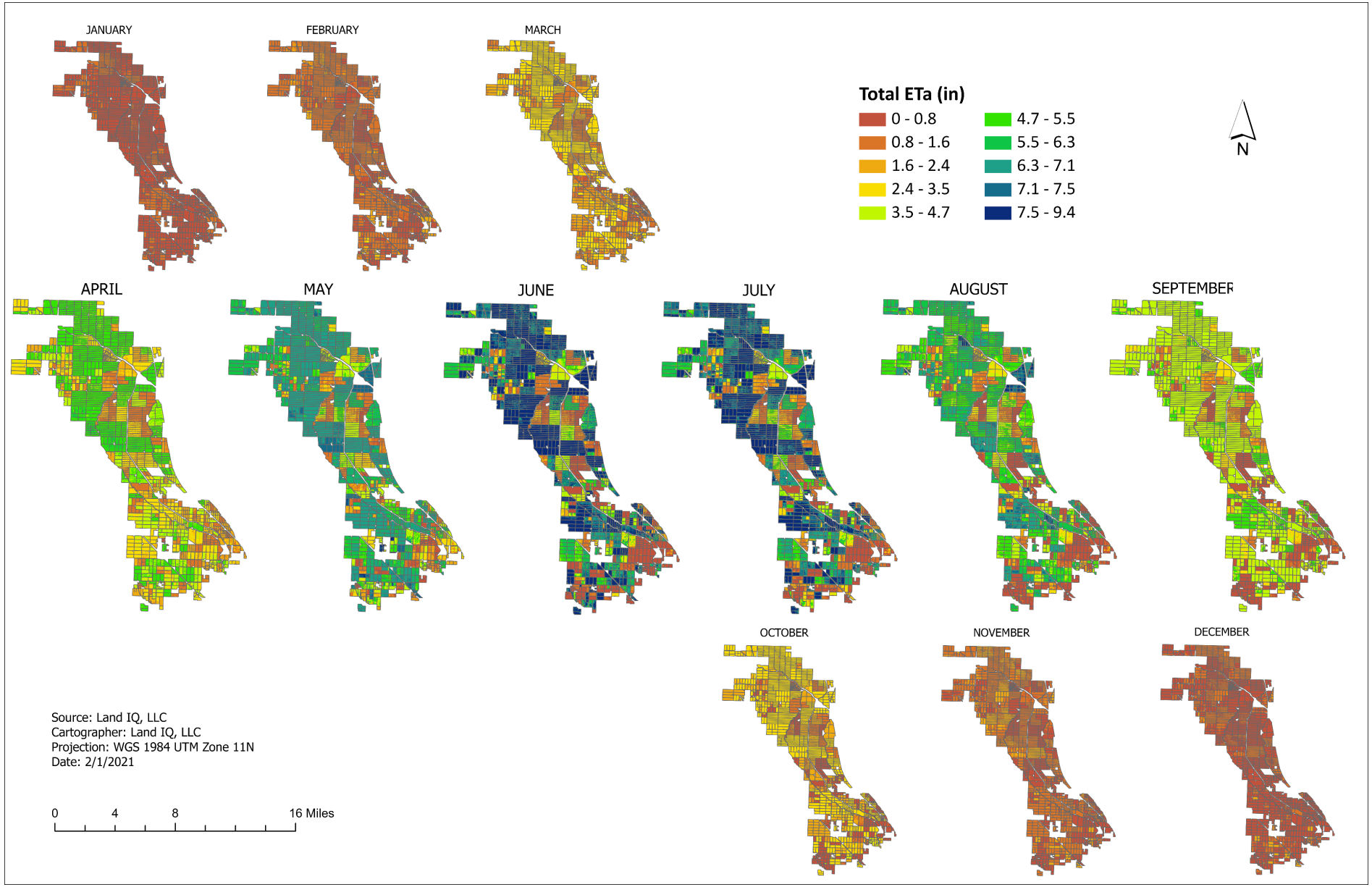
APPROACH – GROUND TRUTHING FOR CALIBRATION

- Installation of 95 stations (currently)
- Including multiple rain gauges for determination of field-by-field precipitation
- Use of both Landsat and Sentinel Imagery (4-6 days)
- 3.8 million acres total footprint
- 2.4 million acres cropped footprint (25% of CA)
- Nearly 40 GSAs or Irrigation Districts
- For the purpose of understanding crop specific and repeated measurements
- Collaboration with UC Davis, UC Cooperative Extension and USDA Agricultural Research Service
- Necessary for more accurate estimation of consumed water in any:
  - Grower use, collaboration, and outreach
  - Water allocation programs
  - Fee-based establishment
  - Demand management programs



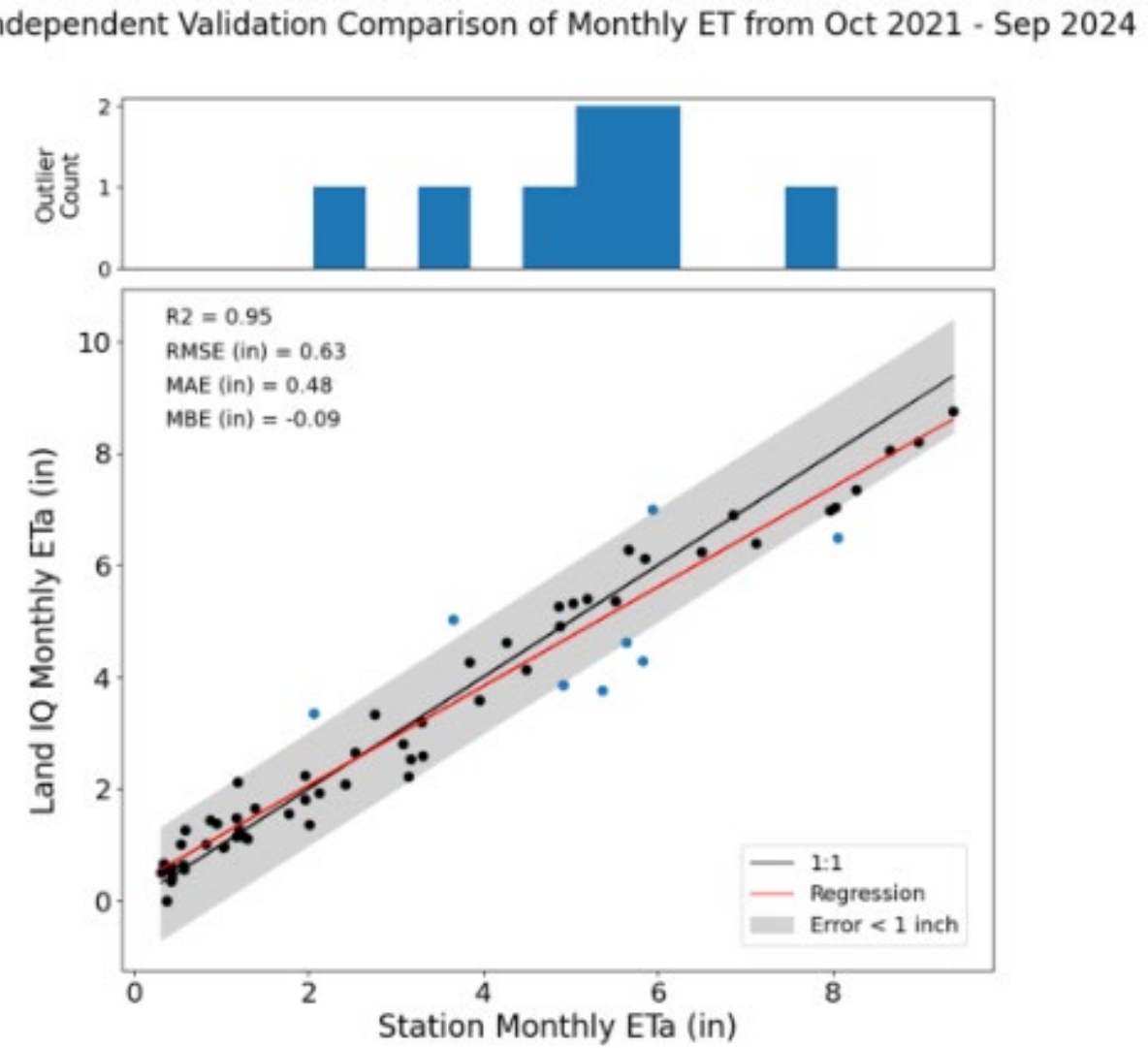
DELIVERABLE PRODUCT 1 – FIELD BY FIELD ET

- Monthly results delivered to the GSA within 30 days of the previous month
- Calibrated and validated by ground truthing climatic stations
- Reviewed by independent advisors
- Used for tracking water use, water management, reporting, allocations, fee structures, etc.



