Response to Request for Proposal

Madera County Groundwater Sustainability Agency

Measurement Services

June 16, 2025

PREPARED FOR:

Aleta Allen
559-831-7166
Aleta.Allen@maderacounty.com

PREPARED BY:

LAND IQ

2020 L Street, Suite 210
Sacramento, CA 95811

Joel Kimmelshue
916-517-2482
jkimmelshue@landiq.com

Mica Heilmann
916-517-2483
mheilmann@landiq.com

LAND IQ
2020 L Street, Ste 210
Sacramento, CA 95811
(916) 265-6330
www.LandIQ.com

June 16, 2025

Madera County Groundwater Sustainability Agency
200 West Fourth Street
Madera, CA 93637

Subject: RFP/Proposal for Madera County Groundwater Sustainability Agency Measurement Services

Dear Ms. Allen:

Land IQ, LLC appreciates the opportunity to provide the attached proposal for your consideration in response to the solicitation for Madera County Groundwater Sustainability Agency Measurement Services.

Land IQ is a private technology and consulting firm that specializes in integrating agronomic sciences with spatial sciences and technologies to address large-scale land management and landscape analysis challenges. Specifically, we integrate rigorous ground truthing, advanced remote sensing approaches, data management, agricultural sciences, and web-based tools to understand agricultural management at the field-scale and to effectively disseminate that information to necessary stakeholders. This unique combination of expertise in agriculture and regulatory compliance aligns well with the needs of this project, as do some of the base data that we have developed and have available for your use, covering the entire state of California.

Staff expected to work on this project from Land IQ have been involved in various aspects of Groundwater Sustainability Plan (GSP) implementation and overall Sustainable Groundwater Management Act (SGMA) regulatory compliance support since the inception of the program, and in agricultural remote sensing and geospatial analysis and large-scale data management for the last 20 years. Additionally, our team has spent more than 28 years working in agriculture in California. Our team members are parts of family farming operations, which brings an additional level of understanding and care.

We are dedicated to working collaboratively with the Madera County Groundwater Sustainability Agency (GSA) to assist in the on-going compliance and GSP implementation as required by the SGMA by providing satellite measurement services. For the last three years, Land IQ has provided monthly, field-by-field evapotranspiration (ET) and precipitation measurements, as well as annual land use and permanent crop age. We also provide unlimited access to our agronomic and spatial scientists for any questions related to overall or specific grower results. We are confident in our ability to continue providing quality services for the purposes of your GSA.

Land IQ has been providing ET measurements to Irrigation Districts and GSAs since 2016. Throughout this process we have continuously sought ways to be more efficient and accurate in our analyses, as well as provide GSAs and growers with the tools they need to better manage resources. As such, we have listened to growers and designed a daily irrigation management tool to allow growers to track their daily water consumption in relation to a district-, GSA-, or grower-defined threshold. This will allow the grower to adjust water management decisions during the year on a real time basis to achieve, and hopefully not exceed, this threshold.

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While Land IQ is not proposing on the groundwater accounting platform, our data is currently being utilized by all known platforms including Basin Safe (developed by 4 Creeks and used in the Tule Subbasin), Watermark (developed by MLJ Environmental and used in the Kings Subbasin), the Groundwater Accounting Platform (developed by California Water Data Consortium, Environmental Science Associates & Environmental Defense Fund and used in the Kern Subbasin), and the Water Dashboard (developed by Agri Tracking and used in the Kaweah Subbasin).

We greatly look forward to the potential opportunity of leveraging our multiple decades of experience through this critical effort. Please feel free to contact us at any time with any questions or clarifications needed while reviewing this proposal.

Sincerely,

Joel Kimmelshue, PhD, CPSS
Principal Scientist and Owner
(916) 517-2482
jkimmelshue@landiq.com

Mica Heilmann, CPSS
Principal Scientist and Owner
(916) 517-2483
mheilmann@landiq.com

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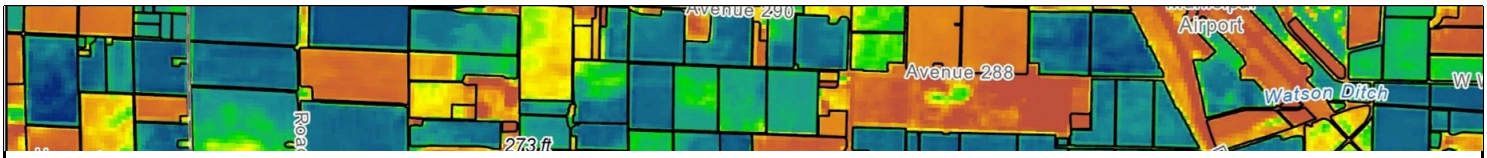


1 Organizational Chart

Land IQ is a specialized Agricultural Science and Remote Sensing firm that pairs scientific knowledge of agronomic, native plant, and land systems with advanced remote sensing technologies, custom modeling, and analytical methods to develop powerful and cost-effective client solutions. For over two decades we have focused on large scale land systems and management solutions. Currently we provide field-by-field ET for 40 GSAs or Irrigation Districts in nine different Subbasins. Our personnel are equipped with extensive experience in remote sensing and spatial analysis, crop production systems, irrigation management and technologies, soil and agricultural sciences, native ecosystems, large scale data management, image processing, agroclimatology and water resource modelling, and scientific and regulatory issues related to land and water resources. We are a Central Valley firm, with boots on the ground.

Land IQ's remote sensing techniques are derived from and informed by our understanding of agricultural and natural systems. We have consciously built our firm in a fashion that marries both land-based scientists (e.g. agricultural, soil, native systems) and spatial scientists (e.g. remote sensing, GIS, photogrammetry). This has been done purposefully to facilitate a multidisciplinary approach to accurately estimate land use change and water consumption as influenced by all variations of surface land use with the most advanced remote sensing and spatial analysis methodologies informed by our California-specific knowledge of cropping systems. We leverage our understanding of landscape processes, plant communities, land management, production systems, and plant phenology to inform and guide our analytical remote sensing approaches. The results are practical, applicable, and accurate work products including traditional formats, as well as online interactive maps allowing our clients to make objective, informed, and strategic decisions.

The following organization chart identifies the Land IQ staff expected work on this project. The key staff identified have been involved in various aspects of evapotranspiration modeling, agricultural remote sensing, and agronomic regulatory support for the last 3 to 28 years, and are listed below. Other appropriately qualified staff may also participate to facilitate completion of any tasks approved by Madera County.

Principal In Charge
Principal Agricultural Scientist
Joel Kimmelshue, PhD, CPSS

Project Controls
Assistant Project Manager
Casey Gudel, MS

Project Manager
Principal Agricultural Scientist
Mica Heilmann, BS, CPSS

Agronomics

Soil & Agricultural Scientist
Cody Fink, MS, CPSS, CCA

Soil & Irrigation Scientist
Adriana Joosep, BS, CCA, CAIS

Agricultural Scientist
Sadie Keller, MS

Agroclimatology

Biometeorologist
Frank Anderson, MS

Biometeorologist
Jenae Clay, PhD Candidate

Atmospheric Scientist
Danial Azman, BS

Spatial Scientists

Senior Remote Sensing Scientist
Diya Chowdhury, MS

Remote Sensing Scientist
Atsushi Tomita, PhD

Remote Sensing Scientist
Zhehan Tang, PhD

Geospatial Analyst
Justin Sitton, BS

2 Qualifications

Land IQ specializes in integrating agronomic sciences with spatial sciences to address large-scale land management and landscape analysis challenges. Specifically, we integrate GIS, data mining, and remote sensing tools to understand agricultural management at the field-scale. We also build specific, web-based interactive data management tools and solutions. This unique combination of expertise aligns well with the needs of Madera County GSA, as do some of the base data that we have developed for the entire state of California. We bring our field-level spatial data to 40 GSAs or Irrigation Districts, in nine Subbasins, covering over 3.5 million acres in Butte, Fresno, Kern, Kings, Madera, San Luis Obispo, Santa Barbara, Stanislaus, Sutter, and Tulare Counties in order to help address data management and reporting needs.

Staff expected to work on this project from Land IQ have been involved in agricultural remote sensing, geospatial analysis, and large-scale data management, as well as various aspects of regulatory compliance programs for the nearly three decades. All staff resumes are included in the Appendix. Our team have lifetimes of working in agriculture in California, with many members part of family farming operations, which brings an additional level of understanding and care.

- **Principal in Charge and Agricultural Scientist**
  Joel Kimmelshue, PhD, CPSS (28 years experience)
- **Project Manager and Principal Agricultural Scientist**
  Mica Heilmann, BS, CPSS (25 years experience)
- **Project Controls & Assistant Project Manager**
  Casey Gudel, MS (18 years of experience)
- **Soil & Agricultural Scientist**
  Cody Fink, MS, CPSS, CCA (12 years experience)
- **Soil & Irrigation Scientist**
  Adrianna Joosep, BS, CAIS, CCA (8 years experience)
- **Agricultural Scientist**
  Sadie Keller, MS (5 years of experience)
- **Biometeorologist**
  Frank Anderson, MS (24 years experience)
- **Biometeorologist**
  Jenae Clay, PhD Candidate (10 years experience)
- **Atmospheric Scientist**
  Danial Azman, BS (4 years experience)
- **Senior Remote Sensing Scientist**
  Diya Chowdhury, MS (12 years of experience)
- **Remote Sensing Scientist**
  Atsushi Tomita, PhD (8 years of experience)
- **Remote Sensing Scientist**
  Zhehan Tang, PhD (8 years experience)
- **Geospatial Analyst**
  Justin Sitton, BS (12 years experience)
- **Support Staff – Various as needed**

3 Project Understanding and Approach

Satellite Evapotranspiration Measurement

Consumptive use of water by crops, often referred to as evapotranspiration (ET), is often the largest outflow of water within an agricultural region's water balance. The calculation of ET can be performed using several methods, all of which have differing levels of complexity, cost, and accuracy. Land IQ fully understands that Madera County GSA relies heavily on consistent and accurate ET for overall water management, grower use, fee structures, and regulatory compliance. This is similar to many other GSAs in which Land IQ provides ET. It is our main goal to work directly with growers and Madera County GSA for this purpose.

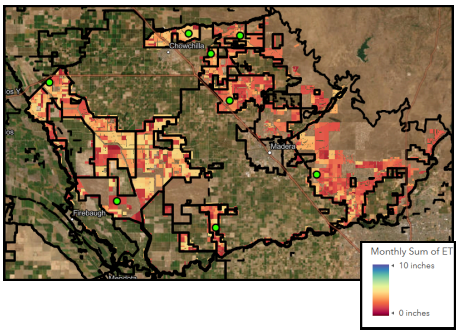
Having worked with various ET approaches and models for a number of years, Land IQ realized the need for accurate land use and calibration of ET estimates to actual cropped fields, centered on rigorous ground truthing and data-driven approaches. As such, over the past 10 years, Land IQ has developed a refined method for determining consumptive use of crops at a field or regional scale. The outcome of this method, when compared against other non-data-driven approaches, results in the most consistent and accurate estimates of ET available. The results of these efforts are being used for decision support by approximately 40 GSAs and Irrigation Districts across 3.5 million acres for grower communications, to inform demand management programs including allocations, regulatory compliance, internal water markets, fee structures, fallowing programs, or other agricultural water management incentive programs.

