

WORKSHOP: GROUNDWATER PUMPING REDUCTION FRAMEWORK AND PILOT PROGRAM

EAST TURLOCK SUBBASIN GROUNDWATER SUSTAINABILITY AGENCY TECHNICAL ADVISORY COMMITTEE

MARCH 7, 2023



Workshop Topics

Introduction and Background

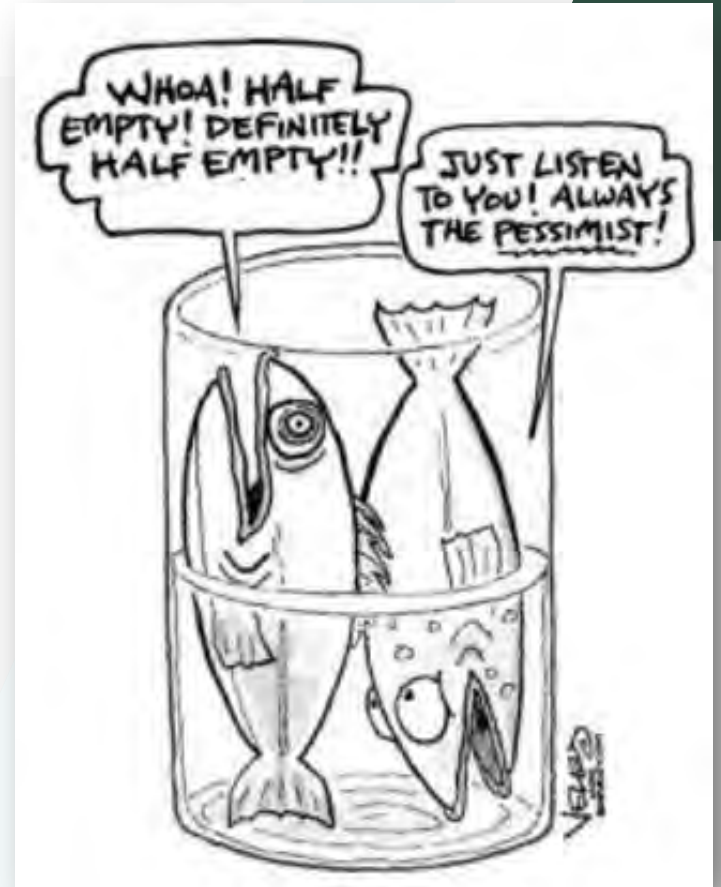
Pumping Management Framework
Implementation Approach

Pumping Baseline and Reduction Target

Pumping Measurement Approach

Credits, Carryover, Pooling and Trading

Pilot Pumping Reduction Program



INTRODUCTION AND BACKGROUND



SUSTAINABLE GROUNDWATER MANAGEMENT ACT (SGMA)

1. Form
GSA

June 2017

2. Develop
GSP

Jan 2020/22

3. Implement
GSP

Over 20 yrs

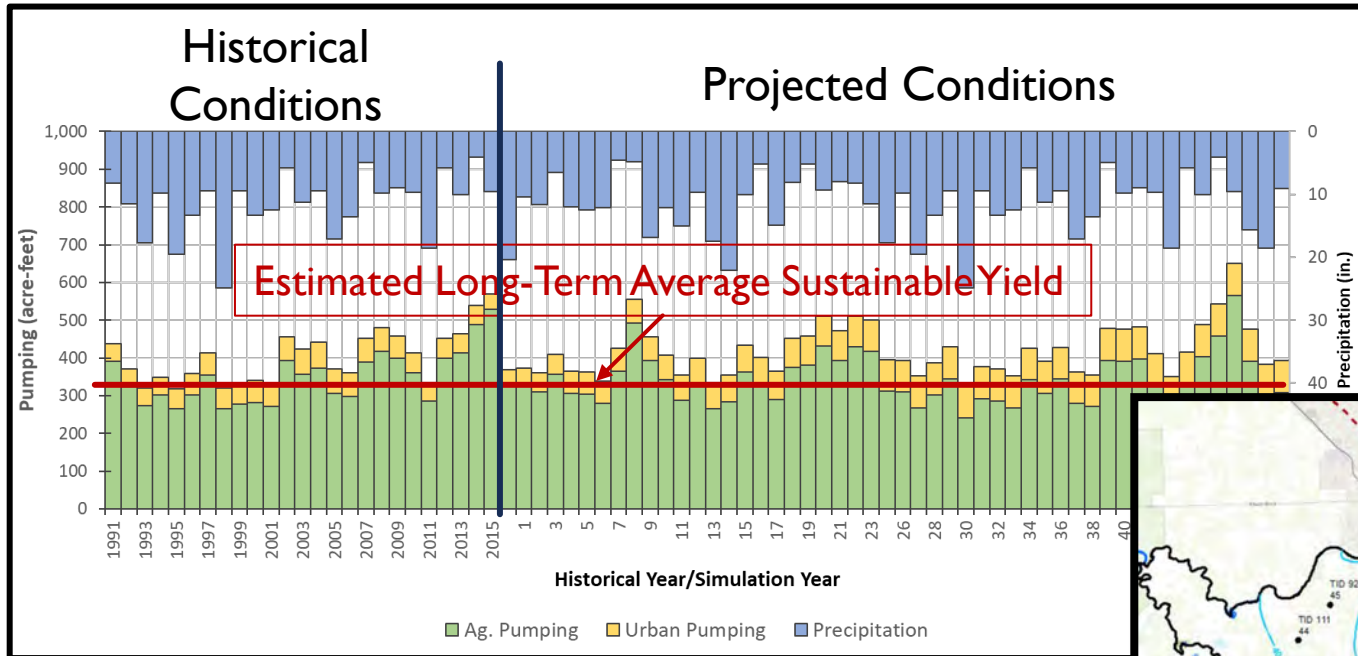
4. Achieve
Sustainability

2040/42



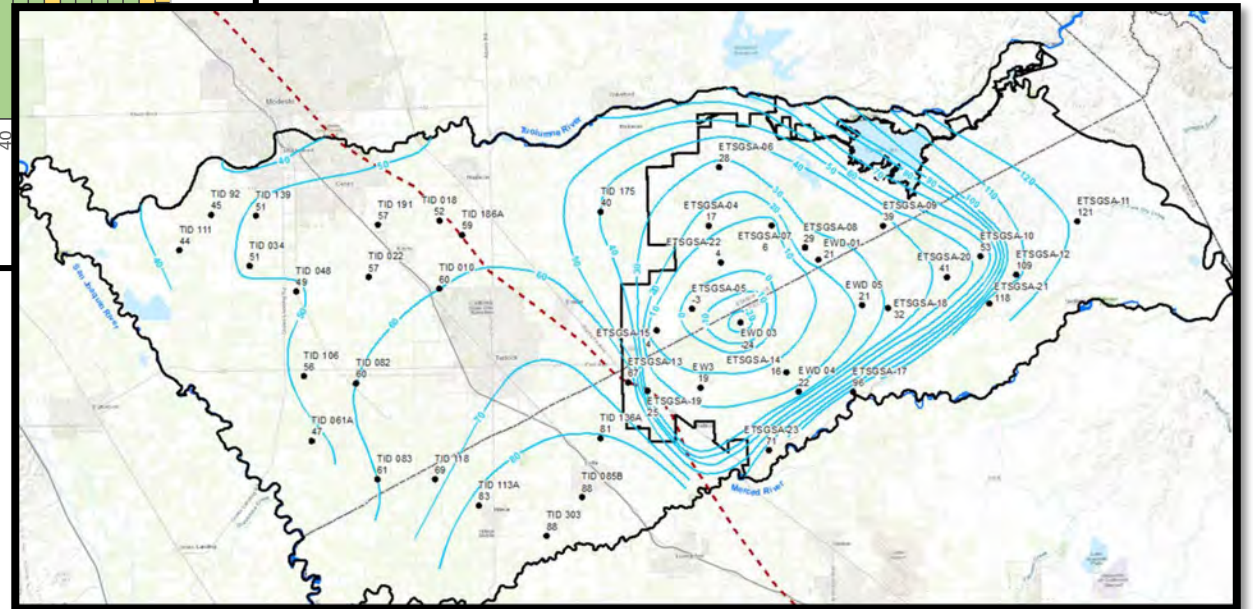
- Achieve groundwater sustainability in medium and high priority GW basins.
- Implement monitoring, projects and management actions to achieve sustainability within 20 years.
- Local control, backstopped by State intervention.

