Irrigated Lands Regulatory Program (ILRP)
Kern County Coalitions' Joint Grower Education Meeting

Grower Education Meeting

Coalition Leads, Nicole Bell

Kern River Watershed Coalition Authority

Buena Vista Water Storage District (BVWSD)

Cawelo Water District Coalition

WWQC Westside Water Quality Coalition

Thursday, January 11, 2024

Kern Ag Pavilion, Bakersfield

Tuesday, January 16, 2024

Live Zoom Webinar

KRWCA

Nicole Bell, Manager
Kern River Watershed Coalition Authority
PO Box 151
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Website: www.krwca.org

Todays Agenda

1. Workshop introduction and coalition leads
2. Annual attendance, housekeeping items, grower reporting deadlines
3. CV-SALTS and Kern Water Collaborative
4. ILRP Farm: Nitrogen Analysis Report (NAR)
5. INMP Worksheet
6. Grower tools and resources
7. Grower INMP Self-certification and continuing education
8. ILRP Farm: Farm Builder, INMP Summary Report, Sign and Submit Page
9. Groundwater Protection Values and Targets; A/R Acceptable Ranges
10. Groundwater Quality Management Plan (GQMP)
11. Groundwater Quality Trend Monitoring Program (GTM)
12. Surface Water Monitoring Program
13. On-Farm Drinking Water Well Testing
14. Guest Speaker: Nitrogen and Irrigation Initiative

Kern ILRP Coalitions

- Buena Vista Coalition (BVC)
- Cawelo Water District Coalition (CWDC)
- Kern River Watershed Coalition Authority (KRWCA)
- Westside Water Quality Coalition (WWQC)

BVC

Tim Ashlock
Buena Vista Water Storage District
PO Box 756
Buttonwillow, CA 93206

Tel: (661) 206-1101
Fax: (661) 764-5053
Email: tim@bvh2o.com
Website: www.bvh2o.com

CWDC

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Cawelo Water District Coalition
17207 Industrial Farm Road
Bakersfield, CA 93308

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Email: dhalopoff@cawelowd.org
Website: www.cawelowd.org

WWQC

Morgan Campbell, Regulatory Manager
Westside Water Quality Coalition
5555 California Ave, Suite 209
Bakersfield, CA 93309

Office: (661) 663-9022
Cell: (805) 305-7072
Email: mcampbell@westsidewa.org
Website: www.wwqc.org

Annual Meeting Attendance NOW Required for ALL Members

- Did you **register** for all memberships, with each of the Coalitions?
  - If not, please provide the Membership name, ID Number and Coalition to cmancour@ppeng.com
- **REMINDER**: Annual attendance at an ILRP coalition-sponsored meeting is **required** for **ALL** Members as a condition of membership.

Meeting Attendance Required

Members shall:

- **Always register** at each meeting attended for each Membership, by providing member name and member #,
- Review outreach materials to become **informed of any water quality problems** to be addressed, **management practices** that are available to address those issues; and reporting requirements,
- **ALL** members **MUST** provide each Coalition with **Annual Certification** of the above.

ZOOM Webinar Posted on Website

- The Live Webinar will be recorded and posted to the KRWCA website at www.krwca.org (for ALL Kern County coalitions).
- The 2024 Winter Outreach Webinar Button will take you to YouTube where you can view the Webinar.
- Slides are available on the KRWCA website
- **IMPORTANT:** Be sure to complete the Grower Attendance Survey to receive credit for attendance.
  - Include ALL memberships that you represent on the Attendance Survey.
  - The Survey acts as your Verification of Attendance.
  - The Power Point Presentation will also be posted BUT viewing does not count towards meeting attendance.

Member Reports Due

- **No Farm Evaluation (FE) or Management Practices Implementation Report (MPIR) due for 2023 Crop Harvest Year.**
- **Irrigation Nitrogen Management Plan Worksheet (2024 Crop Harvest Year)**
  - Required to be completed by ALL members by March 1, 2024.
  - Certification is required for ALL farms with parcels designated in an HVA and/or "outlier".
  - Remains On-Farm: Is **NOT** submitted to the Coalition.
- **Irrigation & Nitrogen Management Plan Summary Report (2023 Crop Harvest Year)**
  - Now **required** to be completed by **ALL** members by March 1, 2024.
  - INMP Summary Report **IS** submitted to the Coalition through ILRP Farm.

Due Dates for Required Reports

Report	Vulnerability	Farm Size	Due Date	Renewal Frequency
Farm Evaluation	**Not due for 2023 Crop Harvest Year**			Five Years
Management Practice Implementation Report	**Not due for 2023 Crop Harvest Year**			Five Years
Irrigation and Nitrogen Management Plan Worksheet*	All *Certification REQUIRED if HVA membership or outlier	All	**March 1, 2024**	Annually
Irrigation and Nitrogen Management Plan Summary Report	All	All	**March 1, 2024**	Annually

March 1, 2024 Deadline

Please Note: There will be **NO EXTENSIONS** to the March 1, 2024 reporting deadline mandated by the Tulare Lake Basin General Order.

APN ENROLLMENT REMINDER

- All **farmed irrigated land** MUST be enrolled.
- **Newly purchased and/or leased** irrigated land must be enrolled once acquired.
- If you have not **paid your membership enrollment fees**, you MUST do so immediately or the **membership will be revoked** and reported to the Central Valley Regional Water Quality Control Board as dictated by the ILRP General Order Requirements.

CV-SALTS

CV-SALTS - Central Valley Salinity Alternatives for Long-Term Sustainability:

- Salt Compliance
  - Salt Control Program, P&O Study Participation
- Nitrate Compliance
  - Nitrate Control Program, Management Zone Participation through your ILRP Coalition for enrolled land

<u>*IMPORTANT</u>: ***CV-SALTS, Salt and Nitrate Compliance for enrolled land is handled by the Coalition on members behalf. For other WDRs related to your operations, it is your responsibility.***

KERN WATER COLLABORATIVE

The Kern Water Collaborative (KWC) was **established in 2022**, by various permitted discharger industries as the Kern County Management Zones (4) administrative entity.

- The KWC Board of Directors is made up of 11 industry representatives from; Irrigated Lands, Oil & Gas, Dairy/Cattle, Food Processors, and Publicly Owned Treatment Works (POTW).

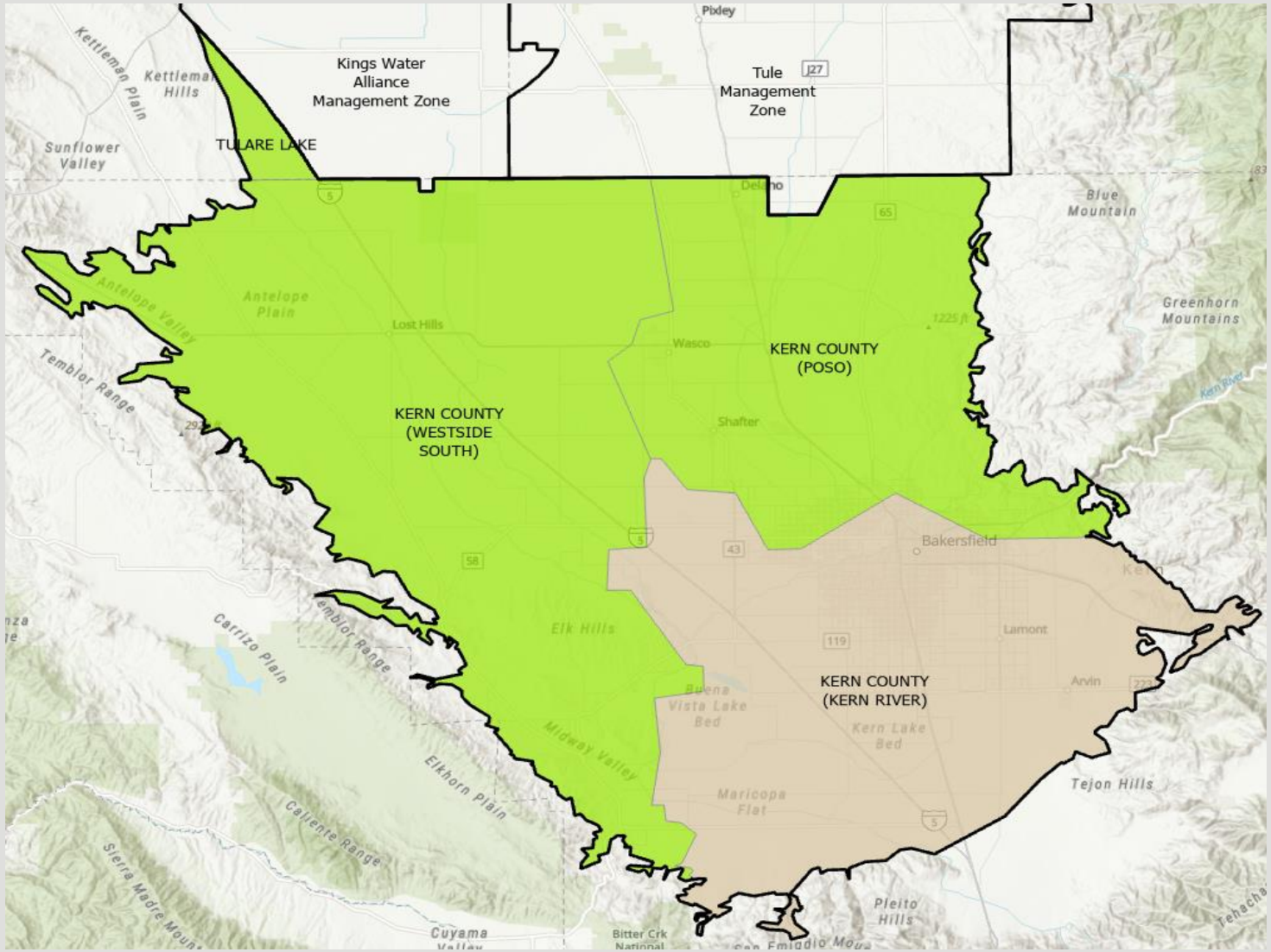
KERN WATER COLLABORATIVE

- The Kern Water Collaborative (KWC) will be administered and managed by KRWCA staff.
- The Kern Water Collaborative will be housed at the KRWCA Office.
- **Four Management Zones** will be managed by the KWC

KWC PROPOSED MZ BOUNDARIES

Proposed Management Zone:

- Small portion of one P2 subbasin
- 2 complete P2 subbasins
- 1 non-prioritized subbasin

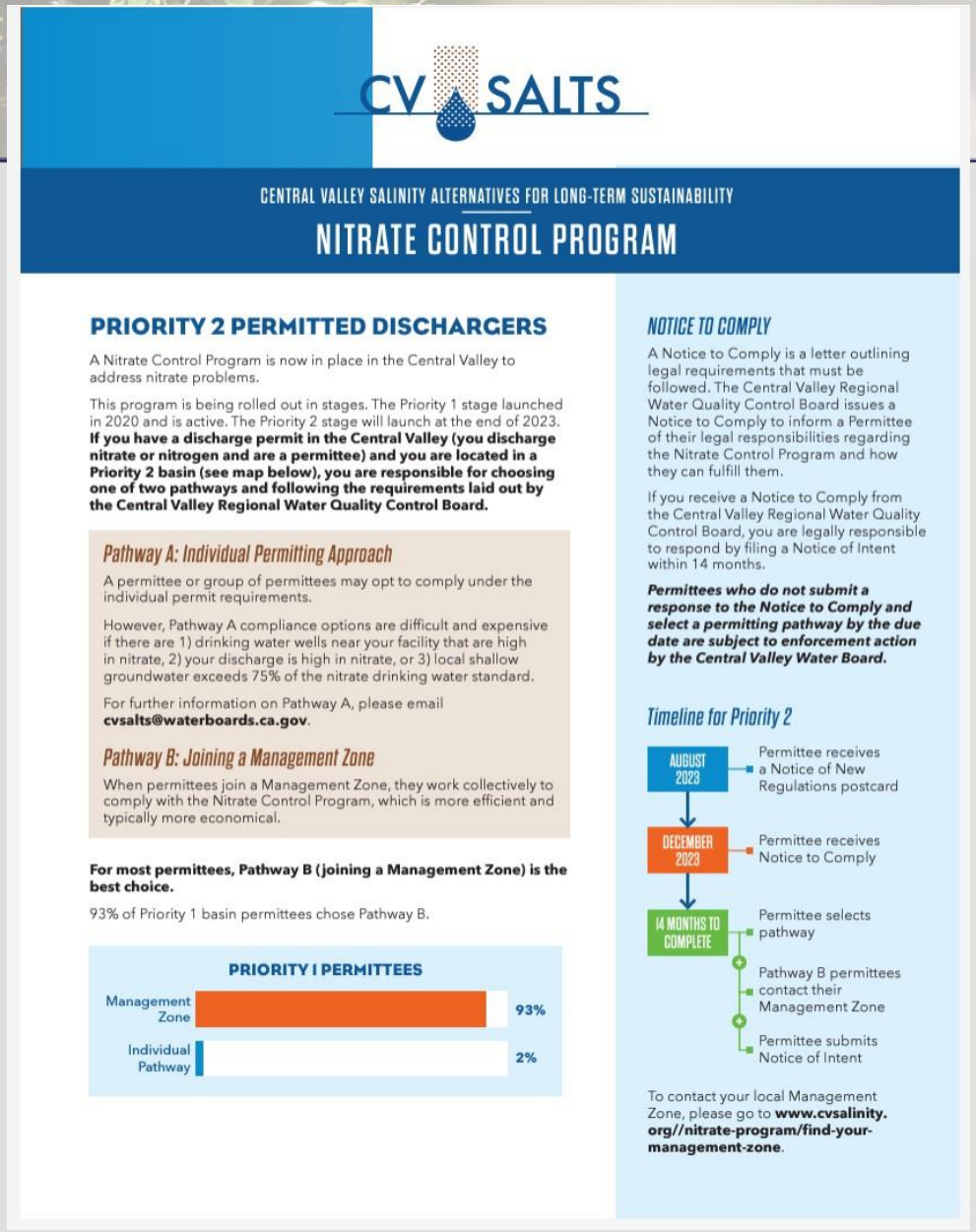


KWC PROPOSED MZ BOUNDARIES INCLUDE

KWC Boundary Contains:

- Tulare Lake P2 Subbasin
- Kern County (Westside South) P2 Subbasin
- Kern County (Poso) P2 Subbasin
- Non-Prioritized Kern County (Kern River) Subbasin

NITRATE CONTROL PROGRAM BROCHURE



CV SALTS

CENTRAL VALLEY SALINITY ALTERNATIVES FOR LONG-TERM SUSTAINABILITY

NITRATE CONTROL PROGRAM

PRIORITY 2 PERMITTED DISCHARGERS

A Nitrate Control Program is now in place in the Central Valley to address nitrate problems.

This program is being rolled out in stages. The Priority 1 stage launched in 2020 and is active. The Priority 2 stage will launch at the end of 2023. **If you have a discharge permit in the Central Valley (you discharge nitrate or nitrogen and are a permittee) and you are located in a Priority 2 basin (see map below), you are responsible for choosing one of two pathways and following the requirements laid out by the Central Valley Regional Water Quality Control Board.**

Pathway A: Individual Permitting Approach

A permittee or group of permittees may opt to comply under the individual permit requirements.

However, Pathway A compliance options are difficult and expensive if there are 1) drinking water wells near your facility that are high in nitrate, 2) your discharge is high in nitrate, or 3) local shallow groundwater exceeds 75% of the nitrate drinking water standard.

For further information on Pathway A, please email **cvsalts@waterboards.ca.gov**.

Pathway B: Joining a Management Zone

When permittees join a Management Zone, they work collectively to comply with the Nitrate Control Program, which is more efficient and typically more economical.

For most permittees, Pathway B (joining a Management Zone) is the best choice.

93% of Priority 1 basin permittees chose Pathway B.

NOTICE TO COMPLY

A Notice to Comply is a letter outlining legal requirements that must be followed. The Central Valley Regional Water Quality Control Board issues a Notice to Comply to inform a Permittee of their legal responsibilities regarding the Nitrate Control Program and how they can fulfill them.

If you receive a Notice to Comply from the Central Valley Regional Water Quality Control Board, you are legally responsible to respond by filing a Notice of Intent within 14 months.

Permittees who do not submit a response to the Notice to Comply and select a permitting pathway by the due date are subject to enforcement action by the Central Valley Water Board.

Timeline for Priority 2

To contact your local Management Zone, please go to **www.cvsalinity.org//nitrate-program/find-your-management-zone**.

NITRATE CONTROL PROGRAM BROCHURE

Priority 2 Permitted Dischargers

Why Are Permittees Responsible for Participating in This Program?

Most of the nitrate accumulating in the groundwater comes from sources such as fertilizer, manure, wastewater treatment, septic systems, and others. In the Central Valley, 90% of residents rely on groundwater wells for drinking water, and some of this supply is now unsafe. The Central Valley Regional Water Board implemented new regulations for permittees (growers, dairies, municipalities, food processors, etc.) to participate in projects that provide safe drinking water. In exchange, those providing safe drinking water are provided more options and time to collaborate to achieve nitrate compliance.

To streamline resources while addressing nitrate management issues, groundwater basins in the Central Valley have been grouped into three categories for nitrate management. The highest priority areas with the most affected drinking water supplies were addressed first. These Priority 1 areas are located in these Basins or Subbasins: Chowchilla, Kaweah, Kings, Modesto, Tule, and Turlock.

Now, **Priority 2 areas are being addressed**. This may include you.

Permittees in Priority 2 areas include:

- Food Processors
- Wineries
- Poultry
- Dairy and Bovine
- Oil & Gas
- Irrigated Agriculture
- Non-Chapter 15 POTWs
- Industries
- Recycled Water Permittees

Priority 2 groundwater basins/subbasins are Delta-Mendota, Eastern San Joaquin, Kern County (Poso), Kern County (West-side South), Madera, Merced, Tulare Lake, and Yolo. See map and link for more information.

Please go to **www.cvsalinity.org//nitrate-program/find-your-management-zone** for an interactive map of Priority 2 Basins/Subbasins and Management Zones.

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NITRATE CONTROL PROGRAM BROCHURE

Management Zones

What is a Management Zone?

A Management Zone is a formally defined area with specific boundaries where permittees agree to work collaboratively to provide safe drinking water and to manage nitrate. Flexibility, local discretion, and cooperation are hallmarks of the Management Zone approach.

Through this choice, the new Nitrate Control Program recognizes diverse demographic, climate, hydrologic, and geologic conditions and allows local interests to determine the best steps for providing safe drinking water, managing nitrate discharges, and safeguarding water resources and the economy.

Choosing Pathway B and joining a management zone provides permittees with the simplest, most manageable compliance option. By choosing this pathway, permittees avoid the rigorous, complex requirements of the traditional Pathway A.

Management Zone Responsibilities

- Conducting outreach to affected residents and communities, elected officials, and community leaders.
- Identifying potentially affected residents and ensuring they have an opportunity to participate in designing and accessing proposed long-term safe drinking water solutions.
- Developing specific actions for providing interim replacement drinking water to affected residents within the Management Zone. Key things to consider:
  - Input from local communities.
  - Types of facilities and operational agreements with water filling stations or vendor-supplied facilities.
  - Alternatives such as home bottled water delivery or point-of-use treatment.
  - Well water sampling and groundwater quality analyses.
- Developing and managing a Management Zone Implementation Plan to control nitrate discharges and identify long-term drinking water solutions.
- Preparing and implementing an Early Action Plan that looks to test wells and provide alternative drinking water at no cost to the resident if the well exceeds drinking water standards.

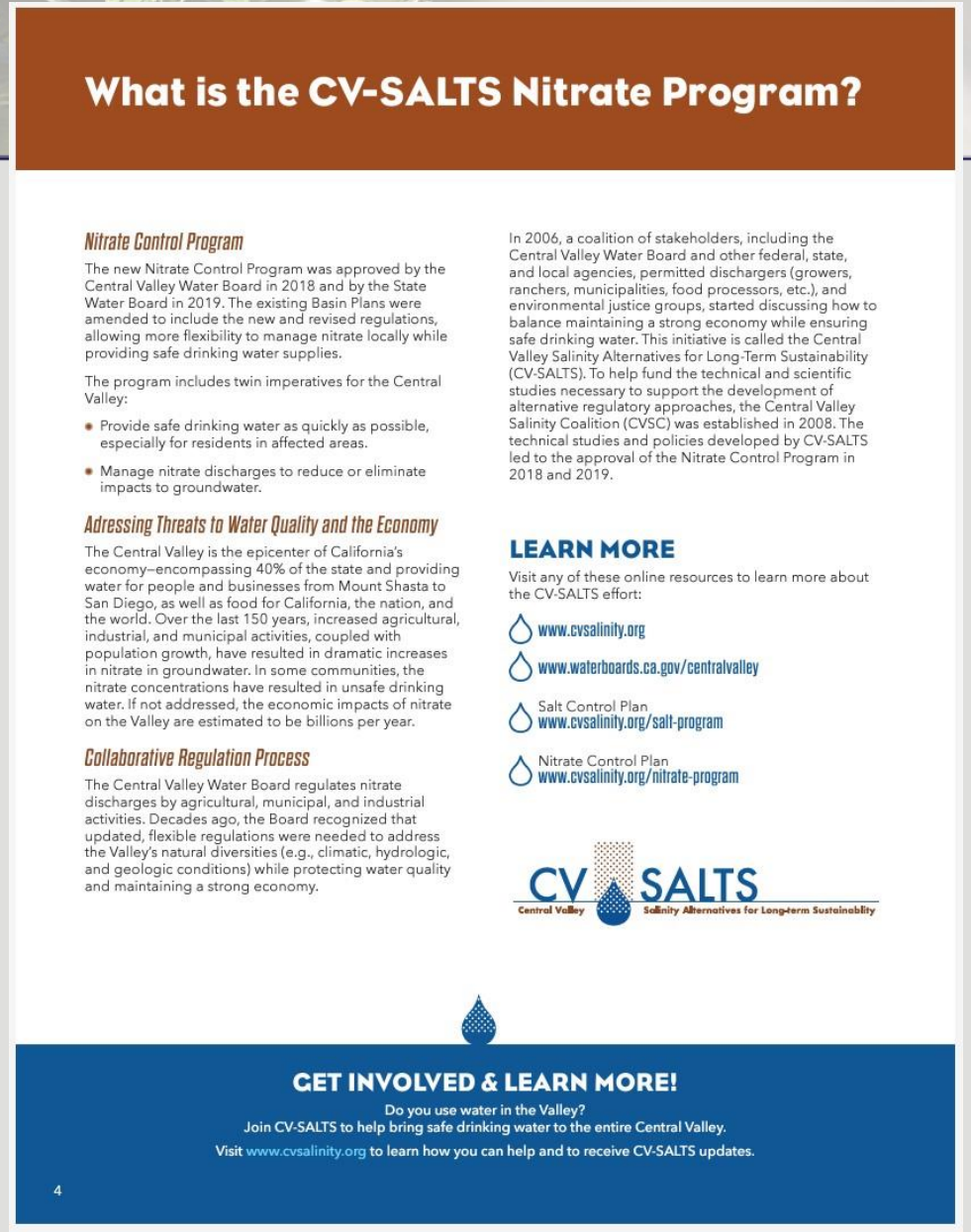
Advantages of Joining a Management Zone

Joining a Management Zone offers water quality permit holders a chance to work together and achieve mutual benefits such as:

1. **Less cost.** Meeting regulatory objectives through shared resources and economies of scale reduces costs for individual permittees.
2. **More time.** Participating in a Management Zone earns permit holders more time to meet Nitrate Control Program objectives.
3. **Fewer headaches.** Being part of a Management Zone lightens the burden for individual permit holders by transferring much of the required technical work to experts working for the collaborative.
4. **More flexibility.** Through Management Zones, permittees can tailor solutions for safe drinking water and nitrate management to local conditions.

3

NITRATE CONTROL PROGRAM BROCHURE



What is the CV-SALTS Nitrate Program?

Nitrate Control Program

The new Nitrate Control Program was approved by the Central Valley Water Board in 2018 and by the State Water Board in 2019. The existing Basin Plans were amended to include the new and revised regulations, allowing more flexibility to manage nitrate locally while providing safe drinking water supplies.

The program includes twin imperatives for the Central Valley:

- Provide safe drinking water as quickly as possible, especially for residents in affected areas.
- Manage nitrate discharges to reduce or eliminate impacts to groundwater.

Adressing Threats to Water Quality and the Economy

The Central Valley is the epicenter of California's economy–encompassing 40% of the state and providing water for people and businesses from Mount Shasta to San Diego, as well as food for California, the nation, and the world. Over the last 150 years, increased agricultural, industrial, and municipal activities, coupled with population growth, have resulted in dramatic increases in nitrate in groundwater. In some communities, the nitrate concentrations have resulted in unsafe drinking water. If not addressed, the economic impacts of nitrate on the Valley are estimated to be billions per year.

Collaborative Regulation Process

The Central Valley Water Board regulates nitrate discharges by agricultural, municipal, and industrial activities. Decades ago, the Board recognized that updated, flexible regulations were needed to address the Valley's natural diversities (e.g., climatic, hydrologic, and geologic conditions) while protecting water quality and maintaining a strong economy.

In 2006, a coalition of stakeholders, including the Central Valley Water Board and other federal, state, and local agencies, permitted dischargers (growers, ranchers, municipalities, food processors, etc.), and environmental justice groups, started discussing how to balance maintaining a strong economy while ensuring safe drinking water. This initiative is called the Central Valley Salinity Alternatives for Long-Term Sustainability (CV-SALTS). To help fund the technical and scientific studies necessary to support the development of alternative regulatory approaches, the Central Valley Salinity Coalition (CVSC) was established in 2008. The technical studies and policies developed by CV-SALTS led to the approval of the Nitrate Control Program in 2018 and 2019.

LEARN MORE

Visit any of these online resources to learn more about the CV-SALTS effort:

- www.cvsalinity.org
- www.waterboards.ca.gov/centralvalley
- Salt Control Plan www.cvsalinity.org/salt-program
- Nitrate Control Plan www.cvsalinity.org/nitrate-program

CV SALTS
Central Valley Salinity Alternatives for Long-term Sustainability

GET INVOLVED & LEARN MORE!

Do you use water in the Valley?
Join CV-SALTS to help bring safe drinking water to the entire Central Valley.
Visit www.cvsalinity.org to learn how you can help and to receive CV-SALTS updates.

4

CV-SALTS

- Go to cvsalinity.org for more information about CV-SALTS Salt and Nitrate Compliance Requirements.
  - The KWC website will be linked to cvsalinity.org and krwca.org once it's established.