Land IQ ET was developed for detailed, field-scale water use tracking by Irrigation Districts, Groundwater Sustainability Agencies, and sub watersheds. Land IQ ET is used to interpret image data and leverages robust ground station data with direct image analysis. The approach can utilize a variety of image and ground data sources and yields more accurate results because ground calibration data are consistently driving model results.

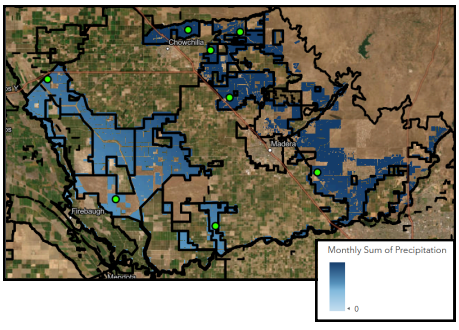
Land IQ ET is differentiated from other models and approaches by the following:

- Primary unit of analysis is at the field scale
- Integrates repeated and rigorous ground truthing eddy covariance and surface renewal environmental stations and historical results for similar crop and canopy types
- Incorporates Land IQ field-level crop mapping at 98+% accuracy
- Differentiates permanent crop age in the analysis process
- Integrates other agronomic features of modern cropping systems
- Allows for unlimited feed-back and optimization for any grower or management organization
- Results are ingested and used by all four known water accounting platforms based on their desired unit of analysis, whether it is at the field scale, parcel level, or farm unit

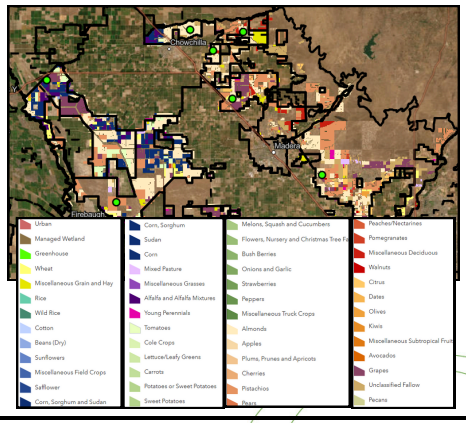
Field-level Evapotranspiration



Field-level Precipitation



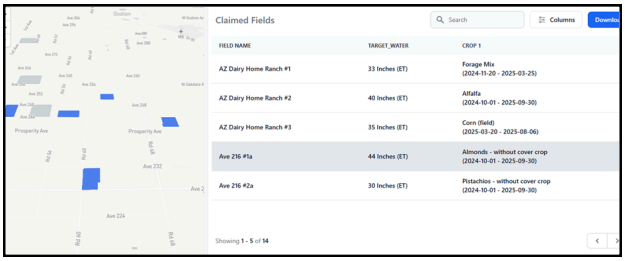
Field-level Crop Type

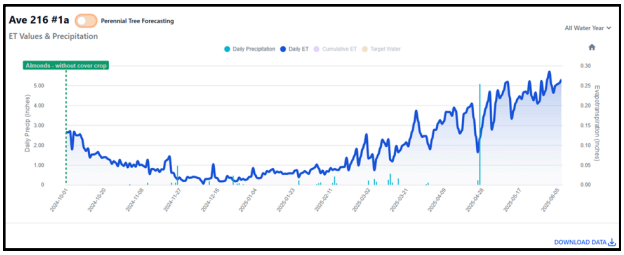


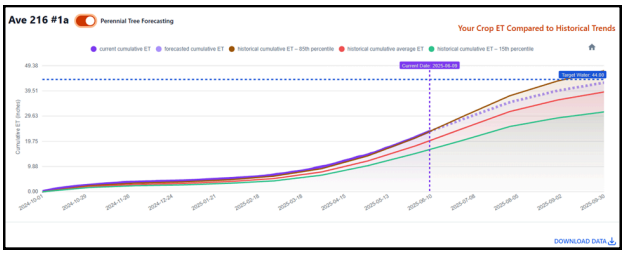
Daily Irrigation Management Tool

Land IQ listens and responds to grower and GSA priorities. For example, feedback from growers over the past few years indicated that they trust the accuracy of our current 30-day results, delivered 30 days later. That said, growers expressed an interest in daily ET and precipitation results delivered near-real time. In response, Land IQ has developed a grower-level, field-by-field, daily ET product portal in which a grower/operator can only view their fields. We have also developed a manager level-portal, that allows the GSA/District manager to view all fields. The full operational capability of this tool will be rolled out in the fall of 2025. For consistency, the results of this daily product will match the proven results of the 30-day ET results that are currently provided to Madera County GSA and its growers, and as proposed here. The goal is to allow growers to track their water use on a daily basis in relation to a district-, GSA-, or grower-defined threshold. The grower can then adjust water management actions during the year on a real time basis to approach, but not exceed this threshold. Visual examples of the tool are provided below.

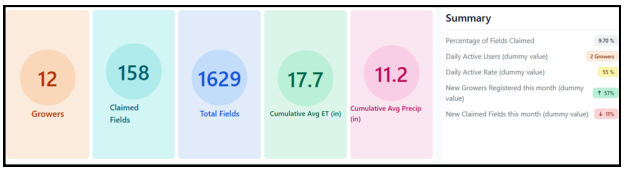
Grower Portal Visualizations

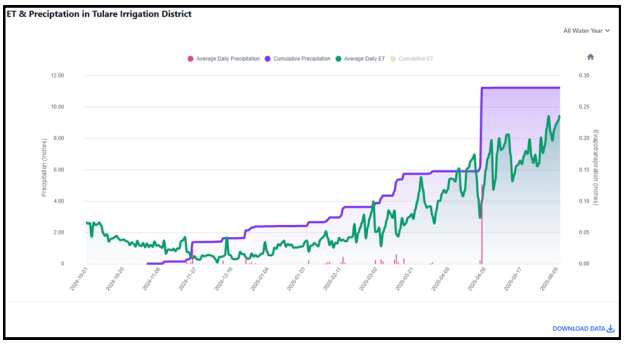






Additional Administrator Portal Visualizations





Accuracies

Land IQ has utilized multiple methods for evaluating model accuracy. One method is an independent validation of model results, using the data from two stations per month for the past 3.5 years. The stations are randomly selected for exclusion from model calibration data. See figure on next page.

The second method of evaluating model accuracy was by comparison of model results to growers' applied water records. Grower irrigation flowmeter data was obtained for over 170 orchards (almonds, citrus, and pistachios) in the Southern San Joaquin Valley for WY 2022 – 2024 and was compared to ET model results. To evaluate accuracy, the total received water for the orchard (irrigation plus precipitation) was compared against model ETa.

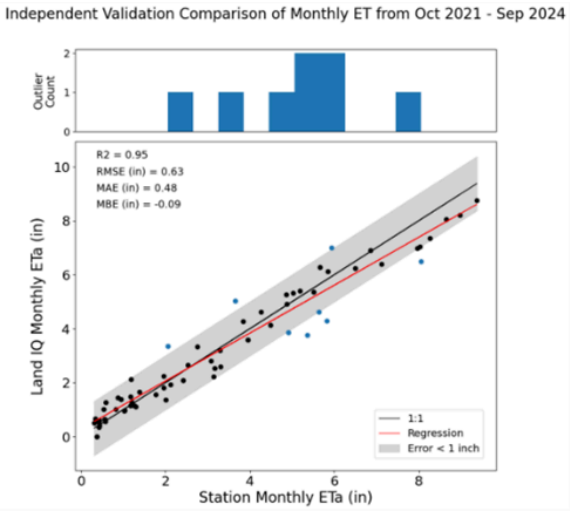
4 Project Experience and Success

Field Level Consumptive Use Estimates

Regulatory requirements associated with the implementation of and compliance with SGMA, require GSAs to understand the annual consumptive use or evapotranspiration (ET) in relation to annual water supply allocations when developing water budgets. At the grower level, it is important for the GSA water users to understand ET at their individual field level to facilitate water management practices and water use efficiency, for improving irrigation scheduling and to assist with crop selection.

Land IQ has developed and refined our remotely sensed Data Driven Model for determining crop ET since 2016. Satellite data are ideally suited for deriving spatially continuous ET surfaces that can be pared down to the field scale because of their temporal and spatial characteristics. However, the most accurate use of RS models requires calibration to surface measurements at the field level. For these reasons, Land IQ uses a combined approach to calculating ET by implementing comprehensive "ground truthing" for calibration and validation, a spatial approach to recognize field-by-field differences, the integration of crop type for improved results, and knowledge of agronomic systems.

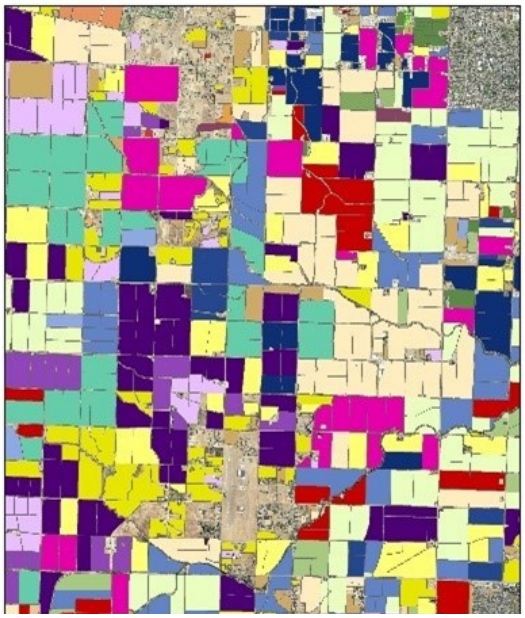
Analysis is conducted every 6 to 8 days every month to characterize ET and calibrate daily, time-resolved analysis for the year. Currently, Land IQ is incorporating the use of Sentinel-2/SAR image resources to enhance the consumptive use estimates with more frequent image resources coupled with Landsat. The resulting analyses are overlaid with Land IQ derived cropping information to determine field-by-field and crop-by-crop ET results. This allows our approximately 40 individual clients to integrate the data into groundwater models, develop groundwater allocations, and invoice their water users based upon actual water use rather than delivered or applied water.



Land IQ utilizes multiple methods for evaluating model accuracy. These include independent validation of model results, utilizing data from randomly selected climatic stations each month, as well as a comparison of applied water versus consumed water.