GROUNDWATER PUMPING AND SUSTAINABLE YIELD

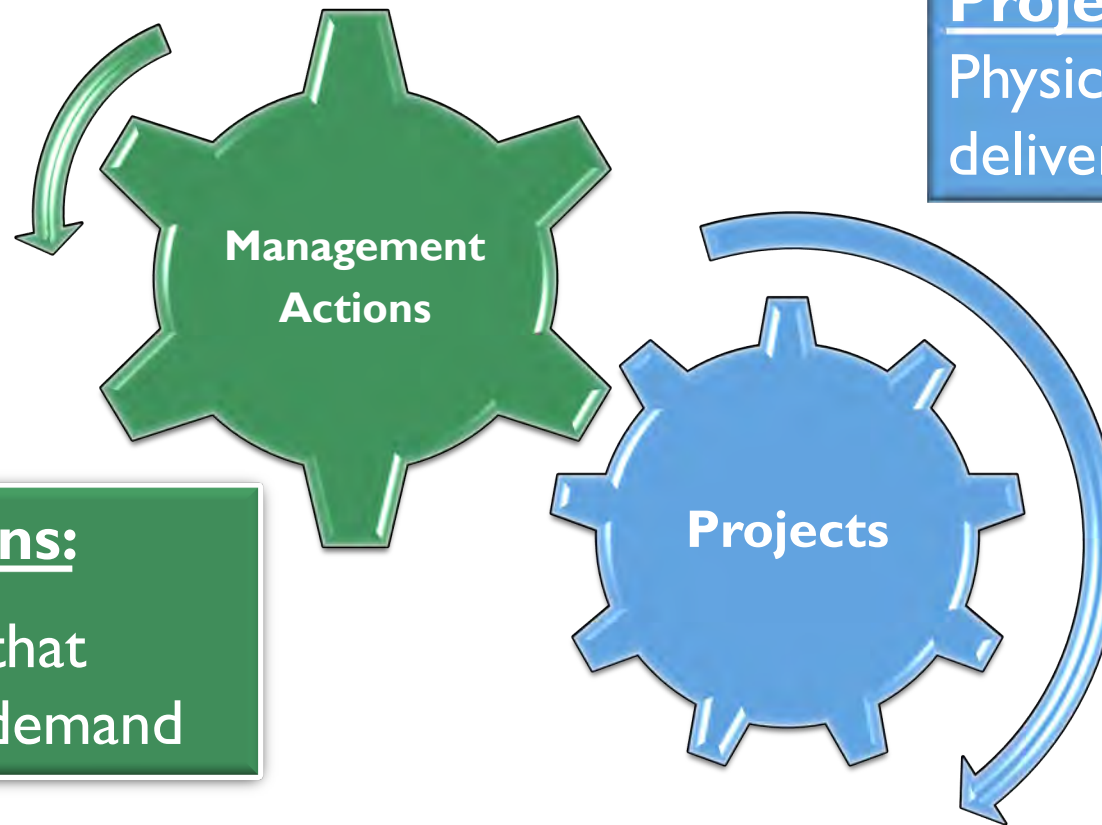


- Long-term average sustainable yield is exceeded under current and projected demand conditions.

- Long-term groundwater extraction has created a cone of depression in the eastern subbasin



HOW WILL WE MEET SUBBASIN SUSTAINABILITY GOALS?



Management Actions:

Programs or policies that reduce groundwater demand

Projects:

Physically constructed water delivery and recharge projects

Project Implementation Strategy

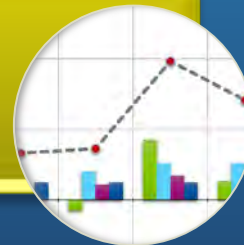
- In Lieu Recharge
- Direct Recharge (Basins, Down Wells, Ag MAR)
- Dispersed Recharge
- Multi-Benefit Projects
- Land fallowing or repurposing

Approaches



- Recharge Master Planning
- GRAT Modeling Tool and Prioritization Criteria
- Prioritize surface water
- Prioritize based on cost-benefit potential
- Prioritize multiple benefits

Priorities



- Incentive programs and policies for:
- Land fallowing/repurposing
 - Potential on-farm recharge credits
 - Facilitation programs

Incentives



Planned Projects

Planned Now

- Replenishment Water from Highline Canal
- Mustang Creek Flood Control Recharge Project
- Turlock Lake Rehabilitation

Recharge Master Plan

- Dry well FS and Pilot Studies
- Rouse Lake Multi-Benefit FS
- Dispersed Recharge FS and Pilot Studies
- Canal Water Recharge Pilot Study
- Turlock Lake Reoperation FS

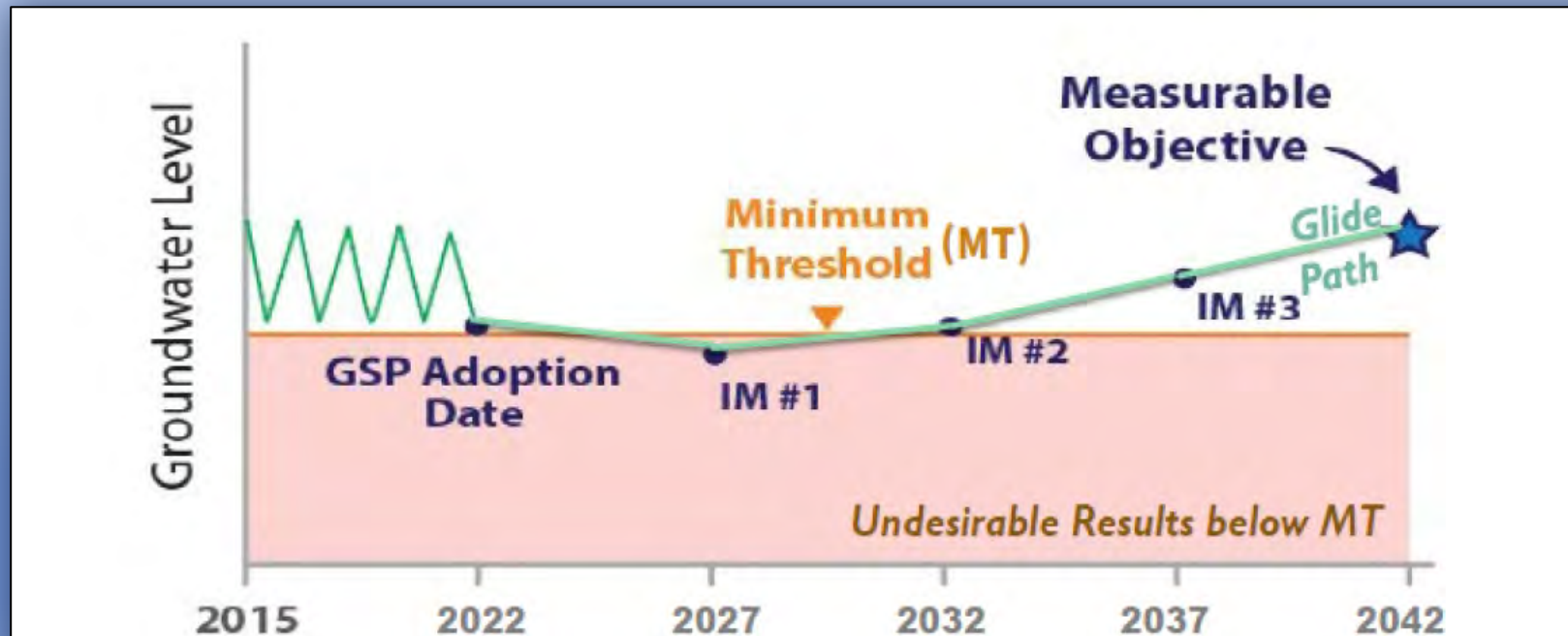
MANAGEMENT ACTIONS

Category	Number	Management Action
Demand Reduction Strategies	1	Voluntary Conservation and/or Land Fallowing
	2	Conservation Practices
Pumping Management Framework	3	Groundwater Extraction Reporting Program
	4	Groundwater Allocation and Pumping Management Program
	5	Groundwater Extraction Fee
	6	Groundwater Pumping Credit Market and Trading Program
Mitigation Strategies	7	Domestic Well Mitigation Program
	8	Minimum Threshold Exceedance Response Plan