QUESTIONS

D. Ryan Dodd, CPSS, CPAg, CCA, TSP

Scientist/Soil Scientist/Agronomist

1. ILRP Farm Online Regulatory Form Submission
2. Emerging Regulatory Changes
3. Groundwater Trend Monitoring Program
4. Surface Water Monitoring Program
5. On Farm Drinking Water Well Monitoring

Regulatory Form Process for Crop Harvest Year 2023

(*INMP SR due to Coalition by March 1, 2024*)

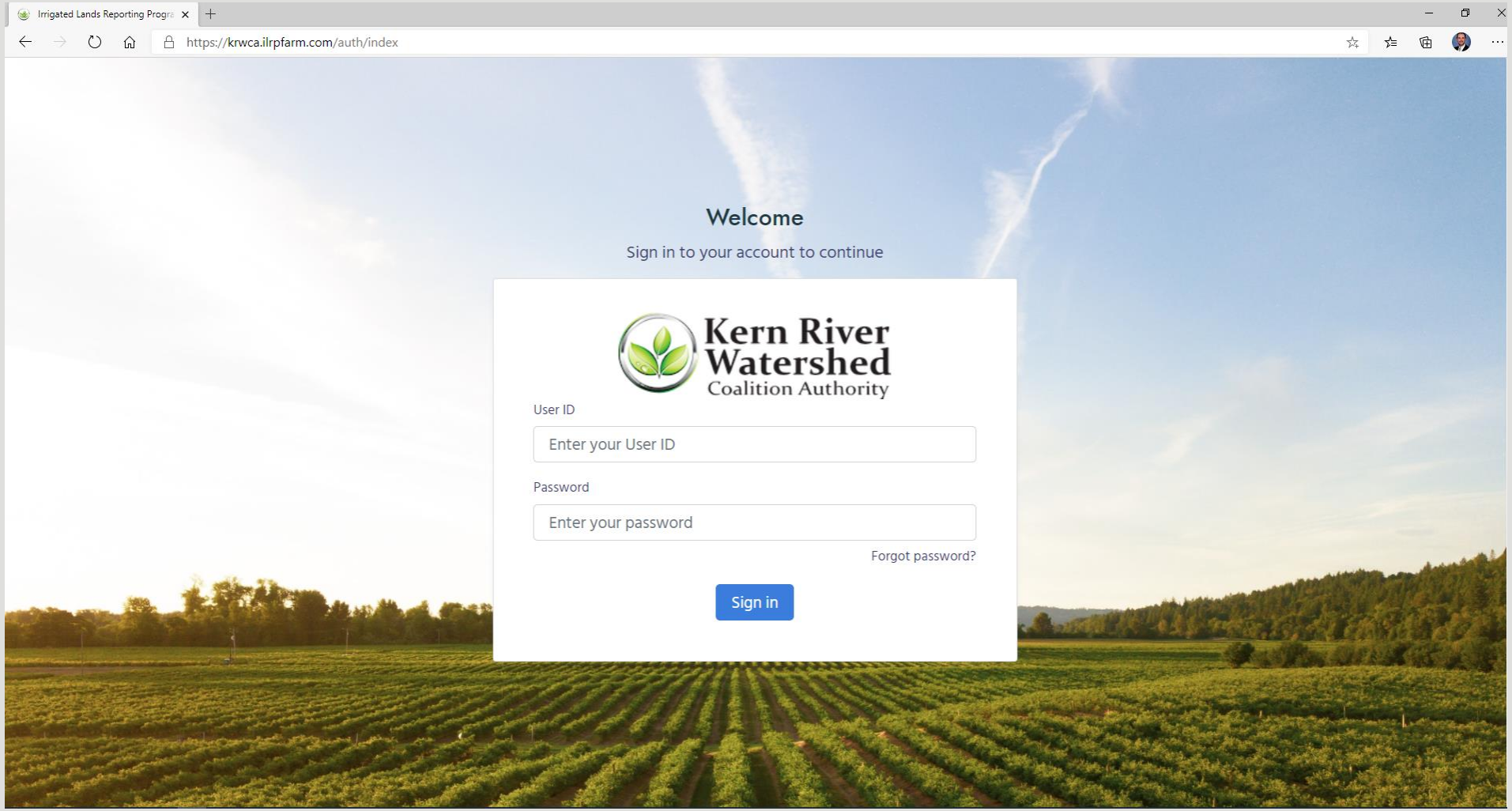
Regulatory Form Reporting Process – ILRP Farm

1. Login to ILRP Farm
2. Build your farm in “Farm Builder”
3. Complete the 2022 Crop Harvest Year INMP Summary Report
4. Sign and Submit
5. Review 2022 Crop Harvest Year Outlier Status

ILRP Farm: Online Submissions

Member Menus

- Member Profile
- Nitrogen Analysis Report
- Invoice
- Farm Builder
- INMP Summary Report
  - Irrigation & Nitrogen Management Practices
  - INMP Summary Report
- Sign & Submit

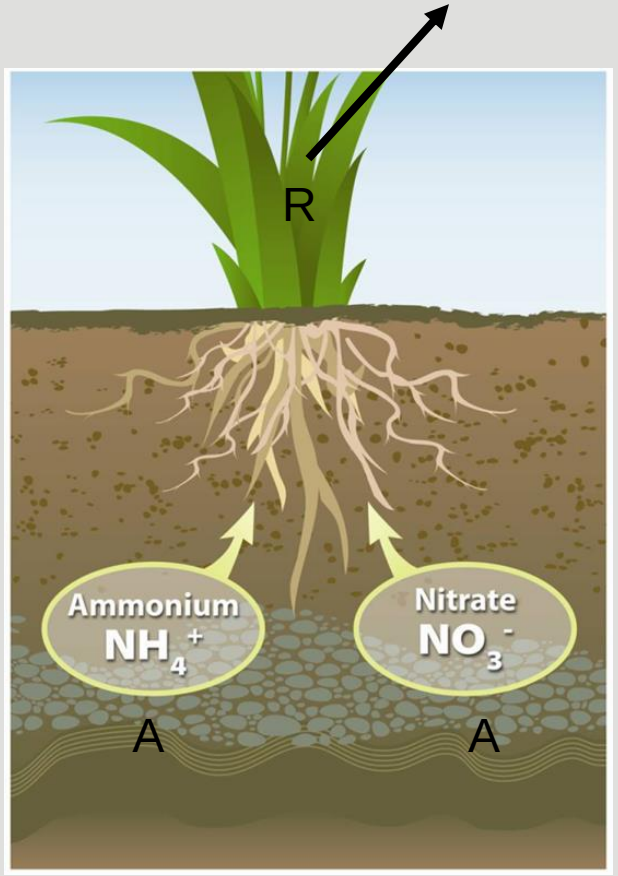


INMP Step 1: Review Nitrogen Analysis Report (NAR)

Review NAR for any issues from previous year (e.g., outliers, errors, etc.), try to fix them during the upcoming year

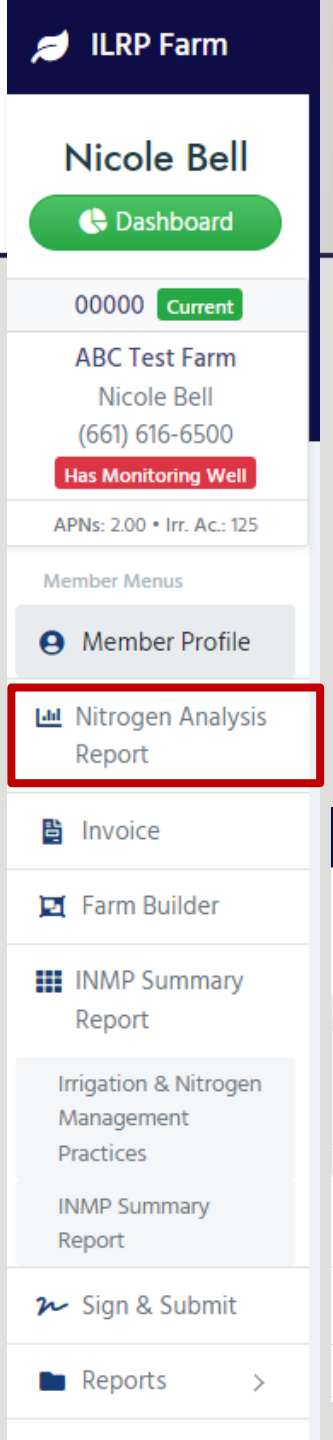
What is A/R and A-R?

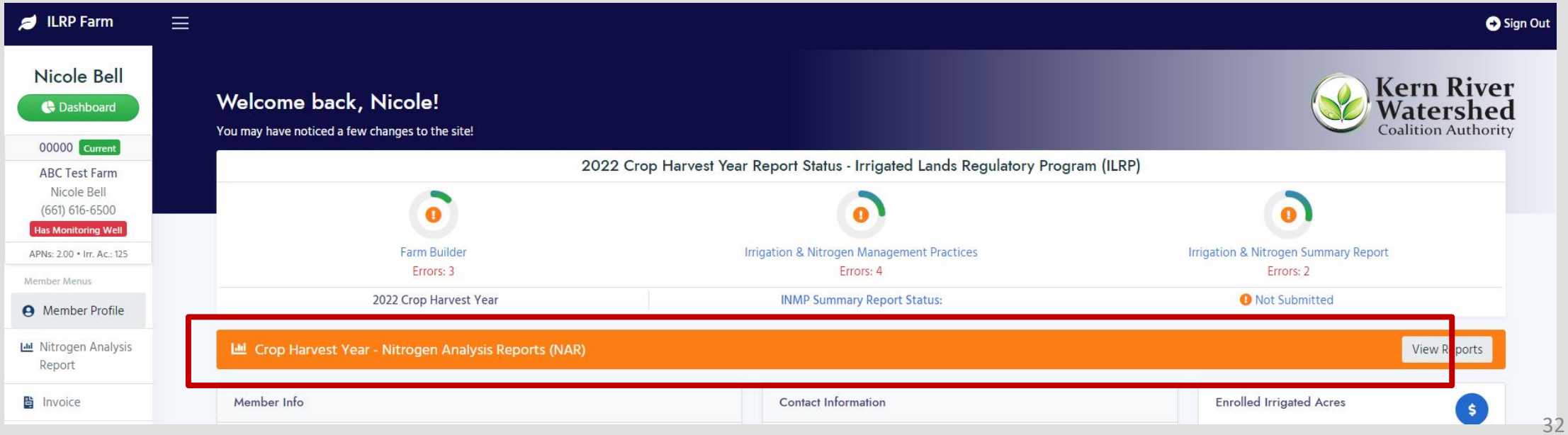
- **A** = Total **applied** nitrogen
- **R** = Nitrogen **removed** from the field + sequestered in permanent tissue
- Metrics used for nitrogen use **efficiency**
- Possible future **regulatory metric**
  - For example, Dairy General Order A/R limit of 1.4 to 1.65
- Appropriate ranges <u>are being developed</u>



INMP Step 1: NAR

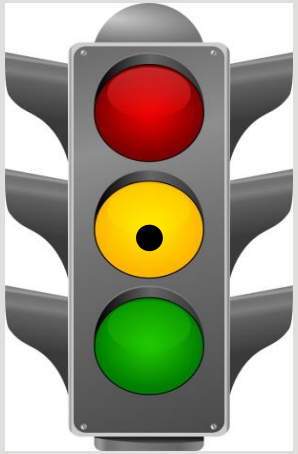
- **NAR accessible via ILRP Farm** (previous years available)
- **Two ways to access:**
  - **Dashboard**
  - **Left navigation tool bar**





INMP Step 1: NAR - Layout

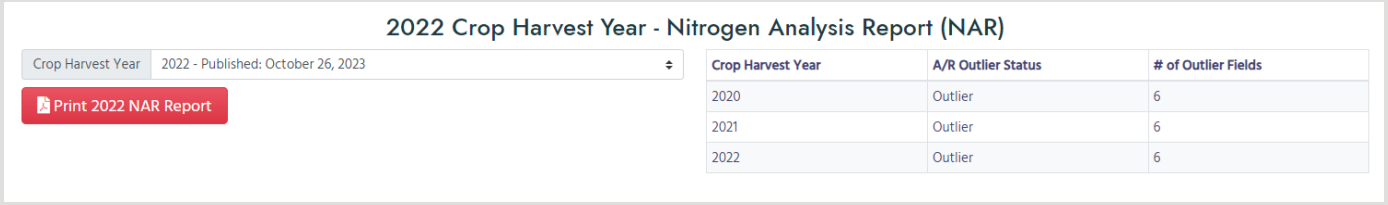
1. General Member info
2. Select Crop Harvest Year, print, historical outlier status
3. FAQs
4. Current outlier status & legend
5. Outlier fields (when applicable)
6. Main NAR table and graphs

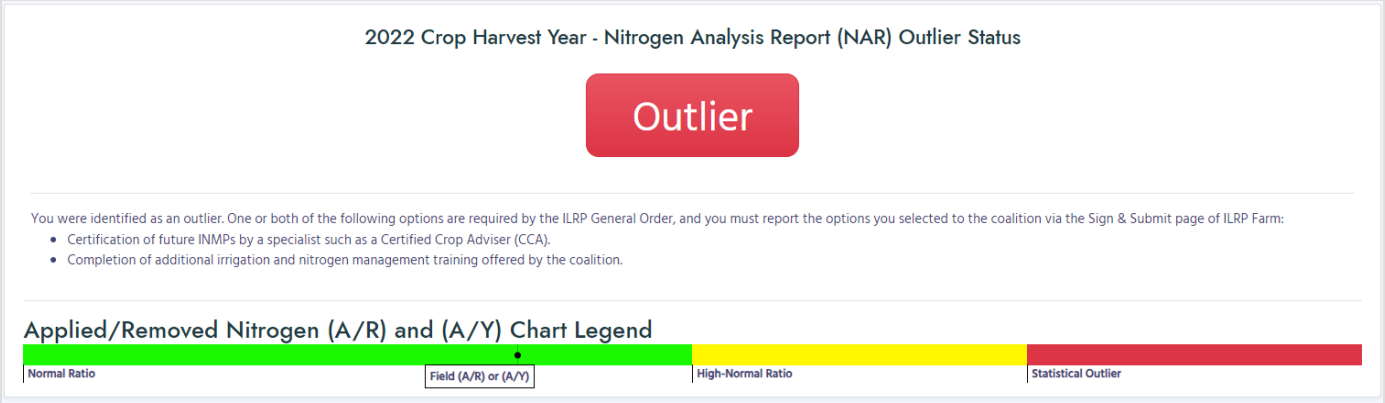


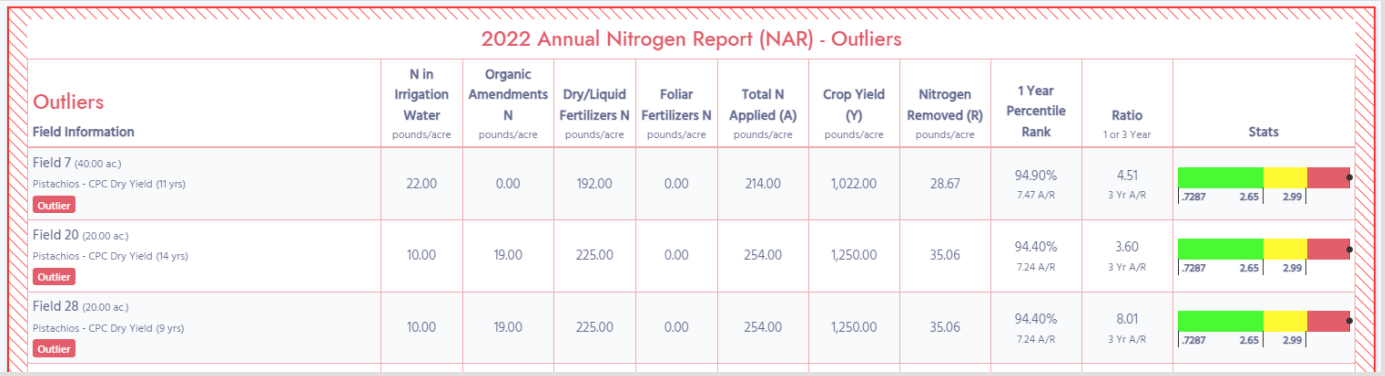
error

warning

OK







Tools and Resources

What do I do if I didn't make any errors, but I still have outlier fields?

1. Must certify future INMP Worksheets
2. Review information with coalition and CCA
3. California Fertilization Guidelines (Google)
   http://geisseler.ucdavis.edu/Guidelines/Home.html
4. CropManage: https://cropmanage.ucanr.edu/
5. UC Nitrogen Course: https://ucanr.edu/sites/nitrogencourse/
6. Nitrogen and Irrigation Initiative (NII): https://ucanr.edu/sites/nii/
7. Southern San Joaquin Valley Management Practices Evaluation Program (**SSJV MPEP**) agmpep.com

Tools and Resources

http://geisseler.ucdavis.edu/Guidelines/N_Uptake.html

A collaboration between

cdfa

FERTILIZER RESEARCH AND EDUCATION PROGRAM FREP

UCDAVIS UNIVERSITY OF CALIFORNIA

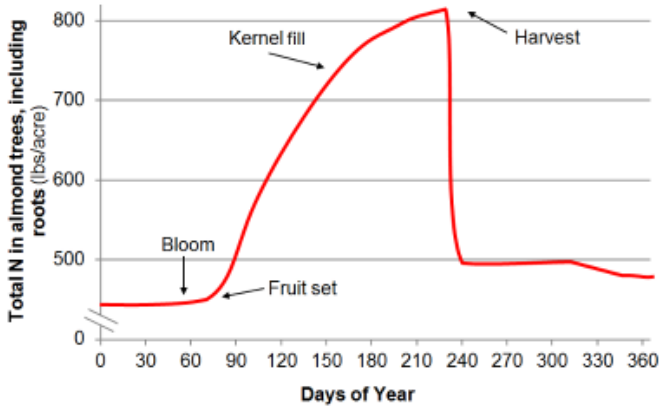
- Guidelines Home
- Nitrogen Removal Report

Crops

- **Overview**
- Almonds
- Avocado
- Barley
- Broccoli
- Carrot
- Cauliflower
- Celery
- Citrus
- Corn for Grain

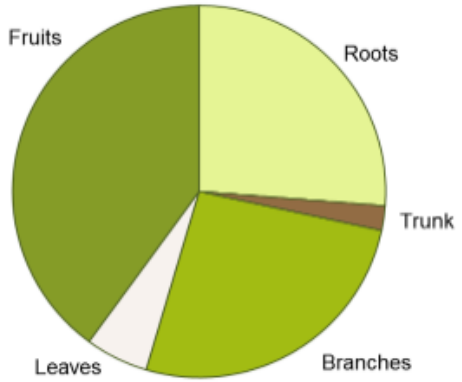
Almond Nitrogen Uptake and Partitioning

Seasonal N Uptake



Changes in almond orchard N balance in annual and perennial organs as determined by sequential tree excavation and serial sampling of all organs scaled to a whole-orchard basis. Samples were taken in an orchard

Nitrogen Partitioning



Nitrogen distribution in 13-year old almond trees with a kernel yield of 4,800 lbs [4].

Nitrogen and Irrigation Initiative

Free on-farm consultations

https://ucanr.edu/sites/nii/

University of California
Agriculture and Natural Resources

SIGN UP NOW: FREE ON-FARM CONSULTATIONS

Through a program called the Nitrogen and Irrigation Initiative (NII), farm advisors are working with growers to identify management practices, monitoring techniques, and infrastructural upgrades that can reduce nitrogen fertilizer and irrigation use without compromising yield or quality. During an NII on-farm consultation, farm advisors will provide individualized recommendations and assist growers with implementing efficient practices.

Kern County Farm Advisor: Mohammad Yaghmour

Nitrogen Fertilizer Practices

- Testing nitrogen in irrigation water
- Leaf and soil sampling
- Split fertilizer applications
- Using a nitrogen budget
- Application of compost or manure
- Planting cover crops
- Fertigation

Irrigation Practices

- Soil moisture sensors
- Estimating evapotranspiration
- Irrigation scheduling
- Irrigation system maintenance
- Testing distribution uniformity
- Using pressure chambers

Schedule Now

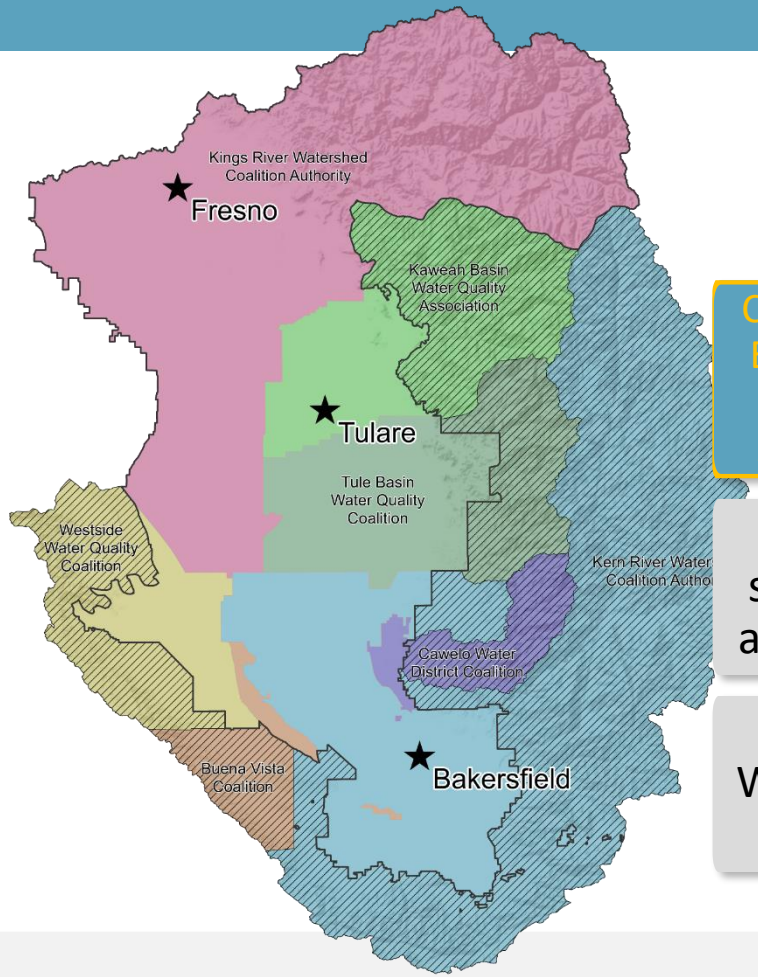
To schedule an on-farm consultation contact Mohammad Yaghmour, Kern County Farm Advisor: mayaghmour@ucanr.edu

INTEGRATED WATER & NITROGEN MANAGEMENT

TRAININGS

Feb 2025 & 2026

THE SOUTHERN SAN JOAQUIN VALLEY
MANAGEMENT PRACTICES EVALUATION PROGRAM



Continuing Education Credits Available

A 3-part curriculum will be delivered in collaboration with UC experts

Who should attend?

Growers, farm managers, other farm staff, crop advisors, consultants, and technical service providers are welcome.

Where?

Fresno, Tulare, Bakersfield

Online content delivered on agmpep.com

- Overview of the regulatory landscape and the connection between management and groundwater quality at the landscape scale.
- Irrigation efficiency and nutrient management content for nut and fruit trees, citrus, grapes, forage and grains, and row crops.
- Decision-support tool tutorials for CropManage.

Funded by CDFA Water Efficiency Technical Assistance

Irrigation and Nitrogen Management Plan (INMP) Worksheet

Visit the KRWCA YouTube page for past outreach videos: https://www.youtube.com/@krwca

Watch the 2021 webinar for a detailed example of how to complete the INMP worksheet. Not going through all details in this presentation.

2021 Webinar: https://www.youtube.com/watch?v=UHwkbwmMOhA

IRRIGATION AND NITROGEN MANAGEMENT PLAN (INMP) WORKSHEET

Member ID #: 00000 **Member Name:** ABC Test Farm

Was this management unit identified as a statistical outlier by the Coalition last year?
☐ Yes ☑ No

Crop Year (Harvested): 2024

PARCEL MANAGEMENT

Management Unit (MU) or Field	APN	County	Crop	Crop Age (Years)	Irrigated Acres
Almond 1	002-002-02	Kern	Almonds	10	80
				Total Acres:	80

Comments/Notes:

-All 80 acres managed the same.
-One irrigation well (NO3-N=5 ppm from ag lab); No district water.
-CIMIS ETo Zone 15. Crop ET from Almond Irrigation Improvement Continuum.
-Assuming steady state soil nitrogen conditions.
-Nitrogen Use Efficiency (NUE)=70%.
-Nitrogen Removed 68 lbs N/1000 lbs kernels = 25 lbs/acre for tree growth
-Assumed Distribution Uniformity=0.9; no runoff.
-Assumed Leaching Requirement=5%.

I N M P

IRRIGATION AND NITROGEN MANAGEMENT PLAN (INMP) WORKSHEET

IRRIGATION AND NITROGEN MANAGEMENT PLAN (INMP) WORKSHEET

Member ID: 00000 INMP Field or MU: Almond 1 Crop: Almond Total Acres: 80

IRRIGATION MANAGEMENT

1. Irrigation Method*
(check one for Primary; if applicable, check one for Secondary)

Primary	Secondary[1]	
☑	☐	Drip
☐	☐	Micro Sprinkler
☐	☐	Furrow
☐	☐	Sprinkler
☐	☐	Border Strip
☐	☐	Flood

Pre-Season Planning

2. Crop Evapotranspiration (ET, inches)	54
3. Anticipated Crop Irrigation (inches)	64.5
4. Irrigation Water N Concentration (ppm or mg/L, as NO_3-N)	5

5. Irrigation Efficiency Practices* (Check all that apply)

- ☑ Laser Leveling
- ☑ Use of ET in scheduling irrigations
- ☑ Water application schedule to need
- ☑ Use of moisture probe (e.g. tensiometer)
- ☐ Soil Moisture Neutron Probe
- ☑ Pressure Bomb
- ☑ Other NRCS By Feel Method
- ☐ Other

HARVEST / YIELD INFORMATION

Harvest / Yield Information			Expected (A)	Actual (B)
6. Production Unit (lbs, tons, etc.)	pounds	**7. Harvested Yield***	2200	2000

NITROGEN MANAGEMENT

8. Nitrogen Efficiency Practices* (Check all that apply)

- ☑ Split Fertilizer Applications
- ☑ Irrigation Water N Testing
- ☑ Soil Testing
- ☑ Tissue/Petiole Testing
- ☑ Fertigation
- ☑ Foliar N Application
- ☐ Cover Crops
- ☐ Variable Rate Applications using GPS
- ☑ Other: Nutrient Mgmt Plan
- ☑ Other: Early season N model

Nitrogen Sources	Recommended/ Planned N (A)	Actual N (B)
9. Soil – Available N in Root Zone (Annualized, lbs/ac)	0	0
10. N in Irrigation Water* (Annualized, lbs/ac)	61	50
11. Organic Amendments* (Manure/Compost/Other, lbs/ac estimate)	0	0
12. Dry/Liquid Fertilizer N* (lbs/ac)	178	170
13. Foliar Fertilizer N* (lbs/ac)	10	10
14. TOTAL NITROGEN (lbs/ac)	249	230

[1] A secondary irrigation system could be used for crop germination, frost protection, crop cooling, etc.
***(Bold Text)** Data to be reported to the Coalition on the INMP Summary Report, based on Actual Yield and Actual N.