With the implementation of SGMA and execution of GSPs, more Irrigation Districts and GSAs are looking for ways to quantify the amount of water used for irrigated agriculture. Since 2016 approximately 40 GSAs or Irrigation Districts, covering over 3.5 million acres in Butte, Stanislaus, Madera, San Luis Obispo, Santa Barbara, Fresno, Kings, Tulare, and Kern Counties are using Land IQ ET. Land IQ is contracted with these entities on a project basis with a per acre charge.

Statewide Land Use Mapping



Land use data is critically important to the work of the Department of Water Resources (DWR) and other California public agencies. Understanding the impacts of land use, crop location, acreage, and management practices on environmental attributes and resource management is an integral step in the ability of GSAs to execute GSPs and implement projects to attain sustainability. As a result, Land IQ was contracted by DWR to develop a comprehensive and accurate spatial land use database beginning with the 2014 crop year, covering over 9.4 million acres of irrigated agriculture on a field scale and additional areas of urban extent.

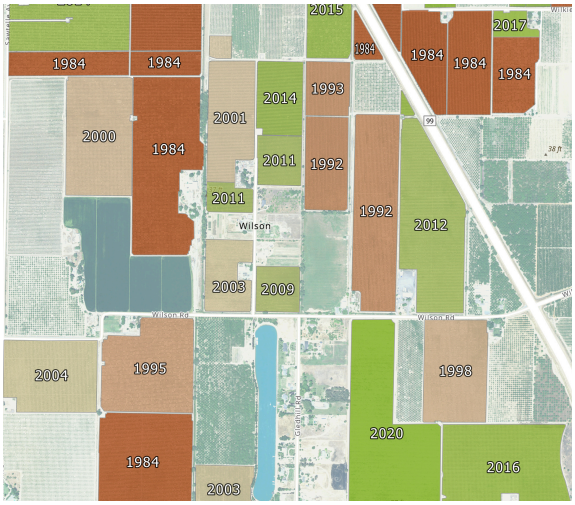
The primary objective of this effort was to produce a spatial land use database with accuracies exceeding 95% using remote sensing, statistical, and temporal analysis methods. Over the past nine years, Land IQ has conducted statewide land use mapping for 2014, 2016, and then annually from 2018 - 2023, which classified over 15 million acres of land annually into agriculture and urban areas on a water year (WY) basis. Unlike the 2014 and 2016 datasets, the WY 2018 through 2023 datasets include multi-cropping. WY 2024 is currently being developed.

Land IQ integrates crop production knowledge with detailed ground truth information and multiple satellite and aerial image resources to conduct remote sensing land use analysis at the field scale. Land IQ provides the following:

- Individual field boundaries of homogeneous crop types representing true cropped area, rather than legal parcel boundaries.
- Individual fields are classified using a supervised classification algorithm. Fields are classified into two legends, a crop category legend (DWR) and a more specific crop type legend (Land IQ).
- To determine frequency and seasonality of multiple-cropped fields, peak growth dates and percentage of the field cropped are determined for annual crops. Time-series statistics are also developed to better define planting, peak vigor and crop termination dates for annual crops.

The Land IQ mapping process takes approximately 20 months to complete. The first 12 months is spent collecting ground truth data, the crops that are in the ground during the water year. The next 8 months are spent classifying the crops. Land IQ does perform advanced mapping for clients who are contracted to receive field-level consumptive use estimates. These data are delivered within 4-5 months of the end of the water year.

Land IQ's land use mapping was the first statewide account of land use developed for DWR and beginning in 2018, the first continuous land use set spanning over five years. Land IQ is contracted with DWR through the 2028 water year, on a project basis with a per acre charge.



5 References

1.	**Client Name:**	Tulare Irrigation District Mid Kaweah Groundwater Sustainability Agency
	Address:	6826 Avenue 240 Tulare, CA 93274
	Contact Name & Phone Number	Aaron Fukuda (559) 707-8928 akf@tulareid.org
	Description of Services Provided:	Provide field-level monthly consumptive use estimates and land use data. Performed retrospective analysis to complete Water Year 2021 (October 2020 - June 2021). Currently beta testing the Daily Irrigation Management Tool.
	Dates of Services:	July 2021 - present

2.	**Client Name:**	East Kaweah Groundwater Sustainability Agency
	Address:	315 E Lindmore St Lindsay, CA 93247
	Contact Name & Phone Number	Chris Hunter (559) 967-5617 chunter@lindmoreid.com
	Description of Services Provided:	Provide field-level monthly consumptive use estimates and land use data. Performed 5-Yr historical evapotranspiration analysis.
	Dates of Services:	May 2020 - present

3.	**Client Name:**	Semitropic Water Storage District
	Address:	1101 Central Avenue Wasco, CA 93280
	Contact Name & Phone Number	Jason Gianquinto (661) 565-5384 jgianquinto@semitropic.com
	Description of Services Provided:	Provide field-level monthly consumptive use estimates and land use data.
	Dates of Services:	January 2017 - present

4.	**Client Name:**	California Department of Water Resources
	Address:	715 P Street, 6th Floor Sacramento, CA 95814
	Contact Name & Phone Number	Stanley Mubako (916) 873-4784 Stanley.Mubako@water.ca.gov
	Description of Services Provided:	Provided annual land use for crop years 2014 and 2016. Provided land use for the water year beginning in 2018 and continuing through 2023. Water year 2024 is currently being classified. Land IQ current contract is through water year 2028.
	Dates of Services:	July 2016 - present

6 Cost

Land IQ is providing the following cost table for review by the GSA. The costs outlined below are all inclusive of the following deliverables and support:

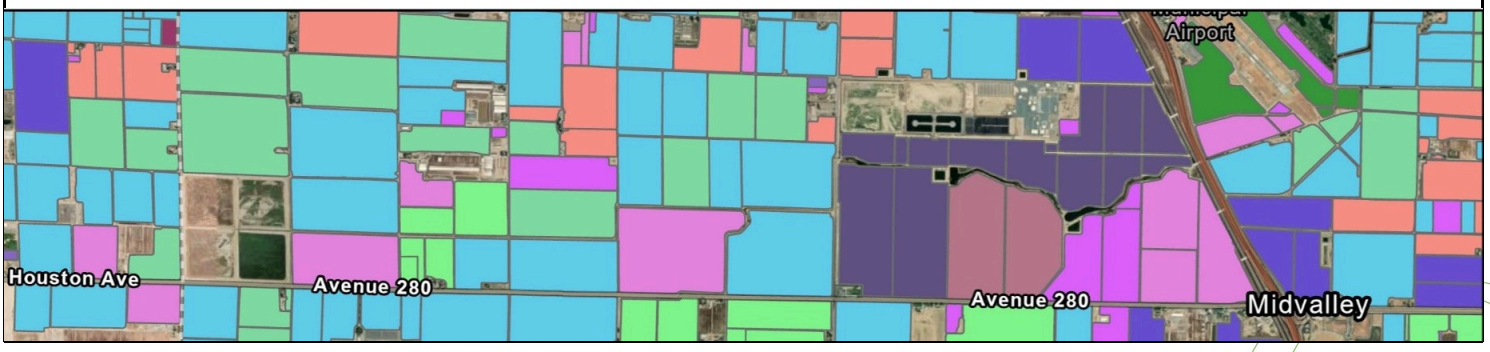
- Monthly and Daily (optional) Field Scale Evapotranspiration
- Monthly and Daily (optional) Field Scale Precipitation
- Annual expedited crop mapping
- Annual expedited field boundary updates
- Annual expedited permanent crop age mapping
- Monthly and annual summary reporting
- Unlimited grower support for answering questions/web tool functionality
- Unlimited GSA support for results summaries, regulatory compliance, public meeting presentations, workshops, stakeholder communications, etc.

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**



APPENDIX

Joel Kimmelshue, PhD, CPSS
Agricultural Scientist

Years of Experience
28

Education
Ph.D., Soil Science (Water Concentration), North Carolina State University, 1996

M.S., Soil Science, (Ag Engineering Concentration), North Carolina State University, 1992

B.S., Soil Science (Crop Science Concentration), California Polytechnic University, SLO, 1990

Professional Registrations and Affiliations
- Certified Professional Soil Scientist (#18204)

Distinguishing Qualifications
- Land use assessments and crop identification
- Soil/water/plant relations in arid climates
- Irrigation and drainage management
- Crop consumptive use estimates
- Soil and land use evaluations for the implementation of irrigation systems and crop production
- Water resources
- Soil nutrient interactions and environmental issues in soils
- Water quality for irrigated agriculture
- Regulatory support and negotiation for agriculture
- Policy, regulatory, and environmental influences on agricultural production systems

Dr. Kimmelshue is a Principal Soil and Agricultural Scientist for Land IQ. Dr. Kimmelshue is also a founding Owner in the firm. He has experience in agricultural and water resources consulting in the western United States (especially California), and agricultural research and crop production throughout the United States. This experience stretches to various locations in Europe and the Middle East. Dr. Kimmelshue has performed technical leadership and/or managed numerous projects and tasks worth nearly $40 million dollars over the past 28 years.

Dr. Kimmelshue's consulting experience includes practical and applied solutions for development of water/soil management systems and agricultural systems, specifically with irrigated agriculture. This technical expertise also includes expert witness testimony, crop consumptive use estimates, erosion and dust control, regulatory support and negotiation, water resources science and planning, land reclamation, soil/plant nutrient dynamics, irrigation and drainage in arid and humid climates, soil classification, crop production, land application of municipal and agricultural wastes, and revegetation/reclamation efforts.

Predominantly, the objective scientific work that Dr. Kimmelshue performs is driven by ever-changing policy, legislative and environmental pressures on production agricultural systems. Dr. Kimmelshue thoroughly understands these drivers and applies sound scientific results to help his clients address these challenges.

REPRESENTATIVE PROJECT EXPERIENCE

LAND USE MAPPING

Principal in Charge and Technical Lead – Statewide Crop and Land Use Mapping – California Department of Water Resources. Land IQ is contracted by the state of California to conduct statewide crop mapping of approximately 50 different crop types on over 9.4 million acres of agricultural land for fields of 2.0 acres and larger (sometimes smaller depending on crop type – (e.g. avocados)). The entire dataset amounted to

over 450,000 individual polygons and an average field size of 34 acres. The mapping spanned the entire state from the Mexico, Nevada, and Arizona borders to the Pacific Ocean. The ultimate accuracy of the 2014 mapping based on thousands of miles of ground truthing was 96.6%. The 2023 statewide accuracy was 98%. Land IQ is now mapping multi-cropping systems throughout the state in addition to the main season cropping systems. The mapping provided the first ever statewide crop map and since 2018, has now provided over five years of continuous mapping.