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PUMPING MANAGEMENT FRAMEWORK IMPLEMENTATION APPROACH



2024 - 2042
Pumping
Management
Program



2024 - 2042
Groundwater
Extraction
Monitoring



2023 - 2042
Project
Implementation



Ongoing
Groundwater
Monitoring and
Data Evaluation



2027, 2032, 2037
Evaluate Trajectory;
Further Decrease
Pumping if Needed



Ongoing
Stakeholder
Engagement



2042
Sustainable Groundwater
Management

PATHWAY TO SUSTAINABLE GROUNDWATER MANAGEMENT



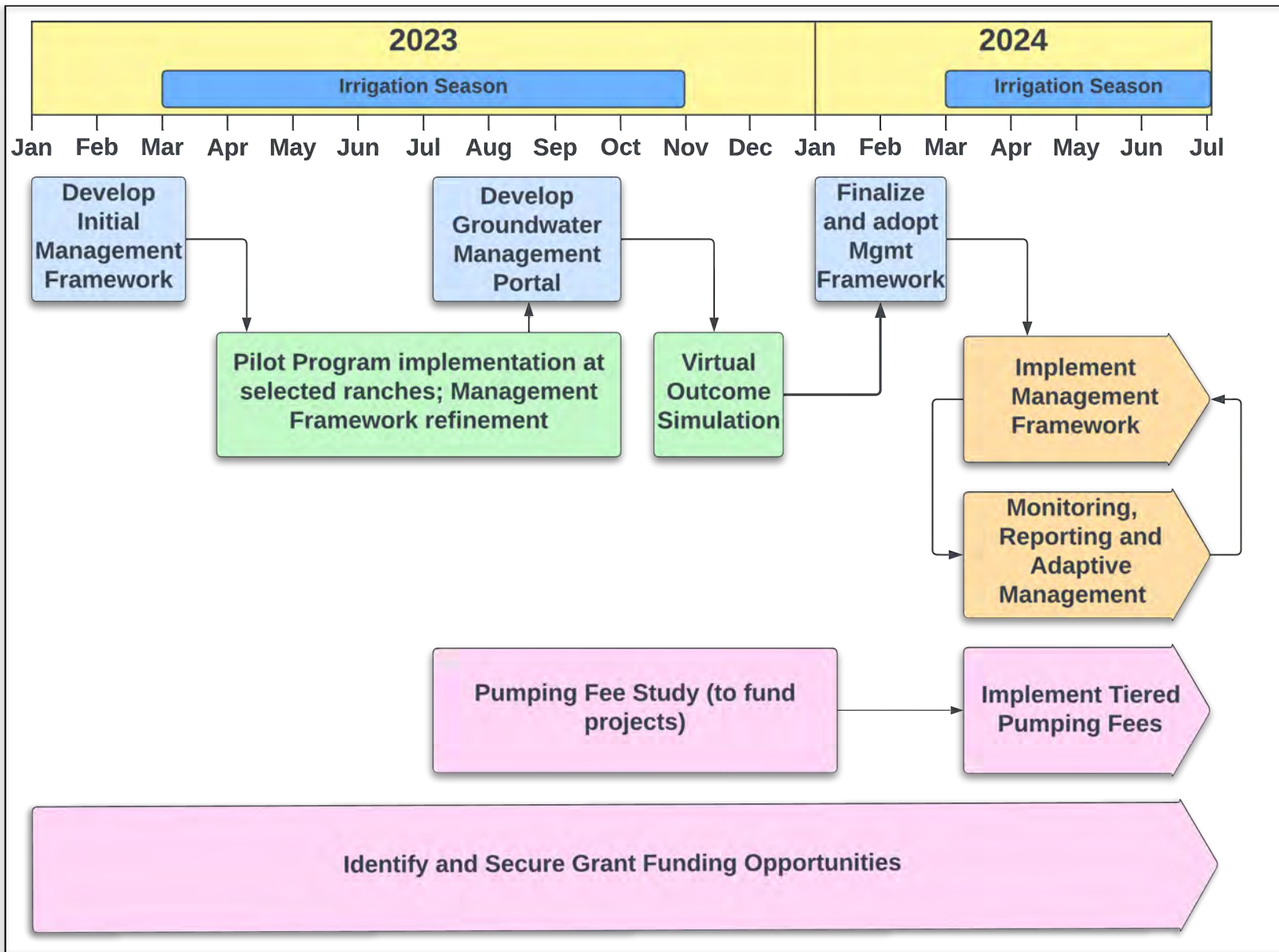
PUMPING MANAGEMENT APPROACH

- Sustainable Yield can't be precisely quantified yet. Preliminary estimate is ~ 25% reduction in net groundwater demand basin-wide is needed
- Met through combination of Projects and Management Actions
- Goal is to achieve sustainable pumping over 20 years
- **Strategy:**
 1. **Identify opportunities and implement recharge projects to the extent water is available and they are physically and economically feasible**
 2. **Begin Management Actions early**
 3. **Monitor results and adjust approach to achieve Interim Milestones**

ADAPTIVE MANAGEMENT IMPLEMENTATION STRATEGY

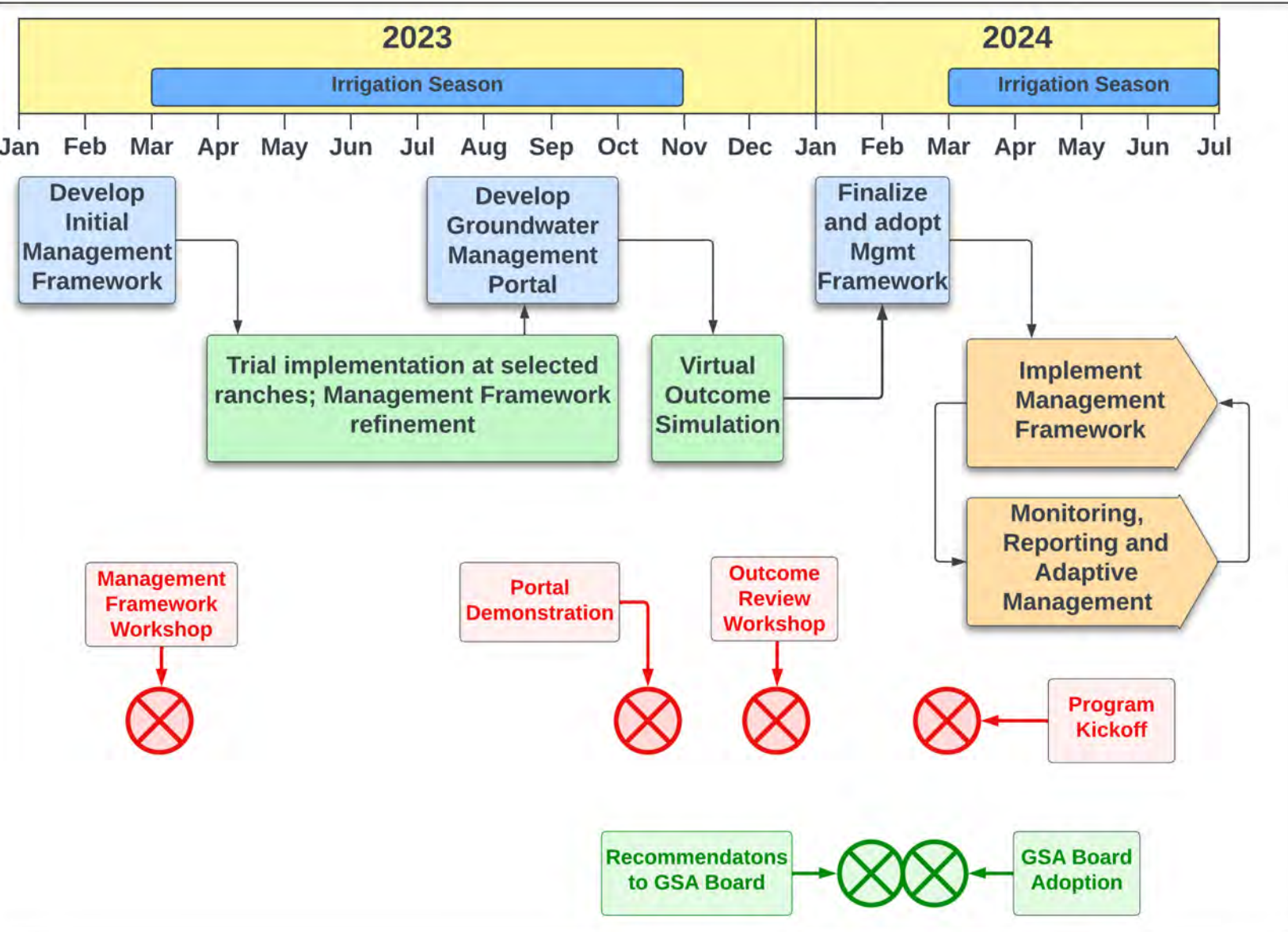
Adaptive Management of Pumping Reduction and Project Implementation to Achieve Sustainable Yield