Plan Certifier Initials: tmm

INMP Worksheet Certification and Continuing Education Requirements

- **ALL** memberships with at least one High Vulnerability Area (HVA) parcel must certify their INMP Worksheets via:
  - *Professionals* listed in the WDR (not PCAs)
  - *Grower Self-Certification* (if NMP/INMP Self-Certification course completed)

CERTIFIED CROP ADVISER

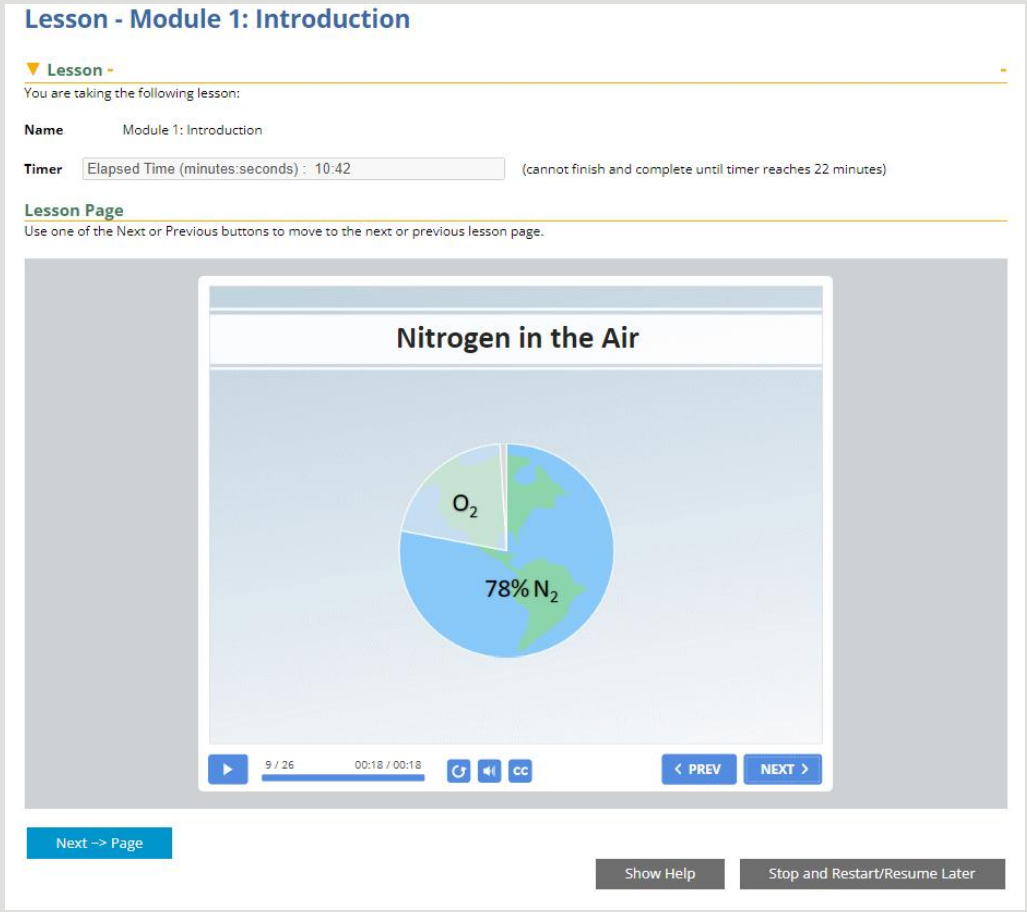
CPSS
Certified Professional Soil Scientist

cdfa

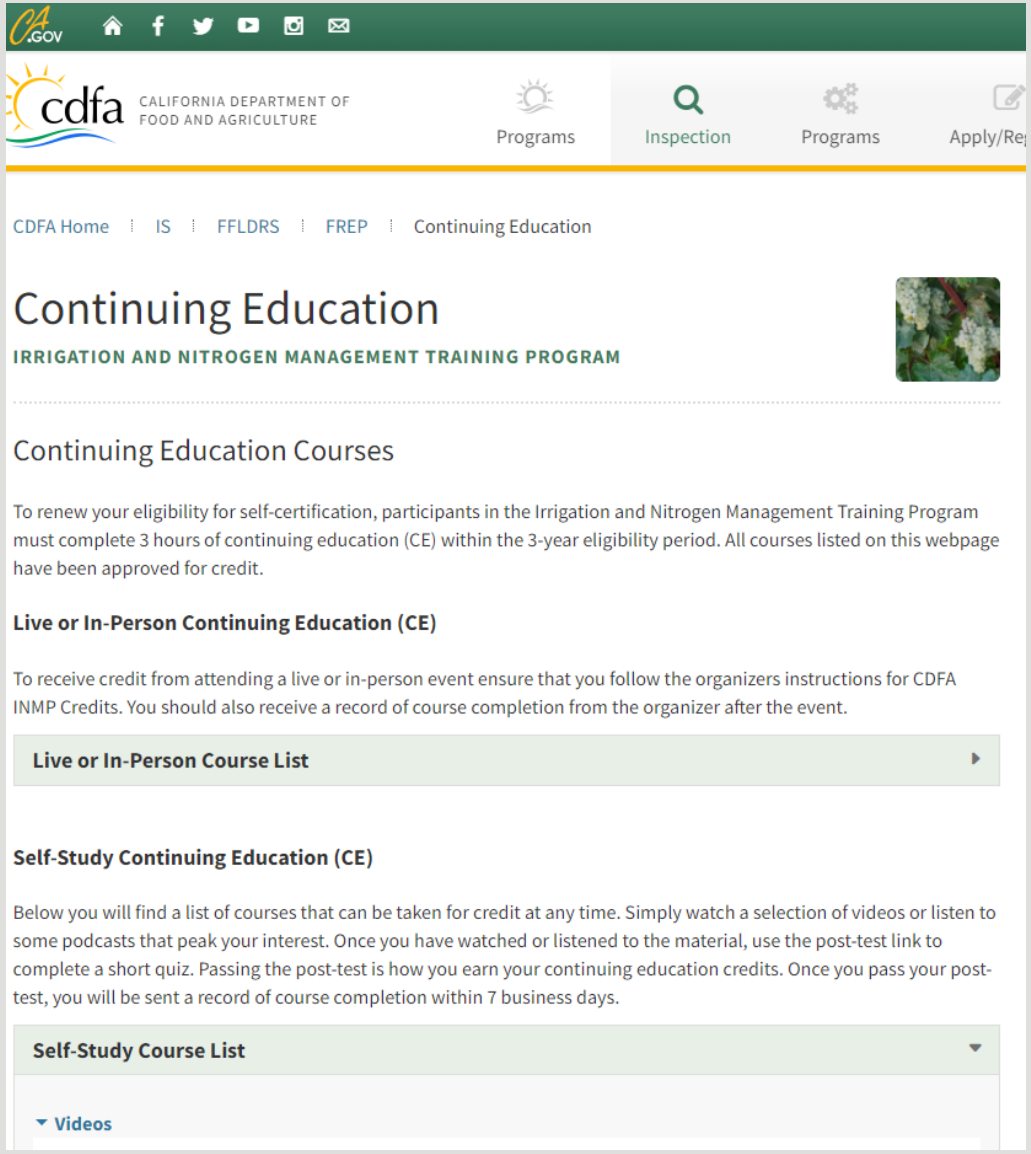
- Low Vulnerability Area growers must now certify INMP Worksheet if they have nitrogen **outlier fields**, as identified via NARs
- **Continuing Education Units** (CEUs): 3 hours every 3-year cycle (according to your certification date)

INMP Grower Self-Certification Program – Online Course

- **New** (as of 2022) online and on-demand course now available
- 2-3 hours, 30 question exam
- Pass and you are self-certified for 3-years
- Detailed INMP training workbook available
- Should help with improved irrigation and nitrogen management
- https://www.cdfa.ca.gov/is/ffldrs/frep/training.html



INMP: Certification & Continuing Education



Website of approved CEU courses:

https://www.cdfa.ca.gov/is/ffldrs/frep/continuing_education.html

or search:
“cdfa frep continuing education”

Regulatory Form Reporting Process – ILRP Farm

1. Login to ILRP Farm
2. Build your farm in “Farm Builder”
3. Complete the 2023 Crop Harvest Year INMP Summary Report
4. Sign and Submit
5. Review 2022 Crop Harvest Year Outlier Status

ILRP Farm: Farm Builder

2023 Crop Harvest Year - Farm Builder

Locked

Build out your field list, associate crop information, and assign apns acres

125 ac. of 125 — Enrolled Irrigated Acres: 0 ac. Remaining

2 of 2 — APNs Associated: 0 Remaining

Farm Builder Status: 0 Issues

No Issues Found!

2023 Crop Harvest Year • Not Submitted

Grouped by Field | Grouped by APN | Only Show Issues

Fields

Add New Field

Export Farm Builder

Type to Search | Clear

Nursery Field 1 80 ac. — Organic

Carrots — Pri. Sprinkler

002-002-02
80 ac.

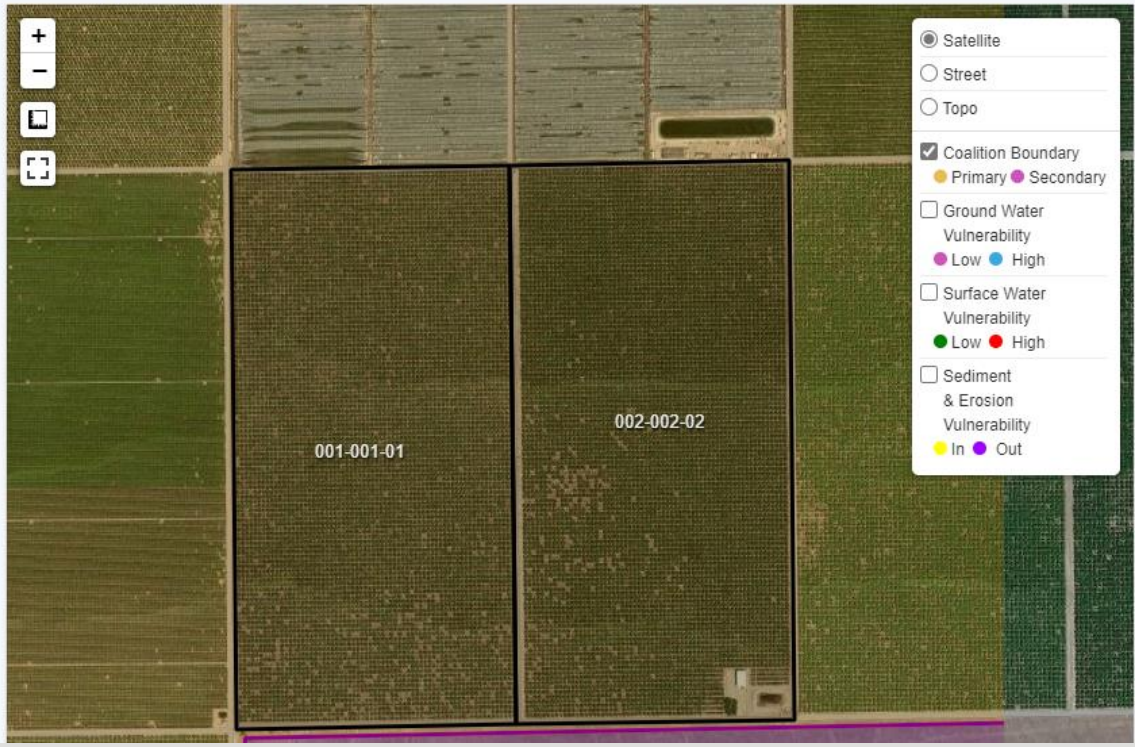
tesat 45 ac. — Organic

Pistachios - CPC Dry Yield — Pri. Furrow

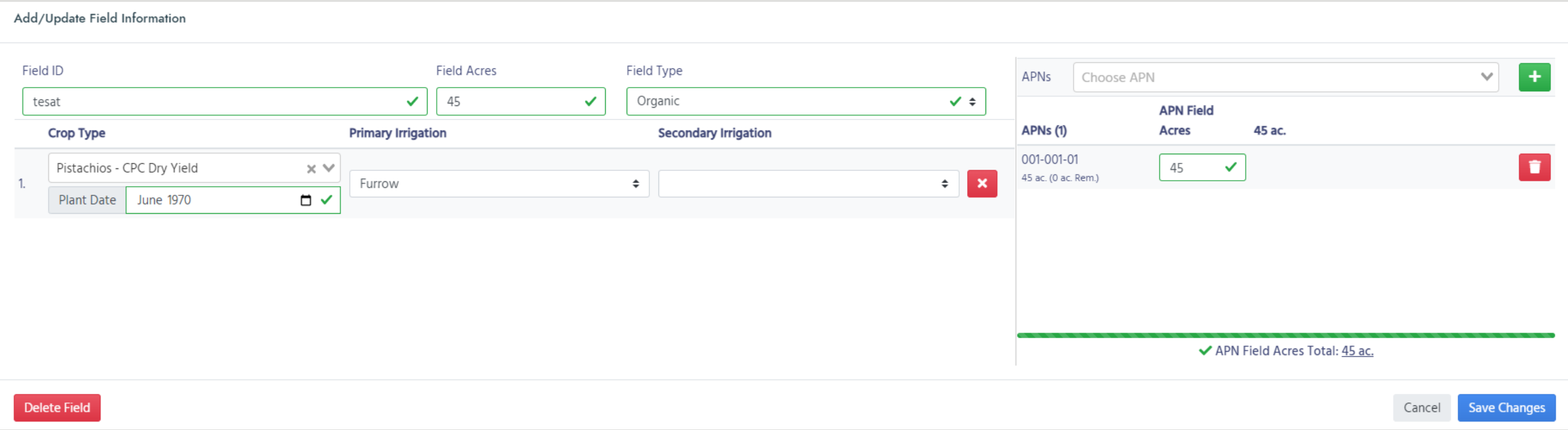
Planted: 1970-06

001-001-01
45 ac.

Status Bar: Changes will be saved automatically when options on the page are changed

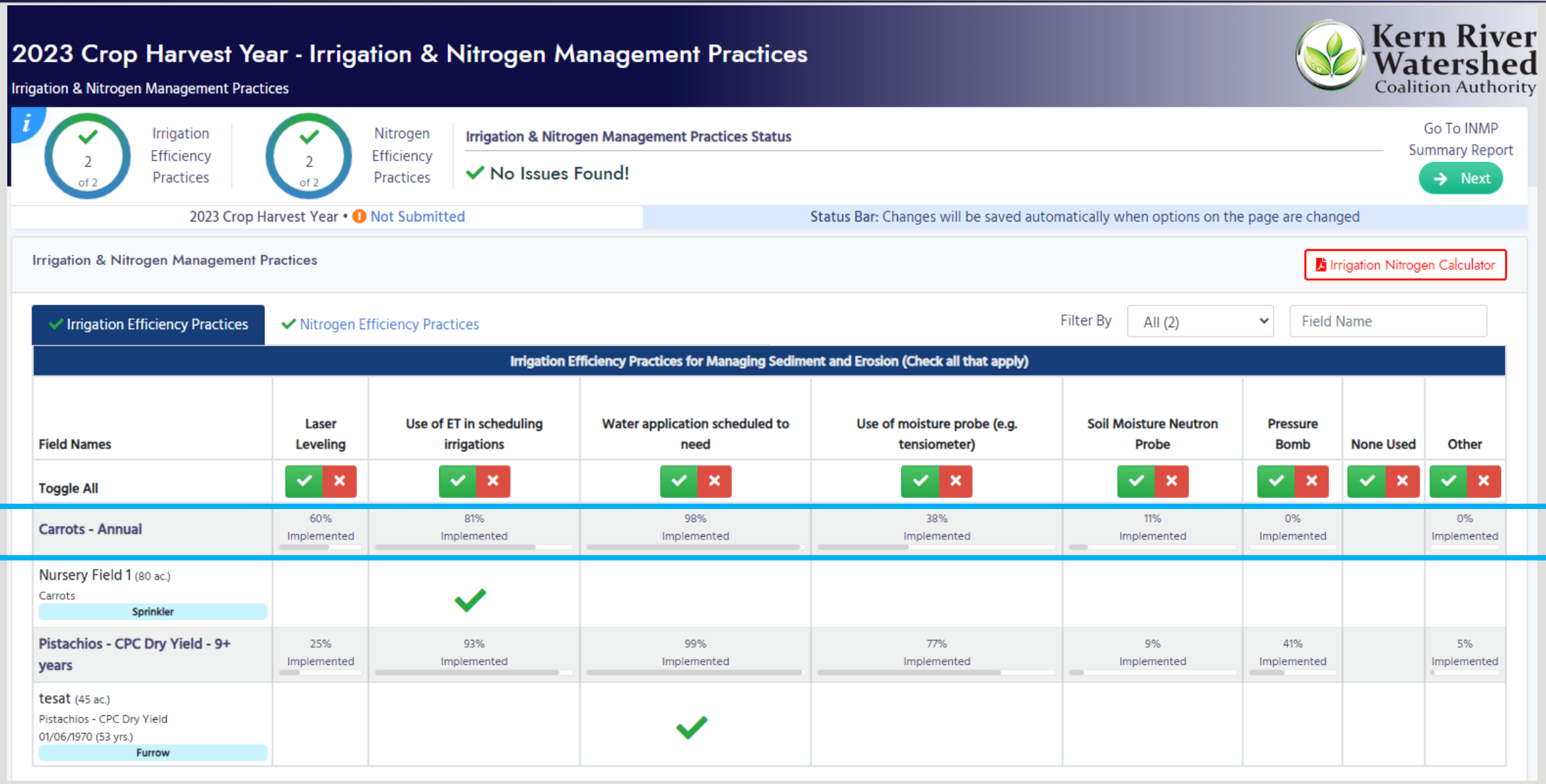


ILRP Farm: Farm Builder – Edit Field Details



Irrigation and Nitrogen Management Plan (INMP) Summary Report

ILRP Farm: Survey Questions 1



2023 Crop Harvest Year - Irrigation & Nitrogen Management Practices

Irrigation & Nitrogen Management Practices

Kern River Watershed Coalition Authority

2 of 2 Irrigation Efficiency Practices

2 of 2 Nitrogen Efficiency Practices

Irrigation & Nitrogen Management Practices Status

No Issues Found!

Go To INMP Summary Report

Next

2023 Crop Harvest Year • Not Submitted

Status Bar: Changes will be saved automatically when options on the page are changed

Irrigation & Nitrogen Management Practices

Irrigation Nitrogen Calculator

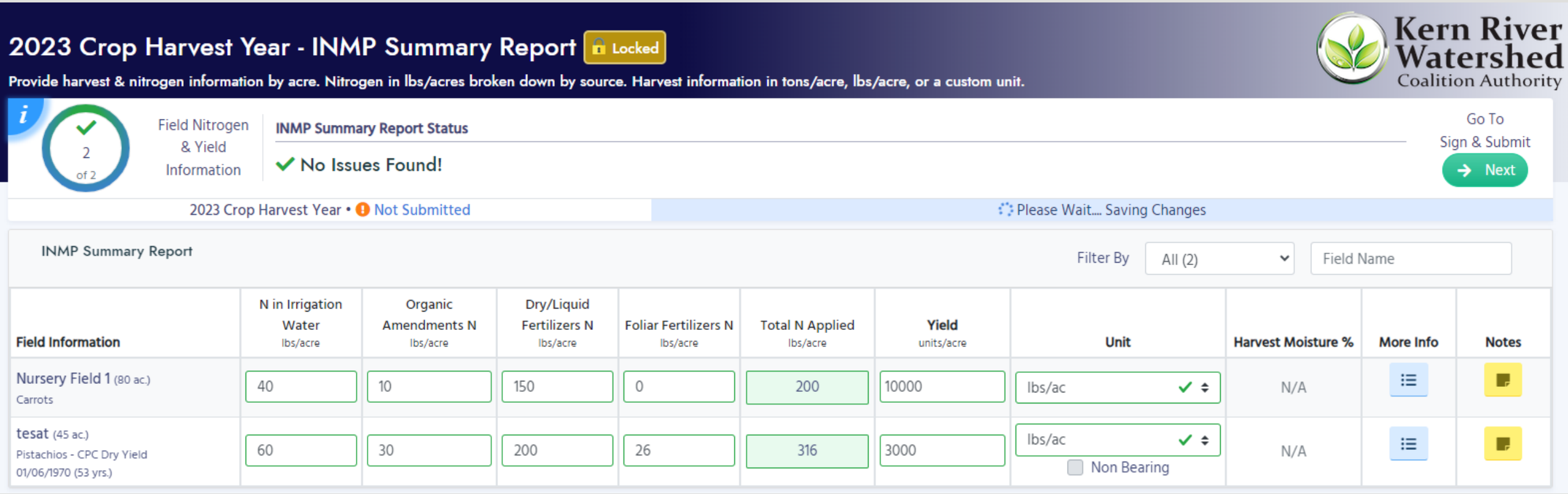
Irrigation Efficiency Practices | Nitrogen Efficiency Practices

Filter By: All (2) | Field Name

Irrigation Efficiency Practices for Managing Sediment and Erosion (Check all that apply)

Field Names	Laser Leveling	Use of ET in scheduling irrigations	Water application scheduled to need	Use of moisture probe (e.g. tensiometer)	Soil Moisture Neutron Probe	Pressure Bomb	None Used	Other
Toggle All	✓ ✗	✓ ✗	✓ ✗	✓ ✗	✓ ✗	✓ ✗	✓ ✗	✓ ✗
Carrots - Annual	60% Implemented	81% Implemented	98% Implemented	38% Implemented	11% Implemented	0% Implemented		0% Implemented
Nursery Field 1 (80 ac.) Carrots Sprinkler		✓						
Pistachios - CPC Dry Yield - 9+ years	25% Implemented	93% Implemented	99% Implemented	77% Implemented	9% Implemented	41% Implemented		5% Implemented
tesat (45 ac.) Pistachios - CPC Dry Yield 01/06/1970 (53 yrs.) Furrow			✓					

ILRP Farm: INMP Summary Report



- Data entered. Notice boxes are green, no red or yellow “errors”

ILRP Farm: Live Validation

Extensive “Live Validation” in ILRP Farm	Min/max yields, N rates, moisture, etc.
If red, something is likely incorrect (some exceptions)	Threshold values refined annually

2023 Crop Harvest Year - INMP Summary Report

Locked

Provide harvest & nitrogen information by acre. Nitrogen in lbs/acres broken down by source. Harvest information in tons/acre, lbs/acre, or a custom unit.

Kern River Watershed Coalition Authority

0 of 2 — Field Nitrogen & Yield Information

INMP Summary Report Status

tesat: Pistachios - CPC Dry Yield issues: More Info Requred

Nursery Field 1: Carrots issues: More Info Requred

Go To Sign & Submit — Next

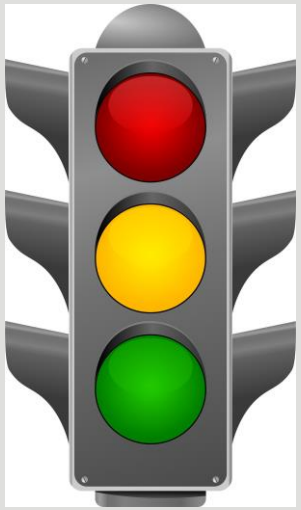
2023 Crop Harvest Year • Not Submitted

Please Wait.... Saving Changes

INMP Summary Report

Filter By: All (2) | Field Name

Field Information	N in Irrigation Water lbs/acre	Organic Amendments N lbs/acre	Dry/Liquid Fertilizers N lbs/acre	Foliar Fertilizers N lbs/acre	Total N Applied lbs/acre	Yield units/acre	Unit	Harvest Moisture %	More Info	Notes
Nursery Field 1 (80 ac.) Carrots	1000 extremely high	10	150	0	1160 extremely high	10000 extremely high	tons/ac	N/A		
tesat (45 ac.) Pistachios - CPC Dry Yield 01/06/1970 (53 yrs.)	60	350 very high	200	26	636 extremely high	220 very low	lbs/ac Non Bearing	N/A		



error

warning

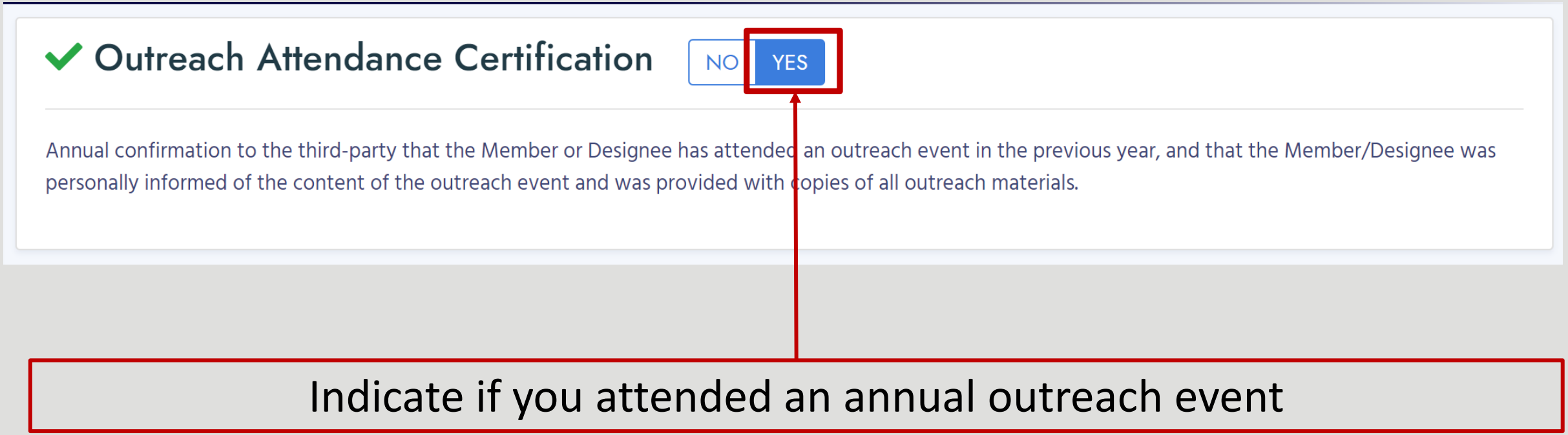
OK

<u>NOTE</u>: If items are flagged red, must provide “More Info”. Encouraged in all cases.