AGRICULTURAL WATER RESOURCES

Principal in Charge and Project Manager – Monthly Remotely Sensed Crop Consumptive Use – Over 40 Groundwater Sustainability Agencies (GSAs) and Irrigation Districts. As a part of the California Sustainable Groundwater Management Act (SGMA) regulatory requirements, highly accurate and timely evapotranspiration measurement are a key input to hydrologic models and overall efficient water management. Land IQ ET covers approximately 3.5 million acres, across GSAs and Irrigation Districts in Butte, Sutter, Stanislaus, Madera, Fresno, Kings, Tulare, Kern, and San Luis Obispo Counties. A monthly remotely sensed ET field-by-field measurement is performed and delivered to the districts within 30 days following the end of the previous month. The results are created with a remotely sensed regression approach that integrates nearly 100 climatic ground truthing stations that measure the climatic variables necessary to calculate actual ET. These calibration points are then used in the model to estimate ET from every irrigated and non-irrigated field, as well as native areas. The ground truthing stations are also used for validation datasets.

Project Manager and Technical Lead–Demand Reduction Strategies - Vina Subbasin Groundwater Sustainability Agencies. This project utilizes Land IQ's expertise in spatial data analysis and crop consumptive water use (evapotranspiration or ET) to conduct two pilot studies in the Vina Subbasin. The Extend Orchard Replacement Program will first estimate, using resources from ongoing ET work conducted in California, water savings from extending the fallow period between orchard removal and replant by one to two years. A field-by-field, subbasin-wide monitoring program will be developed that will include collecting and analyzing data-driven, ground-calibrated, remotely sensed evapotranspiration, measured precipitation, crop type, block boundaries, irrigation method, and permanent crop age in a 2-year pilot study. Based on the results of the pilot project, a final long-term action plan for the program will be developed, including exploration of sustainable funding options.

The Agricultural Irrigation Efficiency Pilot Program also uses ground-truthed ET and crop data to determine practices that optimize beneficial ET and minimize non-beneficial ET. The Land IQ team is working with engagement and outreach consultants to receive grower feedback, preferences, barriers to adoption, and metrics for success. This program leverages education and outreach, a feasibility study piloting innovative technologies, and development of a precision irrigation implementation plan to improve ET-based water management at a broader scale in the Vina Subbasin.

Mica Heilmann, CPSS
Principal Scientist

Years of Experience
25

Education
B.S., Soil Science, California Polytechnic State University, San Luis Obispo, 2000
Minors: Water Science and Viticulture

Fellow, California Agricultural Leadership Foundation Program, 2009

Professional Registrations and Affiliations
- Certified Professional Soil Scientist (#30230)
- Board Member, Placer County Resource Conservation District

Distinguishing Qualifications
- Agricultural systems and crop production
- Remote (satellite/aerial) land evaluation
- Land use and soil evaluation and classification
- Irrigation and drainage management and systems
- Water resource evaluation, planning and conservation
- Agroclimatology and consumptive use analysis/modelling
- Nutrient and salinity management in soil and water systems
- Soil, plant and water interactions
- Large-scale land stabilization and sediment control
- Project management and stakeholder coordination extent

Ms. Heilmann is a Principal Scientist and founding partner with Land IQ. She specializes in large-scale land surface mapping and land and water resource evaluation and management. Ms. Heilmann is a technical lead of the team that developed Land IQ's remote land use mapping capabilities over the last 15 years, integrating agronomic knowledge with remote sensing and geospatial analytical techniques. She has over 25 years of experience providing scientific expertise on large-scale land classification, agricultural systems, native vegetation systems, water resource management, irrigation management and agroclimatology and soil-plant-water interactions. An experienced project manager, Mica works closely with clients and stakeholders in evaluating land systems and applying that knowledge in decision making and business systems. Mica leverages a wide range of science and technology advancements to provide innovative, practical, and sustainable solutions for clients.

REPRESENTATIVE PROJECT EXPERIENCE

LAND USE MAPPING

Technical Project Manager – Statewide Crop and Land Use Mapping – California Department of Water Resources. Developed and implementation ongoing annual remotely sensed land mapping using advanced remote sensing analysis and ground truthing techniques. Statewide data are detailed to the field scale and highly accurate, exceed 97% accuracy and have become the standard for broad, multi-agency decision science and planning. Resulting data products are public and accessed by over 100 public and private agencies for improved decision science and foundational resource analysis. Several derivative remote sensing analyses are also performed including crop age determination, irrigation method determination, evapotranspiration analysis, and other time series change detections.

Mica Heilmann, CPSS
Principal Agricultural Scientist

Project Manager - Sacramento-San Joaquin Delta Comprehensive Land Use Mapping, California Department of Water Resources, Sacramento, CA. Performed comprehensive remote sensing land use classification for the Sacramento-San Joaquin Delta for 2015, 2016, and 2017. Classification included agricultural crops, native areas, open water, urban areas, farmsteads and semi-agricultural areas, and floating vegetation. The detailed legend for agricultural crops was aligned with DWR standard legend and provided additional detail in both permanent and annual crop categories. This work was informed by and validated against independent, in-season ground truth data collected throughout the delta. Both supervised and unsupervised classification techniques were used to digital image resources including Landsat (30 m) and Pleiades (2 m) satellite imagery. Results were over 96% accurate and will be used to inform both remote sensing and empirical evapotranspiration models.

AGRICULTURAL WATER RESOURCES

Agricultural Scientist - Sacramento-San Joaquin Delta Bouldin Island Evapotranspiration Analysis – Semitropic Water Storage District, Bouldin Island, CA. Evaluated reduction in ET from the land surface as a result of fallowing efforts in support of potential water transfer action in the Sacramento-San Joaquin delta. Supported site placement and installation of surface renewal monitoring instrumentation for real time data collection at three sites in the Delta. Assisted in calculation of actual ET and relating to remotely sensed ET models to generate comprehensive spatial ET for the island. Results provided an approach to defining the water savings that could be used in water transfer agreements.

Technical Lead and Project Manager – Remotely Sensed Crop Mapping and Consumptive Use Analysis Supporting Crop Land Fallowing Program; Yuma Mesa Irrigation and Drainage District, Yuma Arizona. Managed a 5-year remote sensing crop mapping and consumptive use analysis supporting a cropland fallowing program in coordination with the Arizona Department of Water Resources.

Project Manager - Sacramento-San Joaquin Delta Comprehensive Land Use Mapping and fallow ET Assessment; San Luis Delta Mendota Water Agency. Coordinated with landowners, Delta interests, UC Davis and State Water Resources Control Board to lead a collaborative study of fallow and agricultural water use in the California Delta. Performed comprehensive remotely sensed land use classification for agricultural, native and water areas. Assisted with installation of telemetered monitoring system and detailed data QAQC and analysis. Lead multi-stakeholder meetings, providing scientific and study guidance and implementation.

Technical Lead and Project Manager - Demand Management for Sonoma County Groundwater Sustainability Agencies, Sonoma County, CA. Performed an assessment of groundwater demand from agricultural and outdoor residential and commercial properties. Created a tool that leverages existing spatial data and water use efficiency measures that landowners can use to identify demand reduction strategies specific to their parcels.

Casey Gudel, MS
Client Relations & Project Manager

Years of Experience
18

Education
M.S., Agriculture, California Polytechnic University, San Luis Obispo, 2007

B.S., Animal Science, California State University, Chico, 2001

Professional Registrations and Affiliations

- Advisor, California/Nevada Junior Hereford Association
- Project Leader, Sloughhouse Alta Mesa 4-H Beef

Distinguishing Qualifications

- Ability to communicate complex issues to general public in easy to understand language.
- Ability to manage multiple projects simultaneously and under pressure.
- Strong attention to detail and focus on task completion.
- Extensive hands-on experience in the agriculture industry

Ms. Gudel is a Project Manager at Land IQ. Casey received her MS in Agriculture from California Polytechnic University, San Luis Obispo. She manages multiple projects and implements project controls across both land and spatial disciplines at Land IQ. Casey provides comprehensive project support including work scope planning, schedule and deliverable management, project implementation, document coordination, QAQC, cost control and project compliance and reporting. She brings an extensive background in agriculture and project management having previously worked for the California Farm Bureau Federation as their Political Affairs Manager. In that role, she managed the political action committee for the organization, including the raising and distributing funds, execution of grassroots advocacy program and planning of events. Casey and her husband also own and operate Gudel Cattle Company, raising Angus and Sim-Angus cattle and helping to manage thousands of acres of grazing land in California and Oregon.

REPRESENTATIVE PROJECT EXPERIENCE

Project Management/Client Relations – Department of Water Resources, Sacramento, CA. Assist with the development of statewide land use mapping that is produced for the use of Groundwater Sustainability Agencies in complying with the Sustainable Groundwater Management Act. Responsibilities include coordinating trainings and developing materials for DWR staff, drafting technical reports, attending working group meetings and organizing staff resources.

Project Management/Client Relations – Groundwater Sustainability Agencies, Southern San Joaquin Valley, CA. Assist with delivery of monthly field-by-field evapotranspiration results to over twenty Groundwater Sustainability Agencies and Irrigation Districts in the Kings, Tulare and Kern Counties. Serve as a point of contact for client questions.

Casey Gudel, MS
Client Relations & Project Manager

LAND IQ

Project Management/Client Relations – San Joaquin River Restoration Program Seepage Management Project, United States Bureau of Reclamation, San Joaquin Valley, CA. Conduct budget tracking, invoicing and document formatting for Seepage Management project. Responsibilities include coordinating with subcontractors on documentation.

Project Management/Client Relations – Almond Board of California, Modesto, CA. Conduct day to day communications with staff at ABC, manage project teams, draft technical documentation and oversee mapping, spatial analyses and web mapping tools created for helping the almond industry make informed decisions on water resources, land use and marketing.

Project Management/Client Relations – Walnut Handler Tool, California Walnut Board, Folsom, CA. Serve as main contact for updates to online tool used by handlers to report walnut marketing activities. Responsibilities include coordinating with development team on requested updates and fixes to tool.

Project Management/Client Relations – Statewide Rice Mapping, CA. Oversee statewide mapping of rice acreage, communicate with clients, ensure delivery of mapping and derivative products that are valuable to the rice industry for the planning and marketing of the rice crop on an annual basis.

Project Management/Client Relations – Cold Water Rice, Butte County, CA. Assist with a joint water resources project between the Department of Water Resources and four Irrigation Districts to quantify and compensate growers for the impacts cold water has on rice yield. Responsibilities have included assisting with price of rice determination, annual payment calculations, annual reporting and grower, technical panel and advisory group meetings.

Project Management/Client Relations – Sacramento Valley Water Quality Coalition, CA. Coordinate the needs of six subwatersheds in the development of a data management tool for grower reporting and member tracking for the Irrigated Lands Regulatory Program. The tools allow for the tracking of member related information and spatial data on a field-by-field basis, and allows for seamless generation of data analyses, summaries and reports to serve the needs of the subwatershed.

Project Management/Client Relations – California Avocado Commission, Irvine, CA. Primary contact for the CAC staff in developing acreage and condition assessments of avocado groves statewide. This annual assessment helps the CAC in making important decisions related to land resource management as well as the planning and marketing of available crop.