DELIVERABLE PRODUCT 1: ACCURACY

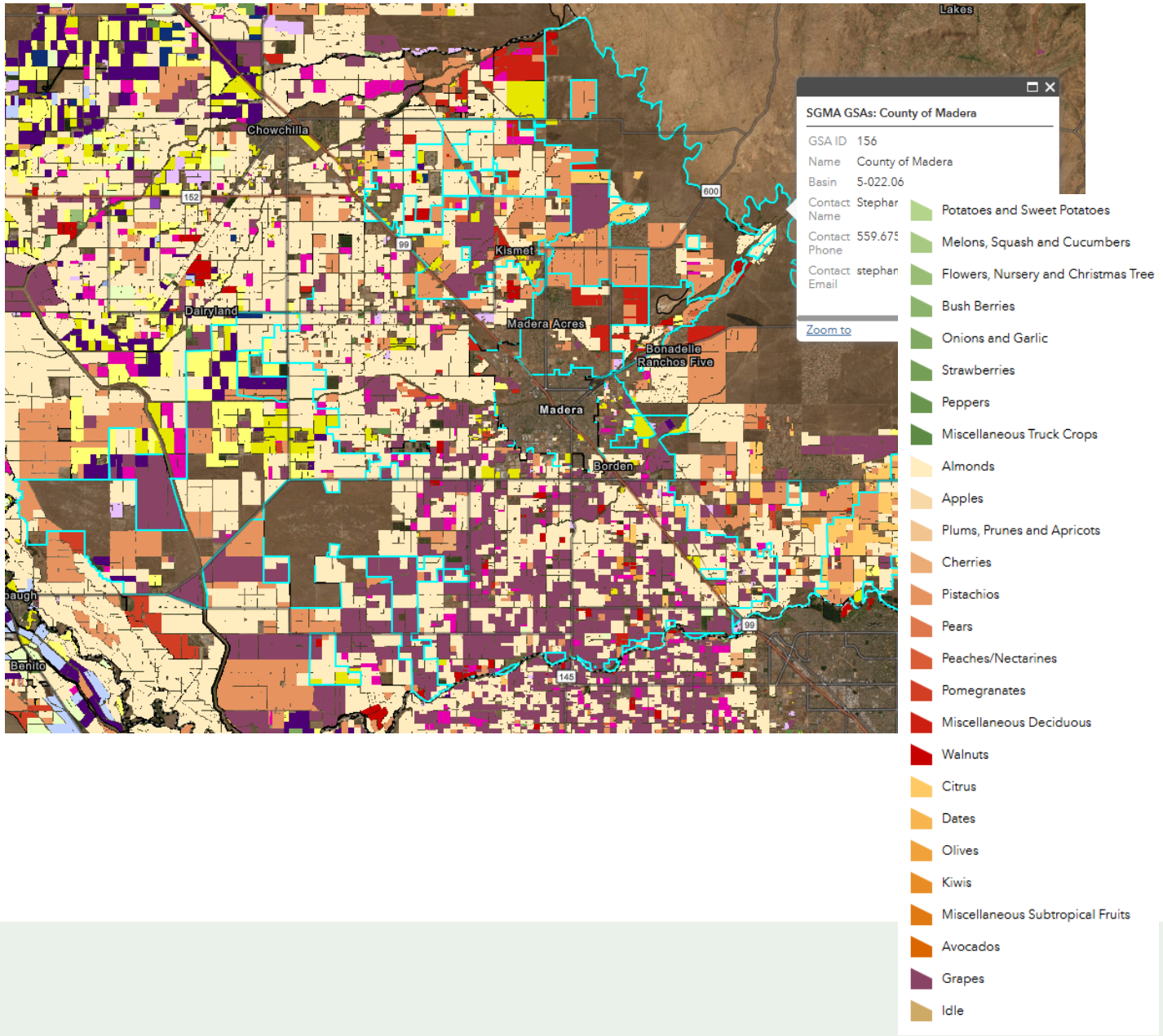
- Land IQ data-driven approach with ground truthing allows for true independent validation
- Supplemented with multiple field studies over the past 4 years.
- Cooperating growers providing calibrated meter result for over 170 blocks of almonds, citrus, pistachios, and the crops
- Dynamic modeling approach to optimize ET estimates during different times of the year, increasing accuracies



LAND IQ

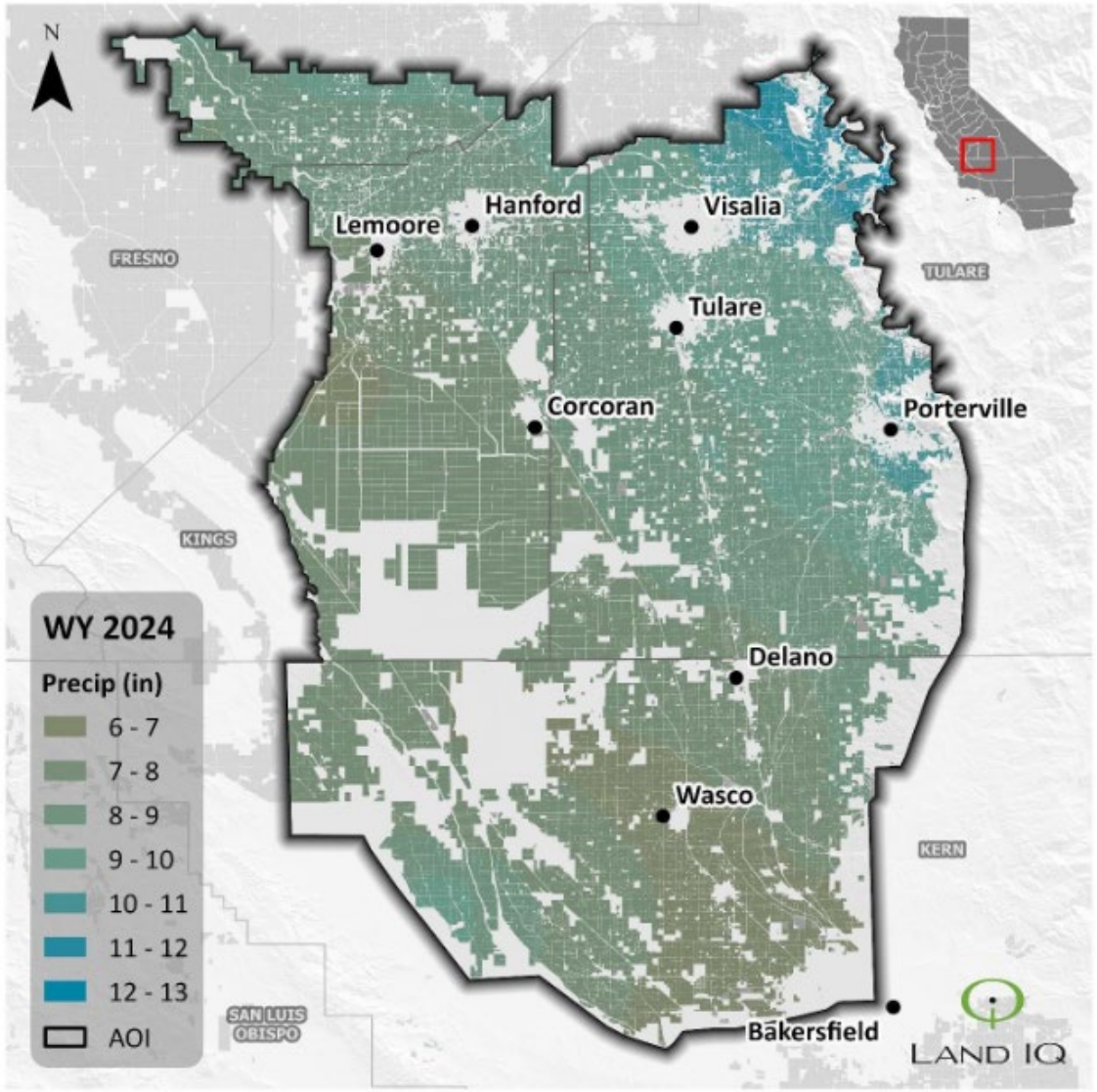
DELIVERABLE PRODUCT 2 – FIELD BY FIELD CROP TYPE

- Same methodology used to provide continuous crop mapping to CA Dept of Water Resources as a requirement of SGMA
- Consistent with results for DWR
- Essentially real-time crop type for inclusion in modeling
- Can be used by GSAs/Districts for tracking irrigated acreage, farm units, in-season water planning and management