Regulatory Form Process

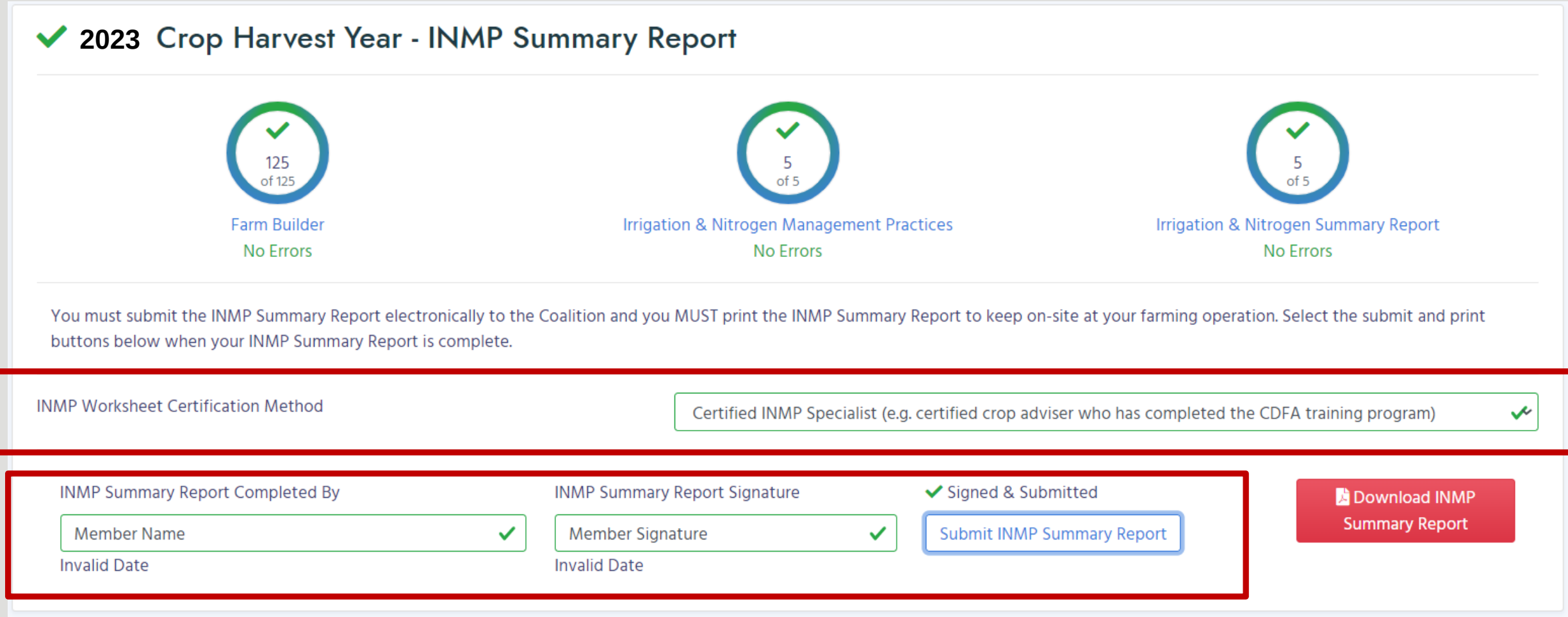
1. Login to ILRP Farm
2. Build your farm out in “Farm Builder”
3. Complete the 2023 Crop Harvest Year INMP Summary Report
4. Sign and Submit
5. Review 2022 Crop Harvest Year Outlier Status

ILRP Farm: Sign & Submit Page



Indicate if you attended an annual outreach event

ILRP Farm: Sign & Submit Page



<u>NOTE</u>: All issues must be resolved before reports can be submitted (Farm Builder and INMP Summary Report)

Regulatory Form Process

1. Login to ILRP Farm
2. Build your farm out in “Farm Builder”
3. Complete the 2023 Crop Harvest Year INMP Summary Report
4. Sign and Submit
5. Review 2022 Crop Harvest Year Outlier Status

ILRP Farm: Sign & Submit Page – Outlier Status

2022 Crop Harvest Year - Outlier Status

Outlier

On 12-31-2021, the Coalition provided information about this membership's nitrogen efficiency for the previous crop year.

You had fields from the 2020 Crop Harvest Year that were identified as statistical nitrogen outliers. The ILRP General Order requires that you either 1) have your INMP Worksheet certified by an INMP specialist (e.g. Certified Crop Adviser) or 2) attend additional training provided by the coalition.

Please provide the options you plan to pursue to meet this regulatory requirement. Select all that apply

- [x] Attend additional irrigation and nitrogen training provided by the coalition
- [ ] Have or already using an irrigation and nitrogen management plan specialist to certify annual INMP Worksheets

Other (specify):

IRRIGATION AND NITROGEN MANAGEMENT PLAN (INMP) SUMMARY REPORT

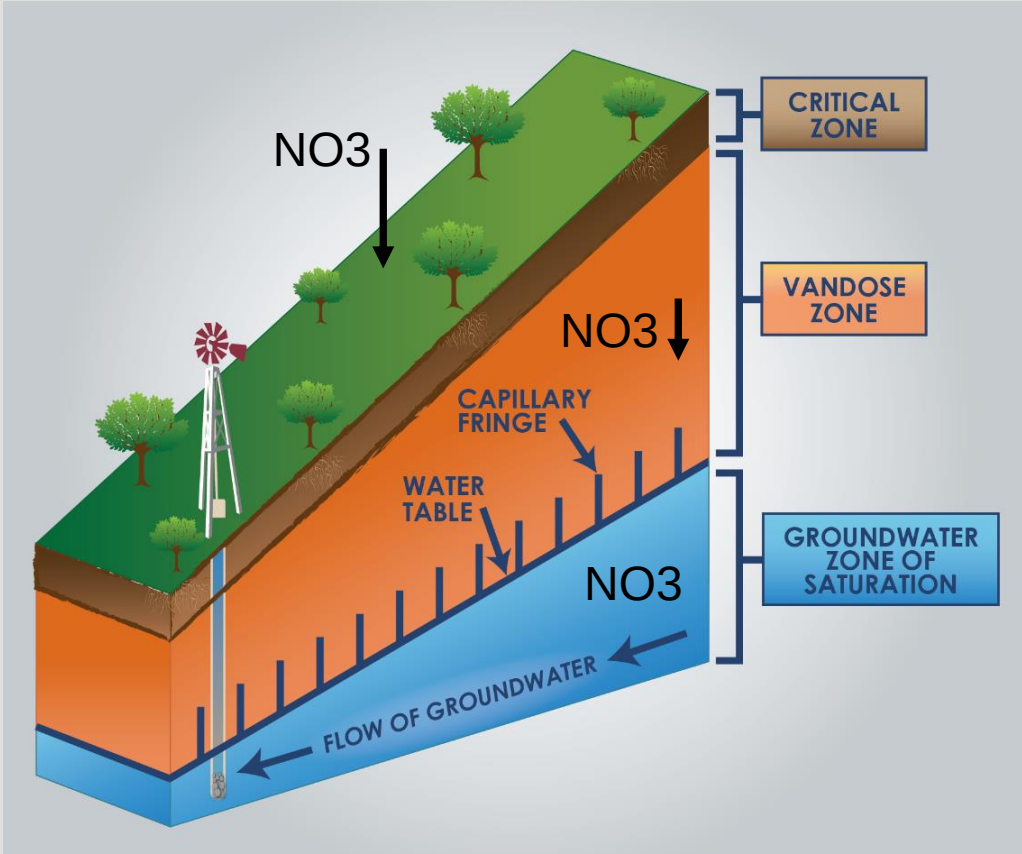
IRRIGATION AND NITROGEN MANAGEMENT PLAN (INMP) SUMMARY REPORT

Refer to your Irrigation and Nitrogen Management Plan (INMP) Worksheet and Parcel Inventory for information to complete an INMP Summary Report for each field or Management Unit.

STEP 1: GENERAL INFORMATION		STEP 2: OUTLIER NOTIFICATION RECEIPT	STEP 3: INMP CERTIFICATION METHOD
Member ID:	00000	On (Date) 10/15/2023 the Coalition provided information about this membership's nitrogen efficiency for the previous crop year and identified management units that were considered outliers compared to other Coalition members growing the same crop. Please check the box below if you were identified as an outlier by the Coalition. ☐	☑ Certified INMP Specialist (e.g. certified crop adviser who has completed the CDFA training program) ☐ Self-Certified (CDFA training program) ☐ Self-Certified (follows NRCS or UC Cooperative Extension site-specific recommendations) ☐ Self-Certified (No fertilizers applied)
Forms Completed By:	ABC Test Farms		
Crop Year (Harvested):	2023		
Submittal Date:	02/29/2024		

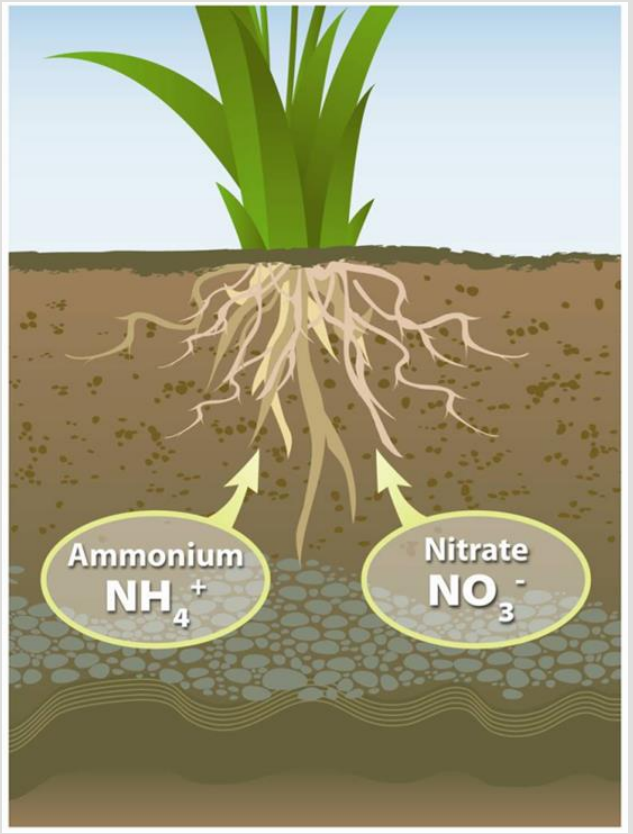
NEW: Groundwater Protection (GWP) Values and Targets

- Substantial **new** N efficiency metric ("Quantifiable Milestone"; township basis)
- Will likely be a **primary grower N metric**
- **GWP Values** = Estimated value of grower discharge, informed by INMP SRs
- **GWP Targets** = Amount of allowable N discharge within a township to protect water quality. Updated every 5 years
- Coalitions will compare **annual GWPVs** to GWPT to **evaluate compliance in township**
- If a township GWPV does not meet GWPT, **growers must address issues**



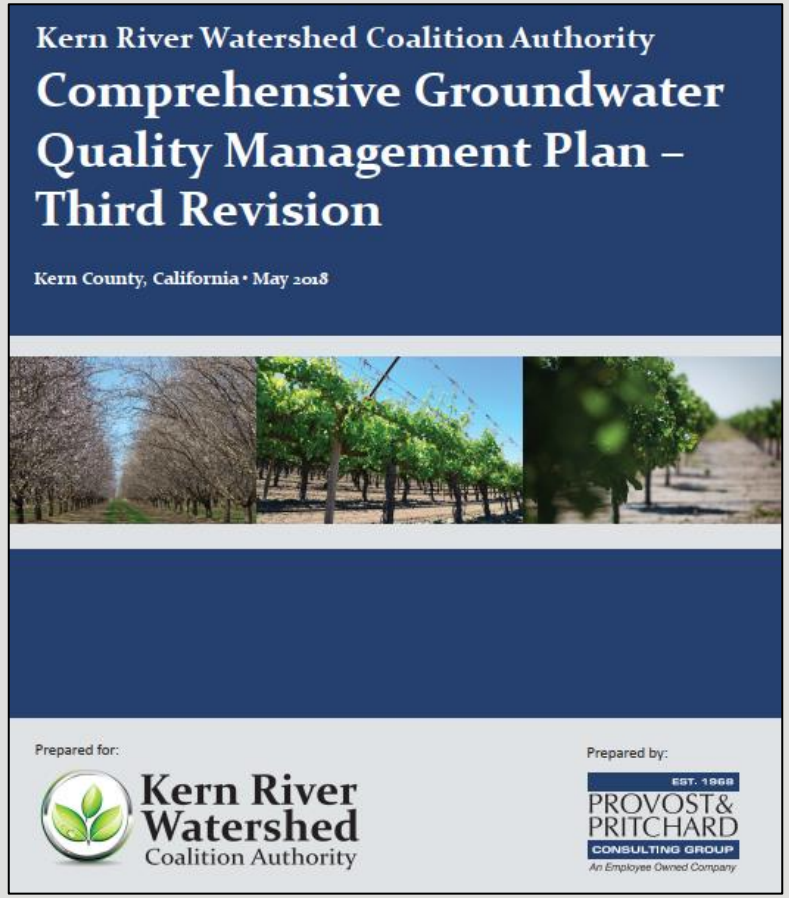
NEW: A/R Acceptable Ranges

- Another **new N efficiency metric**
- **Less focused** on groundwater quality
- A/R cannot be used to estimate N loading to groundwater
- Focused on grower N efficiency at the **field level**
- **Agronomically appropriate** A/R ratios by crop
- May **replace statistical outlier** approach
- Low end of range: lowest that is routinely achievable in optimal conditions
- High end of range: ratio that should be achievable in most cases in real settings



Groundwater Quality Management Plan

- Each coalition's detailed **plan on how to address groundwater quality issues** (mostly nitrate)
- Umbrella plan that **encompasses all ILRP groundwater components**
  - MPEP, GAR, GTM, INMP reporting, outreach, GWPTs, A/R Acceptable Ranges, etc.
- Plan provides the **performance measures** that coalitions are evaluated on
- Plans to **be updated by July 1, 2024**
- Coalitions submit **Annual Status Reports** on progress



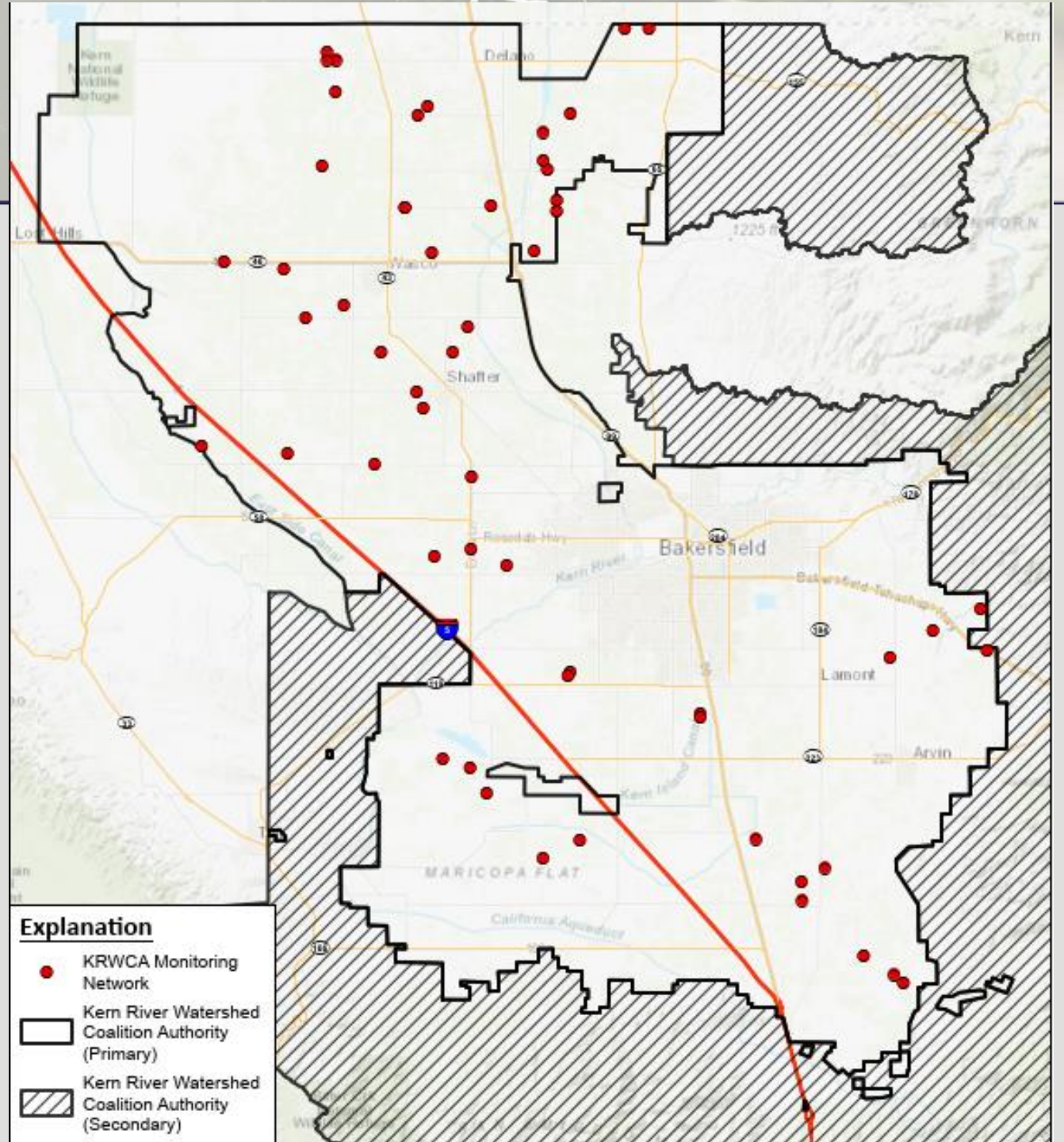
Groundwater Quality Trend Monitoring (GTM)

- Why do we do this?
- It is required
- To evaluate long term trends in groundwater quality that may be partially influenced by irrigated agriculture.
- Test: Annual (EC, pH, DO, temperature, NO3-N); 5-years (TDS, General Minerals)

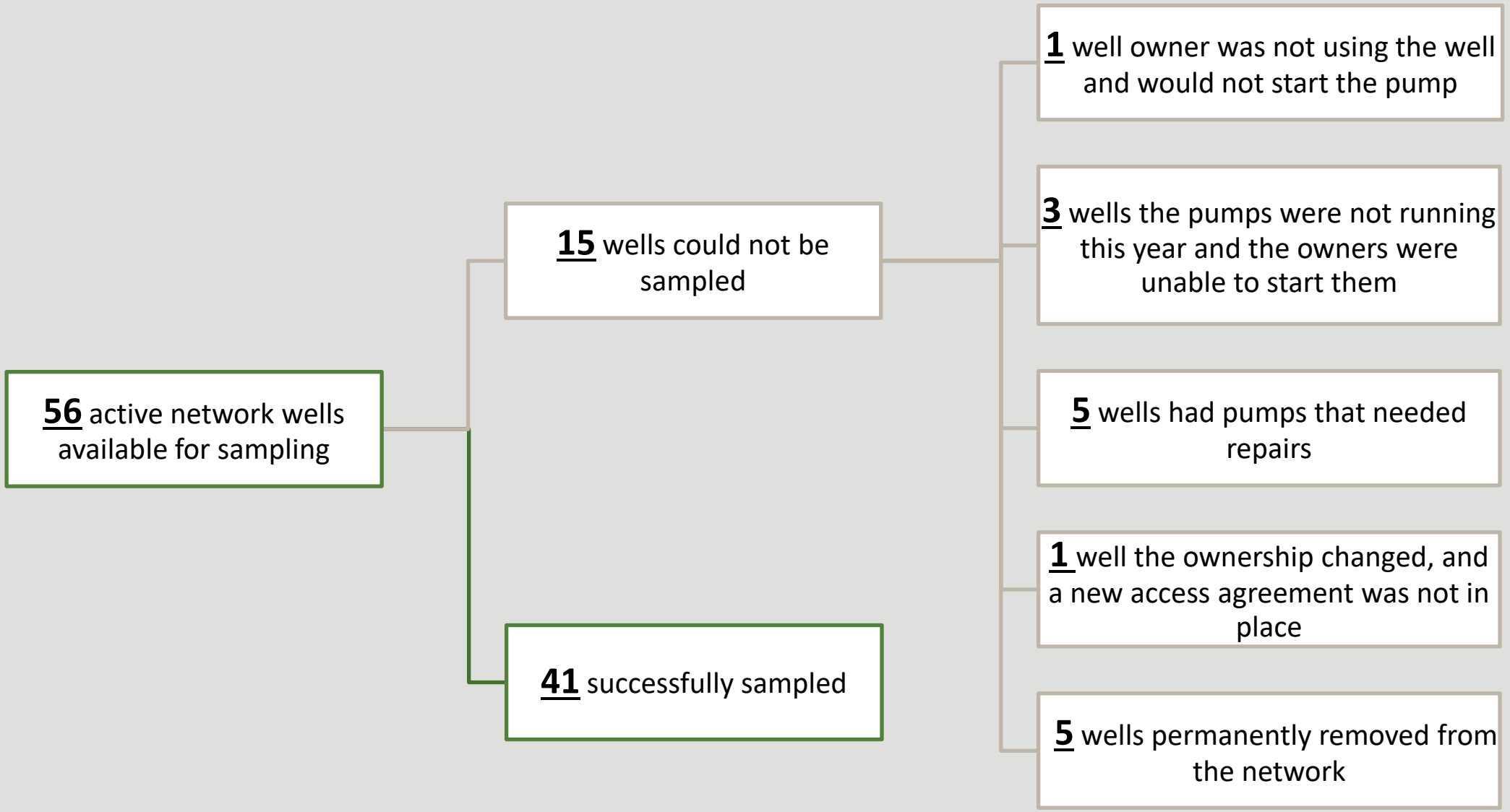
Groundwater Trend Monitoring Well Network Development

- How are wells selected?
- Use existing wells.
- Representative of regional impacts of irrigated agriculture.
- Represents both high and low vulnerability areas.

KRWCA GTM Wells



GTM Well Network Status - 2023

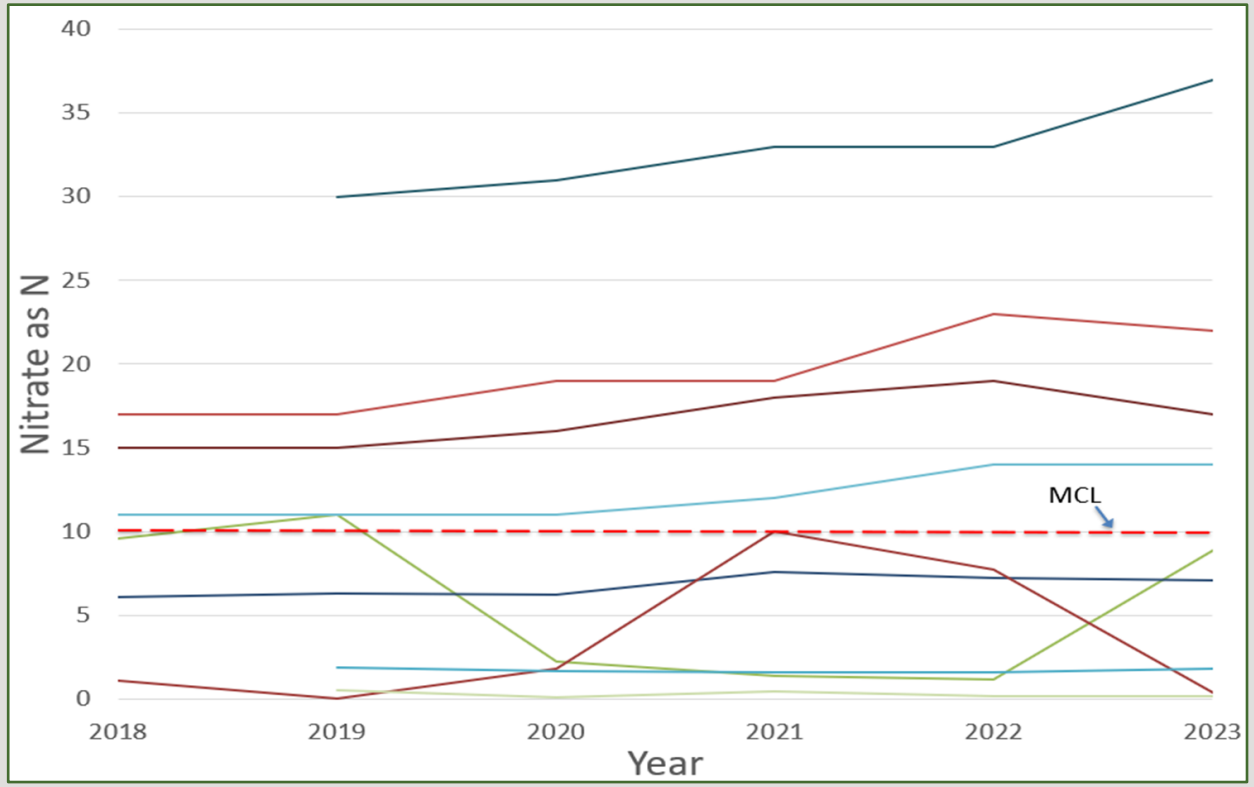


2023 Groundwater Trend Monitoring Results

- Results for the network should be reviewed collectively, GTM network results are intended to be indicative of large, regional land use trends over time
- **GTM results are not used, nor are they intended to be used, to measure the impact of a specific well owner(s) management practices on groundwater quality**

Nitrate-N Results 2023

- Minimum Value: Non-Detect
- Maximum Value: 37.0 mg/L
- Average Value: 8.9 mg/L
- Median Value: 7.1 mg/L
- 63% of results less than or equal to 10 mg/L MCL
- 36% of results over the 10 mg/L MCL*
  - No wells used actively for drinking water exceeded the MCL
- Nitrate concentrations going up, down, or steady; varies by well



10 mg/L is the maximum contaminant level for drinking water. Most wells in the network are irrigation/monitoring wells, not drinking water wells. Being above the drinking water MCL is not a "violation" it is simply a threshold that larger regional trend analyses may use for comparison.