Project Management/Client Relations – California Walnut Board, Folsom, CA. Oversee the development of an online application for handlers to report six types of forms at different frequencies over the course of a crop year, in addition to administrative capabilities to run summary reports on a monthly frequency. This application helped CWB move away from paper submissions to online reporting.

Cody Fink, MS, CPSS, CCA
Soil and Agricultural Scientist

Years of Experience
12

Education
M.S., Soil Science, Pennsylvania State University, 2013

B.S., Soil and Crop Science, Purdue University, 2011

Professional Registrations and Affiliations
- Certified Professional Soil Scientist (#332146)
- Certified Crop Adviser (#332146)

Distinguishing Qualifications
- Soil fertility
- Salinity management
- Dust and erosion control
- Regulatory support
- Geospatial analysis
- Soil morphology and classification

Mr. Fink is a Soil and Agricultural Scientist with Land IQ. His work has focused on providing technical support for management of nutrients, water, and dust control. He has helped lead vegetation establishment efforts for native vegetation dust control areas on the Owens Lake playa which included tracking reclamation of saline soils, development of fertilizer and irrigation recommendations, and satellite-based estimation of vegetation cover. He has provided regulatory support related to nitrogen management and reporting of grower nitrogen data for the Irrigated Lands Regulatory Program (ILRP). Mr. Fink is also experienced in GIS, geospatial analysis, and remote sensing, integrating this into project efforts.

REPRESENTATIVE PROJECT EXPERIENCE

LAND USE MAPPING

Agricultural Scientist – Statewide Crop and Land Use Mapping – California Department of Water Resources, Sacramento, CA. Collected GT data for field-level crop mapping model and performed heads up QA/QC of crop classification, peak dates, and removed orchards for low confidence model results using aerial and satellite imagery.

Agricultural Scientist - Statewide Avocado Mapping - California Avocado Commission, Irvine, CA. Performed heads up crop classification of avocados in California, including an evaluation of planting/removal dates and condition (i.e. stumped, abandoned, young, producing).

Agricultural Scientist - Statewide Small Farms Mapping - California Department of Water Resources, Sacramento, CA. Developed methodology to map small farming operations less than 80 acres using publicly available information from the state ILRP and pesticide use reporting (PUR) programs. Collaborated with programming team to develop automated procedure for matching names with spelling differences and identify duplicate records.

Cody Fink, MS, CPSS, CCA
Soil and Agricultural Scientist

Agricultural Scientist - Vegetation Cover Mapping - Los Angeles Department of Water and Power, Owens Lake, CA. Led compliance assessment to estimate percent cover in vegetation dust control areas on Owens Lake. Led field collection of ground truthing (GT) photos, digital classification of percent cover for GT data, and evaluation and reporting of model results. Determined the acreage of reseeding and/or sod transplanting recommended to achieve compliance cover levels.

AGRICULTURAL WATER RESOURCES

Agricultural Scientist - Land IQ Data Driven Evapotranspiration Modeling - California. Perform monthly agronomist review of Land IQ's 30-meter actual evapotranspiration (ETa) model results for the Groundwater Sustainability Agencies and Irrigation Districts throughout Butte, Sutter, Stanislaus, Madera, Fresno, Kings, Tulare, Kern and San Luis Obispo Counties. Worked with growers to investigate and address model discrepancies with irrigation flowmeters. Performed independent validation assessment of model accuracy.

Agricultural Scientist - Nitrogen and Irrigation Management - Los Angles World Airports, Palmdale, CA. Estimated historic nitrogen loading rates and land use for agricultural land with nitrate impacted groundwater. Monitored and developed recommendations for agronomic rates of application and nitrogen and irrigation water to limit future contributions of nitrate to groundwater.

Agricultural Scientist - Soil Fertility and Irrigation Management - Los Angeles Department of Water and Power, Owens Lake, CA. Evaluated and developed recommendations for soil reclamation, fertilization rates and appropriate fertilizers, and irrigation scheduling for managed vegetation dust control areas to support establishing and maintaining compliant cover levels.

Agricultural Scientist - Soil Fertility and Irrigation Management - Rio Tinto Mining, Queen Creek, AZ. Monitored soil fertility for fields receiving treated mine wastewater to assess if there were potential impacts to agricultural productivity from mine operations.

Agricultural Scientist - Dryland Grape Farming Index - California Sustainable Winegrowing Alliance, California. Collaborated with project team to develop criteria and GIS methodology for rating suitability of existing vineyards in California for dryland farming.

Agricultural Scientist - Irrigated Lands Regulatory Program - Sacramento Valley Water Quality Coalition, California. Managed nitrogen reporting efforts for Sacramento Valley growers in the Irrigated Lands Regulatory Program (ILRP). Coordinated import of historic data into web tool, collection of new data from growers, automation of QA/QC and statistical analysis, identification of outliers for nitrogen applied, and reporting.

LAND IQ

Adriana Joosep, CCA, CAIS
Soil and Irrigation Scientist

Years of Experience
8

Education
B.S., Environmental Soil Science, California Polytechnic University SLO, 2017

Minor: Water Science, specializing in irrigation

Professional Registrations and Affiliations

- Certified Agricultural Irrigation Specialist (CAIS)
- Certified Crop Advisor (#490209) with Nitrogen Management Certification

Distinguishing Qualifications

- Irrigation systems, scheduling and maintenance
- Irrigation water supply reliability and quality
- Crop production systems
- Remotely sensed crop evapotranspiration (ET)
- Soil survey and characterization
- Crop photo (aerial imagery) interpretation
- Geographic Information Systems (GIS) analysis
- Project management

Mrs. Joosep is a Soil and Irrigation Scientist at Land IQ with over nine years of experience in agricultural systems, land use analysis, and remotely sensed evapotranspiration. Her work spans crop production systems, irrigation water supply and quality, and geospatial mapping. She has led and contributed to projects involving crop and urban landscape mapping, as well as remote sensing applications for water use estimation and land use change detection.

In addition to her technical expertise, Mrs. Joosep brings practical agricultural insight through active involvement in her family's farming operation in Stockton, California, where they produce almonds, walnuts, alfalfa, corn, and wheat.

REPRESENTATIVE PROJECT EXPERIENCE

LAND USE MAPPING

Program Manager – Statewide Crop and Land Use Mapping Ground Truth Data Collection – California Department of Water Resources, Sacramento, CA. Lead and managed ground-truth data collection for state-wide California, Arizona, and Australia crops. This included data and route preparation, scheduling, staffing, training, data management, and data cleaning efforts on approximately 24,000 miles of route taking place over the course of 17 weeks, 22 distinct trips, and collecting over 90,000 point features annually.

Project Manager - Cuyama Valley Basin Crop Mapping - Cuyama Valley Groundwater Sustainability Agency (GSA), New Cuyama, CA. Managed annual crop mapping of the Cuyama Valley Basin to support groundwater management efforts for 14 years of cropping. Mapping included both water year and calendar year mapping as well as irrigation status determinations.

Adriana Joosep, CCA, CAIS
Soil and Irrigation Scientist

Agricultural Scientist - Statewide Crop and Land Use Mapping – California Department of Water Resources, Sacramento, CA. Works on a company-wide team responsible for classifying each crop produced, permanent crop age, and crop timing identification on over 9.4 million acres of total cropped area in the state of California on an annual basis. Performs accuracy assessment across to quantify the probability of the dataset correctly classifying crops across 10 hydrologic regions and 56 crop types. This highly accurate dataset ranges between 96 – 98% accuracy annually.

AGRICULTURAL WATER RESOURCES

Project Manager - Consumptive Use Comparisons in the Southern San Joaquin Valley - California. Lead the development of a multi-year assessment of Land IQ's remotely sensed evapotranspiration and precipitation work. Overseeing collaboration among 20+ contributors, including authors, technical reviewers, editors, and peer advisors, to ensure scientific accuracy, clarity, and consistent theme in the publication.

Assistant Project Manager - Land IQ Data Driven Evapotranspiration Modeling - Multiple GSAs and Irrigation Districts, California. Manage a project team of 15+ staff members to deliver monthly, field level actual evapotranspiration (ET) data on over 3.5 million acres of farmland to support groundwater sustainability efforts. This project leverages a network of nearly 100 eddy covariance and surface renewal ET stations, crop mapping, Landsat and Sentinel imagery, and web development to efficiently and accurately track agricultural water use across nearly one-third of California's most productive agricultural regions.

GIS Analyst - Summarization of Actual Evapotranspiration (ETa) of Almonds, Citrus, Pistachios, and Walnuts - Southern San Joaquin Valley, California. Utilized geographic information systems, spatial crop mapping and age data, and remotely sensed ETa to identify the relationship between ETa and orchard age among varying permanent crop types.

Project Lead – California Water Supply Reliability Evaluation; California Walnut Commission, Almond Board of California, American Pistachio Growers, Blue Diamond Growers, AgIS Capital, Select Harvests, Kern Machinery; Central Valley, California. Lead the characterization of California water districts to identifying the source, strength of water rights, state of their groundwater basin, reliability on surface water, use of recycled water, and water storage capacity. This allowed water districts with large agricultural acreages to be compared to one another given a relative score of water reliability. This analysis assisted the clients in their ability to better plan for budgeting purposes, areas of anticipated growth or decline, and to support their growers.

LAND IQ

Sadie Keller, MS
Agricultural Scientist

Years of Experience
5

Education
M.S., Horticulture, Oregon State University, 2023

B.S., Agriculture, California State University Stanislaus, 2020

A.S., Interdisciplinary Studies, Math and Science, San Joaquin Delta College, 2019

Professional Registrations and Affiliations

- Remote Pilot Certification – Part 107, Small Unmanned Aircraft Systems (#4779642)
- California Certified Crop Advisor (CCA) – Expected 2025/2026

Distinguishing Qualifications

- Crop production systems
- Plant physiology and plant-water relations
- Nursery production systems
- Crop photo (aerial imagery) interpretation
- Geographic Information Systems (GIS) analysis

Ms. Keller is an Agricultural Scientist at Land IQ. She began working in the agriculture industry in San Joaquin County in 2017 where she gained valuable experience in crop scouting and crop protection. This work inspired her to obtain her Bachelor of Science in Agriculture from California State University Stanislaus. Ms. Keller then obtained her Master of Science in Horticulture from Oregon State University where her research focused on plant and water relations in nursery production systems. Her graduate school experience sharpened her skills in crop management, plant physiology, data collection, and data analysis.

REPRESENTATIVE PROJECT EXPERIENCE

AGRICULTURAL WATER RESOURCES

Agricultural Scientist - Land IQ Data Driven Evapotranspiration Modeling - Multiple GSAs and Irrigation Districts, California. Assists in the installation and maintenance of nearly 100 agroclimatology stations where the active area of analysis currently spans over one million acres. This data is used to guide a remote sensing modeling process that quantifies the evapotranspiration of the remainder of the landscape monthly. This project work is ongoing.