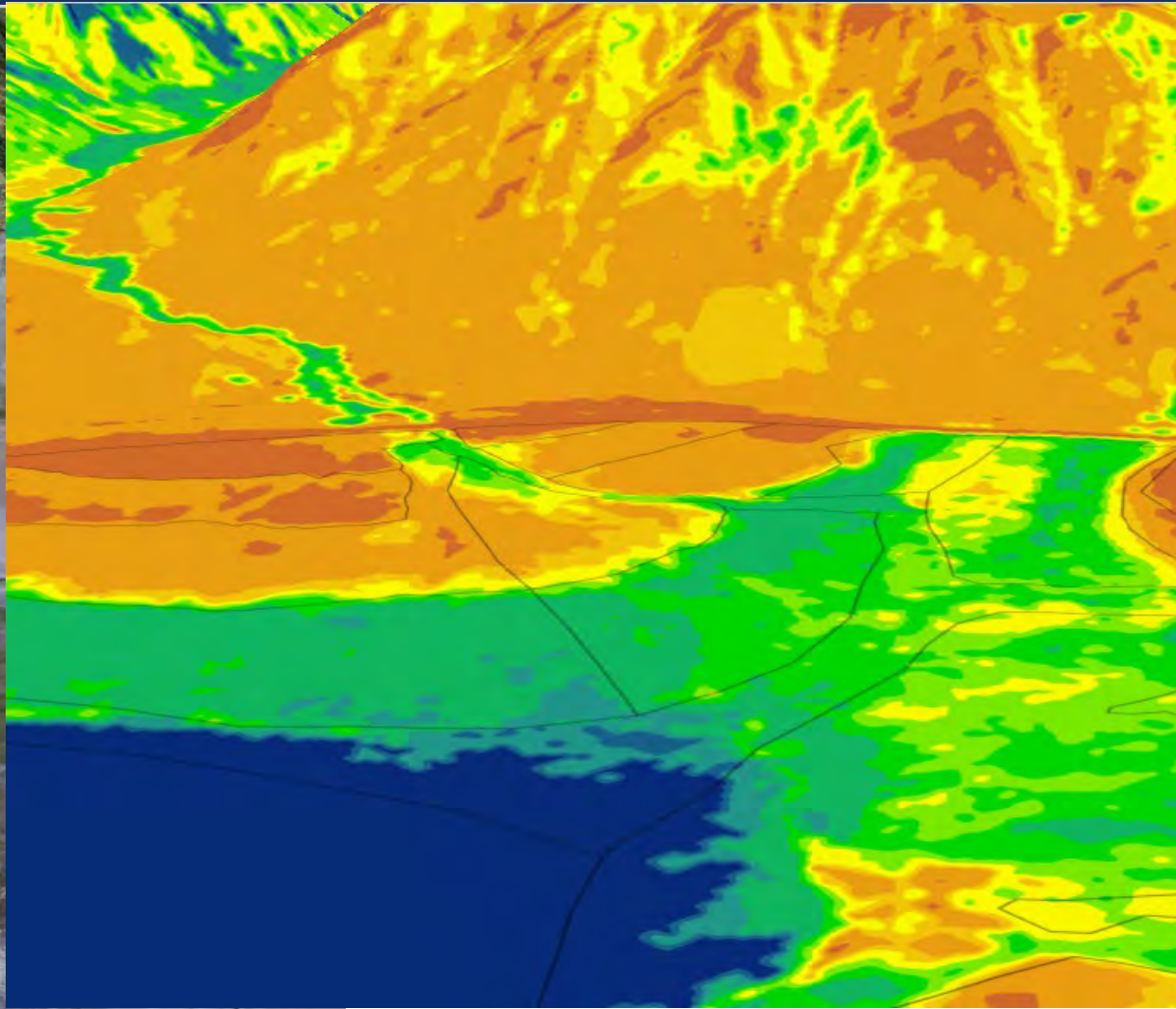
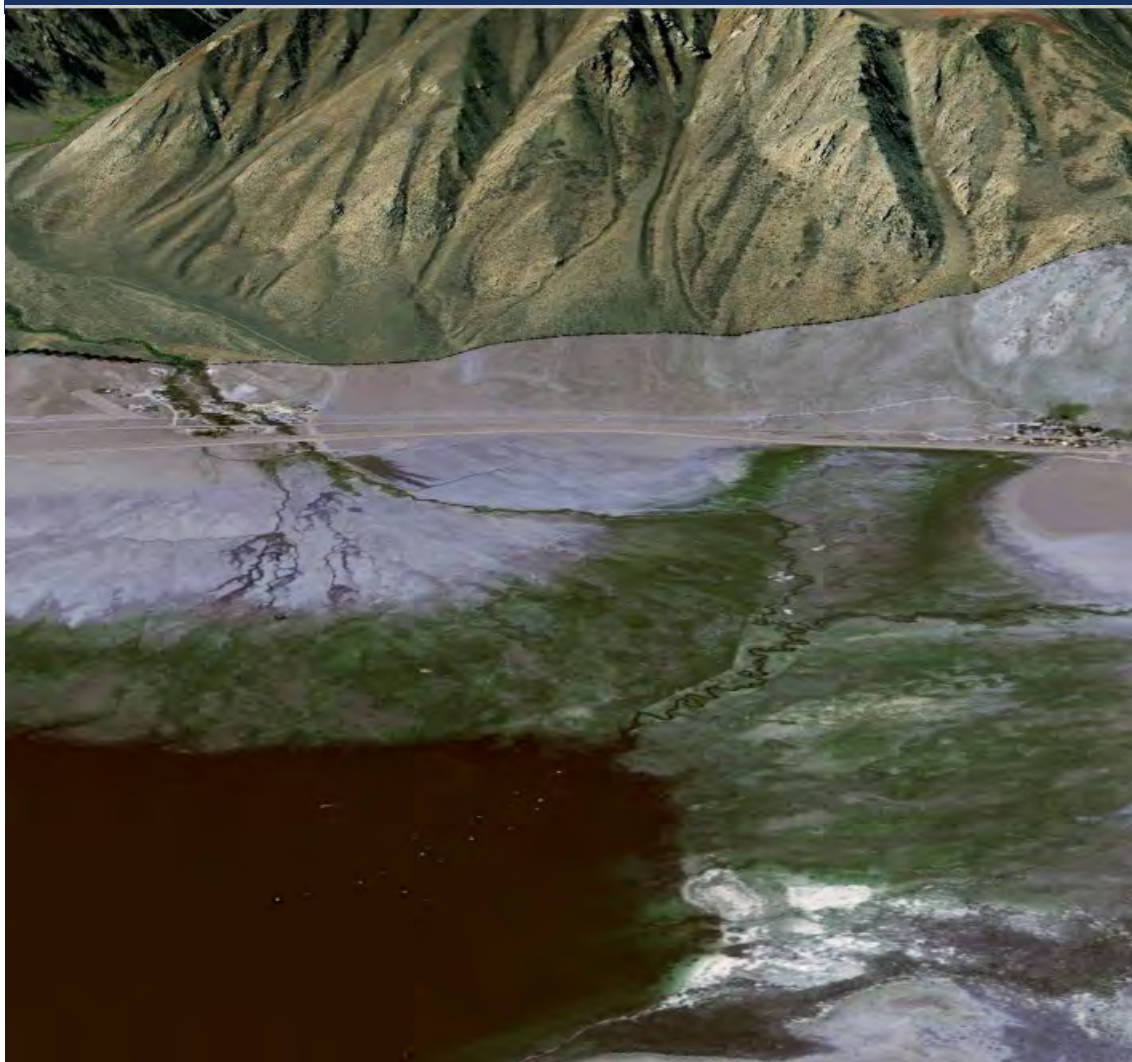