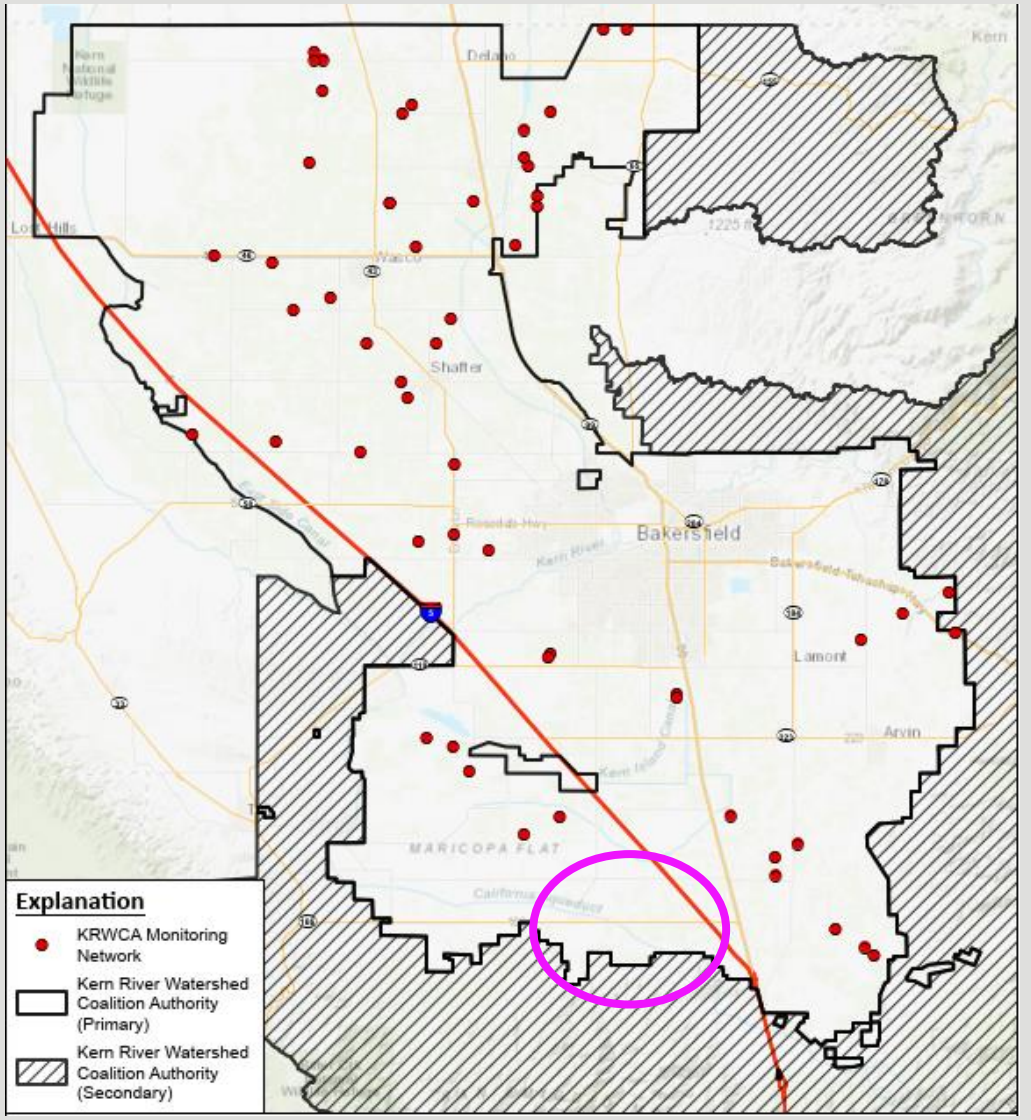
2023 Member Communication

- Result letters for each well sampled in the network will be emailed to members with a summary of their well's field and laboratory results in January.

Thank you to the members and board members that have participated in the GTM program. Your responsiveness and flexibility in sampling scheduling increases our efficiency in the field and reduces unnecessary trips and costs.

Next Steps – More Wells Needed

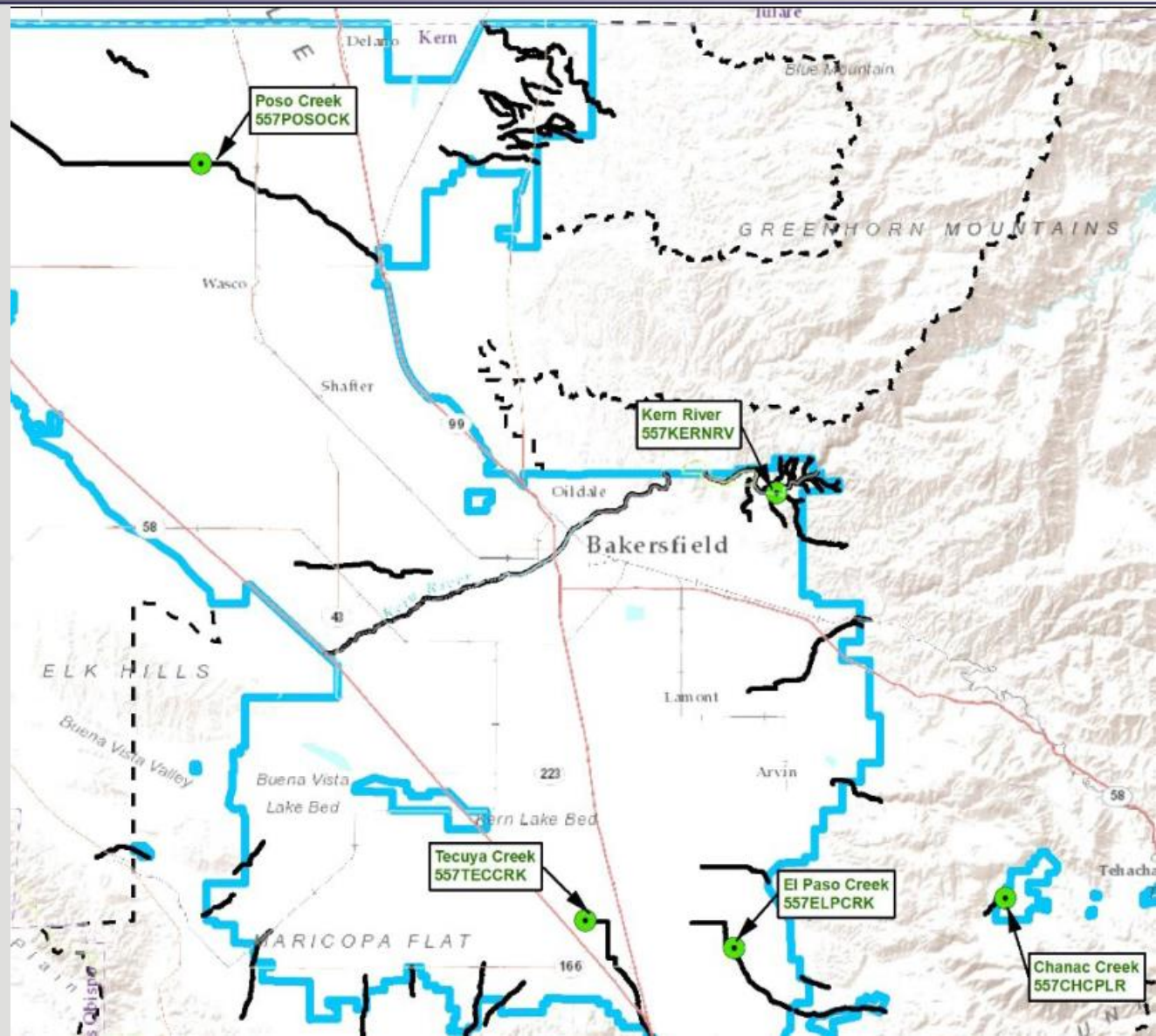
- More wells are needed (spatial gaps, wells that are no longer viable).
- Must add wells along southern border of KRWCA's primary area, west of Interstate 5.
- KRWCA is currently reviewing options for new wells
- **Please respond to the coalitions if they reach out about your well**



Questions?

KRWCA Surface Water Monitoring Program: Program Goals

- Characterize water quality within the coalition's region
- **5** monitoring locations
- Poso Creek, Kern River, Tecuya Creek, El Paso Creek, Chanac Creek
- Identify potential impacts to water quality from irrigated agricultural practices
- Manage any impacts identified



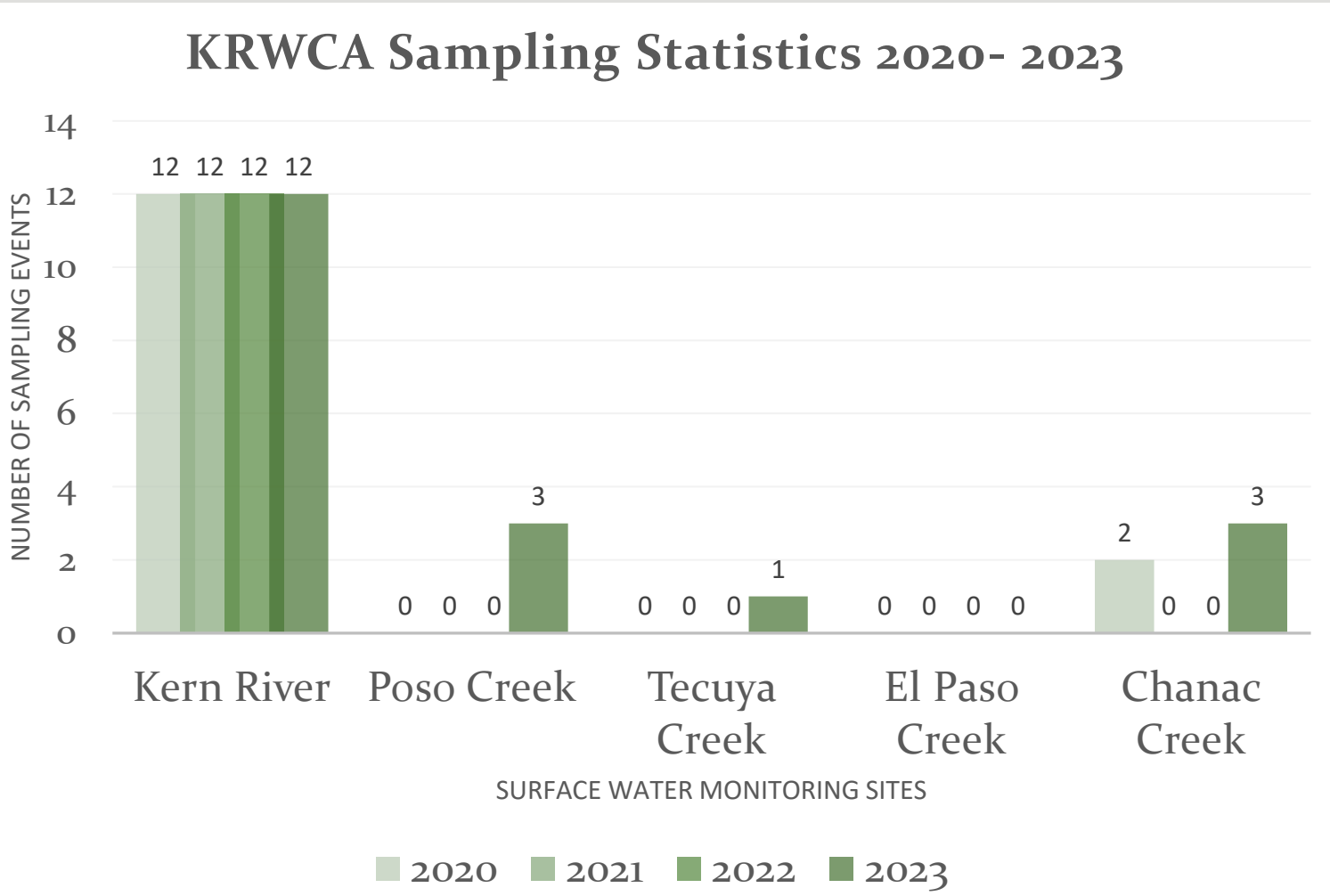
Surface Water Monitoring Program: 2023 Water Year Results

Month (2022/ 2023)	# of Samples 2023 WY
October	1
November	1
December	2
January	2
February	1
March	3
April	2
May	2
June	1
July	1
August	2
September	1
Total	19

* Water Year: October 1- September 30

Surface Water Monitoring Program: 2020-2023 Results

Water Year	# Sites Sampled	Total Samples
2020 WY	2	14
2021 WY	1	12
2022 WY	1	12
2023 WY	3	19



* Water Year: October 1- September 30

Surface Water Quality Management Plans (SQMPs)

- Chanac Creek (2018): DDE, Molybdenum, Total Dissolved Solids, E coli, Toxicity to Algae, and pH
- Kern River (2023): Arsenic Source Identification Study
- Kern River (2023): pH
- Poso Creek (2023): pH & E.coli

Poso Creek

March 2023

Kern River

March 2023

Chanac Creek

December 2022

On-Farm Drinking Water Well Testing

Sampling of On-Farm Drinking Water Wells

- On-farm drinking water wells must be tested annually for Nitrate + Nitrite as N
  - On-farm drinking water well is defined as a well that is located on an APN enrolled in the Coalition that actively provides water for human consumptive use
- Sampling window is calendar year
  Do not wait until the last minute - labs will get backed up
  - Must use an ELAP certified laboratory
- If the result is over the MCL of 10 mg/L, member must provide notice to users using the nitrate notification template and send a copy of the completed template to the Regional Board

Nitrate Notification Template

Do Not Drink Your Water

Use Only Bottled Water Until Further Notice

Failure to follow this advisory could result in serious illness

Test Result: _____ mg/L

Nitrate in your well was found to exceed the drinking water standard of 10 mg/L established for safe drinking water.

- **Pregnant women are at increased risk** for potential health effects and should not drink water with high levels of nitrate. Drinking water with high nitrate levels may also cause serious complications in pregnancy.
- **Do not give the water to infants.** Infant formula and other edible products should be prepared with bottled water or other water with low levels of nitrate. Infants are at increased risk to become seriously ill or even death from consumption of high levels of nitrate.
- **Do not boil your water.** Boiling your water may increase nitrate levels

This notification was provided by:

APN	County
Coalition	Member ID
Name *(of Landowner/Member)*	Contact Phone #
Signature	Date

- ☐ No one drinks or cooks with this well water.
- ☐ Notification has been provided to the user(s) or appropriate landowner(s).
- ☐ Replacement water has been provided to the user(s).

Please submit a signed copy of this notification to the **Central Valley Water Board***:*

Sacramento Office:
11020 Sun Center Dr., #200
Rancho Cordova, CA 95670
☎ (916) 464-4611
Email: irrlands@waterboards.ca.gov

Fresno Office:
1685 "E" Street
Fresno, CA 93706
☎ (559) 488-4396
Email: ilrpinfo@waterboards.ca.gov

Available online here:
https://www.waterboards.ca.gov/centralvalley/water_issues/irrigated_lands/drinking_water/dw_notification_temp.pdf

On-Farm Drinking Water Well Testing

You do NOT need to test your well if:

- Replacement bottled water is being provided to well user (must keep receipts)
- If the well was previously tested, exceeded 10 mg/L, and a notification template was provided to the drinking water user and the Regional Board

Regional Board List of ELAP Certified Laboratories

List of Certified **E**nvironmental **L**aboratory **A**ccreditation **P**rogram (ELAP) Labs for testing nitrate + nitrite nitrogen

Please note that any laboratory on this list can be used regardless of location.

BAKERSFIELD

BSK Associates* *(drop off location)*
700 22nd Street
Bakersfield, CA 93301
Phone: (800) 669-3201
www.bskassociates.com

* *Courier Service Available to Fresno Laboratory location. Please call ahead for containers and instructions.*

Dellavalle Laboratory, Inc.*
(drop off location – located inside of Peninsula Messenger Service)
2015 Westwind Drive, Suite 10
Bakersfield, CA 93301
Phone: (800) 228-9896
dellavallelab.com

* *Courier Service Available to Fresno Laboratory location (Monday through Thursday, 9am-4pm). Please call ahead for containers and instructions.*

Zalco Laboratories, Inc.
4309 Armour Avenue
Bakersfield, CA 93308
Phone: (661) 395-0539
zalcolabs.com

List available online:
https://www.waterboards.ca.gov/centralvalley/water_issues/irrigated_lands/drinking_water/dw_elap_labs_list.pdf

On-Farm Drinking Water Well Testing

How to Get Your Well Tested:

1. Fill out and follow the directions on the member information form
2. Take the completed member information form to your preferred ELAP laboratory
3. Laboratory will provide you with sampling bottles and chain of custody
4. Take a sample of your well following the laboratory instructions
5. Return sample and completed chain of custody to laboratory
6. Laboratory will analyze, upload to Geotracker, and provide you with the results
7. If your results are greater than 10 mg/L, provide water user and the Regional Board* with a copy of the drinking water notification form

If only you (and immediate family) consume water from the tested well that exceeds 10 mg/L and you indicated so on the member information form item 1j turned into the lab, you do NOT need to turn in a nitrate notification template to the Regional Board

California Regional Water Quality Control Board
Central Valley Region
Irrigated Lands Regulatory Program
Drinking Water Well Member Information

Complete entire form if you have a drinking water well on an enrolled Assessor's Parcel Number (APN) and submit it with your well samples to an Environmental Laboratory Accreditation Program laboratory for required data entry into the State's GeoTracker database.

1. Coalition Member Information

(Personal information will not be available to the public, only APN and well sample data will be available to view through the GeoTracker database) – *Note: fields 1a through 1d, 1f and 1e are required to be filled out.

1a. Coalition Name*:

1b. Coalition Member ID #*:

1c. Member's Name*:

1d. Member's Mailing Address*:

1e. Farm Name:

1f. Member's Phone*:

1g. Member's Email*:

1h. Property Address (if different from mailing address):

1i. Is the coalition member also the landowner: ☐ YES (if Yes, skip boxes 2a-2d) ☐ NO

1j. Is the coalition member (including family) the only consumer of the drinking water?
☐ YES ☐ NO (if no, notification to all consumers and the Central Valley Water Board is required if nitrate exceedance is identified)

2. Landowner Information

(Fill out if coalition member is not the landowner)

2a. Landowner's Name:

2b. Landowner's Mailing Address:

2c. Landowner's Phone:

2d. Landowner's Email:

3. Drinking Water Well Information*:

List all drinking water well on Irrigated Lands Regulatory Program enrolled parcel(s) below.

(Note: If well was previously sampled and data is entered into GeoTracker, place an "x" in column to the left of the Well Name/Field Point Name.)

X	Well Name / Field Point Name (required)	Latitude	Longitude	County (required)	Assessor Parcel Number (APN) (required)

4. CERTIFICATION

"I certify under penalty of law that to the best of my knowledge and belief, this document and any attachments submitted is, true, accurate, and complete and was prepared by me or under my direction or supervision. I am aware that there are significant penalties for knowingly submitting false information."

4a. Signature (*required)

4b. Date

Available online here:
https://www.waterboards.ca.gov/centralvalley/water_issues/irrigated_lands/drinking_water/dw_member_info.pdf

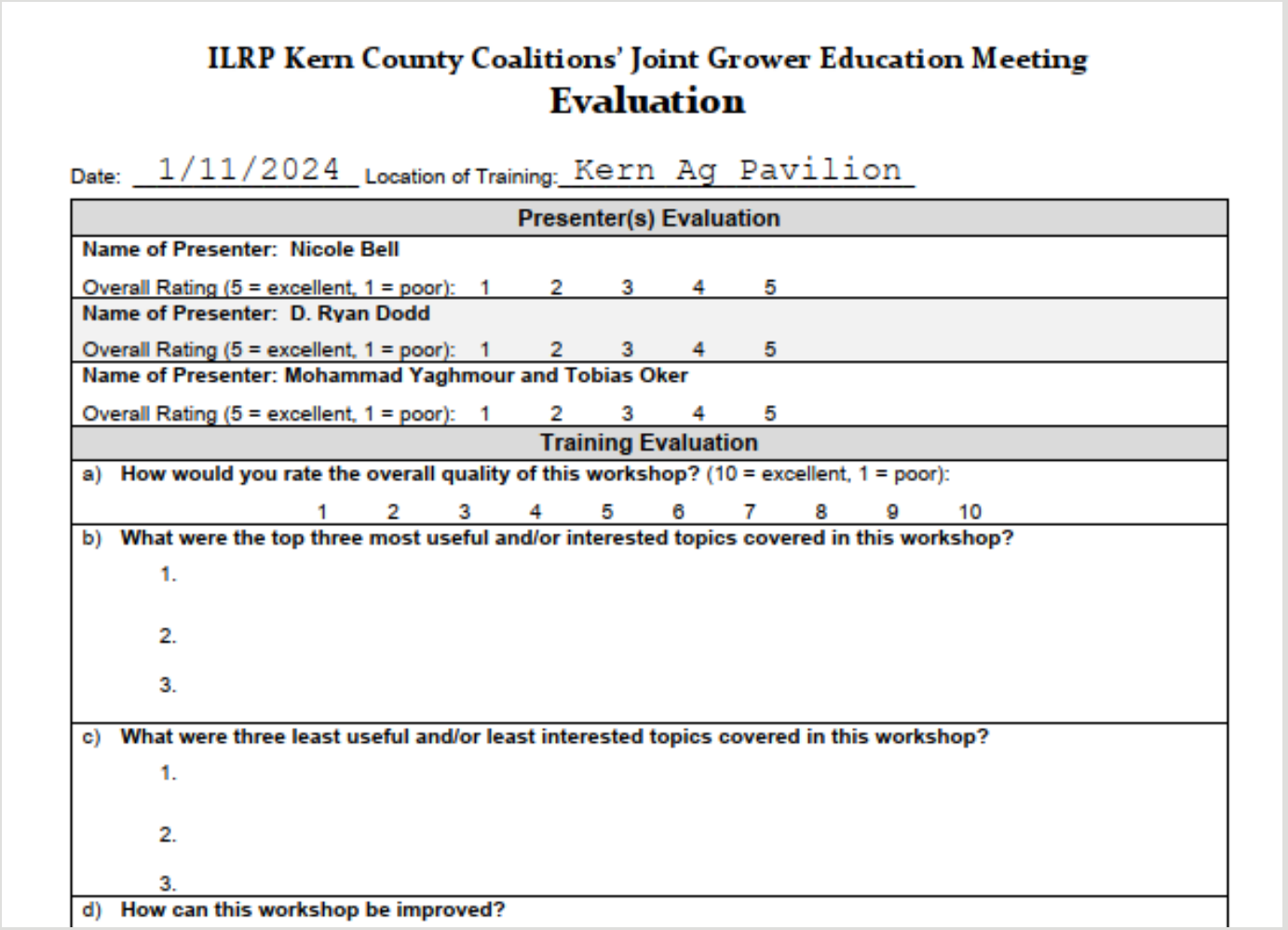
On-Farm Drinking Water Well Testing

For Additional Information:

- **Contact the Regional Board's office at (559) 488-4396 or ilrpinfo@waterboards.ca.gov**
- **Or visit the Regional Board's ILRP On-Farm Drinking Water webpage at** https://www.waterboards.ca.gov/centralvalley/water_issues/irrigated_lands/drinking_water/#ilrpdwwmt

Meeting Evaluation

Please complete and return the meeting evaluation form at the Registration Table.



ILRP Kern County Coalitions' Joint Grower Education Meeting
Evaluation

Date: 1/11/2024 Location of Training: Kern Ag Pavilion

Presenter(s) Evaluation
Name of Presenter: Nicole Bell Overall Rating (5 = excellent, 1 = poor): 1 2 3 4 5
Name of Presenter: D. Ryan Dodd Overall Rating (5 = excellent, 1 = poor): 1 2 3 4 5
Name of Presenter: Mohammad Yaghmour and Tobias Oker Overall Rating (5 = excellent, 1 = poor): 1 2 3 4 5
Training Evaluation
a) **How would you rate the overall quality of this workshop?** (10 = excellent, 1 = poor): 1 2 3 4 5 6 7 8 9 10
b) **What were the top three most useful and/or interested topics covered in this workshop?** 1. 2. 3.
c) **What were three least useful and/or least interested topics covered in this workshop?** 1. 2. 3.
d) **How can this workshop be improved?**

Questions?

Nitrogen and Irrigation Management: Why It Is Important & How it All Works Together

Mohammad Yaghmour
Orchard Systems Advisor UCCE-Kern
mayaghmour@ucanr.edu

UC CE | University of California
Agriculture and Natural Resources | Cooperative Extension

Technical Assistance Collaborations: Nitrogen and Irrigation Initiative

Partners

- UC ANR
- UC Davis
- CDFA

Activities

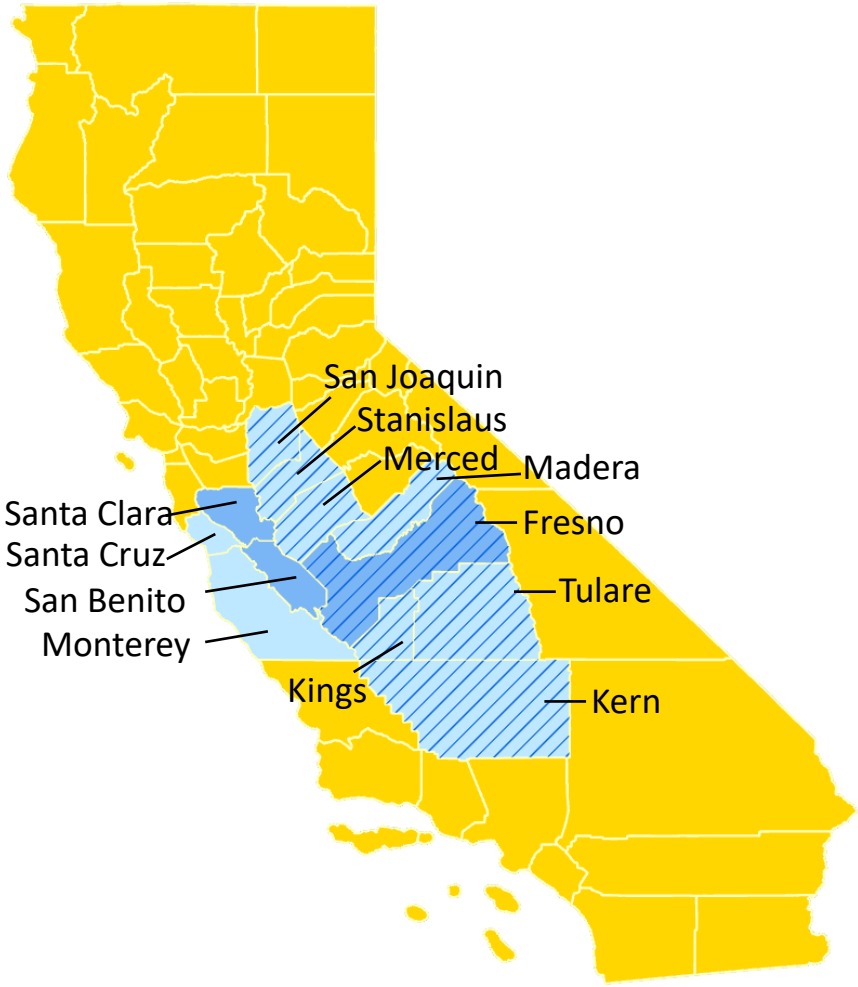
- Develop Educational Resources
- On-farm trials
- Training Events
- Growers consultations

Funding

= FIAB (Fertilizer Inspection Advisory Board)

= FIAB + SCBG (Specialty Crop Block Grant)

= CIG (Conservation Innovation Grant)