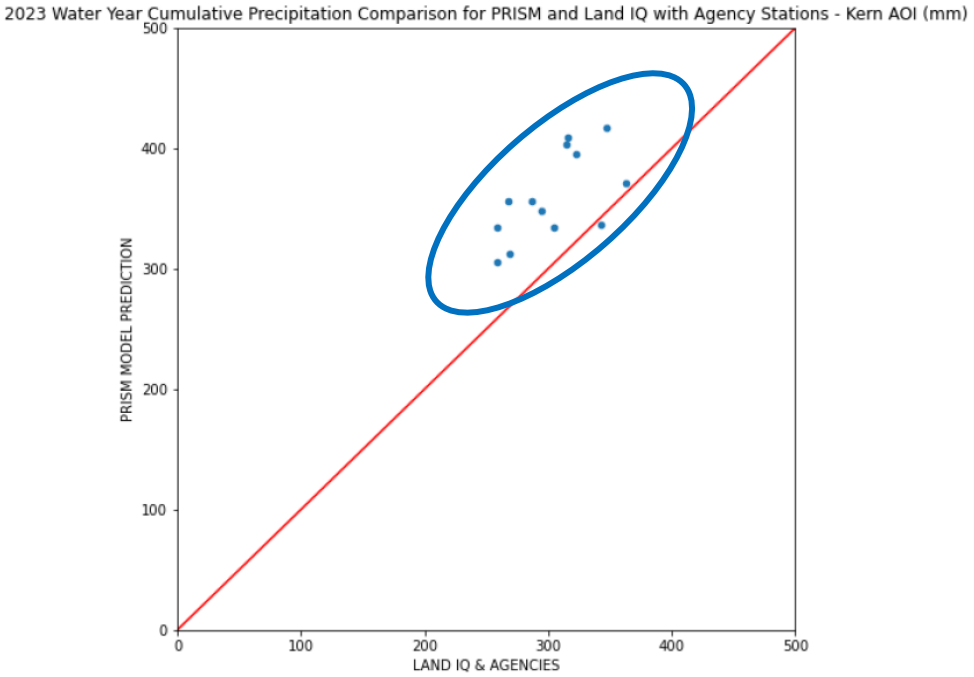
DELIVERABLE PRODUCT 3 – FIELD BY FIELD PRECIPITATION

- Results collected by rain gauges at ground truthing stations
- Incorporation of other public rain gauge results (e.g. CIMIS, airports, cities, etc.
- Conversion of point data into a spatial precipitation map by month and by year
- Assignment of a field-by-field precipitation for rainfall contribution to ET, water budget tracking, allocations, modeling, etc.

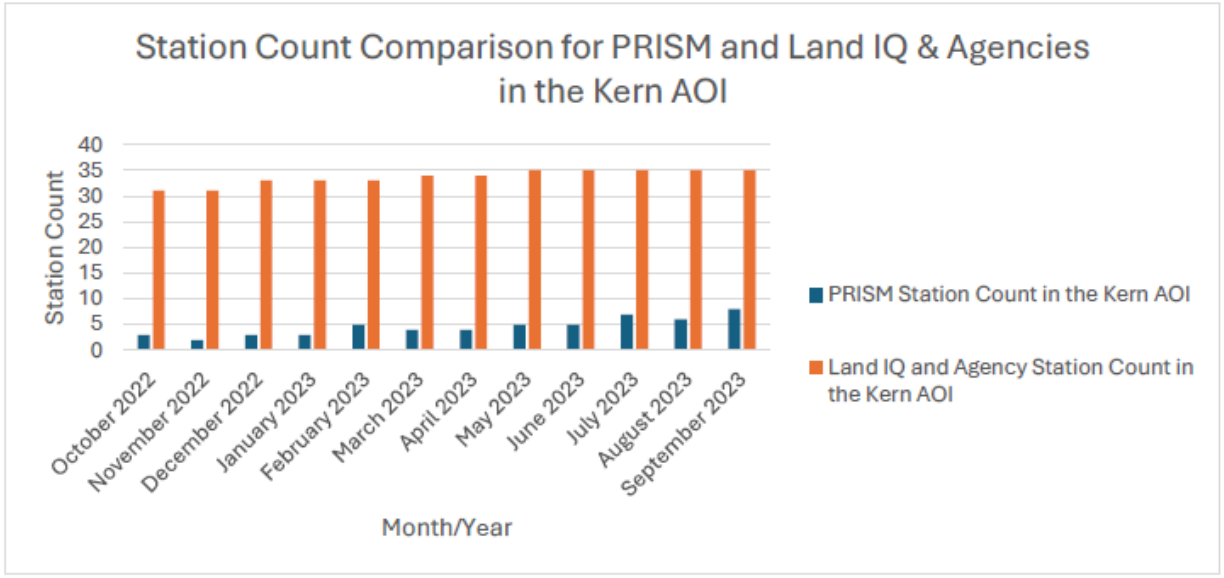


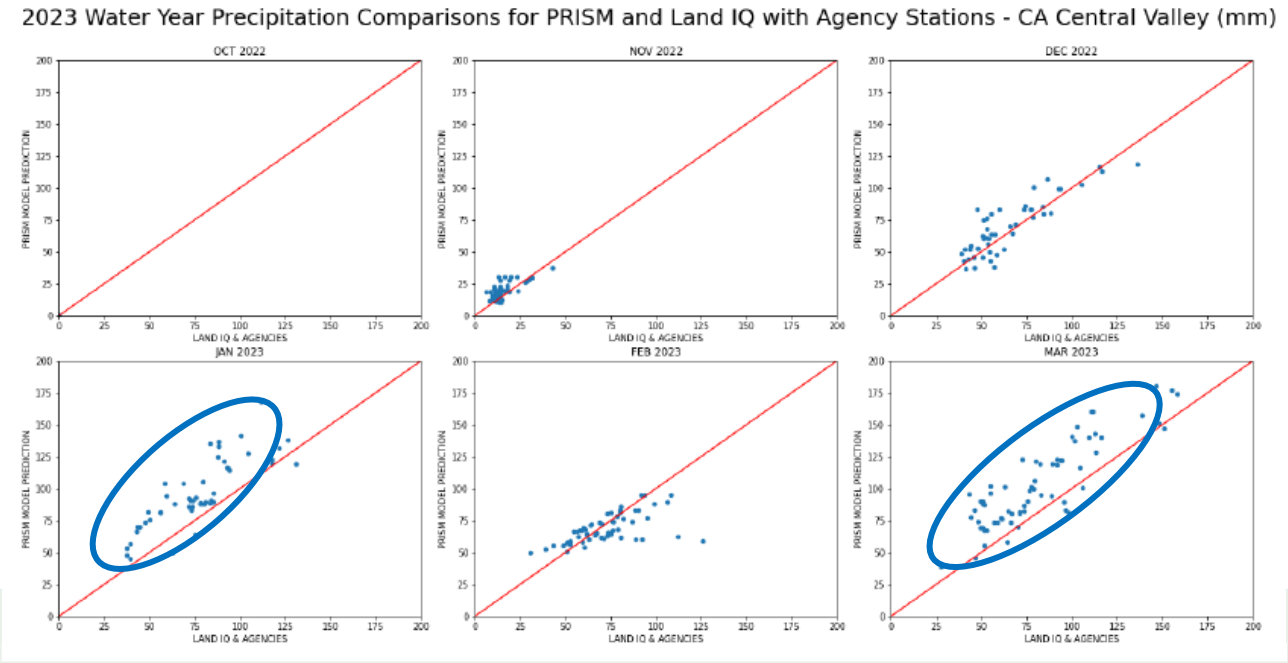
REFINING PRECIPITATION

- Comparison of Land IQ station results and PRISM model results
- Ex: PRISM results in 2023 = 20% greater