Grower Relations Lead - Land IQ Data Driven Evapotranspiration Modeling - Multiple GSAs and Irrigation Districts, California. Primary responsibilities include coordination of field site selection, grower engagement, and daily oversight of evapotranspiration (ETa) data reporting to station hosts. Serve as the main point of contact for station installation, maintenance, and in-season adjustments, particularly during critical periods such as harvest or chemical application. Contribute to the development of standardized documentation for station siting and initial grower outreach to ensure consistency and effective communication.

Sadie Keller, MS
Agricultural Scientist

LAND IQ

LAND USE MAPPING

Project Lead – Statewide Crop and Land Use Mapping Ground Truth Data Collection – California Department of Water Resources, Sacramento, CA. Works on a team responsible for photointerpretation and identification of the peak normalized difference vegetation index (NDVI) for each crop produced within the total cropped area (>9.4 million acres). Also part of the team responsible for the collection of ground truth data to identify and analyze state-wide California crops. Data collection includes crop identification, irrigation method identification, relative age of perennial crops, and planning of crop season observation timing.

Project Lead - Chino Basin - Quarterly Crop Mapping and Fill In Mapping; West Yost & Associates; Davis, California. Leads quarterly crop mapping and annual assessments of irrigation methods and non-agricultural land use to support the Chino Basin Watermaster. Delivered actionable data to inform basin-wide water demand planning and resource management decisions.

Project Lead – Cuyama Valley Basin - Water Year and Calendar Year Mapping & Verification of Irrigation Status; Woodard and Curran; Sacramento, California. Crop classification and irrigation status verification across the Cuyama Basin for the water and calendar years. Conducts all remote sensing analysis, agronomic interpretation, and field-scale mapping to identify irrigated land use. Integrated multi-source imagery, crop phenology, and semiannual ground truth data—to achieve ≥95% classification accuracy. Results support identification of water use patterns and land use changes critical to basin-scale water resource management.

URBAN WATER RESOURCES

Agricultural Scientist - Urban Landscape Classification and Demand Analysis; San Juan Water District, Granite Bay, California. Worked on a team responsible for providing a technical review of urban landscape mapping previously performed by the California Department of Water Resources for SJWD service areas to verify that there were no data gaps and detect the magnitude of any data gaps identified. The mapping efforts helped categorize land area within residential parcels as 1) Irrigated, Irrigable (II); 2) Irrigable, but not currently Irrigated (INI); or 3) Not Irrigable (NI).

REGULATORY COMPLIANCE

Agricultural Scientist - Digital Point Frame Vegetative Cover Assessment; Owens Lake Dust Mitigation Project; Keeler, CA. Assessed vegetative cover to identify compliance levels of managed vegetation dust control practices using photographs collected by Land IQ. Utilized GIS to perform virtual pin counting, resulting in a quantitative measure of vegetative cover to use in a remote sensing approach of vegetative cover measurement. This assessment spans thousands of acres within the Owens Lake Dry Lakebed.

Frank Anderson, MS
Biometeorologist

Years of Experience
24

Education
M.S., Atmospheric Science/Biometeorology, University of California Davis, 2007

B.S., Atmospheric Science, University of California Davis, 2001

Distinguishing Qualifications

- Atmospheric energy and greenhouse gases fluxes
- Eddy covariance and chamber-based measurements
- Meteorological instrumentation and datalogging
- Telemetry and real-time data acquisition
- Agricultural crop and reference evapotranspiration
- Soil, plant, and water processes
- Python: scientific data processing, analysis, and gap-filling techniques
- Regional weather patterns and climatology
- Irrigation management and systems
- Water quality and sensors
- Wetland restoration and management
- Native and invasive plant species

Mr. Anderson is a Biometeorologist with Land IQ. He has over 24 years of experience in micrometeorology measurements from agricultural and natural systems using multiple approaches: eddy covariance, surface renewal and plant-soil chambers. Mr. Anderson has gained a significant amount of experience working throughout California measuring evapotranspiration rates from various agricultural crops including alfalfa, almonds, corn, cotton, pistachios, walnuts, and rice, as well as quantifying carbon fluxes from wetland systems ranging from fresh to saline. His collaborations are both national, working with university scientists and farmers in California to wetland ecologists in the Florida Everglades and Washington State's Puget Sound, as well as international, working with scientists from Italy, Egypt, Brazil and China. His work over the years has required both innovative approaches for sensor deployment, real-time data acquisition, data processing and troubleshooting, and problem-solving techniques. His research interests include agricultural water use and climatology, atmosphere-plant-soil interactions, remotely sensed evapotranspiration rates and energy budget processes, carbon cycling, responses to irrigation practices due to changes in atmospheric conditions, and machine learning data processing.

REPRESENTATIVE PROJECT EXPERIENCE

ACTUAL CROP AND FIELD CONSUMPTIVE USE

Lead Biometeorologist - Land IQ Data Driven Evapotranspiration Modeling - Multiple GSAs and Irrigation Districts, California. To deliver accurate monthly ET rates over this large region, Land IQ developed a remote sensing model, the Land IQ Data Driven Method (LDDM), that incorporates Earth's surface information from multiple satellite imagery and over 100 ground-based calibration stations. These ground-based stations use eddy covariance and surface renewal methodology to measure changes in atmospheric conditions to calculate ET rates on a half-hour basis. Mr. Anderson works with other Land IQ scientists to install and maintain these

ground-based stations. Mr. Anderson is the lead scientist in the delivery of monthly results to the remotes sensing modelers. His duties include raw data telemetry, python-based half-hour calculations of energy fluxes, data analysis and quality control, and a monthly summary presentation to a senior advisory committee. Mr. Anderson also works with companies and contractors to find new ways to measure and calculate rates of ET and reference evapotranspiration rates – increasing the station density in the region.

Lead Biometeorologist - Updating and Sharing Crop Coefficient (Kc) Information to Enhance Agricultural Water Demand Estimations and Irrigation Scheduling in the Water-limited Context of California. Mr. Anderson is responsible for supporting the on-going data collection for annual and perennial crops through remote troubleshooting and instrument maintenance of existing University of California, Davis evapotranspiration towers (approximately 20 towers) in the San Joaquin Valley. Activities and responsibilities include overall support for team members to reach project goals, provide continual remote access to evapotranspiration stations, troubleshooting and maintaining station instrumentation, calculate and analyze station data for energy balance fluxes, and provide quality control assessment.

Lead Biometeorologist - Alternative Evapotranspiration Zones for the Las Posas Valley Basin. Mr. Anderson prepared a technical memorandum for Judge Patrick Walsh to document the estimation of alternative crop evapotranspiration (ETc) zones for the Las Posas Valley Basin (LPVB) using reference evapotranspiration (ETo) rates and crop coefficients (Kc). Using available meteorological information, Mr. Anderson concluded that there were potentially three different zones that could affect the ETo rates in the region. Further, he provided a general range of ETc rates that might be found within these three different ETo zones using Kc values from avocados and citrus.

Biometeorologist - Updating information on evapotranspiration (ET) and crop coefficients (Kc) of micro-irrigated almond production orchards grown in California for use in water resource management and irrigation scheduling decisions. Mr. Anderson supports this multi-collaborative effort through data retrieval, inventory, organization, quality control and analysis for the provision of proprietary field ET datasets collected from mature almond orchards in commercial production setting. In addition, he supports the project by updating information on almond water use with existing tools for modeling water demand and scheduling irrigation for mature almond and the development of the Digital Almond Water Demand Map.

Project Scientist – Evapotranspiration Field Measurements in the Sacramento/San Joaquin Delta; Westlands Water District. Mr. Anderson supported the development and construction of an atmospheric monitoring station for an irrigated pasture in the western delta. The data collected from the stations guided a remote sensing effort that mapped the actual evapotranspiration of the ranch which then dictated water transfer decisions.

Jenae Clay, PhD Candidate
Biometeorologist

Mrs. Clay, Ph.D. Candidate, is a Biometeorologist with Land IQ, and she has been working in the field of biometeorology since 2015. Her research experience includes using surface renewal, eddy covariance, and energy budget residual methods to measure evapotranspiration in California's agricultural ecosystems. She also has experience evaluating the performance of low-cost meteorological sensors, conducting soil sampling, performing stem water potential measurements, and collecting fPAR measurements using ceptometry. She enjoys working with colleagues from across the globe as well as teaching others about meteorological sensors, biometeorology, and atmospheric science in the classroom or through public outreach.

Years of Experience
10

Education
Ph.D. Candidate, Atmospheric Science, University of California Davis, Expected Ph.D. Defense by Winter 2026

B.S., Atmospheric Science, University of Louisiana at Monroe, 2013

Professional Registrations and Affiliations

- American Meteorological Society member since 2011
- American Geophysical Union member since 2015

Distinguishing Qualifications

- Atmospheric energy budget fluxes
- Eddy covariance sensor calibration and maintenance, sensor installation, and data analysis
- Meteorological and micrometeorological instrumentation and datalogging
- Low-cost meteorological sensor development and testing
- Telemetry and real-time data acquisition
- Agricultural crop and reference evapotranspiration
- Regional weather patterns and climatology
- R and Python

REPRESENTATIVE PROJECT EXPERIENCE

ACTUAL CROP AND FIELD CONSUMPTIVE USE

Biometeorologist - Micrometeorological Field Measurements for Land IQ Data Driven Evapotranspiration Modeling - Multiple GSAs and Irrigation Districts, California. Mrs. Clay works with other Land IQ scientists to install and maintain these field-based stations as well as processing daily and monthly data. She assists with python-based half-hour calculations of energy fluxes, data analysis and quality control that are provided to remote sensing scientists and a monthly summary presentation to a senior advisory committee. She also assists with monthly precipitation data analysis, preparing the station-based data to provide to remote sensing scientists for use in statewide precipitation analysis.

Biometeorologist - Updating and Sharing Crop Coefficient (Kc) Information to Enhance Agricultural Water Demand Estimations and Irrigation Scheduling in the Water-limited Context of California. Mrs. Clay helps support the ongoing data collection for annual and perennial crops through remote troubleshooting and instrument maintenance of existing University of California, Davis evapotranspiration stations (approximately 20 stations) in the San Joaquin Valley of California. Activities and responsibilities include overall

support for team members to reach project goals, provide continual remote access to evapotranspiration stations, troubleshooting and maintaining station instrumentation, calculate and analyze station data for energy balance fluxes, and provide quality control assessment.

PREVIOUS EXPERIENCE

Prior to joining Land IQ in 2024, Mrs. Clay served as a Graduate Student Researcher and Teaching Assistant at the University of California, Davis, while earning her Ph.D. in Atmospheric Science. Examples of projects and tasks completed while in those roles are provided below.