UC CE University of California Agriculture and Natural Resources

cdfa California Department of Food & Agriculture

FREP Fertilizer Research and Education Program

California Institute for Water Resources

UCDAVIS

Technical Assistance Collaborations: **Nitrogen and Irrigation Initiative**

UC Project Coordination

Khaled Bali, UCANR
Samuel Sandoval, UCANR/UC Davis
Erik Porse, UC CIWR

Academic Coordinator:
Rachel Shellabarger, UCANR

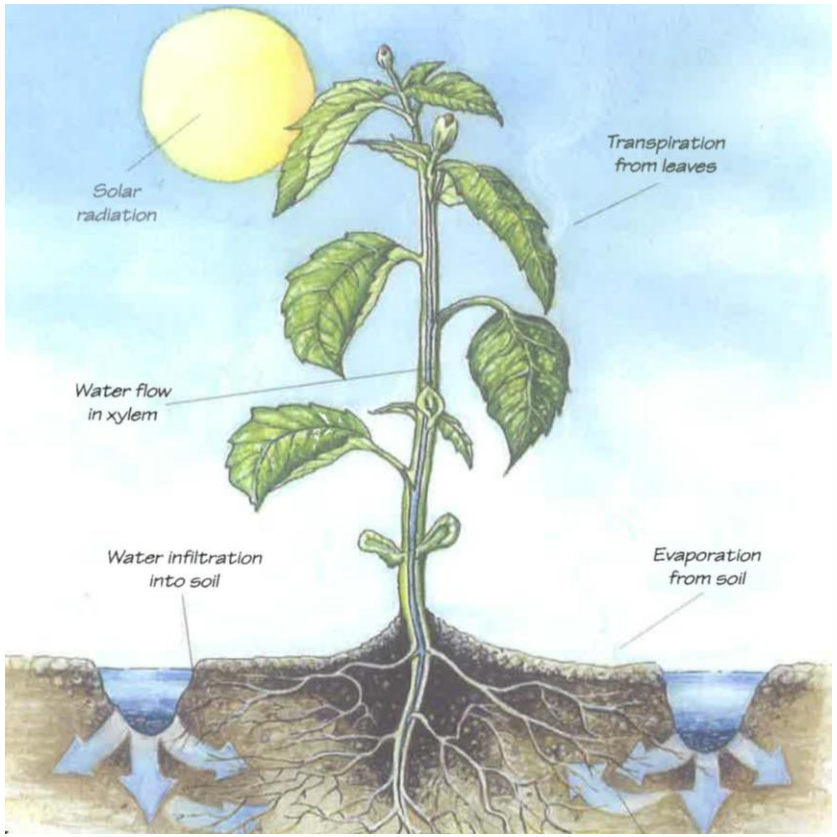
Project Scientist:
Fatemeh Mehrabi, UCANR

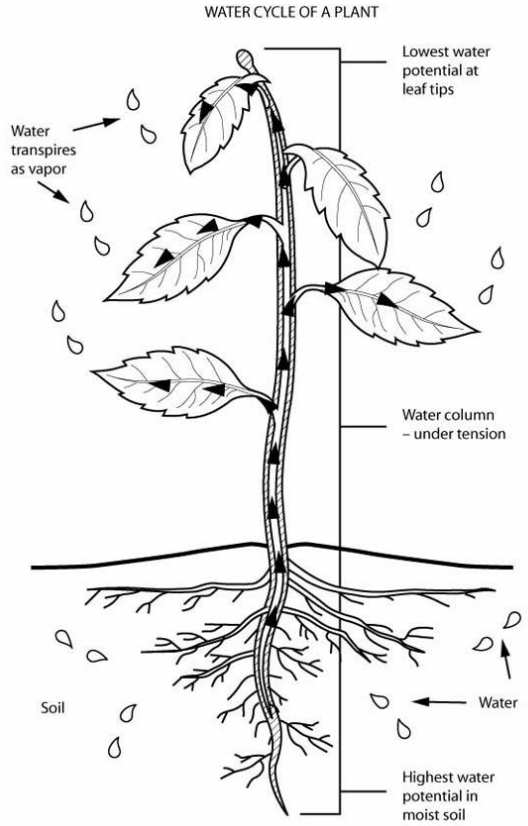
Central Coast Advisors:
Michael Cahn (Monterey)
Aparna Gazula (Santa Clara County)

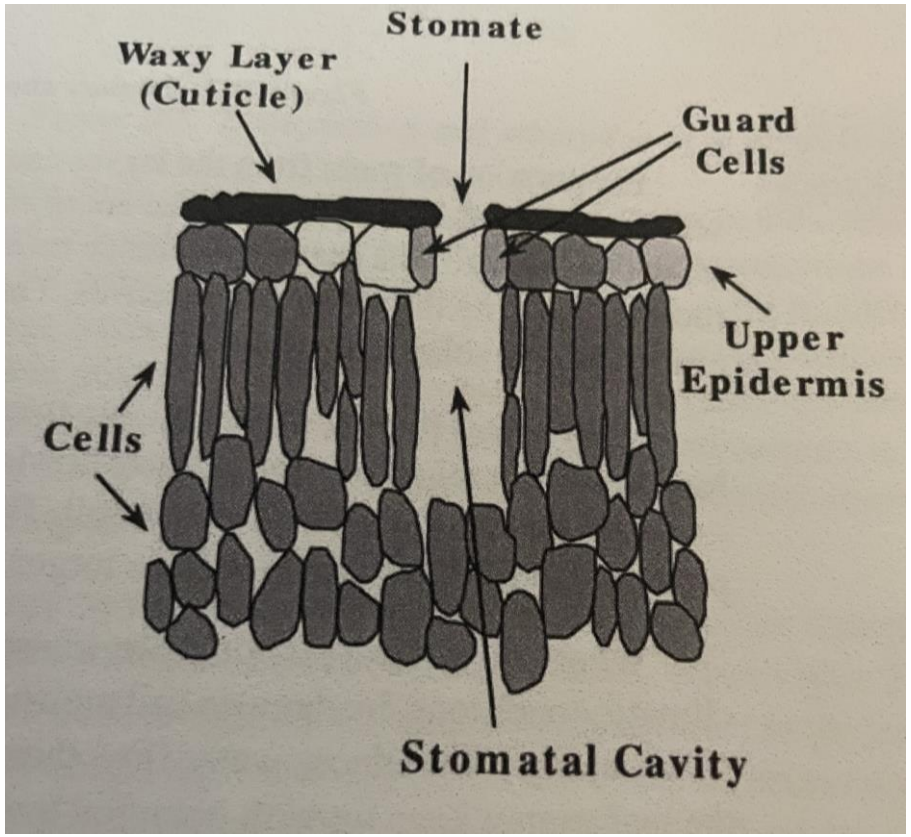
San Joaquin Valley Advisors:
Phoebe Gordon (Madera)
Mae Culumber (Fresno)
Mohammad Yaghmour (Kern)

Staff Research Associates:
David Chambers, Benjamin Halleck,
Jaqueline Vasquez Mendoza,
Cristal Hernandez, Brady Holder, Jorge Calva,
Karla Cornelio, 1 vacancy

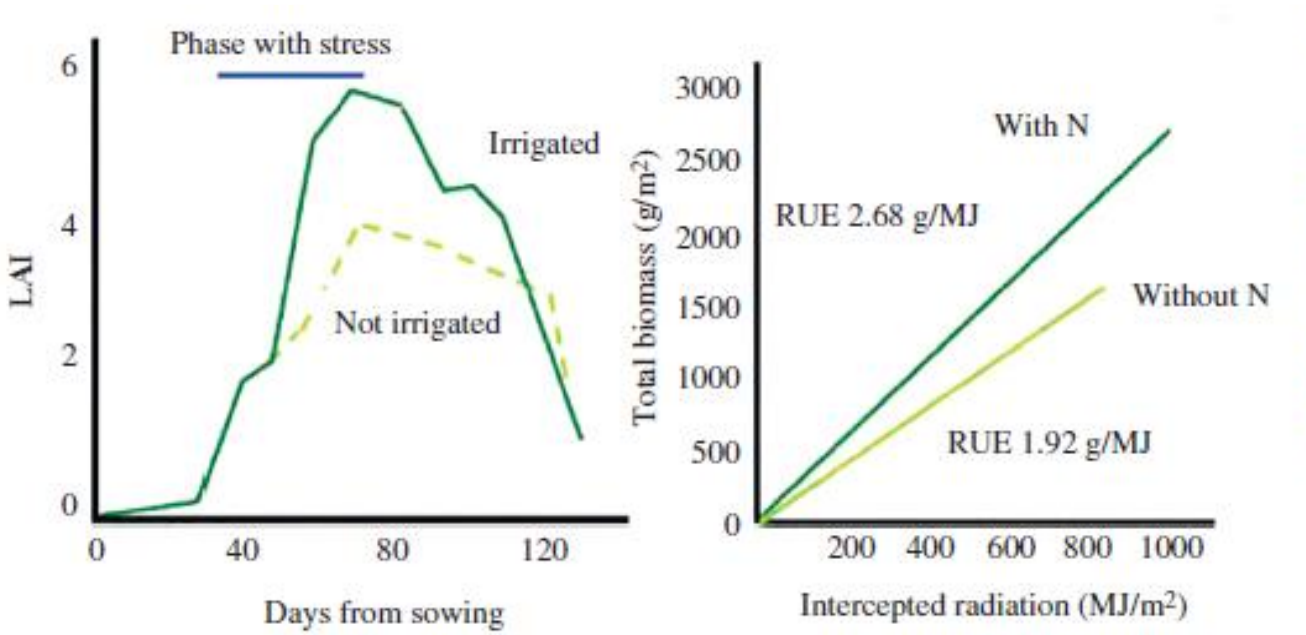
Photosynthesis and Transpiration

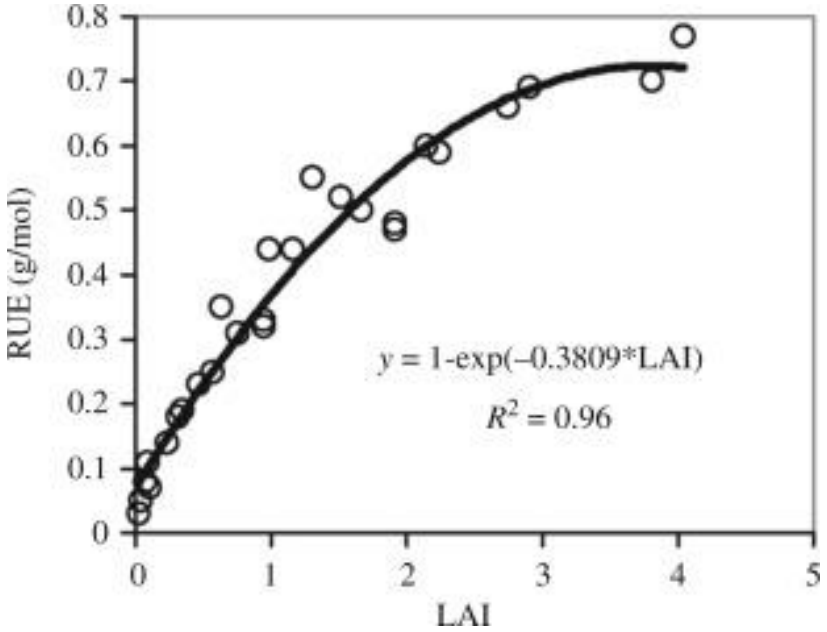




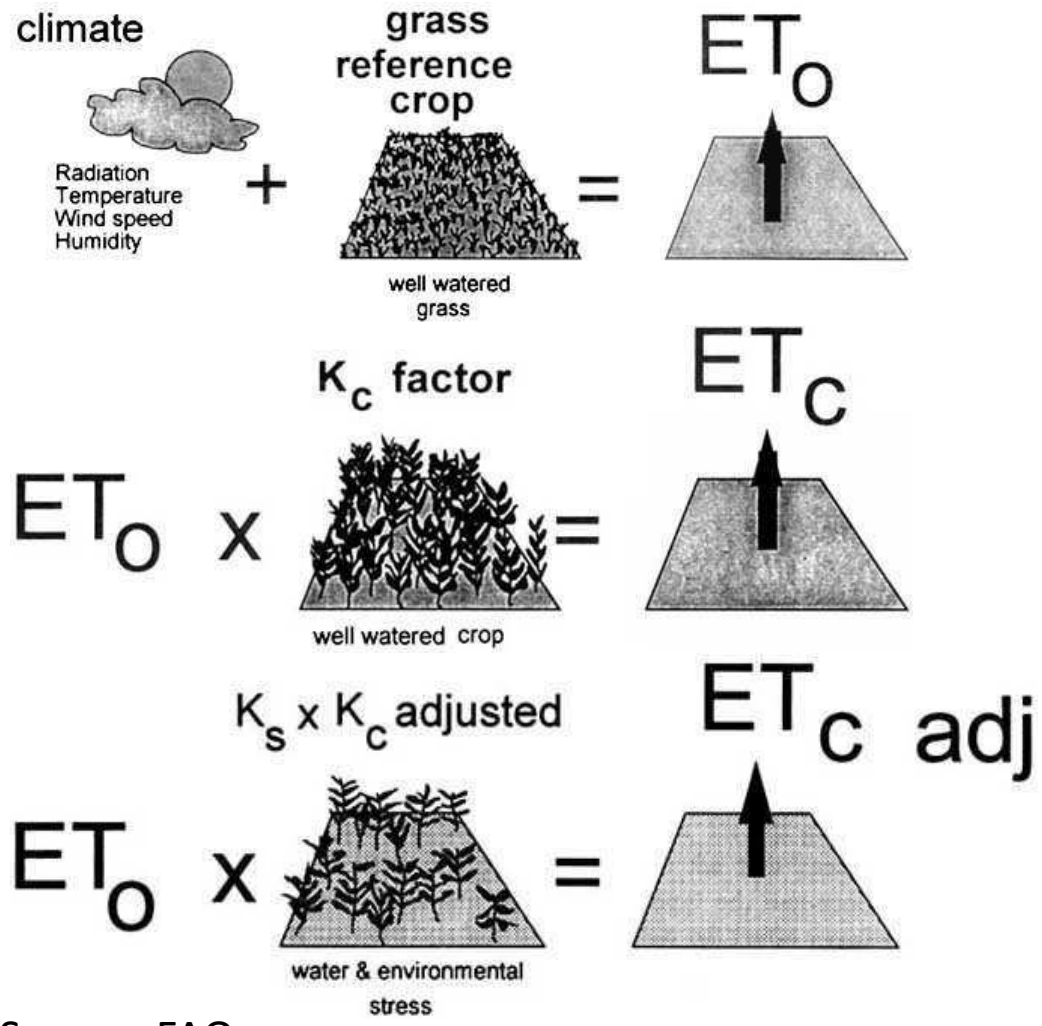


Importance of Irrigation and Nitrogen



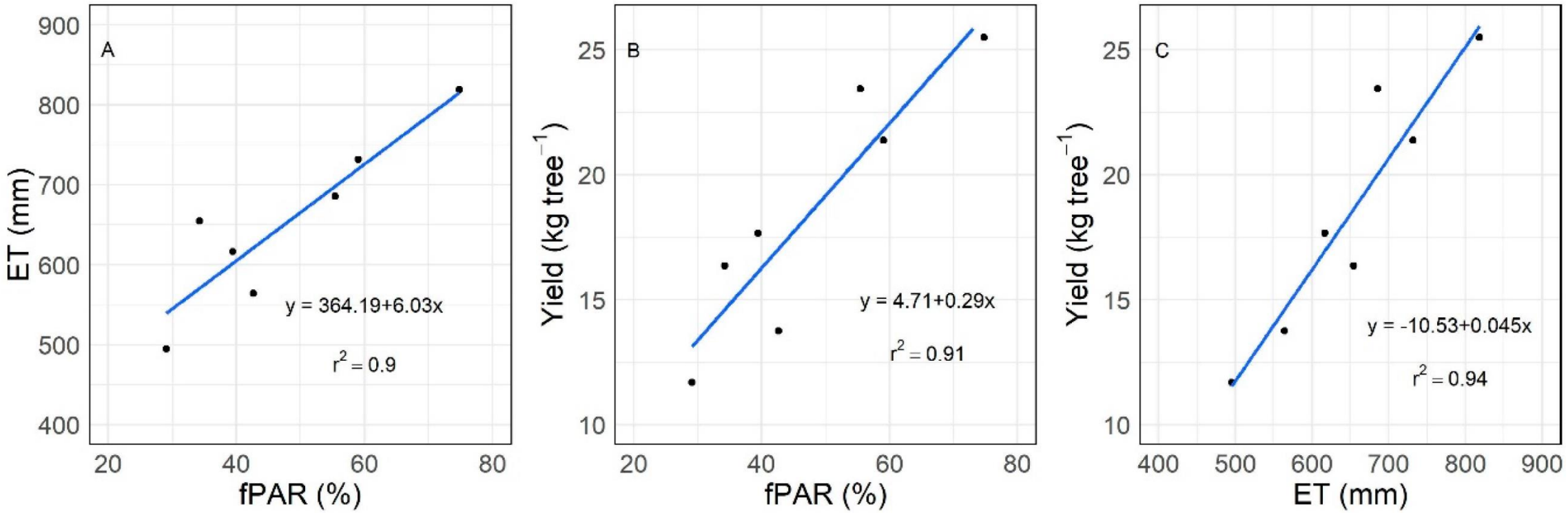


Source: Bhattacharya, A. 2019. Radiation-Use Efficiency Under Different Climatic Conditions. pages 51-109. In Changing Climate and Resource Use Efficiency in Plants.


climate
Radiation
Temperature
Wind speed
Humidity
+
grass
reference
crop
=
ET_O
well watered
grass
K_c factor
ET_O x
=
ET_C
well watered crop
K_s x K_c adjusted
ET_O x
=
ET_C adj
water & environmental
stress

Source: FAO

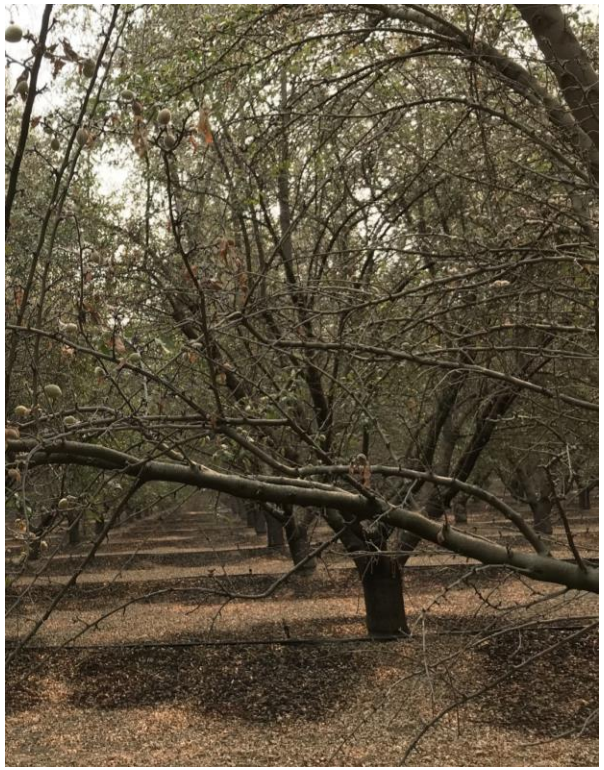
Relationship Between ET, PAR, and Yield of Pistachio Orchard



Source: Marino et al. 2019. Actual Evapotranspiration and Tree Performance of Mature Micro-Irrigated Pistachio Orchards Grown on Saline-Sodic Soils in the San Joaquin Valley of California

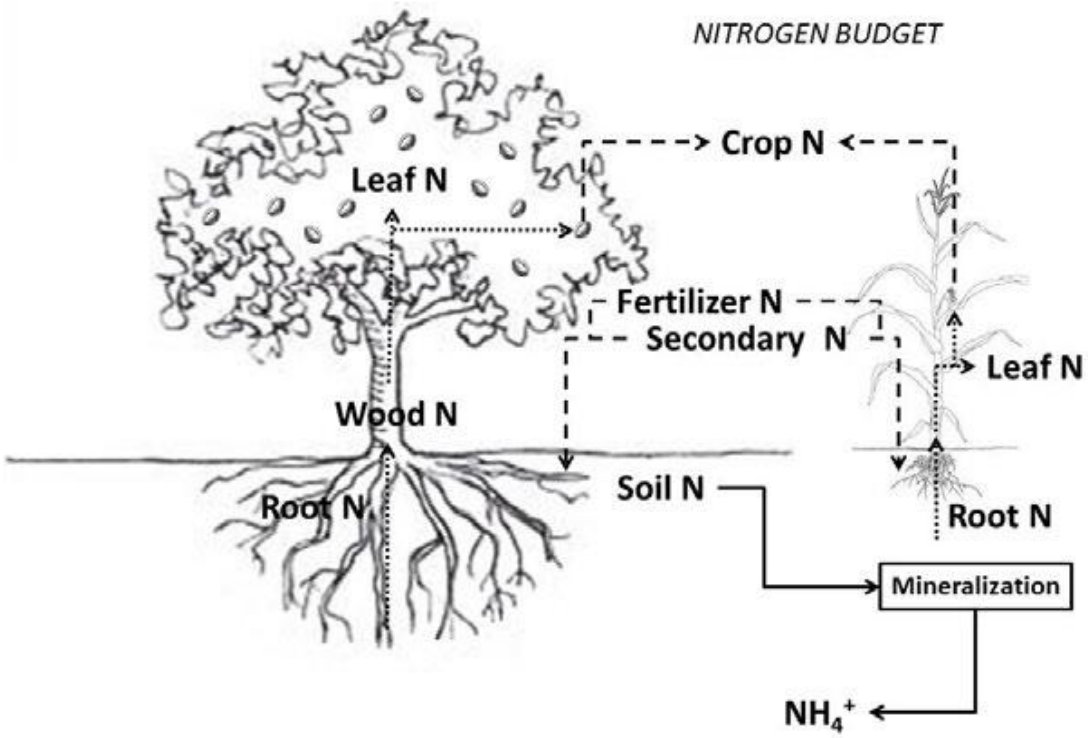
Examples of Orchard Factors Affecting ET



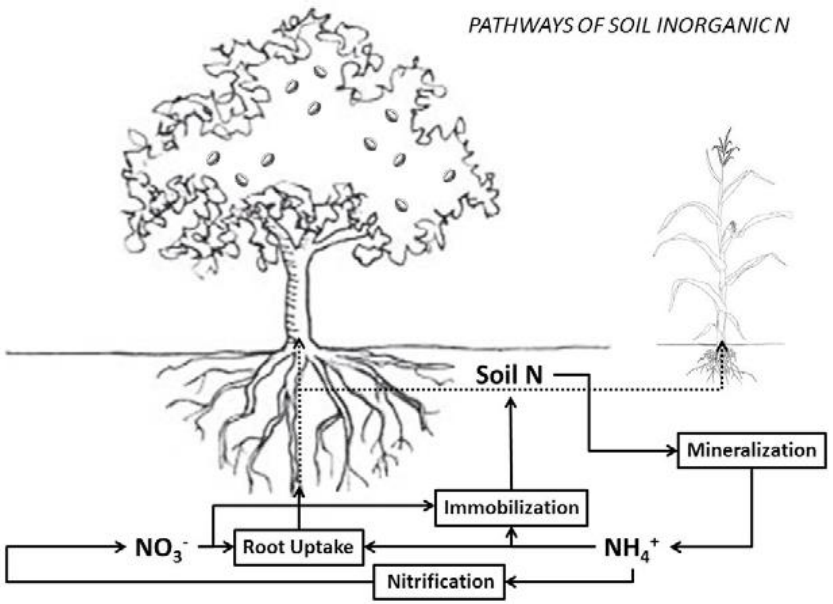



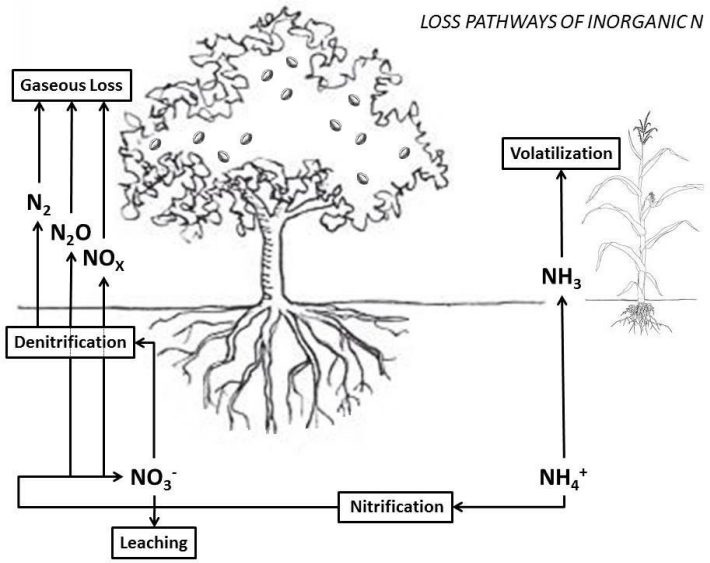
Nitrogen

- An important element for plant growth.
- An important tool to manage N is to have a N budget that is grower-specific.
- Targeted placement of N fertilizer in the root zone combined with timing to match N applications with N uptake
- improved irrigation scheduling and uniformity, and the adoption of irrigation designs optimized for different soil types are options to implement an efficient N budget.



Impact of Irrigation and Nitrogen Management

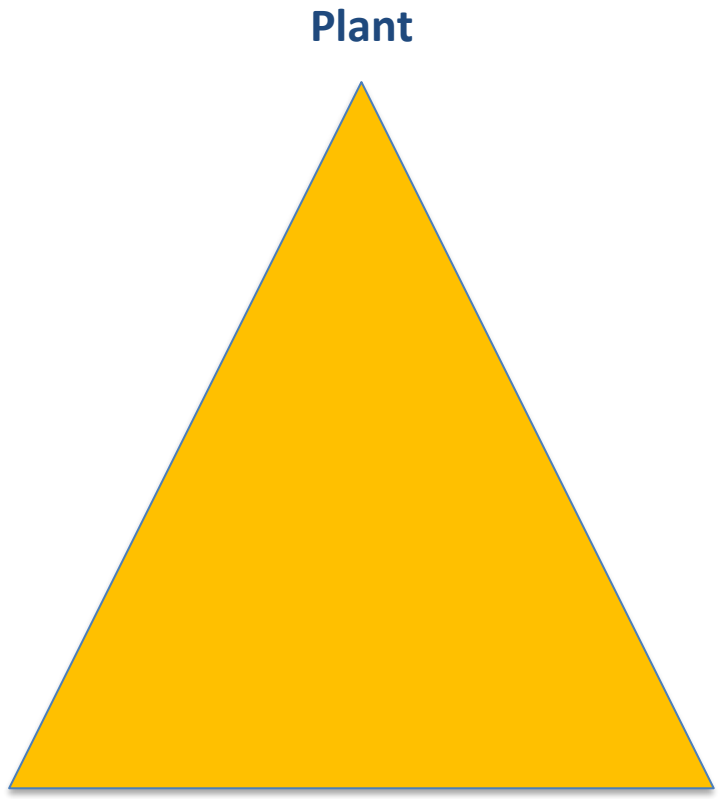




Improved irrigation and N management considerations affects environment, can have economic impact, affects diseases, etc. Thus, Irrigation and N budgeting and efficiency is very important!

Irrigation and Nitrogen Budgeting

- Crop water requirements and irrigation scheduling (ETo, Kc, ETa, CIMIS, Tule, plant-based technologies, and soil moisture), tree growth, etc.
- Soil type (texture and its impact on water holding capacity, infiltration rate, irrigation frequency, and possibly leaching if needed)
- Irrigation system (drip or other systems, efficiency, application rate, flow rate, irrigation frequency, variable rate irrigation), and Irrigation water quality.