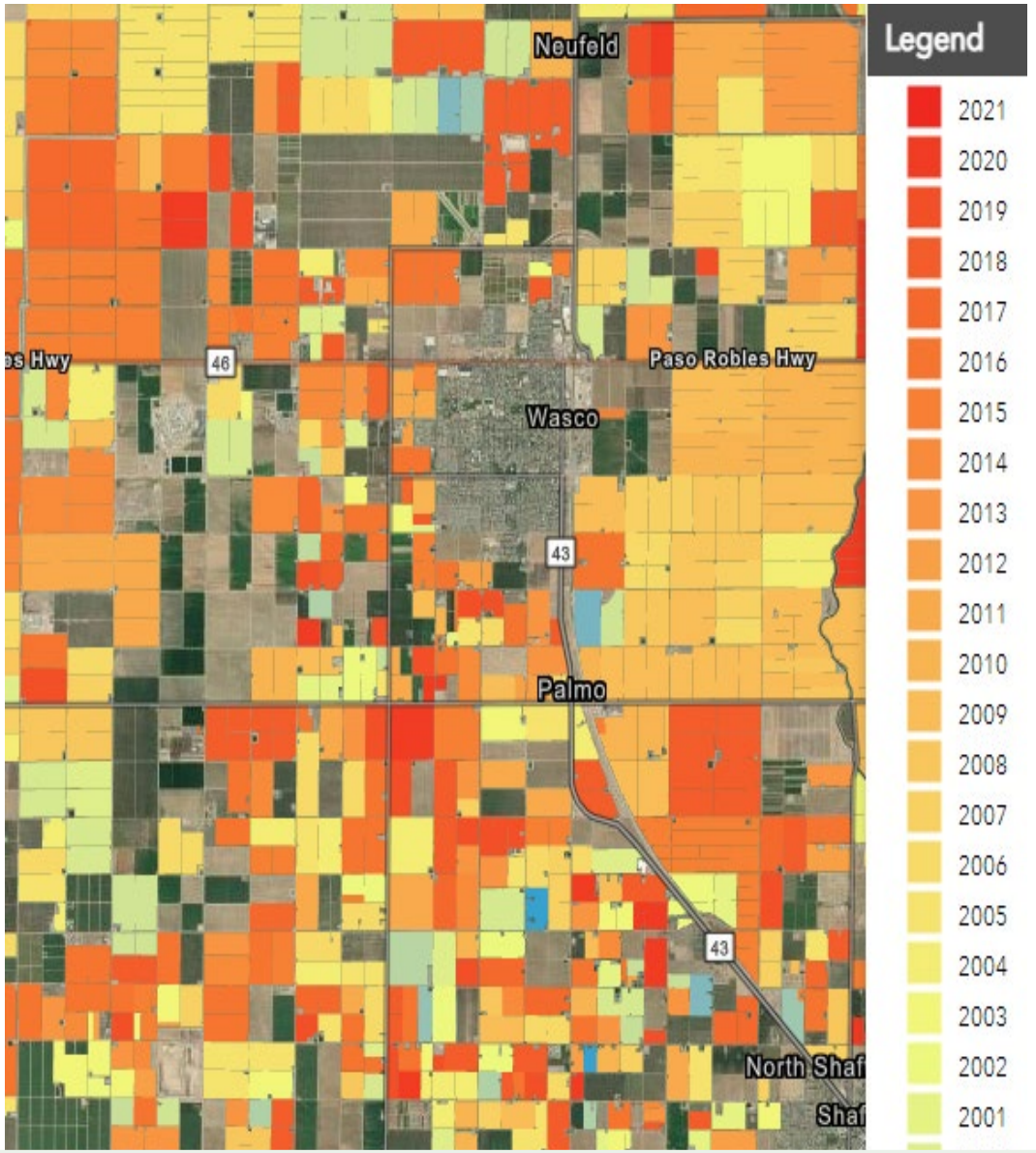
	Land IQ & Agencies (mm)	PRISM Model Prediction (mm)
Mean	303.57	359.86