Graduate Student Researcher – Investigating the Effects of Winter Cover Cropping on the Radiation Balance, Soil-Water Dynamics, and Productivity of Mature, Micro-Irrigated Pistachio Orchards and Vineyards in the California Central Valley. Under the advisory of Dr. Daniele Zaccaria and Dr. Kyaw Tha Paw U from 2020 to 2024, deployed solar radiation sensors above and below the canopy at sixteen pistachio sites and two vineyard sites to evaluate differences in reflected solar radiation from cover-cropped and clean-cultivated rows. Coordinated with lab team members, Kearney Agricultural Research Center employees, and maintained communication throughout project. Performed regular data analysis in R.

Graduate Student Researcher – Examining the Ecological and Water-Use Benefits of Winter Fallowing or Alternative Crops in Rice Fields in California. Under the advisory of Dr. Kosana Suvočarev from 2019 to 2022, deployed and maintained around three evapotranspiration-estimating stations in fallow, wheat, and cover crop fields. Coordinated with lab team members and landowners throughout the project.

Graduate Student Researcher – Studying water use (ET_c) and crop coefficients (K_c) of mature pistachio orchards with salinity-affected soils and pilot study of varying cover crop conditions in the San Joaquin Valley. Under the advisory of Dr. Daniele Zaccaria and Dr. Kyaw Tha Paw U in 2019, deployed solar radiation sensors above and below the pistachio canopy at four sites to evaluate differences in reflected solar radiation Hanford and Coalinga, CA. Performed routine maintenance to existing energy budget residual based ET stations in three pistachio orchards and assisted with harvest duties.

Graduate Student Researcher – Sacramento-San Joaquin Delta Fallowing Pilot Evapotranspiration Monitoring Program. Under the advisory of Dr. Kyaw Tha Paw U from 2017 to 2019, deployed and maintained 18 evapotranspiration-estimating stations and three solar radiation stations in fallow, alfalfa, and tomato fields in the Sacramento-San Joaquin River Delta during the 2018 Water Year. This provided in situ measurements with which to compare estimates of actual evapotranspiration (ET_a) with METRIC-based evapotranspiration estimates derived by Land IQ. Utilized surface-renewal, energy residual methods and direct eddy covariance methods to estimate ET_a. Took bulk density and loose soil samples. Coordinated with lab team members to select sites and maintained communication throughout project. Performed data analysis in R. Prepared main report and field measurement appendix.

LAND IQ

Danial Azman
Atmospheric Scientist

Years of Experience
4

Education
B.S., Biological Systems Engineering, University of California Davis, 2021

A.S., Biological Sciences, Foothill College, 2018

Professional Registrations and Affiliations

- American Society of Agricultural and Biological Engineers (ASABE).
- Engineer-In-Training (EIT) – Expected 2025

Distinguishing Qualifications

- IoT sensors: Arduino/Raspberry Pi/ESP 32
- Instrumentation, Control and Modeling: Simulink/COMSOL Multiphysics
- Precision agriculture systems with energy balance integration.
- Programming languages (Data Science): Python/R/C++
- Computer Aided Design: SOLIDWORKS/FreeCAD.
- Electronic Design Automation: KiCad

Mr. Azman is an Atmospheric Scientist with Land IQ. He has over 8 years of experience in the development of custom systems for the purpose of data acquisition (DAQ) in environmental sciences. His 4 years in Land IQ emphasized data analysis on meteorological equipment, the development of DAQ pipelines and various spatial programming. Mr. Azman's academic background includes agricultural engineering, precision agriculture, and hydrology.

REPRESENTATIVE PROJECT EXPERIENCE

ACTUAL CROP AND FIELD CONSUMPTIVE USE

Atmospheric Scientist - Land IQ Data Driven Evapotranspiration Modeling - Multiple GSAs and Irrigation Districts, California. Point of contact for precipitation data (tabular and raster) along with general data telemetry for internal teams; developed various scripts to streamline data process/analysis and took over as lead for custom flux tower builds. Assists in flux tower installations and monthly station maintenance.

Project Lead - Applied Water Study - San Joaquin Valley, California. Developed and installed a fleet of custom IoT loggers along with backend architecture for real time observation on irrigation events. Deliverables include monthly applied water calculations and comparisons to field-based spatial ET to verify model outputs.

LAND USE MAPPING

Staff Scientist – Statewide Crop and Land Use Mapping Ground Truth Data Collection – California Department of Water Resources, Sacramento, CA. Assist in the collection of ground truth data to identify and analyze state-wide California crops.

Danial Azman
Atmospheric Scientist

LAND IQ

GEOSPATIAL ANALYSIS

Staff Scientist – Statewide Land Use Mapping - California Department of Water Resources, Sacramento, CA. Develop and update various spatial scripts to enable multi county pre-processing checks.

Staff Scientist - Water Supply Reliability Study; California Walnut Board; Folsom, CA. Conducted a spatial and tabular analysis to determine the walnut acres in each Irrigation District for water supply scoring.

REGULATORY COMPLIANCE

Associate Scientist - Digital Point Frame Vegetative Cover Assessment; Owens Lake Dust Mitigation Project; Keeler, CA. Collection of high-resolution photographs for the assessment of vegetative cover to identify compliance levels of managed vegetation dust control practices.

PREVIOUS EXPERIENCE

Prior to joining Land IQ in 2021, Mr. Azman worked as a Research Engineer (Volunteer) for the University of California, Davis. Projects include elementary machine learning for evapotranspiration prediction, NLP systematic reviewing for agricultural papers, and decision analysis dashboard for local growers. His engineering senior design project consisted of a smart irrigation prototype- a precision agriculture system that encompassed LANDSAT acquisition, evapotranspiration mapping and prediction (SEBAL and PTSEB), autonomous data management and IoT instrumentation.

LAND IQ

Years of Experience
12

Education
M.S., Geology, University of California Los Angeles, 2013

B.S., Geology & Physics, University of Pune, 2010

Distinguishing Qualifications

- Proficient in software and programs such as Python, GDAL/OGR, R, IDL, ENVI, QGIS, ArcGIS, ERDAS IMAGINE, ASF Mapready, ESA Toolboxes, GAMMA SAR and Interferometry, ROI_PAC, ADORE-DORIS, etc
- Familiar with software and programs such as Perl, Javascript, and PolSARpro.
- Highly skilled at time series analysis, spatial analysis, object and pixel based image classification, raster and vector processing, machine learning, deep learning and data science.
- Extensive experience in quantitative and qualitative analysis of geospatial data as well as technical writing.
- Expert with Unix, Mac and Windows operating systems.

Diya Chowdhury, MS
Senior Remote Sensing & Data Scientist

Ms. Chowdhury is a Senior Remote Sensing/Data Scientist at Land IQ, LLC. Diya brings an extensive background in remote sensing applications as it relates to agriculture, forestry and geology. brings an extensive background in remote sensing applications as it relates to land use, geology, vegetative systems, and forestry with a focus on sustainability and has been working in this field for 12 years. She is highly skilled at time series land use and vegetation analysis, raster and vector manipulation, spatial analysis and image classification. Diya is also skilled in programming, where she has assisted in large dataset management and QAQC and writing of scripts for automated data integration.

REPRESENTATIVE PROJECT EXPERIENCE

REMOTE SENSING

Remote Sensing Scientist - Statewide Crop Mapping - California Department of Water Resources (DWR), CA. Spatio-temporal supervised crop classification in California for the California Department of Water Resources and the State Water Resources Control Board (Delta Watermaster) using Landsat-8 and Sentinel-2 imagery. The results are used to monitor state wide water consumption, land use change and prediction of future consumption.

Remote Sensing Scientist - Urban Landscape Mapping - Regional Water Authority, Sacramento, CA. Classification of high resolution optical imagery into irrigated, irrigable and un-irrigable landscapes using semantic segmentation. These results are used to quantify outdoor urban water demand for participating agencies.

Remote Sensing Scientist - Statewide Rice Mapping - Multiple Confidential Clients. Processing and analyzing Sentinel-1 SAR data to estimate in-season California state-wide rice acreage. These results are used for market intelligence, water use and management, crop production support and yield forecasting.

Diya Chowdhury, MS
Senior Remote Sensing & Data Scientist

LAND IQ

Remote Sensing Scientist - Spatial Evapotranspiration - Semitropic Water Storage District, Wasco, CA. Quantifying and reporting monthly spatial evapotranspiration using Landsat-8, Sentinel-2 and RapidEye data. These results are used to charge growers for their water consumption rather than their land area as was traditionally used.

STATISTICAL ANALYSIS

Scientist - Owens Lake Dust Mitigation Program; Los Angeles Department of Water and Power (LADWP); Owens Valley, CA. Modeling vegetation cover in Owens Lake, California using Pleiades imagery as part of the LADWP Science team. The results of these analysis are used to test for regulatory compliance of vegetation cover in each dust control area.

Scientist - San Joaquin River Restoration Program - US Bureau of Reclamation; Central Valley, CA. Aggregating spatial and temporal in-situ and modelled data to update the current seepage prioritization map as part of the San Joaquin River Restoration Program. This map identifies areas vulnerable to seepage effects associated with the implementation of restoration flows.

Scientist - Irrigated Lands Regulatory Program - Sacramento Valley Water Quality Coalition; Sacramento, CA. Statistical analyses and representation of data as well as development of tools to automate nitrogen management report generation for individual growers.

PROGRAMMING

Scientist - Evapotranspiration Modeling, California DWR, Sacramento-San Joaquin Delta. Bulk processing climate data to calculate crop evapotranspiration, based on the Penman-Monteith method, to quantify consumptive use of water for the Department of Water Resources.

Scientist - Irrigated Lands Regulatory Program; Sacramento Valley Water Quality Coalition; Sacramento, CA. Cleaning and formatting farm management data provided by each sub-watershed for use by a Data Management Tool. This tool improves the management of reporting and invoicing for every parcel of land in the sub-watershed.

Scientist - Irrigated Lands Regulatory Program; Sacramento Valley Water Quality Coalition; Sacramento, CA. Generating annual Nitrogen Management Practices (NMP) summary report and grower reports for every grower in the participating sub-watersheds.

PREVIOUS EXPERIENCE

Prior to joining Land IQ in 2017, Ms. Chowdhury had worked as a Research Scientist at Applied Geosolutions in Newmarket, NH. She also served as a Researcher and Teaching Assistant at the UCLA Department of Earth, Planetary and Space Sciences as well as the Institute of Environment and Sustainability.

LAND IQ

Atsushi Tomita, PhD
Remote Sensing Scientist

Years of Experience
8

Education
Ph.D., Earth and Environmental Sciences, The Graduate Center of the City University of New York, 2017

M.A., Science and Environmental Reporting, New York University, 2003

M.S., Physics, Keio University, Yokohama, 1995

B.S., Physics, Keio University, Yokohama, 1992

Distinguishing Qualifications

- Remote Sensing methodological development
- Remote Sensing image processing: geo-referencing historical aerial images, special color-adjustment/fitting for visual recognition of crops
- Remote Sensing image classification with Machine Learning algorithms
- Python scientific computing for Remote Sensing data processing and methodological development

Dr. Tomita is a Remote Sensing Scientist at Land IQ, LLC. Dr. Tomita has eight years of experience in remote sensing as it relates to agriculture and forestry. He is particularly skilled at developing robust systems for detecting land cover change, intuitive approaches to crop mapping, time segmentation methods for multi-cropping classification, synergetic uses of quantitative and qualitative methods, and developing graphical approaches for crop mapping that combines time-series data and images.