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Irrigation and Nitrogen Budgeting

- Crop water requirements and irrigation scheduling (ETo, Kc, ETa, CIMIS, Tule, plant-based technologies, and soil moisture), tree growth, etc.
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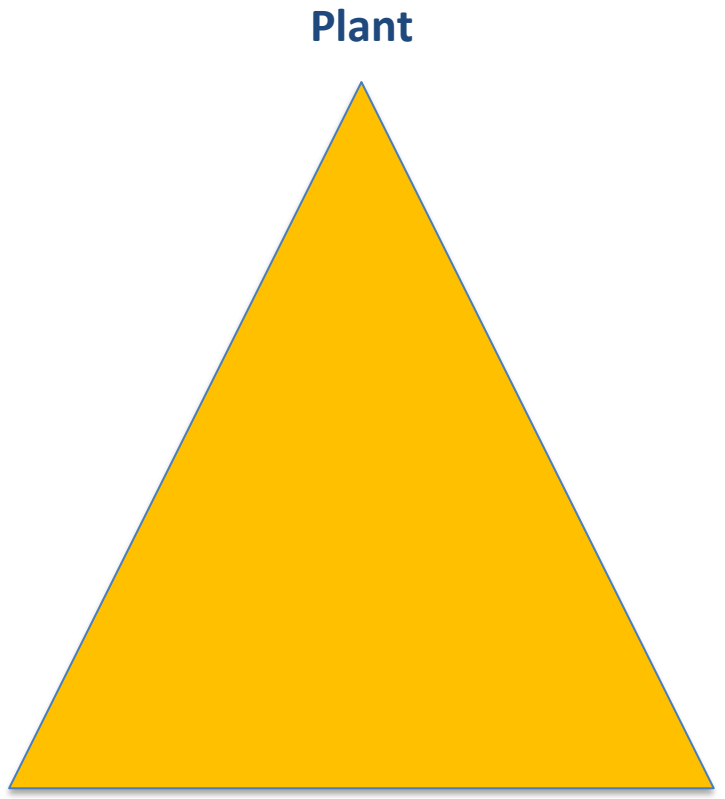

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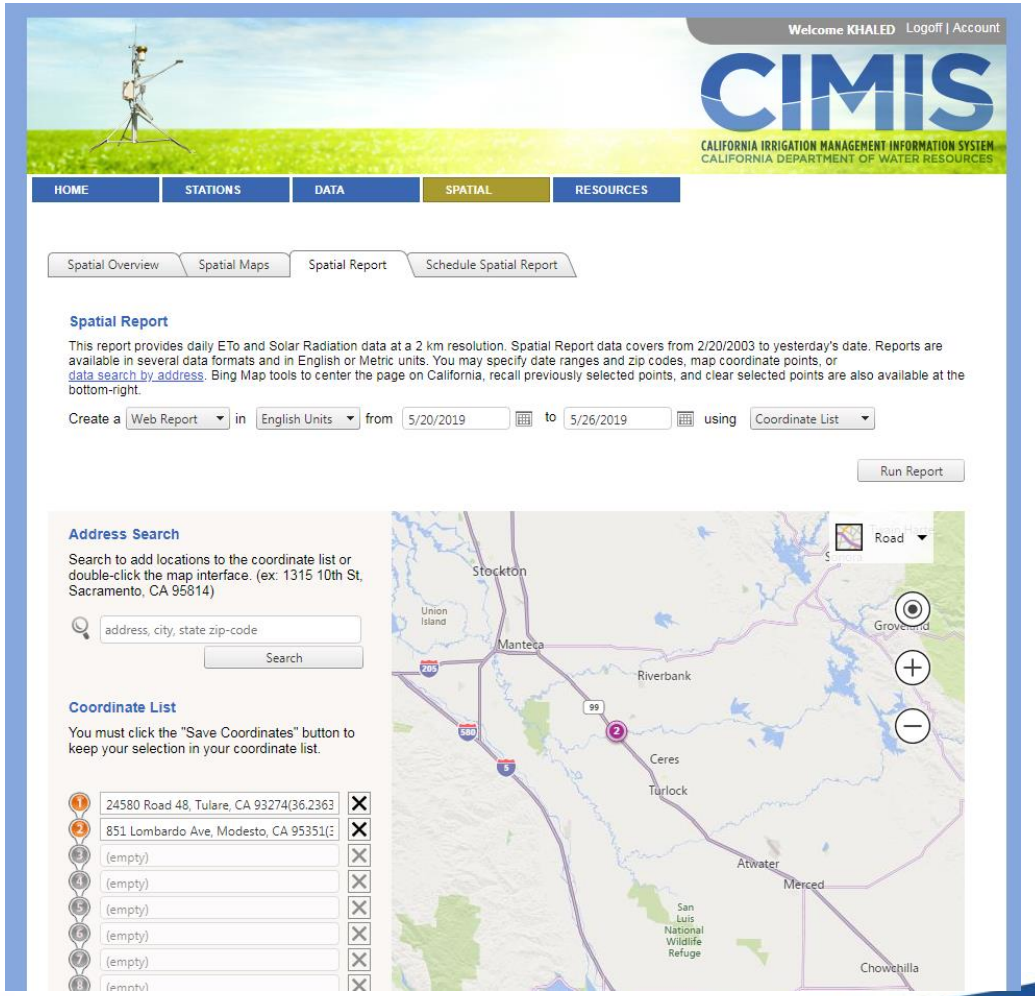
Crop water requirements and irrigation scheduling

- ETo: Spatial CIMIS
- Kc: Crop coefficient (various sources but use as a guide, need to adjust to your farm)
- ETa: Tule technologies, Arable Mark, other sources
- Soil moisture sensors: various vendors

- About CIMIS Weather Stations - Fruit & Nut Research & Information Center (ucdavis.edu)

- http://ucanr.edu/sites/Nut_Crops



Weekly ET Reports
Contact local UCCE farm advisor

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Kern UCCE/DWR Weekly Crop Water Use Report

WEEKLY CROP WATER USE - Based on local CIMIS Weather Stations (in inches)
(Estimated Crop Evapotranspiration or ETc)
07/18/22 through 07/24/22

Crops (Leafout Date)	#5 Shafter			#125 Arvin-Edison			#146 Belridge		
	07/11 -07/17 Water Use	Accum'd Seasonal Water Use	07/18 -07/24 Estimated ETc	07/11 -07/17 Water Use	Accum'd Seasonal Water Use	07/18 -07/24 Estimated ETc	07/11 -07/17 Water Use	Accum'd Seasonal Water Use	07/18 -07/24 Estimated ETc
Almonds (2/24) *	2.34	29.59	1.96	2.49	31.61	2.17	2.22	29.25	2.03
Pistachio (4/4) * **	2.38	25.28	2.03	2.50	27.06	2.24	2.27	24.84	2.10
Citrus (2/1)	1.42	24.51	1.19	1.48	25.81	1.33	1.34	24.36	1.26
Grapes (3/21) (late season table, 75% cover)	2.75	20.46	2.41	2.90	22.08	2.69	2.62	20.09	2.48
Winegrapes (3/21) (50% cover) ***	1.10	14.28	0.91	1.16	15.30	1.05	1.04	14.01	0.98
Alfalfa (2/1)	2.10	34.94	1.75	2.22	36.95	1.96	1.99	34.81	1.82
Cotton (4/18)	2.59	12.30	2.17	2.71	13.24	2.45	2.45	12.00	2.31
Past 7 days precipitation (inches)		0.00			0.00			0.00	
Accumulated precipitation (inches) (since 1/1/2022)		1.75			2.70			1.99	

Accumulations started on the approximate leafout date for a specific orchard crop as indicated in parentheses. Criteria for beginning this report are based on the season's last significant rainfall event where the soil moisture profile is estimated to be near its highest level for the new season.

* Estimates are for orchard floor conditions where vegetation is managed by some combination of strip applications of herbicides, frequent mowing or tillage, and by mid and late season shading and water stress. Weekly estimates of soil moisture loss can be as much as 25 percent higher in orchards where cover crops are planted and managed more intensively for maximum growth.

** Very vigorous, non-salt affected peak season pistachio Kc can be as high as 1.19 – resulting in about 8% greater water use than shown in these tables.

*** Winegrapes irrigated at 50% of ETo starting June 1 to end of September.

PAST WEEKLY APPLIED WATER IN INCHES, ADJUSTED FOR EFFICIENCY [1]

Crops	#5 Shafter				#125 Arvin-Edison				#146 Belridge			
System Efficiency >>	65%	75%	85%	95%	65%	75%	85%	95%	65%	75%	85%	95%
Almonds (2/24)	3.6	3.1	2.8	2.5	3.8	3.3	2.9	2.6	3.4	3.0	2.6	2.3
Pistachio (4/4)	3.7	3.2	2.8	2.5	3.8	3.3	2.9	2.6	3.5	3.0	2.7	2.4
Citrus (2/1)	2.2	1.9	1.7	1.5	2.3	2.0	1.7	1.6	2.1	1.8	1.6	1.4
Grapes (3/21) (late season table, 75% cover)	4.2	3.7	3.2	2.9	4.5	3.9	3.4	3.1	4.0	3.5	3.1	2.8
Winegrapes (3/21) (50% cover)	1.7	1.5	1.3	1.2	1.8	1.5	1.4	1.2	1.6	1.4	1.2	1.1
Alfalfa (2/1)	3.2	2.8	2.5	2.2	3.4	3.0	2.6	2.3	3.1	2.7	2.3	2.1
Cotton (4/18)	4.0	3.5	3.0	2.7	4.2	3.6	3.2	2.9	3.8	3.3	2.9	2.6

1 The amount of water required by a specific irrigation system to satisfy evapotranspiration. Typical ranges in irrigation system efficiency are: Drip, 80%-95%; Micro-sprinkler, 80%-90%; Sprinkler, 70%-85%; and Border-furrow, 50%-75%.

For further information concerning all counties receiving this report, contact the Kern Co. Farm Advisor's office at 661-868-6200.

Weekly ET Reports
Contact local UCCE farm advisor

18ft*9ft
~ 270 trees/ac

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UCCE/DWR Weekly Crop Water Use Report

WEEKLY SOIL MOISTURE LOSS IN INCHES
(Estimated Crop Evapotranspiration or ET_C)
05/06/22 through 05/12/22

Crops (Leafout Date)	#148 Merced			#39 Parlier			#258 Lemon Cove		
	5/6 - 5/12 Water Use	Accum'd Seasonal Water Use	5/13 - 5/19 Estimated ETc	5/6 - 5/12 Water Use	Accum'd Seasonal Water Use	5/13 - 5/19 Estimated ETc	5/6 - 5/12 Water Use	Accum'd Seasonal Water Use	5/13 - 5/19 Estimated ETc
Almonds (3/1) *	1.35	8.94	1.47	1.44	9.21	1.47	1.38	8.93	1.38
Pistachio (4/8) * **	0.96	3.06	1.20	1.04	3.26	1.20	0.99	3.19	1.13
Citrus (2/1)	1.08	10.65	1.10	1.16	10.92	1.10	1.10	10.63	1.05
Raisin Grapes (3/15) (11 ft. row spacing)	0.70	2.38	0.77	0.75	2.52	0.77	0.71	2.45	0.74
Winegrapes (3/15) (10 ft. spacing on California Sprawl Trellis)	0.66	2.64	0.71	0.71	2.78	0.71	0.67	2.73	0.68
Walnuts (4/8)	1.21	4.81	1.30	1.31	5.14	1.30	1.24	5.04	1.23
Stone Fruit (3/10)	0.96	4.69	1.05	1.02	4.82	1.05	0.99	4.73	1.01
Past 7 days precipitation (inches)		0.00			0.00			0.00	
Accumulated precipitation (inches) (1/1/2022)		1.88			1.79			1.82	

Dates in parentheses above, indicate leaf out or starting date for ET accumulation for the specific crop

* Estimates are for orchard floor conditions where vegetation is managed by some combination of strip applications of herbicides, frequent mowing or tillage, and by mid and late season shading and water stress. Weekly estimates of soil moisture loss can be as much as 25 percent higher in orchards where cover crops are planted and managed more intensively for maximum growth.

** Very vigorous, non-salt affected peak season pistachio Kc can be as high as 1.19 – resulting in about 8% greater water use than shown in these tables.

PAST WEEKLY APPLIED WATER IN INCHES, ADJUSTED FOR EFFICIENCY[1]

Crops	#148 Merced				#39 Parlier				#258 Lemon Cove			
System Efficiency >>	65%	75%	85%	95%	65%	75%	85%	95%	65%	75%	85%	95%
Almonds (3/1)	2.1	1.8	1.6	1.4	2.2	1.9	1.7	1.5	2.1	1.8	1.6	1.5
Pistachio (4/8)	1.5	1.3	1.1	1.0	1.6	1.4	1.2	1.1	1.5	1.3	1.2	1.0
Citrus (2/1)	1.7	1.4	1.3	1.1	1.8	1.5	1.4	1.2	1.7	1.5	1.3	1.2
Raisin Grapes (3/15) (11 ft. row spacing)	Assume all grape			0.7	Assume all grape			0.8	Assume all grape			0.8
Winegrapes (3/15) (10 ft. spacing on California Sprawl Trellis)	irrigation type is drip			0.7	irrigation type is drip			0.7	irrigation type is drip			0.7
Walnuts (4/8)	1.9	1.6	1.4	1.3	2.0	1.7	1.5	1.4	1.9	1.7	1.5	1.3
Stone Fruit (3/10)	1.5	1.3	1.1	1.0	1.6	1.4	1.2	1.1	1.5	1.3	1.2	1.0

1 The amount of water required by a specific irrigation system to satisfy evapotranspiration. Typical ranges in irrigation system efficiency are: Drip, 80%-95%; Micro-sprinkler, 80%-90%; Sprinkler, 70%-85%; and Border-furrow, 50%-75%.

PAST WEEKLY APPLIED WATER IN GALLON PER TREE OR VINE

Crops	#148 Merced				#39 Parlier				#258 Lemon Cove			
Almonds 115 Trees/A	496	425	378	331	519	449	401	354	496	425	378	354
Pistachio 106 Trees/A	374	324	274	249	399	349	299	274	374	324	299	249
Citrus 110 Trees/A	420	346	321	272	444	370	346	296	420	370	321	296
Raisin Grapes 566 Vines/A	Assume all grape			34	Assume all grape			38	Assume all grape			38
Winegrapes 622 Vines/A	irrigation type is drip			31	irrigation type is drip			31	irrigation type is drip			31
Walnuts 76 Trees/A	679	572	500	464	715	607	536	500	679	607	536	464
Stonefruit 172 Trees/A	237	205	174	158	253	221	189	174	237	205	189	158

For further information concerning all counties receiving this report, contact the Fresno Co. Farm Advisor's office at (559) 241-7526.

Drought and CIMIS Stations

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Kern UCCE/DWR Weekly Crop Water Use Report

WEEKLY CROP WATER USE - Based on local CIMIS Weather Stations (in inches)
(Estimated Crop Evapotranspiration or ETc)
10/24/22 through 10/30/22

*SEE NOTE BELOW*****

Crops (Leafout Date)	#5 Shafter			#125 Arvin-Edison			#146 Belridge		
	10/17 -10/23 Water Use	Accum'd Seasonal Water Use	10/24 -10/30 Estimated ETc	10/17 -10/23 Water Use	Accum'd Seasonal Water Use	10/24 -10/30 Estimated ETc	10/17 -10/23 Water Use	Accum'd Seasonal Water Use	10/24 -10/30 Estimated ETc
Almonds (2/24) *	0.81	53.04	0.59	~~0.92~~	~~57.08~~	0.62	0.81	51.68	0.57
Pistachio (4/4) * **	0.67	48.02	0.51	~~0.77~~	~~51.53~~	0.54	0.67	46.56	0.49
Citrus (2/1)	0.65	39.91	0.51	~~0.76~~	~~42.48~~	0.54	0.65	39.10	2.89
Grapes (3/21) (late season table, 75% cover)	1.30	51.69	1.00	~~1.49~~	~~56.01~~	1.03	1.30	49.89	0.98
Winegrapes (3/21) (50% cover) *** Irrigation Finished	0.23	25.05	0.21	~~0.27~~	~~26.91~~	0.21	0.23	24.27	0.20
Alfalfa (2/1)	0.93	57.06	0.72	~~1.06~~	~~60.99~~	0.75	0.93	55.95	0.70
Cotton (4/18) Irrigation Finished	0.49	36.73	0.35	~~0.56~~	~~39.68~~	0.35	0.48	35.19	0.34
Past 7 days precipitation (inches)		0.00			0.00			0.00	
Accumulated precipitation (inches) (since 1/1/2022)		1.75			2.78			2.37	

Accumulations started on the approximate leafout date for a specific orchard crop as indicated in parentheses. Criteria for beginning this report are based on the season's last significant rainfall event where the soil moisture profile is estimated to be near its highest level for the new season.

* Estimates are for orchard floor conditions where vegetation is managed by some combination of strip applications of herbicides, frequent mowing or tillage, and by mid and late season shading and water stress. Weekly estimates of soil moisture loss can be as much as 25 percent higher in orchards where cover crops are planted and managed more intensively for maximum growth.

** Very vigorous, non-salt affected peak season pistachio Kc can be as high as 1.19 – resulting in about 8% greater water use than shown in these tables.

*** Winegrapes irrigated at 50% of ETo starting June 1 to end of September.

***** Due to drought conditions 125 Arvin-Edison currently has insufficient vegetative cover to provide accurate ETo data. 5 Shafter and 146 Belridge are providing the best ETo data for Kern County. The "Estimated ET" for next week is based on the 20+ year average (normal year) ETo for that station and is still valid.*

PAST WEEKLY APPLIED WATER IN INCHES, ADJUSTED FOR EFFICIENCY [1]

Crops	#5 Shafter				#125 Arvin-Edison				#146 Belridge			
System Efficiency >>	65%	75%	85%	95%	65%	75%	85%	95%	65%	75%	85%	95%
Almonds (2/24)	1.2	1.1	1.0	0.9	~~1.4~~	~~1.2~~	~~1.1~~	~~1.0~~	1.2	1.1	1.0	0.9
Pistachio (4/4)	1.0	0.9	0.8	0.7	~~1.2~~	~~1.0~~	~~0.9~~	~~0.8~~	1.0	0.9	0.8	0.7
Citrus (2/1)	1.0	0.9	0.8	0.7	~~1.2~~	~~1.0~~	~~0.9~~	~~0.8~~	1.0	0.9	0.8	0.7
Grapes (3/21) (late season table, 75% cover)	2.0	1.7	1.5	1.4	~~2.3~~	~~2.0~~	~~1.8~~	~~1.6~~	2.0	1.7	1.5	1.4
Winegrapes (3/21) (50% cover) Irrigation Finished	0.0	0.0	0.0	0.0	~~0.0~~	~~0.0~~	~~0.0~~	~~0.0~~	0.0	0.0	0.0	0.0
Alfalfa (2/1)	1.4	1.2	1.1	1.0	~~1.6~~	~~1.4~~	~~1.2~~	~~1.1~~	1.4	1.2	1.1	1.0
Cotton (4/18) Irrigation Finished	0.0	0.0	0.0	0.0	~~0.0~~	~~0.0~~	~~0.0~~	~~0.0~~	0.0	0.0	0.0	0.0

1 The amount of water required by a specific irrigation system to satisfy evapotranspiration. Typical ranges in irrigation system efficiency are: Drip, 80%-95%; Micro-sprinkler, 80%-90%; Sprinkler, 70%-85%; and Border-furrow, 50%-75%.

For further information concerning all counties receiving this report, contact the Kern Co. Farm Advisor's office at 661-868-6200.

Example: Crop Water Use:

Tule Technologies Method

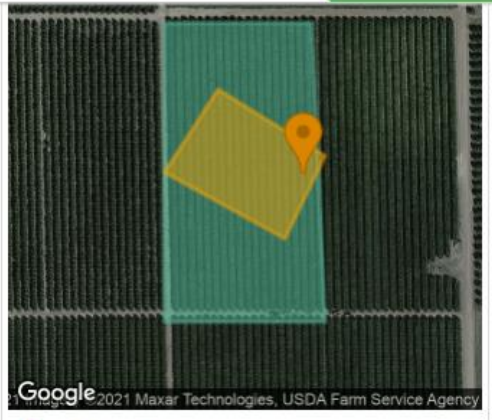
https://www.tuletechnologies.com/towers/4935

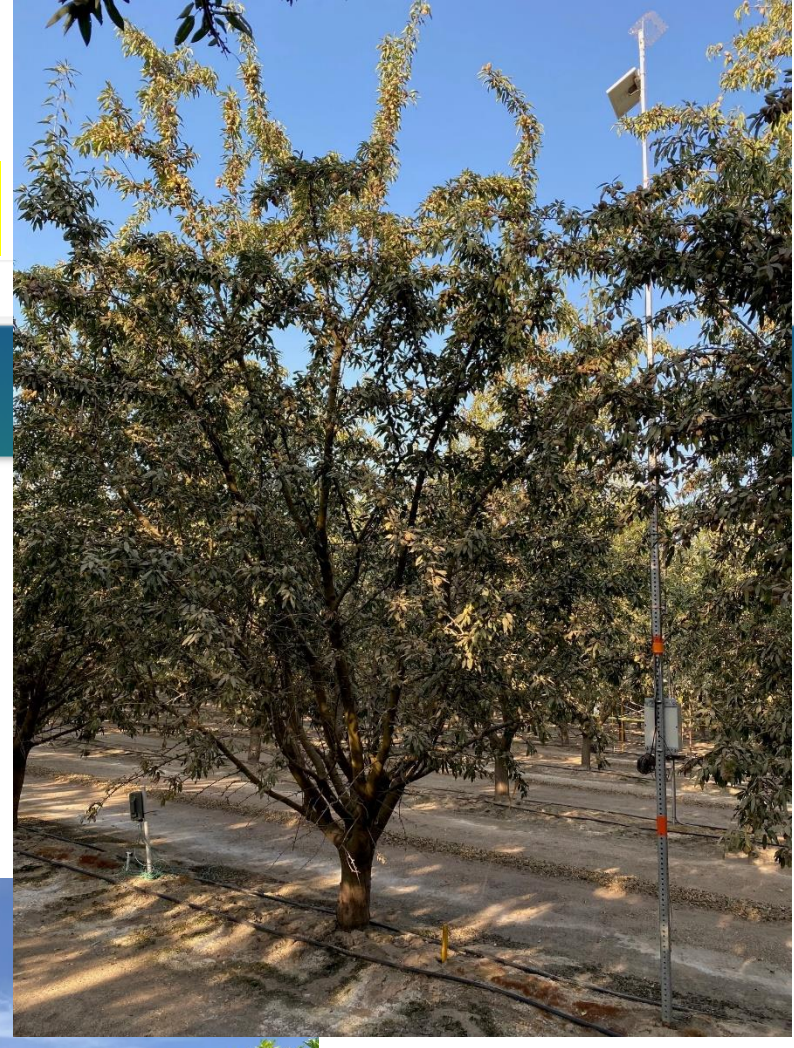
tule Dashboard Reference Guide Blog

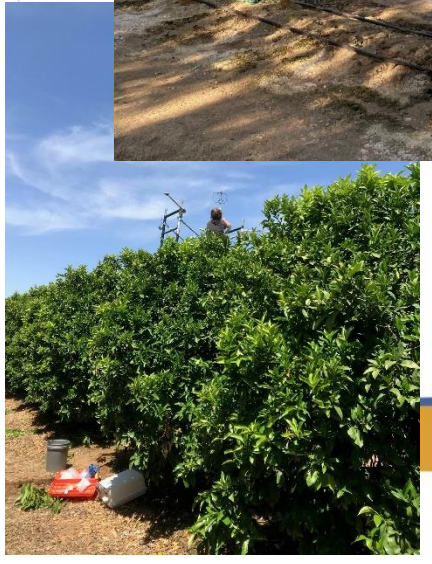
Mandarin Settings

Save Changes

Sensor Location	
Installation Date	August 16th, 2019
Similar Fields Group	Similar fields data includes measurements from 9 similar fields of mature citrus trees in the East San Joaquin Valley on soils with high water holding capacity.
Soil Water Holding Capacity	6.24 inches (provided by NRCS) Edit
Crop	Citrus
Distance Between Rows (ft)	15.0
Distance Between Plants within Row (ft)	12.0
Harvest Method	Hand Harvest
Planting date	2019-07-01

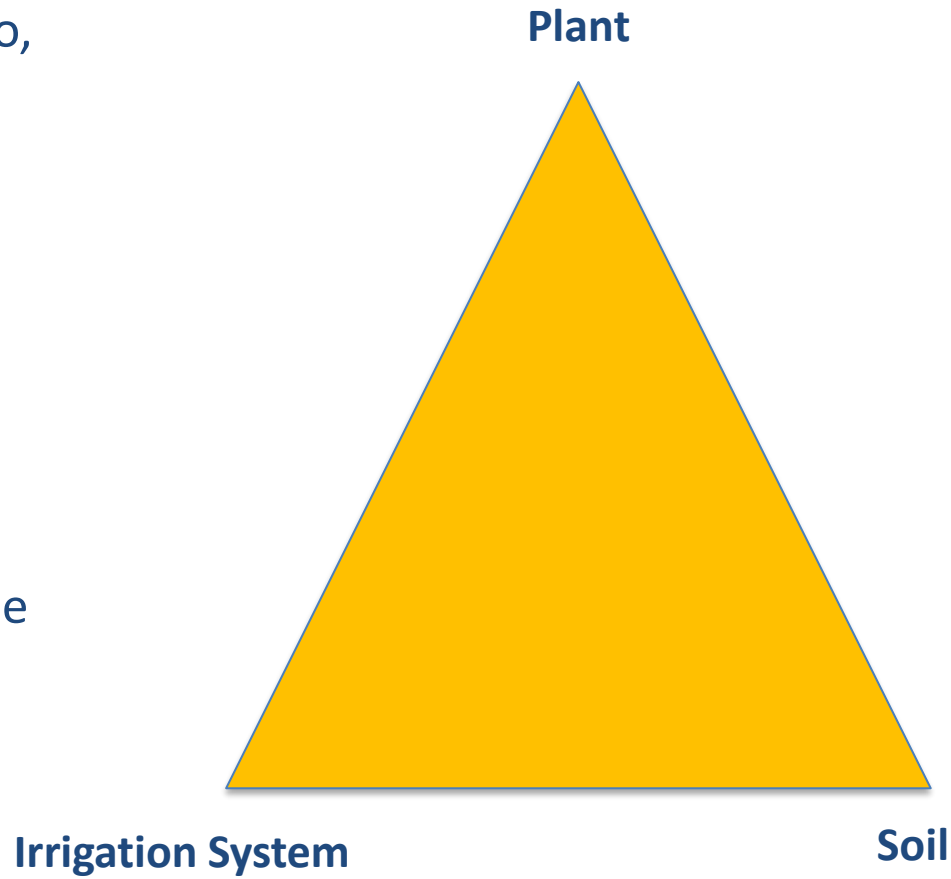






Irrigation and Nitrogen Budgeting

- Crop water requirements and irrigation scheduling (ETo, Kc, ETa, CIMIS, Tule, plant-based technologies, and soil moisture), tree growth, etc.
- Soil type (texture and its impact on water holding capacity, infiltration rate, irrigation frequency, and possibly leaching if needed)
- Irrigation system (drip or other systems, efficiency, application rate, flow rate, irrigation frequency, variable rate irrigation)