PUMPING MANAGEMENT IMPLEMENTATION TIMELINE

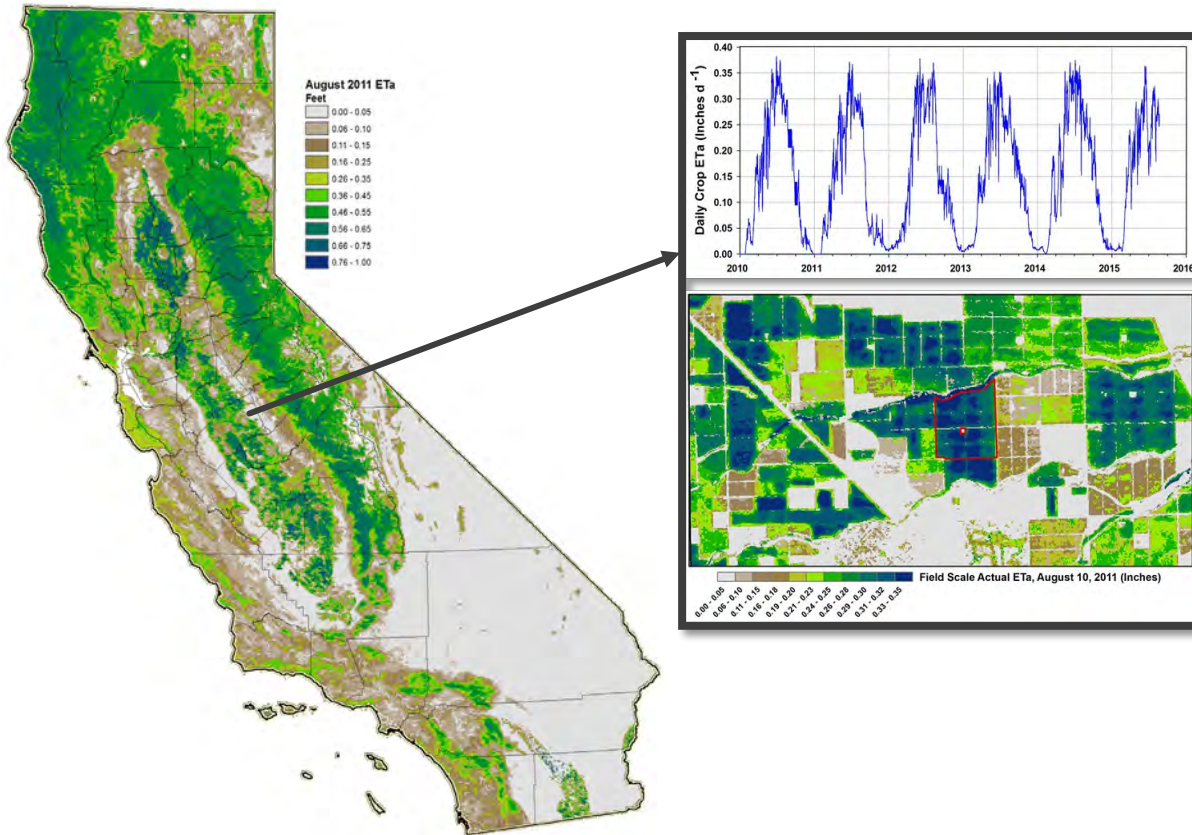
PUMPING MANAGEMENT IMPLEMENTATION TIMELINE – WORKSHOPS AND MILESTONES



PUMPING BASELINE AND REDUCTION TARGET

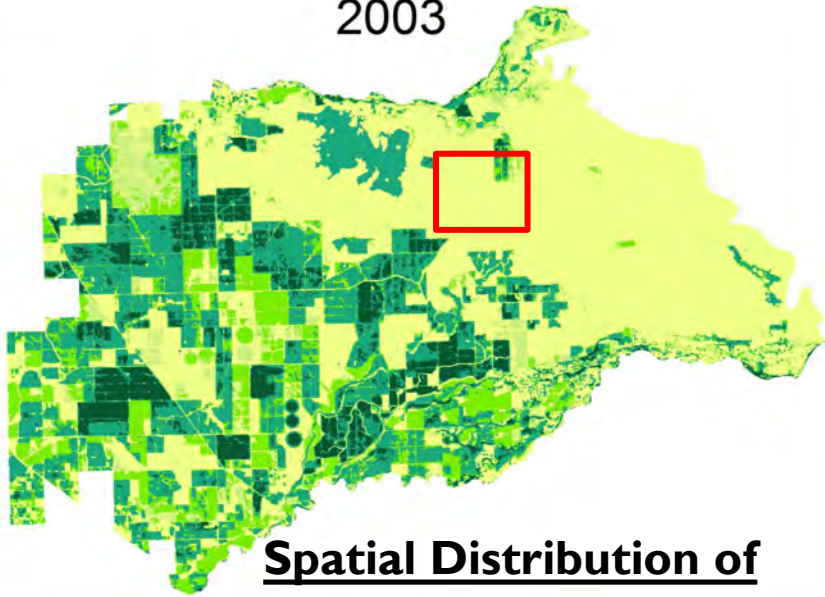


ET DATA USE AND LIMITATIONS



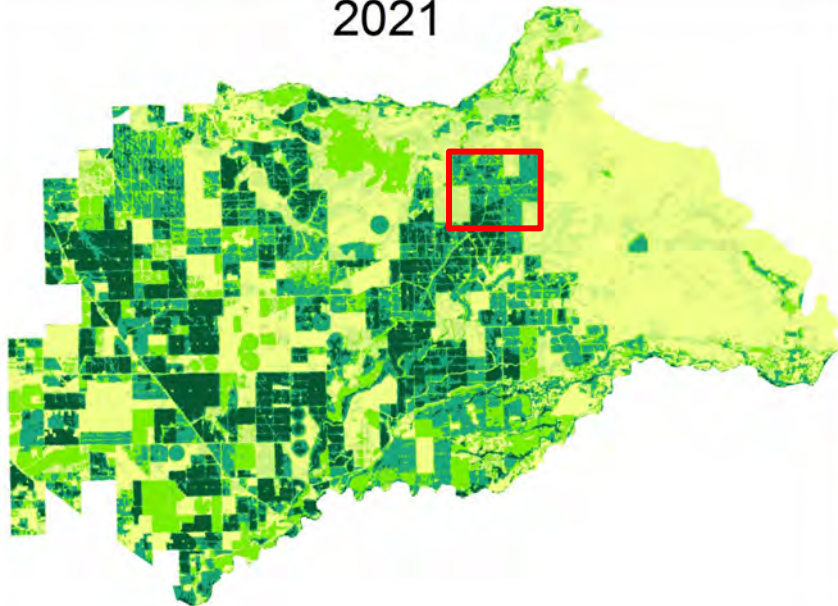
- Evaporation and plant water usage calculated from satellite and weather station data
- Relatively inexpensive, field scale coverage, historical use can be estimated as far back as satellite data are available
- Accuracy can be improved over time by on-the-ground measurement
- Accuracy not as important when two ET measurements are compared to assess trends or percent reductions

2003

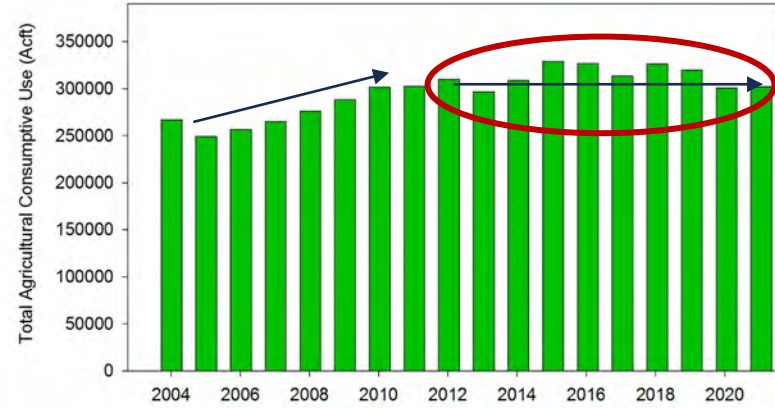


Spatial Distribution of Consumptive Use Over Time

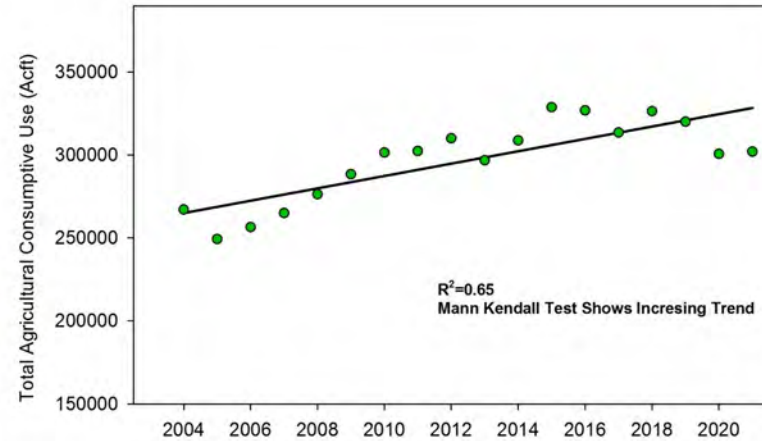
2021



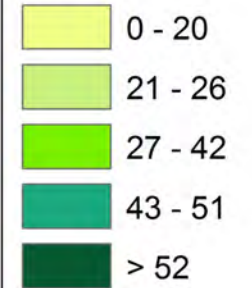
BASELINE: 2012 - 2021



Changes in Average Consumptive Use Over Time



Annual ET Inches



East Turlock Sub-basin GSA

FIGURE 2

Long Term Consumptive Use

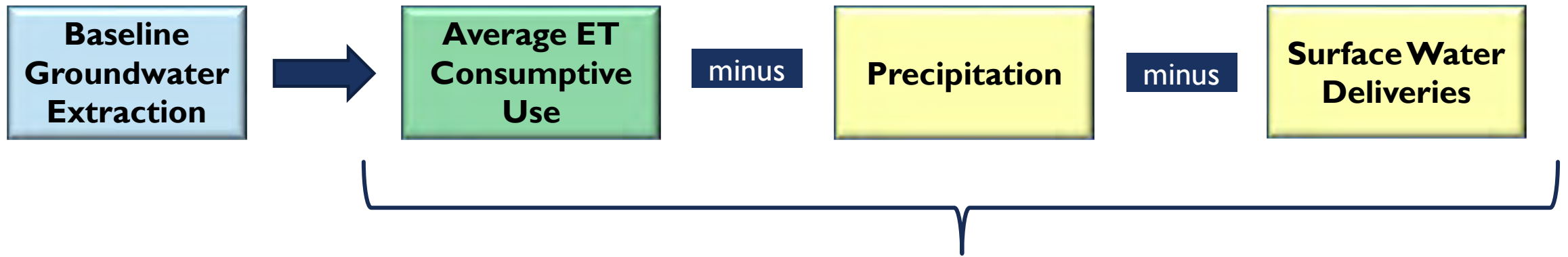
DATE: OCT 06, 2022

BY:

FOR:

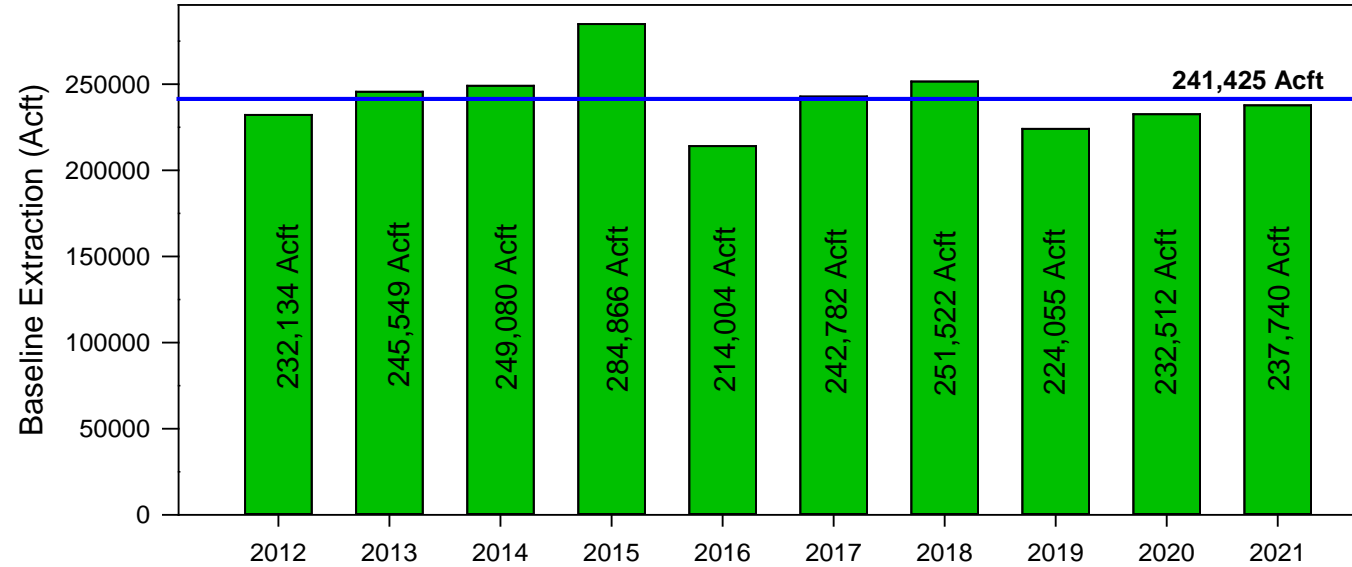
FORMATION ENVIRONMENTAL

BASELINE CALCULATION

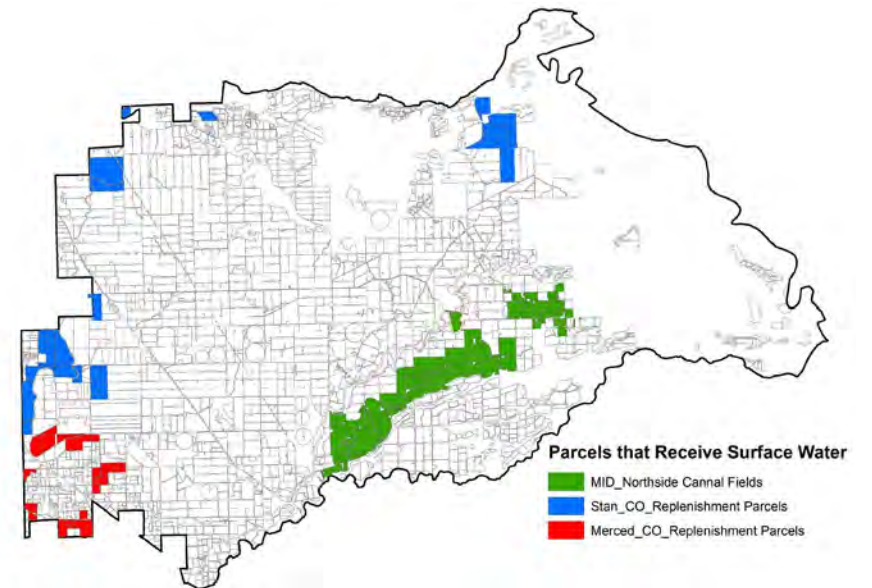
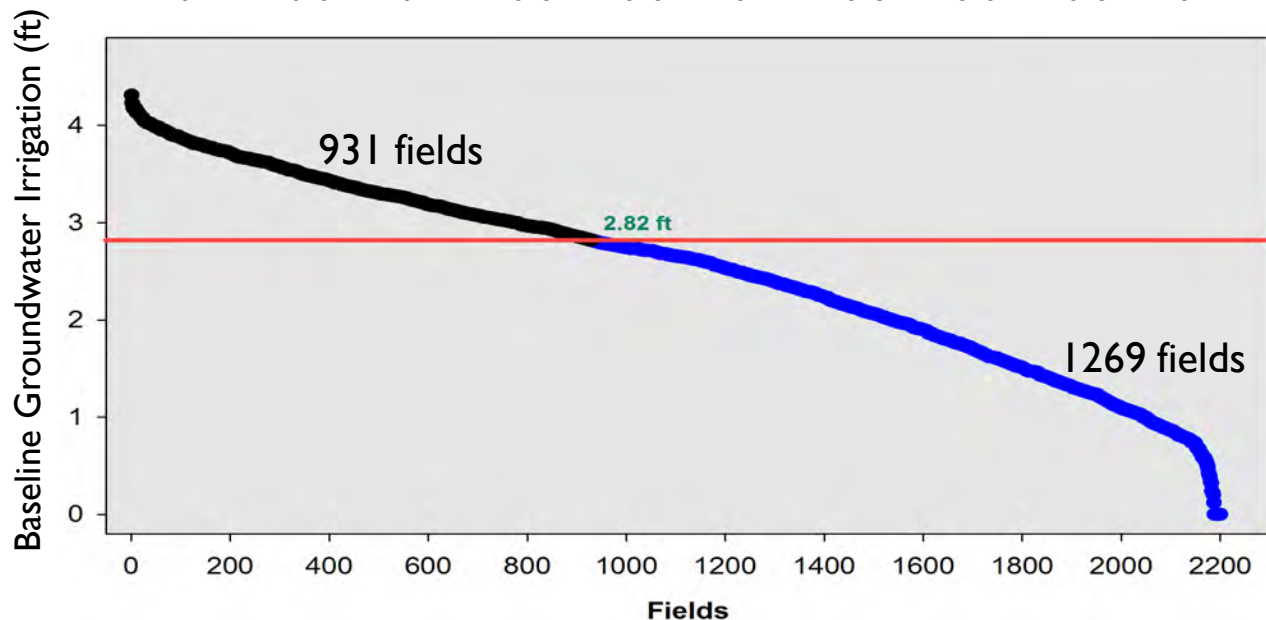


- Surface water deliveries include MID Northside Canal service area deliveries and TID replenishment water deliveries
- Analysis for irrigation season (March – October) to minimize precipitation effects
- Analysis for each field for 2012 to 2021 (10 Years)
- Values averaged

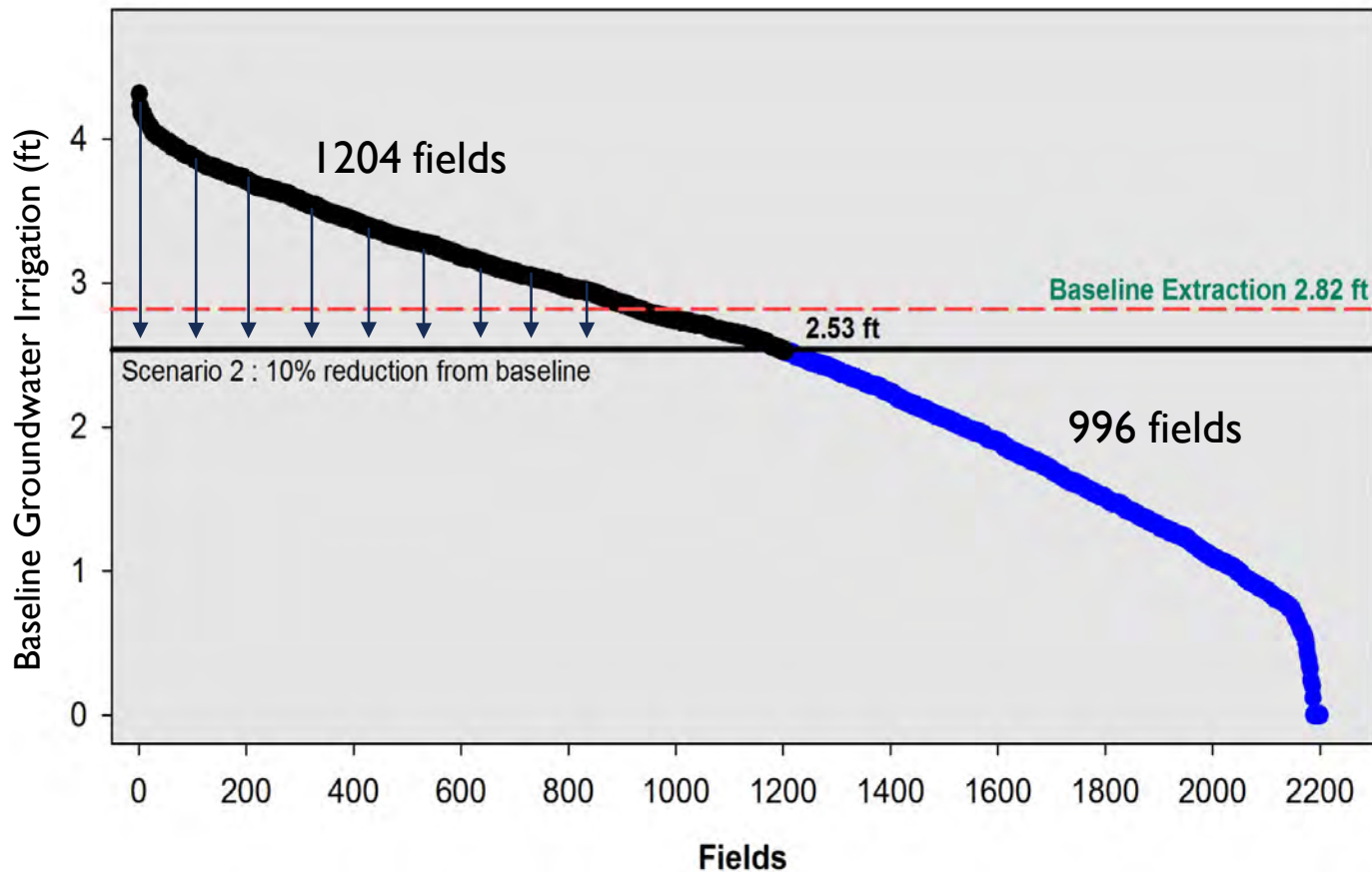
Baseline Extraction in Irrigated Lands, March - October