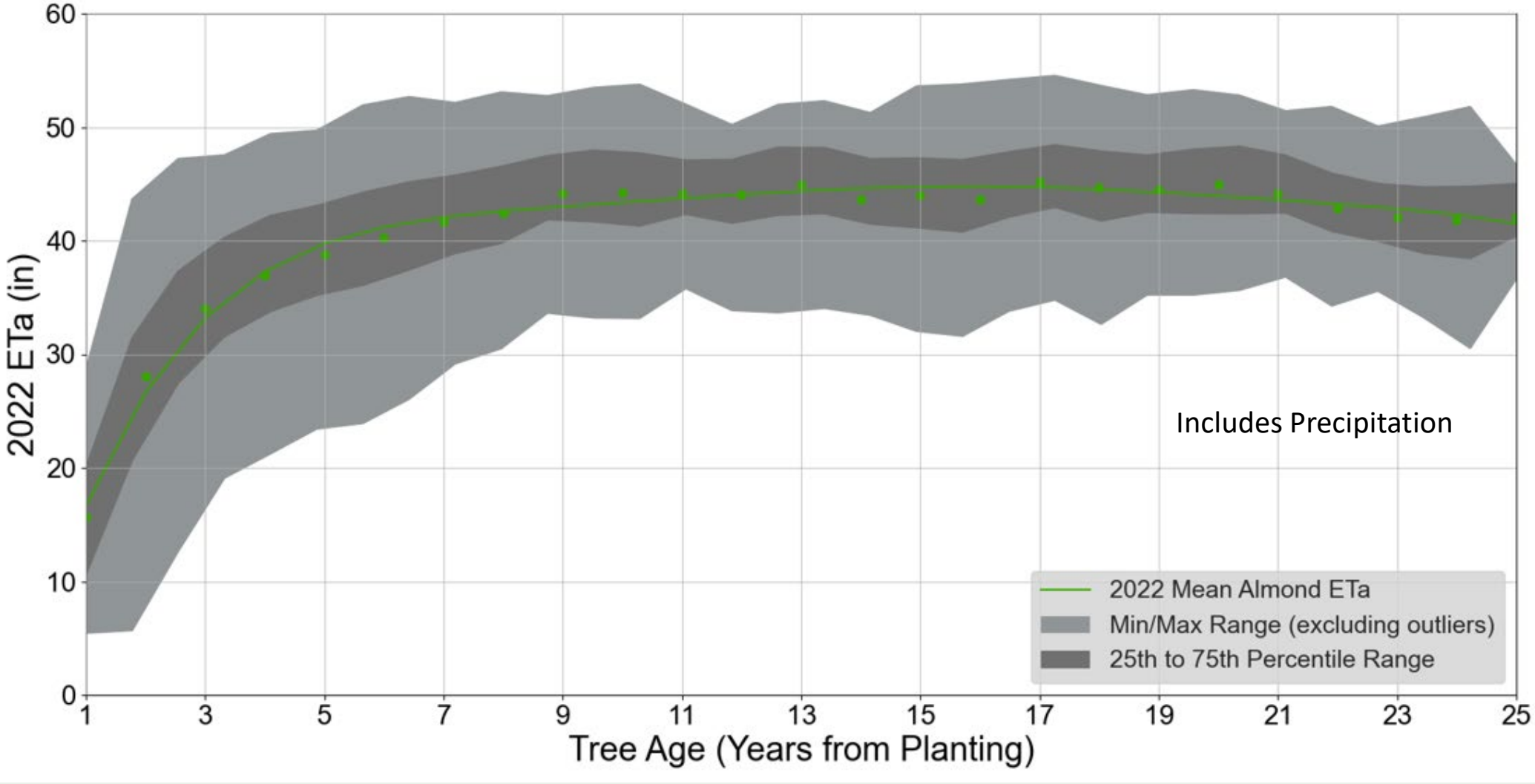


DELIVERABLE 4 – FIELD BY FIELD PERMANENT CROP AGE

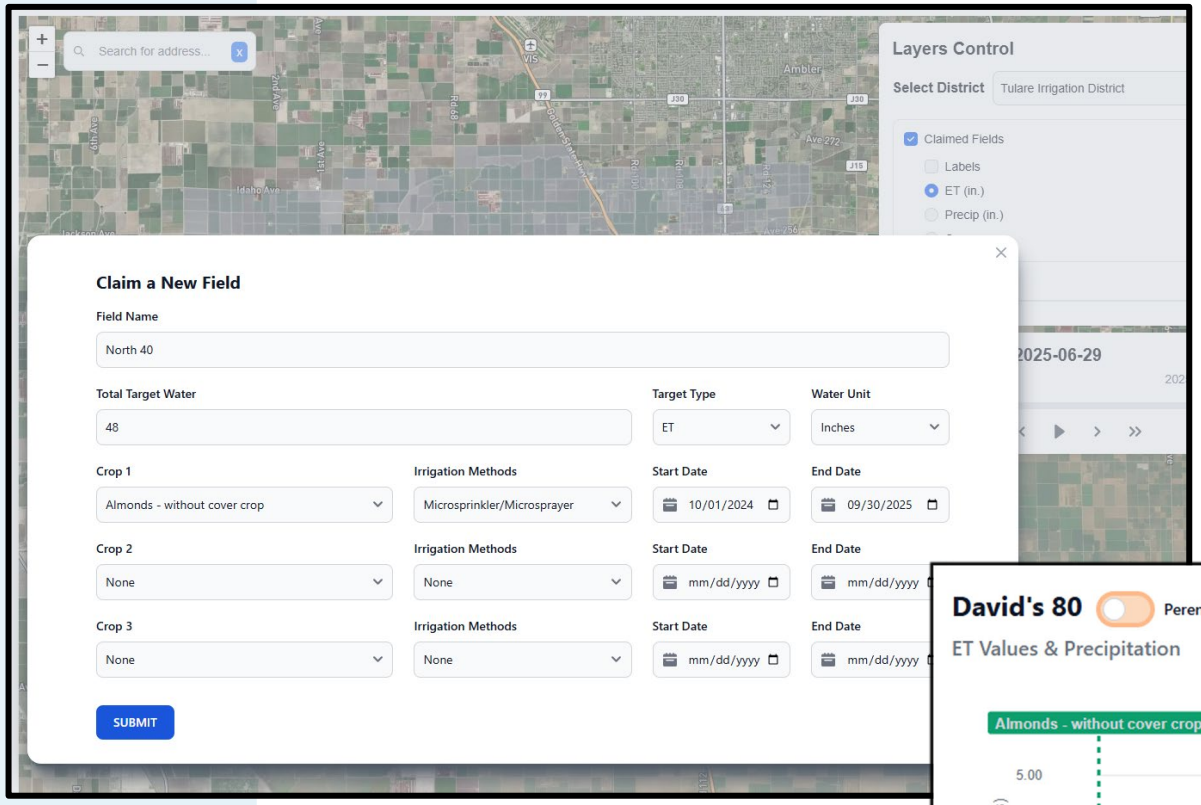
- Same methodology used to provide crop type to CA Dept of Water Resources as a requirement of SGMA
- Consistent with results for DWR
- Highly correlated to consumed water
- Yet another line of evidence that people can use to refine their water management allocations and land use forecasting



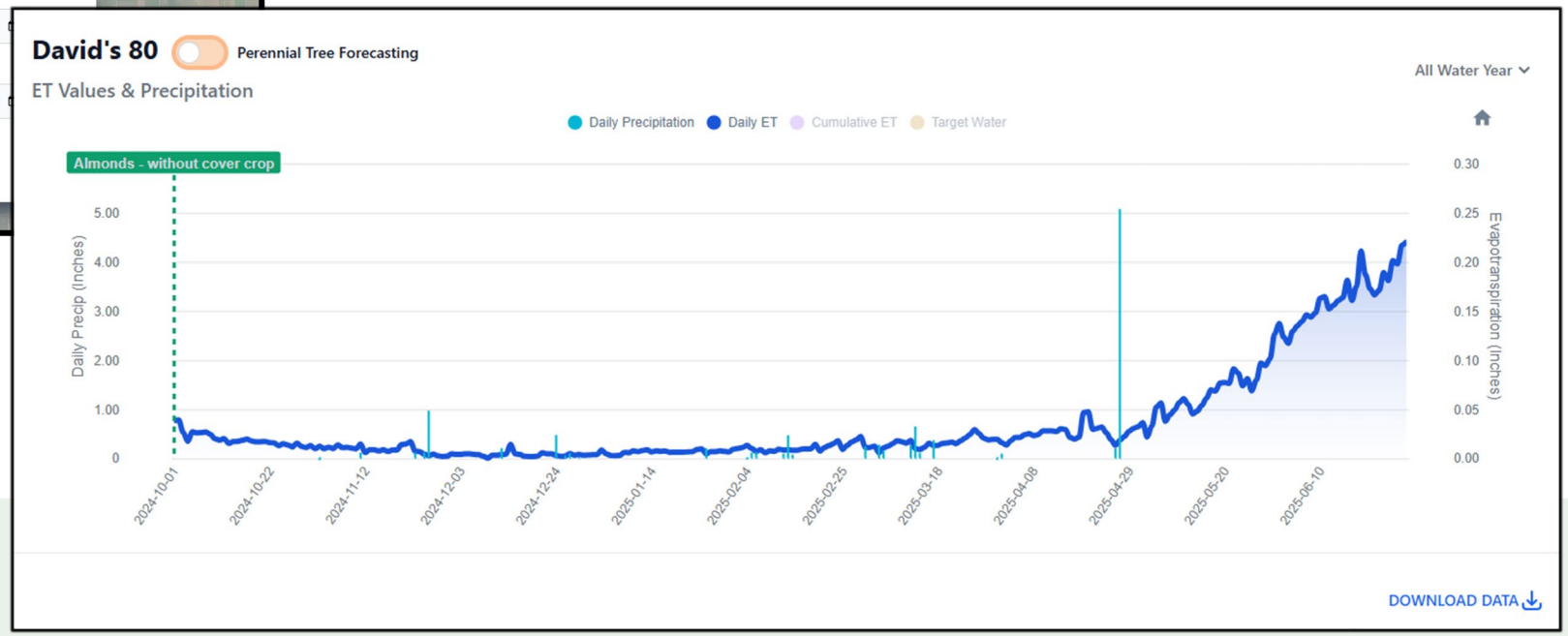
Almond Evapotranspiration By Age



DELIVERABLE PRODUCT 5 – DAILY ET GROWER RESOURCE



- Over the past 2 years, Land IQ has listened and responded to grower requests
- Result: Development of Irrigation Management Tool
- Allows for growers to track daily and cumulative ET and daily and cumulative precipitation for field-by-field water management
- Aligns with trusted and proven Land IQ 30-day ET results
- Implements a crop-specific model for daily ET determination