Soil type (texture and its impact on water holding capacity, infiltration rate, irrigation frequency, and possibly leaching if needed)

- Soil texture: get to know your soil (several sources), start with the soil map but backhoe or at least a shovel is a must
- Check for soil variability (may need to have variable rate irrigation)
- What is your water holding capacity (WHC)?
- Effective rootzone depth (flood vs drip)
- If considering new irrigation system, consider soil variability in the new design (management zones)
- Consider soil type in leaching (if needed)

Map Unit Legend

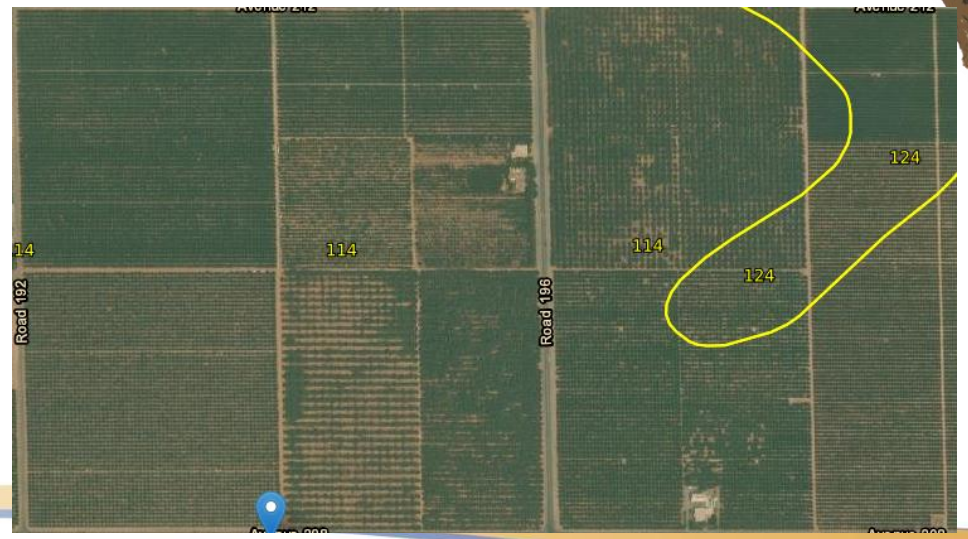
Tulare County, Western Part, California (CA659)

Tulare County, Western Part, California (CA659)

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
114	Exeter loam, 0 to 2 percent slopes	162.4	100.0%
Totals for Area of Interest		**162.4**	**100.0%**

Soil Resources

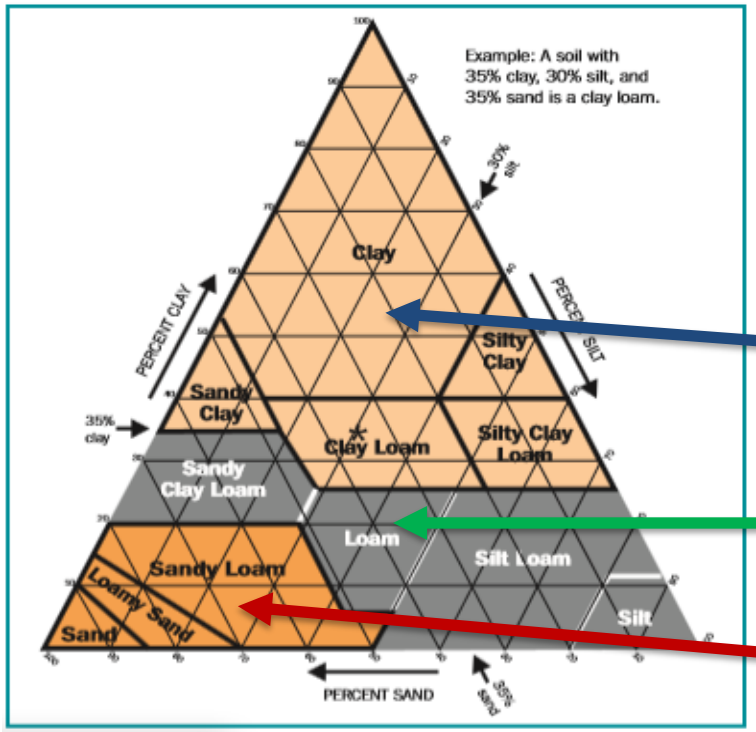
- [California Soil Resource Lab :: Home (ucdavis.edu)]
- [Web Soil Survey - Home (usda.gov)]
- [ANR Catalog (ucanr.edu)]
- NRCS and RCDs



Soil type and irrigation system

- Even within the same texture classification, you may have variations in soil physical properties that may impact irrigation scheduling (compacted soil with low infiltration rate, slope)

- Soil type: Adjust water application rate and irrigation frequency based on soil type

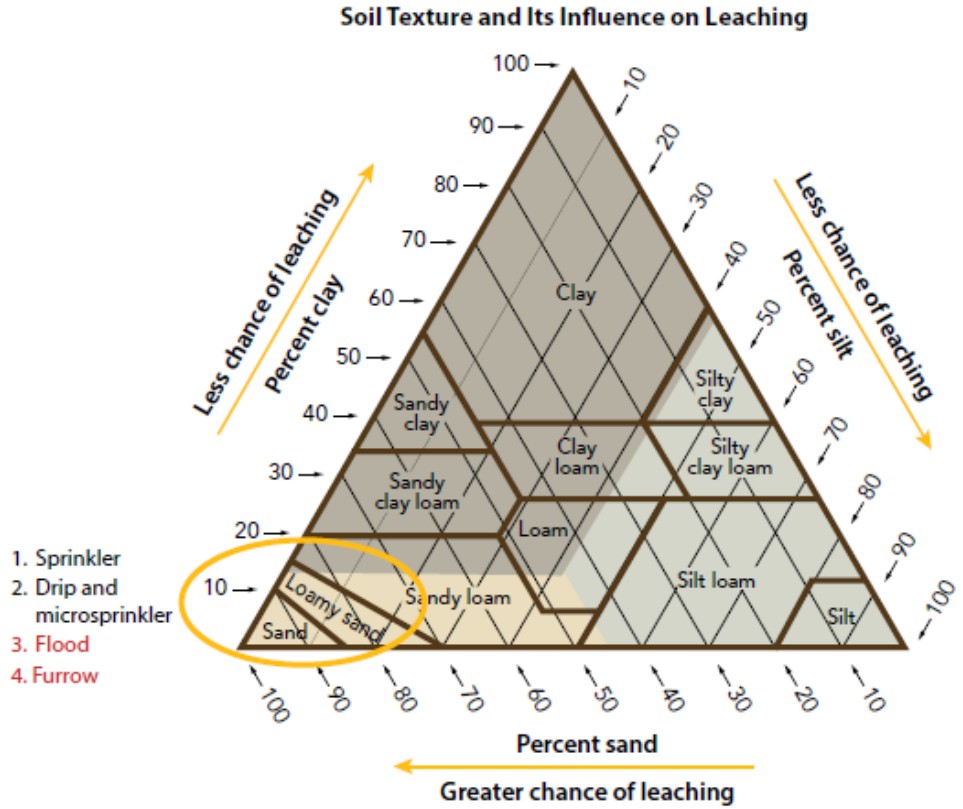


Textural triangle and Water Holding Capacity

High WHC but lower infiltration rate

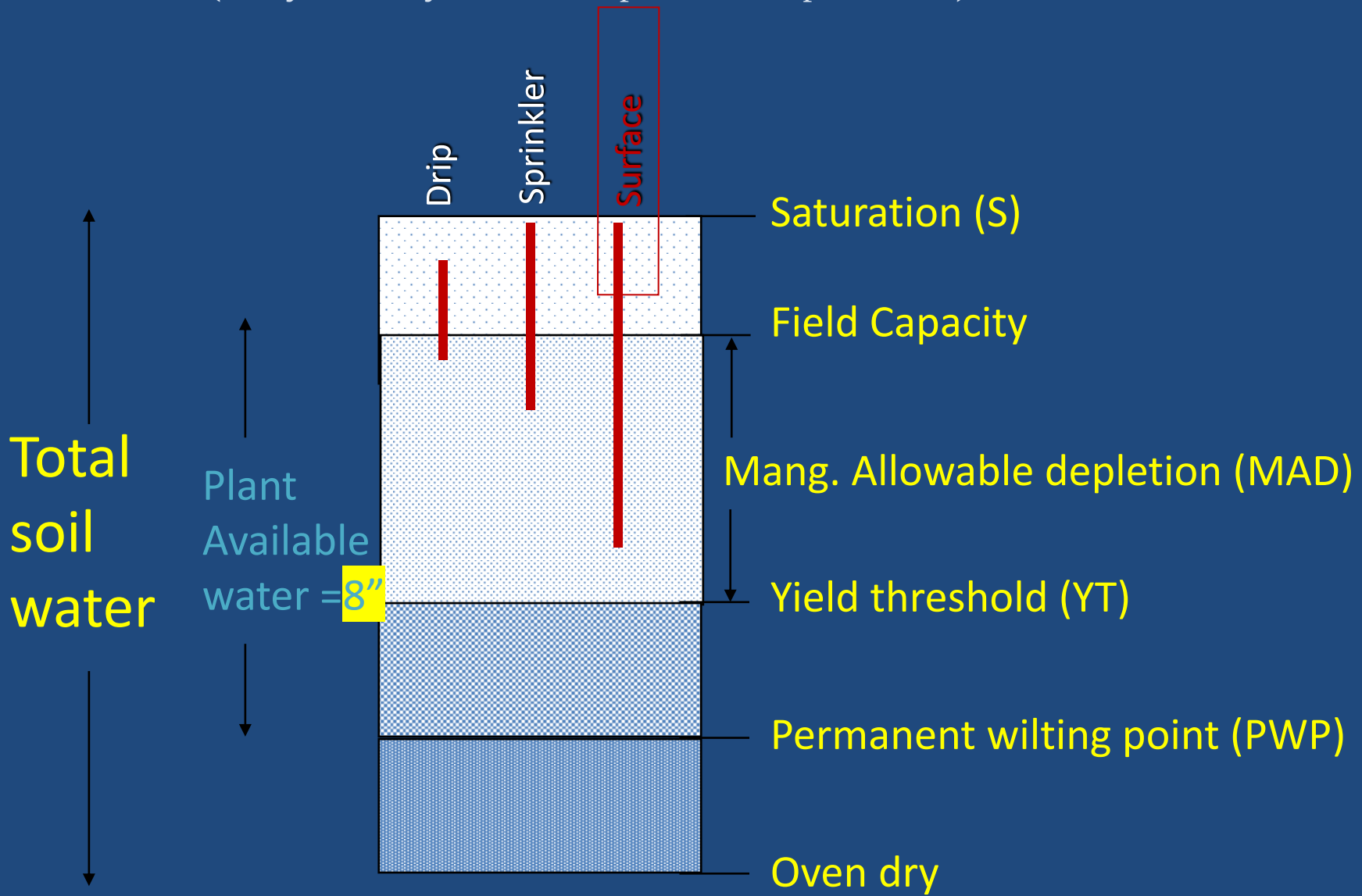
Medium WHC and medium infiltration rate

Low WHC but high infiltration rate



Soil Water Holding Capacity- Soil Moisture

(many units, by volume, depth, etc. simplest; in/ft)



Irrigation and Nitrogen Budgeting

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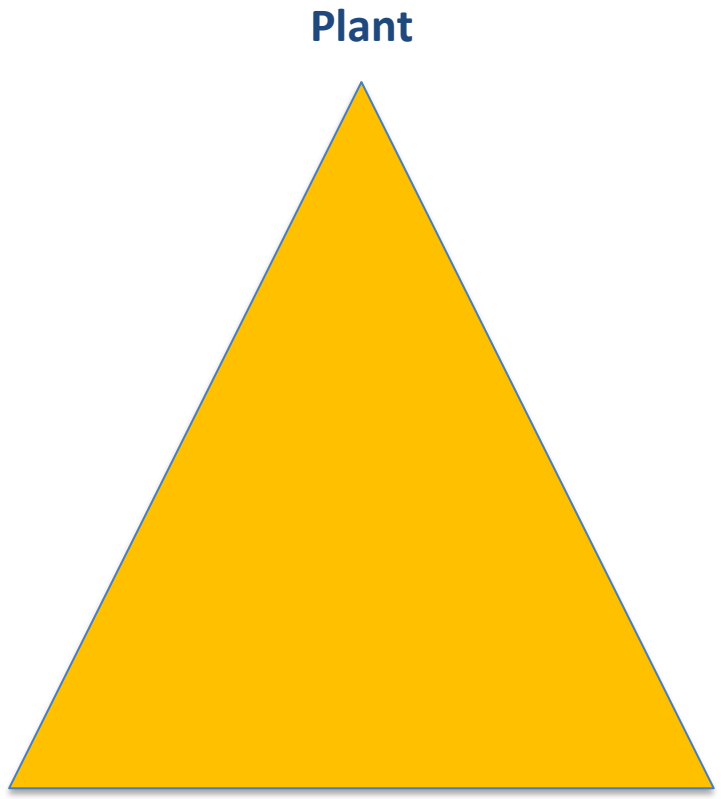

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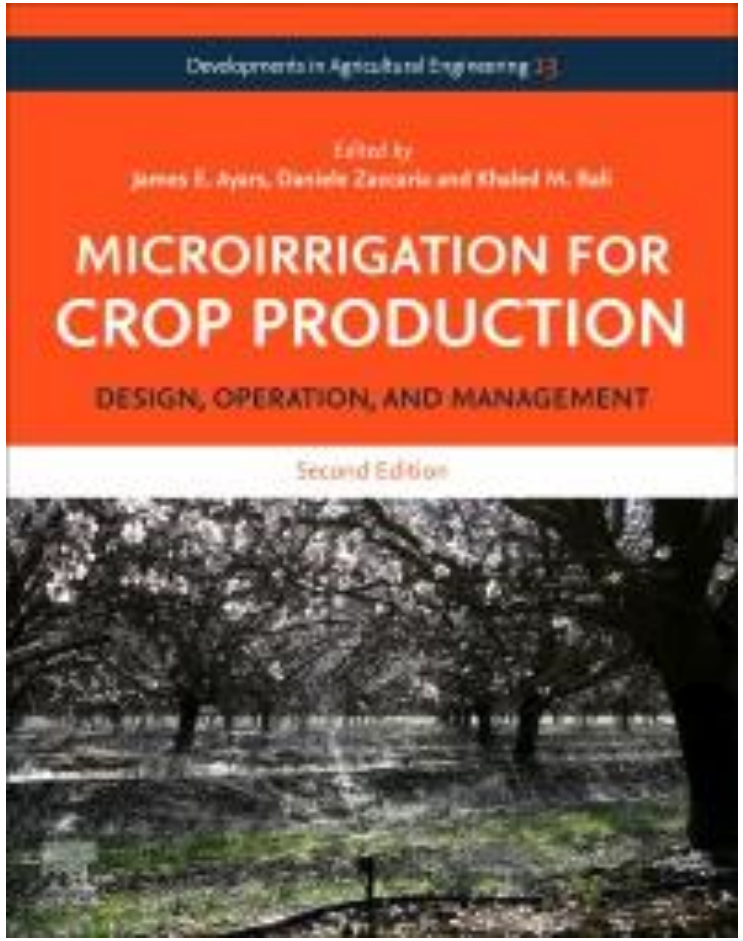
Irrigation system

- Existing irrigation system:
  - Current system design (check application rate, flow meter, and other system components)
  - Check system efficiency (DU) at least once a year
  - Determine system DU (distribution uniformity, >85% good)
  - What can be done to improve efficiency (infiltration rate, emitters, fixing leaks, etc)
  - Remember Application Rate= Crop water needs/DU
  - Consider water and energy costs (lower DU=higher operating costs)
  - Check flow rate vs design application rate
  - Irrigation frequency based on soil texture

- New irrigation system:
  - Consider energy rates and time of use in design (4 pm- 9 pm)
  - Old system design: irrigation day up to 18-20 hrs
  - New system design: 14-20 hrs with high energy costs (except for heat waves)

How Much Water To Apply and How Long Should You Irrigate?

- 1 Acre-foot = 325,851 gallons
- 1 inch of water = 27,158 gallons / Acre
- 1 cubic foot =7.48 gallons
- D= (Q x T)/ (449 x A)
  - D: Average inches of water applied to the field (inch)
  - Q: Flow rate (gallons/min)
  - T: Hours required to irrigate the field
  - 449: conversion factor
  - A: Acres irrigated



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Water Flow Rates and Conversion Factors

$$Q * T = D * A$$

where:
Q = flow rate (acre-in/hr or cfs)
T = time (hr)
D = gross depth applied (in)
A = area (acres)

$$Q = \frac{453 * A * D}{F * H}$$

where:
Q = flow rate (gpm)
A = area (acres)
D = gross application depth (in)
F = irrigation period (days)
H = hours of operation per day

Water Flow Rates:
1 cubic foot per second (cfs)
= 448.8 gallons per minute
1 cfs for 1 hour = 0.99 acre-inch
1 cfs for 24 hr = 1.98 acre-ft
1,000 gpm = 2.23 cfs
1,000 gpm for 24 hr = 4.42 ac-ft
1 cfs = 40 miner's inches in OR, AZ, MT, No. CA
1 cfs = 50 miner's inches in ID, KS, NE, NM, ND, SD, So. CA
1 cfs = 38.4 miner's inches in CO
1 miner's inch = 9.0 gpm in ID
1 cfs = 28.32 liters/sec
1 cfs = 0.02832 cubic meters/s
1 cubic meter/sec = 35.3 cfs
1 liter/sec = 15.85 gpm

Pump Power Requirement:

$$\text{Horsepower} = \frac{\text{Pump Head in ft} * \text{gpm}}{3960 * \text{Pump Efficiency}}$$

Water Volumes & Weights:
1 cubic foot = 7.48 gallons
= 62.4 lb
= 28.3 liters
1 acre-foot = 43,560 cubic feet
(1 acre covered 1 ft deep)
12 acre-inches = 1 acre-ft
1 million gallons = 3.07 acre-ft
1 acre-ft = 1,234 cubic meters
1 cubic meter = 1,000 liters

Pressure and Pressure Head:
1 psi = 2.31 ft of pressure head
1 atmosphere (sea level)
= 14.7 psi = 33.9 ft of head

Lengths and Areas:
1 mile = 5,280 ft = 1.61 km
1 meter = 3.28 ft = 39.37 inches
1 acre = 43,560 square ft
1 hectare = 2.47 acres

Source: NRCS (https://efotg.sc.egov.usda.gov/references/Delete/2012-3-17/Archived_449js1EXidaho_120316.pdf)

Fine-tuning your water budget

Weekly ET Reports
Contact local UCCE farm advisor

18ft*9ft
~ 270 trees/acre

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UCCE/DWR Weekly Crop Water Use Report

WEEKLY SOIL MOISTURE LOSS IN INCHES
(Estimated Crop Evapotranspiration or ET_c)
08/27/21 through 09/02/21

Crops (Leafout Date)	#148 Merced			#39 Parlier			#258 Lemon Cove		
	8/27 - 9/2 Water Use	Accum'd Seasonal Water Use	9/3 - 9/9 Estimated ETc	8/27 - 9/2 Water Use	Accum'd Seasonal Water Use	9/3 - 9/9 Estimated ETc	8/27 - 9/2 Water Use	Accum'd Seasonal Water Use	9/3 - 9/9 Estimated ETc
Almonds (3/5) *	1.61	38.52	1.54	1.80	41.19	1.44	1.67	38.29	1.46
Pistachio (4/16) * **	1.65	33.00	1.56	1.82	35.59	1.47	1.69	32.78	1.48
Citrus (2/1)	1.02	29.70	1.05	1.12	31.50	1.01	1.06	29.39	1.02
Raisin Grapes (3/12) (11 ft. row spacing)	1.27	26.17	1.24	1.38	28.28	1.16	1.29	26.04	1.18
Winegrapes (3/12) (10 ft. spacing on California Sprawl Trellis) ***	1.44	28.72	1.39	1.59	31.04	1.30	1.48	28.55	1.32
Walnuts (4/5)	1.53	35.11	1.39	1.68	37.70	1.30	1.57	34.86	1.32
Stone Fruit (3/10)	1.65	31.55	1.60	1.82	34.05	1.51	1.69	31.37	1.53
Past 7 days precipitation (inches)		0.00			0.00			0.00	
Accumulated precipitation (inches) (1/1/2021)		5.54			3.66			3.90	

Dates in parentheses above, indicate leaf out or starting date for ET accumulation for the specific crop
* Estimates are for orchard floor conditions where vegetation is managed by some combination of strip applications of herbicides, frequent mowing or tillage, and by mid and late season shading and water stress. Weekly estimates of soil moisture loss can be as much as 25 percent higher in orchards where cover crops are planted and managed more intensively for maximum growth.
** Very vigorous, non-salt affected peak season pistachio Kc can be as high as 1.19 – resulting in about 8% greater water use than shown in these tables.

PAST WEEKLY APPLIED WATER IN INCHES, ADJUSTED FOR EFFICIENCY [1]

Crops	#148 Merced				#39 Parlier				#258 Lemon Cove			
System Efficiency >>	65%	75%	85%	95%	65%	75%	85%	95%	65%	75%	85%	95%
Almonds (3/5)	2.5	2.1	1.9	1.7	2.8	2.4	2.1	1.9	2.6	2.2	2.0	1.8
Pistachio (4/16)	2.5	2.2	1.9	1.7	2.8	2.4	2.1	1.9	2.6	2.3	2.0	1.8
Citrus (2/1)	1.6	1.4	1.2	1.1	1.7	1.5	1.3	1.2	1.6	1.4	1.2	1.1
Raisin Grapes (3/12) (11 ft. row spacing)***	2.0	1.7	1.5	1.3	2.1	1.8	1.6	1.5	2.0	1.7	1.5	1.4
Winegrapes (3/12) (10 ft. spacing on California Sprawl Trellis) ***	2.2	1.9	1.7	1.5	2.4	2.1	1.9	1.7	2.3	2.0	1.7	1.6
Walnuts (4/5)	2.4	2.0	1.8	1.6	2.6	2.2	2.0	1.8	2.4	2.1	1.8	1.7
Stone Fruit (3/10)	2.5	2.2	1.9	1.7	2.8	2.4	2.1	1.9	2.6	2.3	2.0	1.8

1 The amount of water required by a specific irrigation system to satisfy evapotranspiration. Typical ranges in irrigation system efficiency are: Drip, 80%-95%; Micro-sprinkler, 80%-90%; Sprinkler, 70%-85%; and Border-furrow, 50%-75%.

PAST WEEKLY APPLIED WATER IN GALLON PER TREE OR VINE

Crops	#148 Merced				#39 Parlier				#258 Lemon Cove			
Almonds 115 Trees/A	590	496	449	401	661	567	496	449	614	519	472	425
Pistachio 106 Trees/A	623	548	473	424	698	598	523	473	648	573	498	448
Citrus 110 Trees/A	395	346	296	272	420	370	321	296	395	346	296	272
Raisin Grapes 366 Vines/A	96	82	72	62	101	86	77	72	96	82	72	67
Winegrapes 622 Vines/A	96	83	74	65	105	92	83	74	100	87	74	70
Walnuts 76 Trees/A	857	715	643	572	929	786	715	643	857	750	643	607
Stonefruit 172 Trees/A	395	347	300	268	442	379	332	300	410	363	316	284

For further information concerning all counties receiving this report, contact the Fresno Co. Farm Advisor's office at (559) 241-7526.

Example: Simple Crop Water Budget:

$$ETc = ETo \times Kc$$

From previous slide: ETc is 1.06 inches/week
Irrigation system DU:85%
Irrigation requirements: 1.06/0.85= 1.25 inches
Last 7 days precipitation: 0 inches
No need to irrigate if precipitation is higher than ETa (but check soil moisture, slope and runoff)

If precipitation is **zero**, we need to apply 1.25”/week
If irrigation system application rate is 0.09 in/hr,
need to irrigate for 1.25/0.09=14 hrs

Nitrogen Management and Budgeting: 4 Rs

- **Right Rate** based on tree demand
- **Right Time** based on tree uptake
- **Right Place** in the active root zone or foliage
- **Right Source** for crop and environment

- **The primary components of a N budget include**:
  - **Nitrogen demand based on current yield assessments (Example: Pounds N exported per 1000 lbs of crop harvested for 1000 of almond is 68)**
  - **N credits (water, manure, compost, cover crop)**
  - **Amount of additional Nitrogen needed.**

WELL "A" WATER ANALYSIS

Physical Characteristics

pH	6.68	
Electrical Conductivity	3.89	mmho/cm
Total Dissolved Salts	2489.60	ppm
SAR (adj.)	18.12	

Chemical Analysis	(Results in ppm)	(Results in meq/l)
Sodium	433.32	18.60
Potassium	6.10	0.16
Calcium	222.04	11.10
Magnesium	109.05	9.09
Boron	0.62	
Chloride	245.00	7.00
Bicarbonate	707.9	11.2
Carbonate	0.3	
Nitrate	7.71	0.12
Phosphate	0.01	****.**
Sulfate-S	635.62	19.86

WELL “B” WATER ANALYSIS

	.....meq/l.....					.....meq/l.....			..... ppm				
EC $\times 10^3$	Ca	Mg	Na	SAR	SAR adj	Cl	CO_3+ HCO_3	SO_4	B	NO_3-N	Fe	Mn	pH
0.91	3.3	2.7	4.0	2.3	5.2	2.7	5.1		1.8	2.0			7.6

Nitrogen content of irrigation water reported as ppm

Water content of	Multiply by	To determine
PPM NO_3	0.052	Pounds N/acre inch
PPM NO_3	0.62	Pounds N/acre foot
PPM NO_3-N	0.23	Pounds N/acre inch
PPM NO_3-N	2.72	Pounds N/acre foot

Source: Estimating N contribution from irrigation water containing nitrate
http://ucanr.edu/blogs/CropManage/index.cfm?tagname=nitrate%20conversion%20factors

Example of N budget for almond orchard

N source	N budget for 3000 lbs Cropload
N credits (irrigation water + compost)	-57
Crop N requirement	3*68=**204**
Crop N requirement after credits	147
Extra N due to 70% efficiency	63
Apply (lbs N)	**210**

Summary

- Understand your soil (texture and its impact on water holding capacity, irrigation frequency, salinity)

- Consider irrigation water quality (salinity, leaching, etc)

- Irrigation system (drip or other system, efficiency, application rate, flow rate, irrigation frequency, variable zone irrigation)

- Energy cost and irrigation efficiency

- Crop water requirements and irrigation scheduling (ETo, Kc, ETa, CIMIS, Tule, plant-based technologies, and soil moisture)

- Nitrogen budget based on the 4Rs

- Fine-tuning your water budget and N budget (FRET, soil moisture, other technologies)

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Thank You