REPRESENTATIVE PROJECT EXPERIENCE

EVAPOTRANSPIRATION

Remote Sensing Scientist - Land IQ Data Driven Evapotranspiration Modeling, California. Conduct remote sensing modeling utilizing image analysis and ground truth data from climatic stations to determine field-level actual evapotranspiration for over 3.5 million acres in Butte, Fresno, Kern, Kings, Madera, San Luis Obispo, Stanislaus, Sutter, and Tulare Counties.

CROP MAPPING

Remote Sensing Scientist - Statewide Crop Mapping - California Department of Water Resources (DWR), California. Spatio-temporal supervised crop classification in California for the California Department of Water Resources using Landsat-8 and Sentinel-2 imagery for the counties of Imperial, Riverside, Ventura, Santa Barbara, San Luis Obispo, Sacramento, Solano, Yolo, Sutter, Yuba, Colusa, Glenn, Butte, and Tehama. Overall dataset is comprised of over 9.4 million acres of agricultural land.

Remote Sensing Scientist - Near Real-time Crop Mapping; Groundwater Sustainability Agencies. Perform near real-time crop mapping twice a year for Kern, Tulare, Kings, and parts of Fresno County to serve multiple Groundwater Sustainability Agencies in complying with the Sustainable Groundwater Management Act.

Atsushi Tomita, PhD
Remote Sensing Scientist

LAND IQ

DATA ANALYSIS

Remote Sensing Scientist -Time Series Analysis for Land Use Mapping, Research and Development. Developed an innovative time series plot method utilizing NDVI, for the use in multi-crop classification and peak date determination.

Remote Sensing Scientist - Classification Method for Multi-Cropping, Research and Development. Developed an object-based crop detection and classification method for multi-cropping based on time series analysis. Developed a time-segmentation method for detecting individual cropping.

Remote Sensing Scientist - Crop Time Series Library, Research and Development. Developed an innovative crop time-series library that can serve multiple purposes in crop mapping and beyond.

IMAGERY PROCESSING

Cold Water Rice Yield Loss Calculation via Remote Sensing; California DWR; Butte County, California. Responsible for pre-processing meter-class satellite (Pleiades or equivalent) imageries such as geometric correction, radiometric correction, color-matched seamless mosaicking, and calculation of soil line and PVI for the remote sensing analysis to determine rice yield loss in cold water affected areas.

Owens Lake Dust Mitigation Program; Los Angeles Department of Water and Power (LADWP); Owens Valley, California. Responsible for geometrically correcting meter-class satellite (Pleiades or equivalent) imageries for managed vegetation assessments.

PREVIOUS EXPERIENCE

Dr. Tomita has extensive experience in Remote Sensing. Prior to joining Land IQ in 2019, he had seven year's work experience as a technical officer at the Japanese Ministry of Agriculture, Forestry, and Fisheries, where he was involved/engaged in research activities in Agricultural Climatology, Remote Sensing, and Landscape Science. He continued to enrich his experiences in Remote Sensing, image processing, and land use/land cover (LULC) change analysis in the United States. He worked as part time researcher at Panthera, where he was engaged in delineating wildcats' habitats and their historical changes using satellite imageries. He led multiple research projects at the City University of New York (CUNY). At the CUNY, he developed a monitoring system of LULC change in tropical Asia using long-term Landsat observation data. After graduating from the CUNY, he continued to develop a monitoring system of long-term LULC changes in tropical Asia and the United States and taught an advanced Remote Sensing course at the CUNY.

LAND IQ

Years of Experience
8

Education
Ph.D., Geography, University of California Davis, 2022

B.S., Agricultural Science, Cornell University, 2016

B.S., Agronomy, Zhejiang University, 2014

Distinguishing Qualifications

- Remote Sensing method development: develop robust and innovative methodologies to acquire, process and analyze remote sensing data from different sources.
- Machine learning and deep learning: proficient in applying machine learning and deep learning frameworks to solve complex problems of image segmentations, crop type classification, time series classification, etc.
- Python and R programming: highly skilled in using Python and R for remote sensing image and GIS data processing, quantitative data analysis, and model building.

Zhehan Tang, PhD
Remote Sensing Scientist

Dr. Tang is a Remote Sensing Scientist at Land IQ, LLC. Dr. Tang has eight years of experience in remote sensing as it relates to agriculture monitoring. He is passionate about applying remote sensing and data science technology to improve agricultural productivity and sustainability. He is skilled in developing models to develop evapotranspiration predictions and crop classifications.

REPRESENTATIVE PROJECT EXPERIENCE

EVAPOTRANSPIRATION

Remote Sensing Scientist - Land IQ Data Driven Evapotranspiration Modeling, California. Built monthly data-driven model to map evapotranspiration in San Joaquin Valley, based on station data, crop information, satellite imagery and weather data; Streamlined and automated the data processing steps; analyzed trends and relationships of historical evapotranspiration and precipitation data.

Remote Sensing Scientist - Sonoma County Water Use Efficiency Assessment; Sonoma County Groundwater Sustainability Agencies, Sonoma County, California. Estimated vegetation evapotranspiration of all irrigated fields in the area using cloud computing; Segmented NAIP image to identify unclassified irrigated fields using state-of-art computer vision model.

Remote Sensing Scientist - Irrigation Scheduling Tool; San Joaquin Valley, California. Designed and developed an automatic satellite image and weather data processing tool to provide daily evapotranspiration estimate to help with irrigation scheduling.

Zhehan Tang, PhD
Remote Sensing Scientist

CROP MAPPING

Remote Sensing Scientist - Statewide Crop Mapping - California Department of Water Resources (DWR), California. Spatio-temporal supervised crop classification in California for the California Department of Water Resources using Landsat-8 and Sentinel-2 imagery for multiple counties in Northern California**.**

Remote Sensing Scientist - Automatic Detection of Tree Removals - Research and Development, California. ·Designed and developed an SAR-based algorithm to identify tree removal in almond and walnut orchards in early stages.

YIELD PREDICTION

Remote Sensing Scientist - ·Cold Water Rice Yield Loss Prediction; California DWR; Butte County, California. Processed high-resolution satellite image from Pleiades and PlanetScope; Applied image segmentation on rice fields in high-resolution satellite image to identify yield objects measured by harvester; Built machine learning model to predict yield loss due to cold water.

PREVIOUS EXPERIENCE

Prior to joining Land IQ in 2022, in his PhD study, Zhehan Tang conducted multiple research projects about building machine learning models to detect water stress of different variety of crops using data from satellite, UAV imagery and proximal sensors, mapping tomato fields and predict tomato yield with time series of satellite and weather data in California.

LAND IQ

Justin Sitton
Geospatial Analyst

Years of Experience
12

Education
B.S., GIS/Computer Cartography, University of Maryland, 2013

Distinguishing Qualifications

- Geographic Information Systems (ArcGIS for Desktop and ArcGIS Online)
- Data analysis and revision
- Data collection
- Data Management
- Cartography

Mr. Sitton is a Geospatial Analyst with Land IQ. He has over twelve years of professional experience working with Geographic Information Systems. Mr.Sitton is skilled in collecting and processing spatial land use and environmental data, managing and analyzing data to divulge meaningful insights, and creating maps to display complex information and analysis that suits clients' specific needs. He has managed broad aspects of land surface imagery, topography, parcel data, irrigation district boundaries, urban footprints, agricultural field boundaries, and numerous regulatory boundaries to inform analyses and data management tools for client's needs.

REPRESENTATIVE PROJECT EXPERIENCE

LAND USE MAPPING

Statewide Crop Mapping - California Department of Water Resources (DWR), California. Responsible for digitizing field boundaries and completing metadata for the final deliverable. Created several maps to illustrate yearly datasets. Responsible for managing team of interns and ensuring project stayed on schedule.

Almond Orchard Removals - Almond Board of California; Modesto, California. Responsible for determining the amount of almond acreage removed annually, beginning in 2014. Error for the project was 1.75%.

Urban Area Delineation - Confidential Client. Responsible for digitizing urban areas within Mesilla and Rincon for 1936 – 2016, when data was available, to determine water usage in Mesilla Valley, Texas.

Almond Age Classification - Almond Board of California; Modesto, California. Responsible for age classifying the almond dataset annually. Analysis was conducted using the prior year almond dataset and determining the NDVI for each field to identify which orchards have been replaced or removed.

Justin Sitton
Geospatial Analyst

LAND IQ

GEOSPATIAL ANALYSIS

Unimpaired River Flows Analysis - Almond Board of California; Modesto, California. Responsible for compiling California county, groundwater basins, detailed analysis units, and DWR Irrigation District boundary spatial data. Conducted spatial analysis to determine almond acreage within each layer for the given study area. Create mapping products to display the almond acreage that existed within and outside the borders of Irrigation Districts that fell within the study area.

Almond and APN Analysis - Almond Board of California, Modesto, California. Responsible for combining the almond mapping developed by Land IQ and County Assessor information, to overlay the two resources and create a list of APNs and acreages for annual surveys conducted by the United States Department of Agriculture – National Agricultural Statistics Service.

Coalition Membership Layer - Colusa-Glenn Subwatershed Program; Willows, California. Responsible for updating the Colusa Glenn membership parcel layer. The goal was to create a more accurate layer for CGSP web mapping tool, utilizing agricultural commissioner and the county parcel layers.

Schools and Day Care Proximity Analysis - Pistachio Research Board; Fresno, California. Responsible for finding the number of pistachio acres within 1.5 miles of private/public schools and day care centers. The study was created by using a multi-ring buffer starting at a quarter mile and finishing at 1.5 miles at quarter mile intervals, and each level had an associated acreage.

Water/Irrigation District Layer – Research and Development; Land IQ; Sacramento, California. Responsible for creating a layer that depicts all of the water and Irrigation Districts in California that serve agriculture.

DATA MANAGEMENT & WEB APP DEVELOPMENT

Web Map Layers Update - Almond Board of California; Modesto, California. Responsible for creating layers to be added to the Almond Board of California's internal and external web maps. Deliverables included layers such as School Proximity, Almonds Orchard Nitrates, Almond Orchard Age, Almond Orchard Ground water recharge Suitability, and Almond Orchard High Vulnerability Areas.

Web Map - Wonderful Orchards; Lost Hills, California. Responsible for compiling GIS layers regarding county parcels and agricultural commissioner fields dataset, as well as California Pesticide Use Report Data.

Statewide Avocado Mapping - California Avocado Commission; Irvine, California. Responsible for management of data and compiling final layers, acreages, and maps for the California Avocado Commission.