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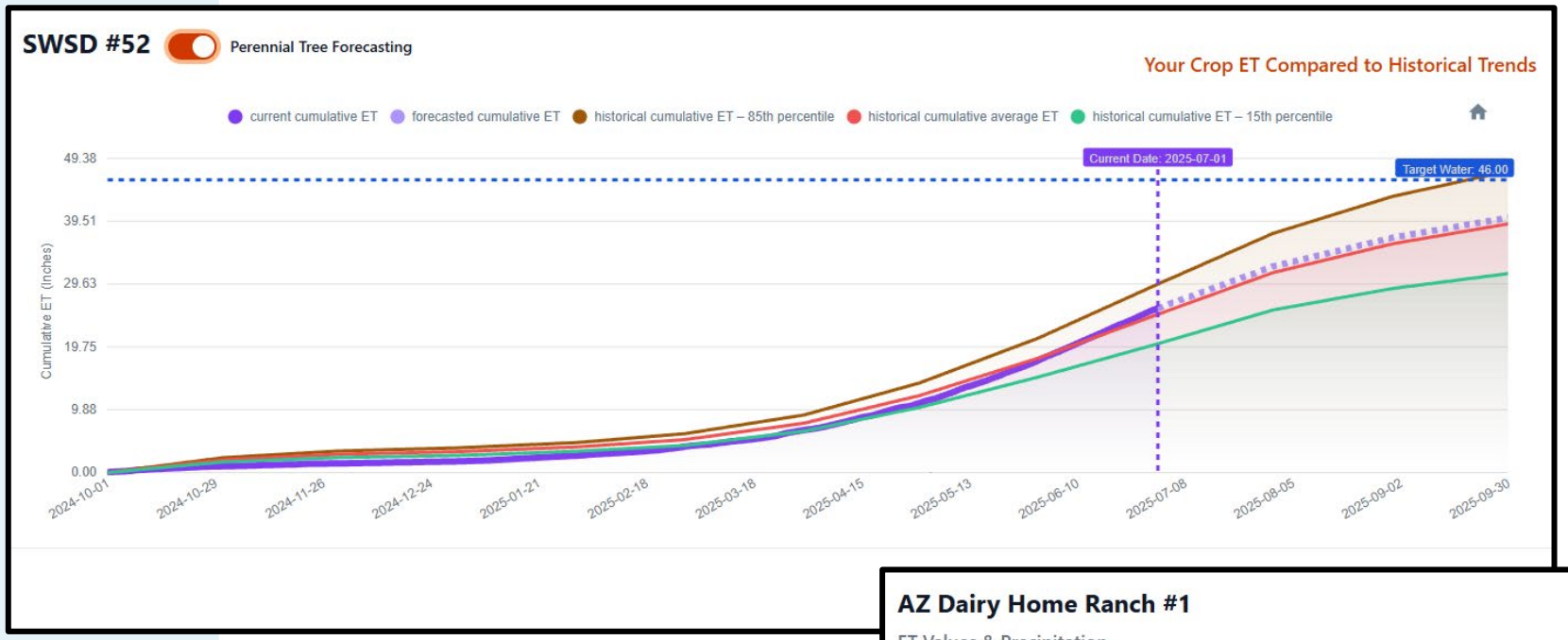
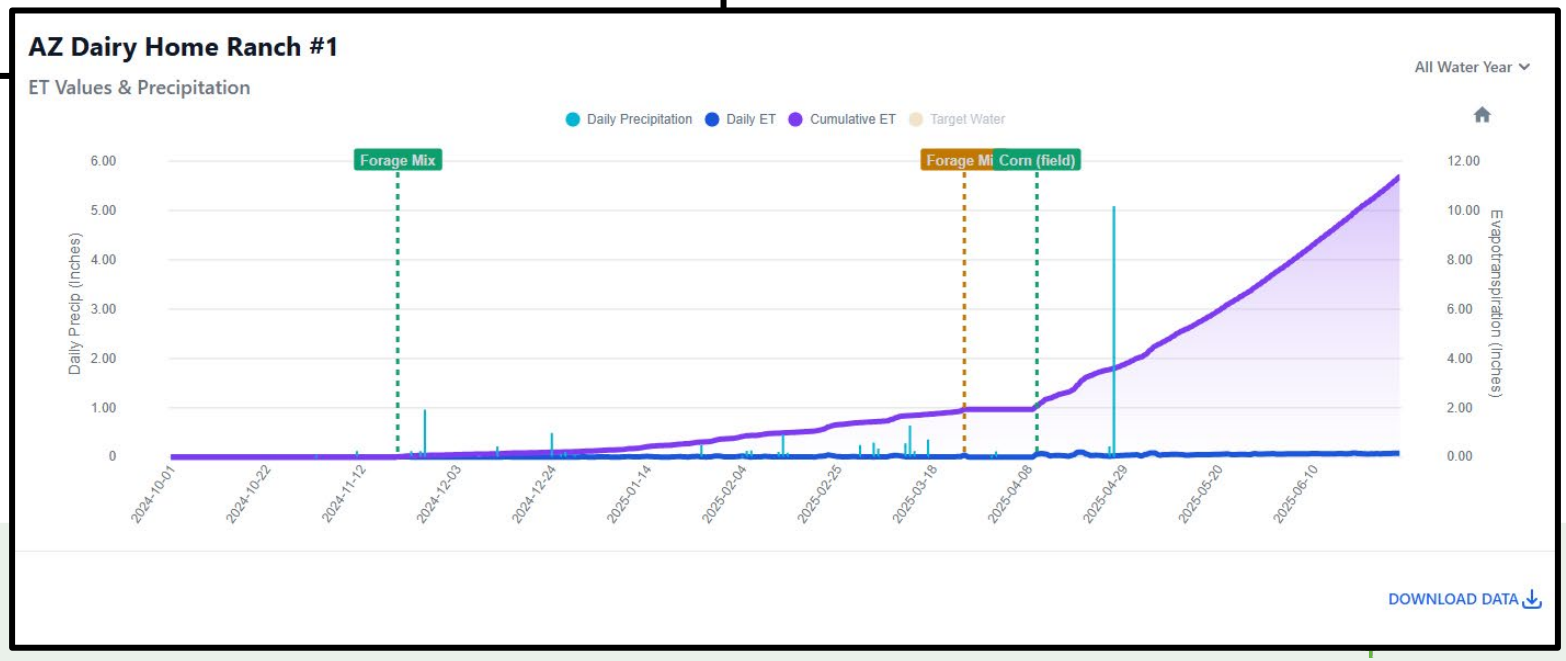
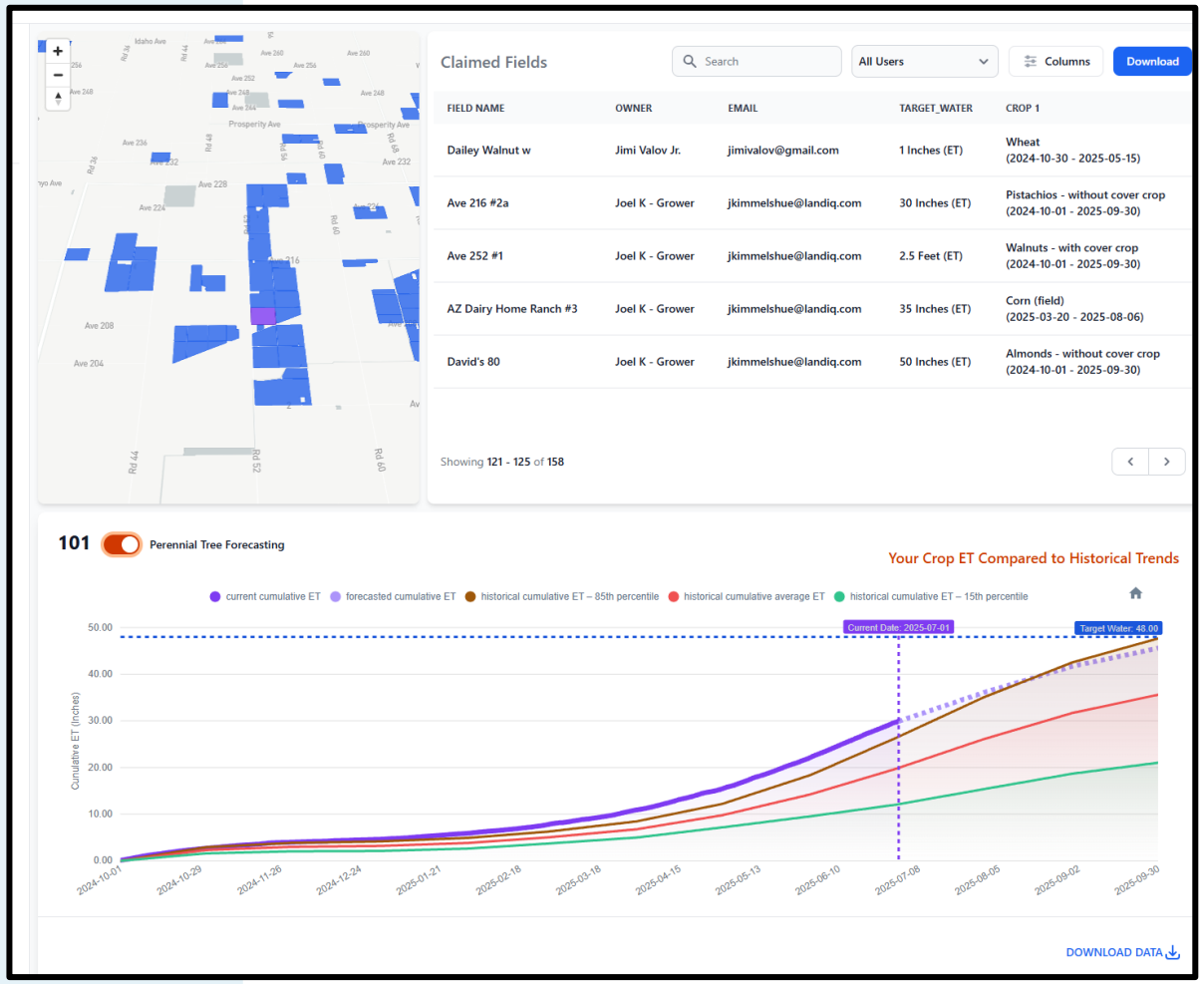
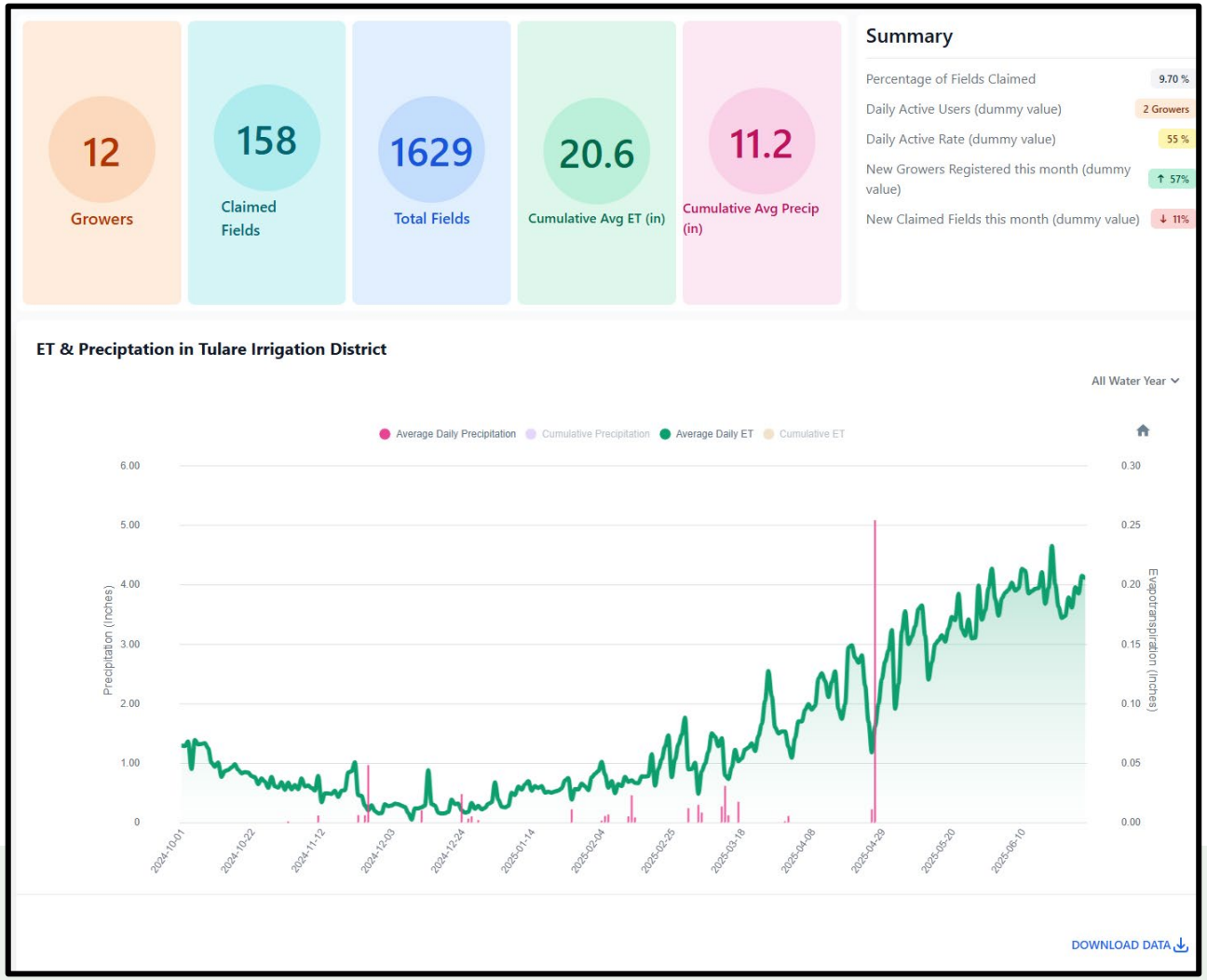