Baseline Groundwater Extraction
 = 241,425 AF/year
 Equivalent Irrigation Water Application
 = 2.82 ft/year (33.8 in/year)
 Approximate Surface Water Deliveries
 = 12,000 AF/year



Pumping Reduction Target for Groundwater Irrigated Lands – 10%



Baseline Irrigation Water Application
= 2.82 ft/year (33.8 in/year)
Target Irrigation Reduction
= 2.53 ft/year (30.4 in/year)
Average Irrigation Reduction
Achieved (Without Credits)
= 2.27 ft/year (27.3 in/year)
Percent Reduction Achieved
= 19 %

GROUNDWATER USE MEASUREMENT OPTIONS



HOW WE WILL USE ET AND METER DATA

PILOT PROGRAM (2023)

Establish Baseline and Initial Reduction Targets using ET

Start scaling to Land IQ ET data and available meter data

INITIAL IMPLEMENTATION (2024 – 2027)

Use ET data until meters can be deployed

Meter data may be used if available and meets minimum standards

LONG-TERM IMPLEMENTATION (2028 FORWARD)

Use meter data

Option to use ET data

METERING PROGRAM IMPLEMENTATION

■ Develop Groundwater Metering Plan and Policy

- Meter specifications, installation and maintenance requirements and standards
- Approved installation vendors
- Grandfathering and variance requirements
- Telemetry preferred, or alternative reporting requirements

■ Program Funding

- Round 2 SGMA Support Grant Application includes \$985,000 to develop program and subsidize meter costs
- Identify other grant and incentive opportunities
- Owner pays for installation and maintenance

METERING PROGRAM REQUIREMENTS

■ Meter Specifications

- EM meters with possibility of variance
- Minimum accuracy +/- 5% certified by vendor (SB X7-7)
- Mid Kaweah GSA list is acceptable

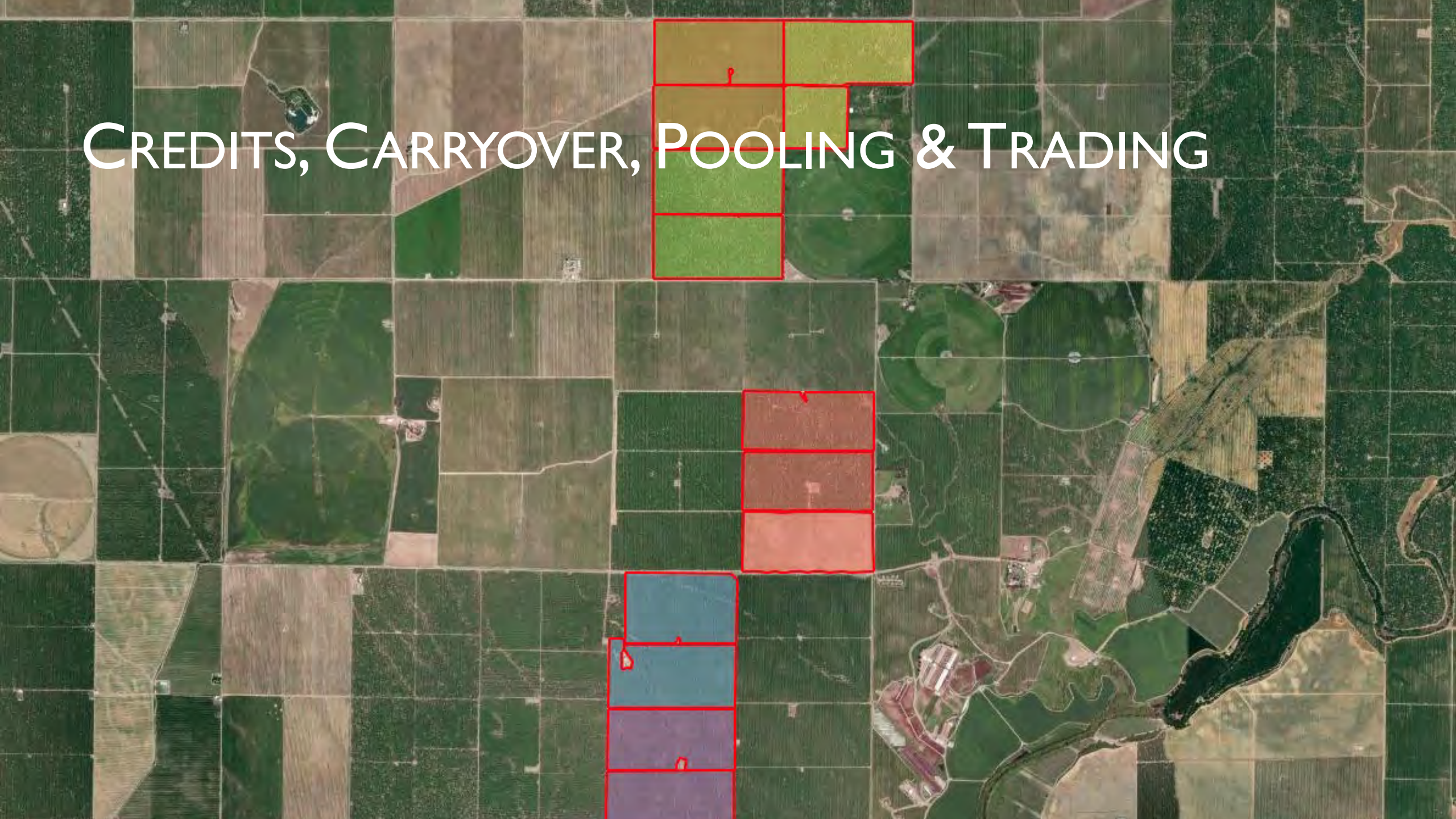
■ Meter Installation

- Comply with AWWA Standards and Standard Details to be developed
- Installed accuracy +/- 10% (SB X7-7)
- Telemetry with possibility of variance

■ Variance and Grandfathering

- Alternative metering approach as recommended by a Qualified Professional and approved by the GSA Board
- Calibration per SB X7-7 requirements

CREDITS, CARRYOVER, POOLING & TRADING



IMPLEMENTATION

- Intended to add operational flexibility, decrease adverse economic impacts
- Credit calculated by comparing actual pumping to pumping target allocation at the irrigated parcel level
- Based on ET data or meter data
- Managed using an internet portal where growers can securely access and manage information regarding their parcel

CREDITS AND CARRYOVER

■ Eligibility

- To be eligible, parcels must be designated as irrigated by the County Assessor
- Credits Issued to eligible parcels that pump groundwater below their allocated target in any given year
- Consideration will be given to a tiered credit system that awards a percentage of credit depending on how much a parcel pumps below its pumping target allocation
- Consideration will be given to providing longer-duration credits for irrigated parcels converted to permanent non-irrigated status to serve as an incentive