DELIVERABLE PRODUCT 5 – DAILY ET GROWER RESOURCE – MANAGER/GSA

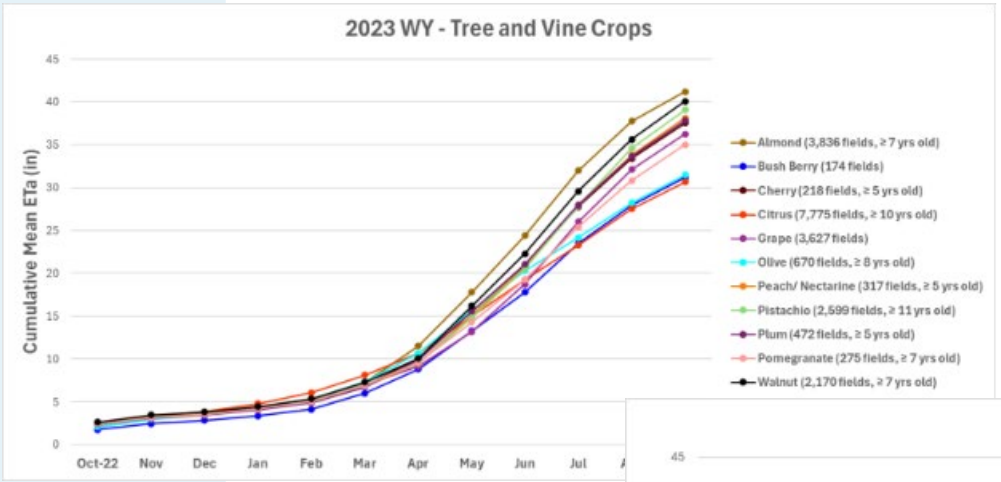
- Allows for managers/GSA to view all fields and work directly with growers on the same platform

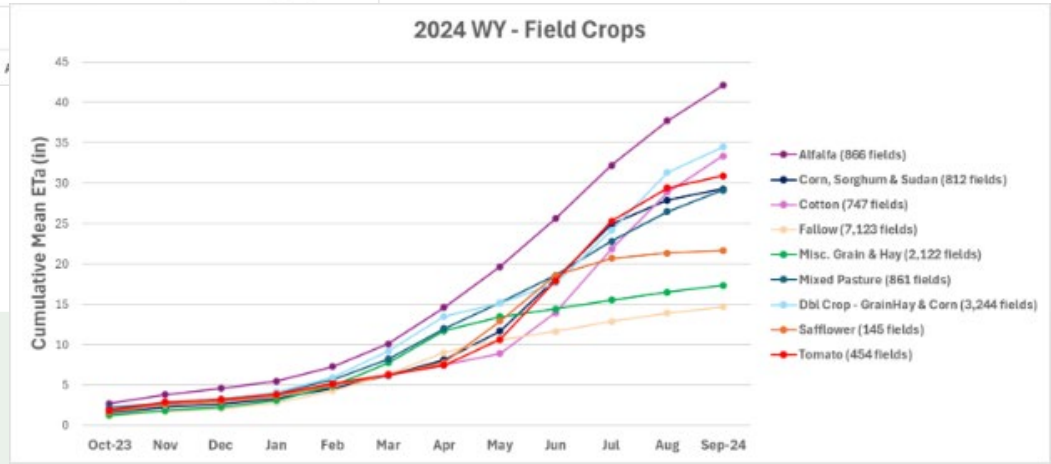




DELIVERABLE PRODUCT 6 – GROWER & GSA SUPPORT

- Direct access (via email or phone) to multiple certified agronomic scientists experienced in ET, irrigation management, and crop production
- Will work with any grower & GSA to help them fully understand their results including field visits





LAND IQ

DELIVERY OF RESULTS

- Land IQ provides ET, precipitation, crop type, crop age to nearly 40 GSAs or Irrigation Districts
- Representing 3.8 million gross acres including about 2.5 million irrigated acres
- Work with all four accounting platforms
  - 4-Creeks – Basinsafe
  - United Water Tracking Systems – Water Dashboard
  - MLJ – Watermark
  - CA Water Data Consortium – Groundwater Accounting Platform
- Results delivery are customized according to the requirements of the GSA and the platform

COST SUMMARY

Costs are all inclusive including ground truthing stations, maintenance, deliverables, grower tool, and unlimited grower and GSA support

Monthly ET, Precip, Annual Crop Type, Annual Age, Unlimited Agronomic Support

	Current			Escalation 3%	3%	
	Jan-Dec, 2023	Jan-Dec, 2024	Jan-Dec, 2025	Jan-Dec, 2026	Jan-Dec, 2027	Jan-Dec, 2028
Cropped Area (Acres)	121,622	121,622	121,622	120,669	120,669	120,669
Cost ($/Acre/Year)	$ 1.20	$ 0.98	$ 0.76	$ 0.81	$ 0.83	$ 0.86
Annual Cost ($/Year)	$ 145,946	$ 119,190	$ 92,433	$ 97,742	$ 100,674	$ 103,694
Non-Cropped Area (Acres)	88,872	88,872	88,872	83,543	83,543	83,543
Cost ($/Acre/Year)	$ 0.53	$ 0.45	$ 0.38	$ 0.40	$ 0.41	$ 0.43
Annual Cost ($/Year)	$ 47,102	$ 39,992	$ 33,771	33,651	34,661	35,700
Total Cost ($/Year)	**193,049**	**159,182**	**126,204**	**131,393**	**135,335**	**139,395**
Total Cost ($/Month)	**16,087**	**13,265**	**10,517**	**10,949**	**11,278**	**11,616**

Optional: Daily ET, Daily Precipitation and Irrigation Management Tool

	Current			Escalation 3%	3%	
	Jan-Dec, 2023	Jan-Dec, 2024	Jan-Dec, 2025	Jan-Dec, 2026	Jan-Dec, 2027	Jan-Dec, 2028
Cropped Area (Acres)	N/A	N/A	N/A	120,669	120,669	120,669
Cost ($/Acre/Year)	N/A	N/A	N/A	$ 0.55	$ 0.57	$ 0.58
Annual Cost ($/Year)	**N/A**	**N/A**	**N/A**	**$ 66,368**	**$ 68,359**	**$ 70,410**
Monthly Cost ($/Month)	**N/A**	**N/A**	**N/A**	**5,531**	**5,697**	**5,867**

Questions

jkimmelshue@landiq.com
916.517.2482

FIELD-BY-FIELD EVAPOTRANSPIRATION, CROP TYPE, AND PRECIPITATION – LAND IQ APPROACH AND RESULTS

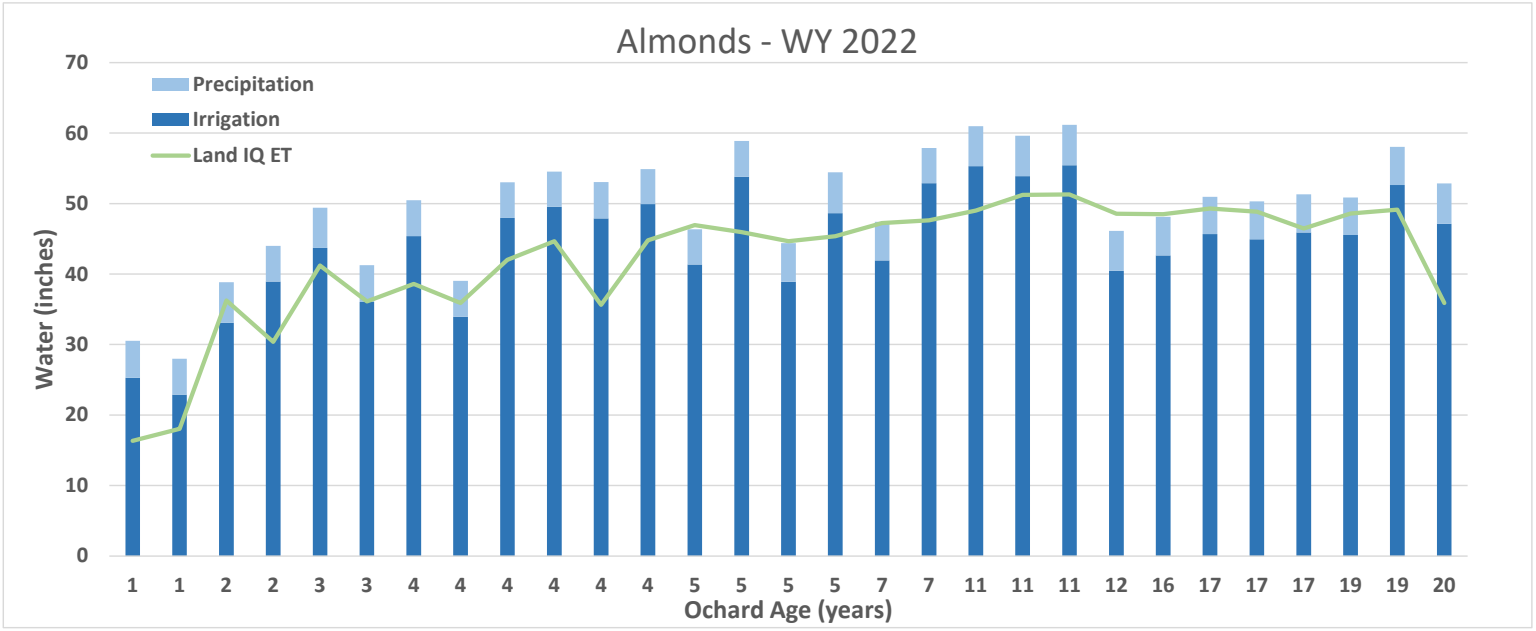
LAND IQ

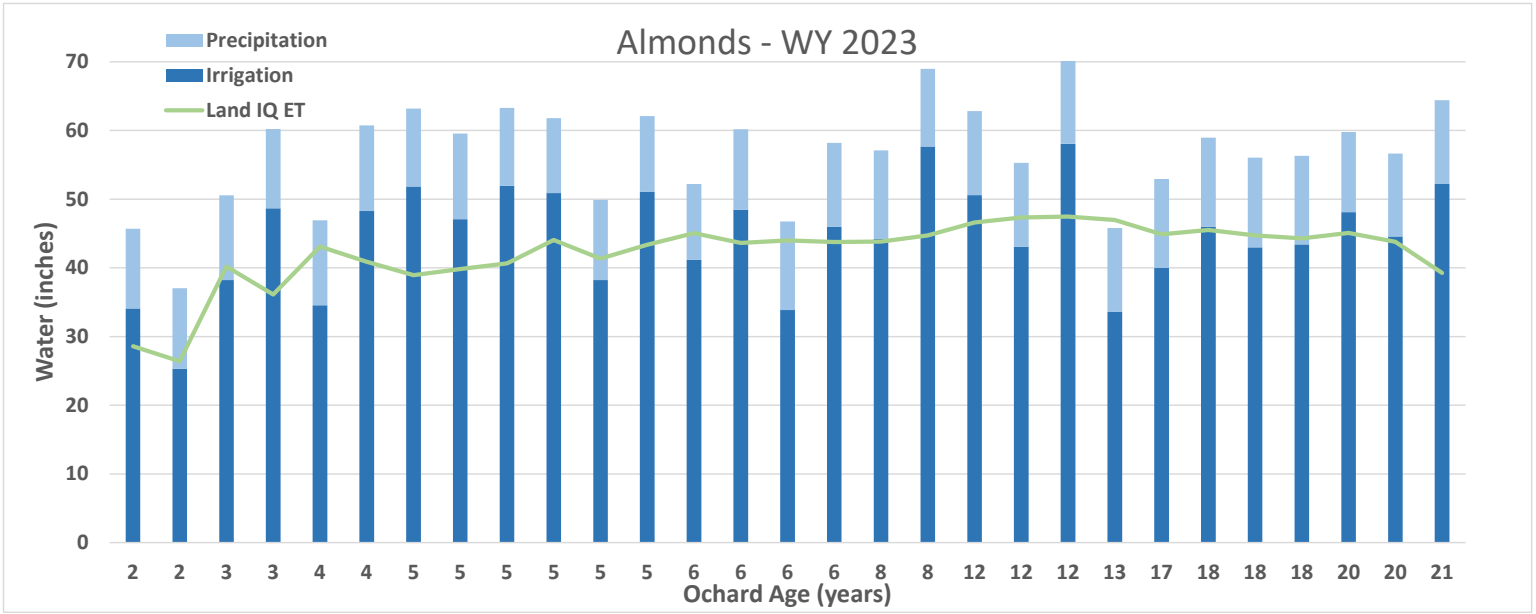
MADERA COUNTY
ESTABLISHED 1893
HEART OF CALIFORNIA

JULY 1, 2025

Water Received versus Consumed by Age - Almonds

- Similar trends for almonds
- Almonds have some increased variability due to differences in variety, spacing, irrigation management, hull split harvest timing.
- Walnuts and pistachios have some of these same characteristics





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