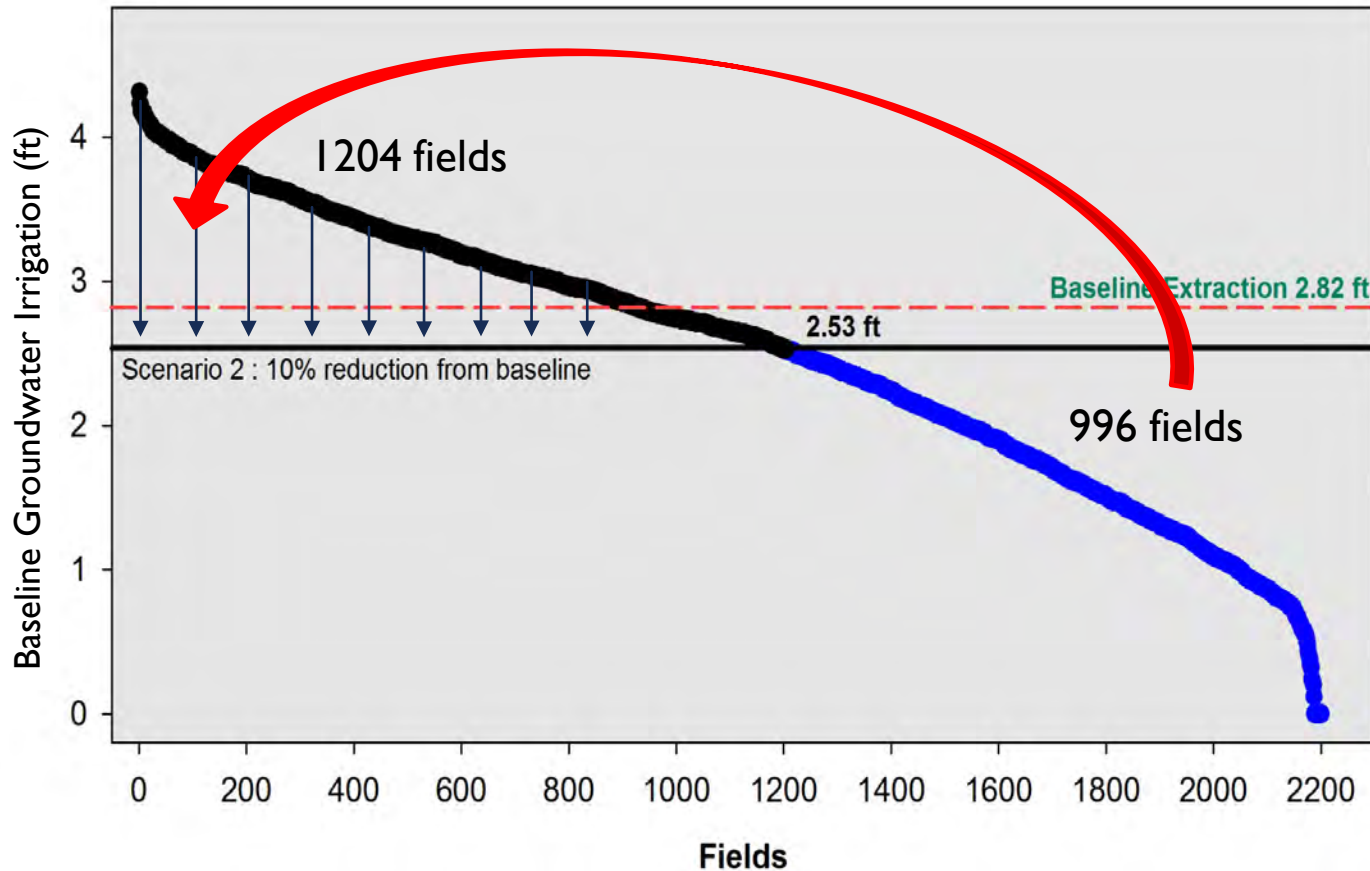
■ Application and Use

- Can be used to offset fees associated with pumping in excess of target allocations
- May be carried over on the parcel where they were issued, or pooled / traded with nearby parcels
- Use of credits would be registered on a secure internet portal

POOLING AND TRADING CONCEPTS

- **Preliminary Pooling and Trading Rules for Pilot Program**
 - Credits may be carried over for on the parcel on which they were originated at the following rates: 100% for one year and 50% for two years
 - Credits may be pooled across multiple parcels under the same operation or ownership located within 3 miles of each other
 - Credits may be traded with nearby parcels under different operation or ownership within 3 miles of each other as a private transaction
 - Additional pooling and trading rules will be evaluated during the Pilot Program:
 - Potential additional rules based on local conditions (e.g., location near rivers)
 - Use of tiered credits, i.e., full credit up to a certain percentage below the target allocation and particle credit below that percentage

Pumping Reduction (10% Target) with Credits



- Fields Needing Credits = 1,204
- Fields with Credits Available = 996
- Reduction Achieved without Credits = 2.27 ft/year (27.3 in/year; 19%)
- Minimum Reduction Achieved with Full Exercise of Credits = 2.53 ft/year (30.4 in/year; 10%)
- Possible application of tiered credits based on amount that a parcel pumps below the target pumping allocation

PUMPING MANAGEMENT FRAMEWORK PILOT PROGRAM

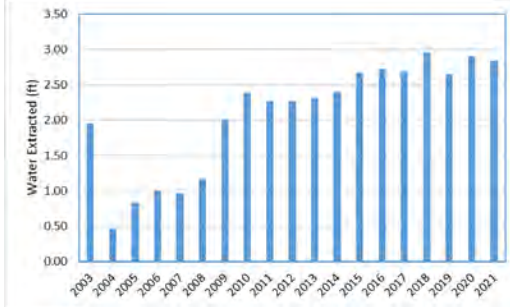


PILOT PROGRAM OVERVIEW

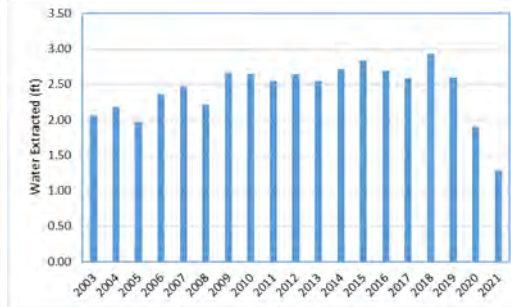
- **Initial Pilot Program**
 - Up to 20 Participants; Choice of “Active” or “Passive” participation
 - Monthly Reports
 - ET data for Assessor’s Parcels, “Fields” and “Ranches”
 - Historical and allocated target annual ET with monthly breakdown for tracking
 - Forecast outcomes
- **Full Scale Virtual Program Interactive Portal (Late 2023)**
 - Portal will provide ability to view 2023 outcomes for any irrigated parcel
 - Secure: Growers can only see their own data; Data/processing using cloud computing protected against loss or theft
 - Decision Support Tool: Dashboard developed to inform irrigation decisions and credit use based on Initial Pilot Program
 - Transferable: Once built, GSA can manage and operate
 - Scalable: Can add credit pooling and trading, metering telemetry, customizable reports, etc.

Pilot Program Approach

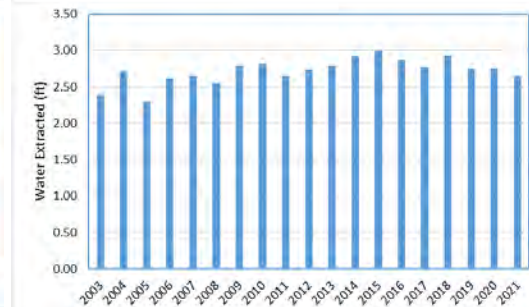
Overview of Historical ET Demand



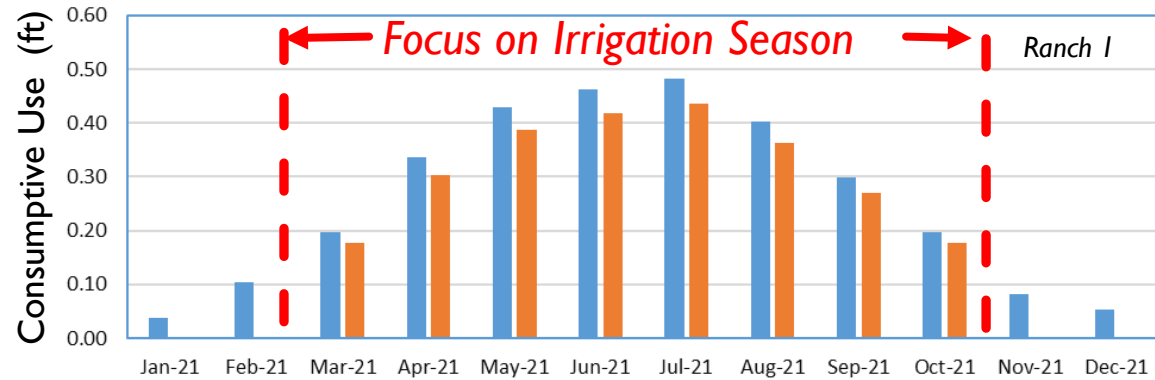
Ranch 1



Ranch 2



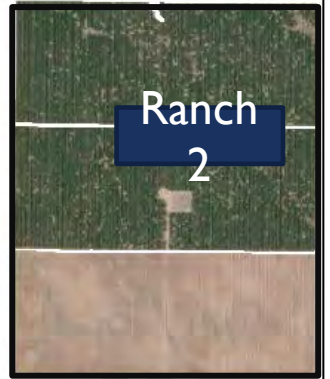
Ranch 3



	Jan-21	Feb-21	Mar-21	Apr-21	May-21	Jun-21	Jul-21	Aug-21	Sep-21	Oct-21	Nov-21	Dec-21
Extracted	0.04	0.10	0.20	0.34	0.43	0.46	0.48	0.40	0.30	0.20	0.08	0.05
Allocated			0.18	0.30	0.39	0.42	0.44	0.36	0.27	0.18		

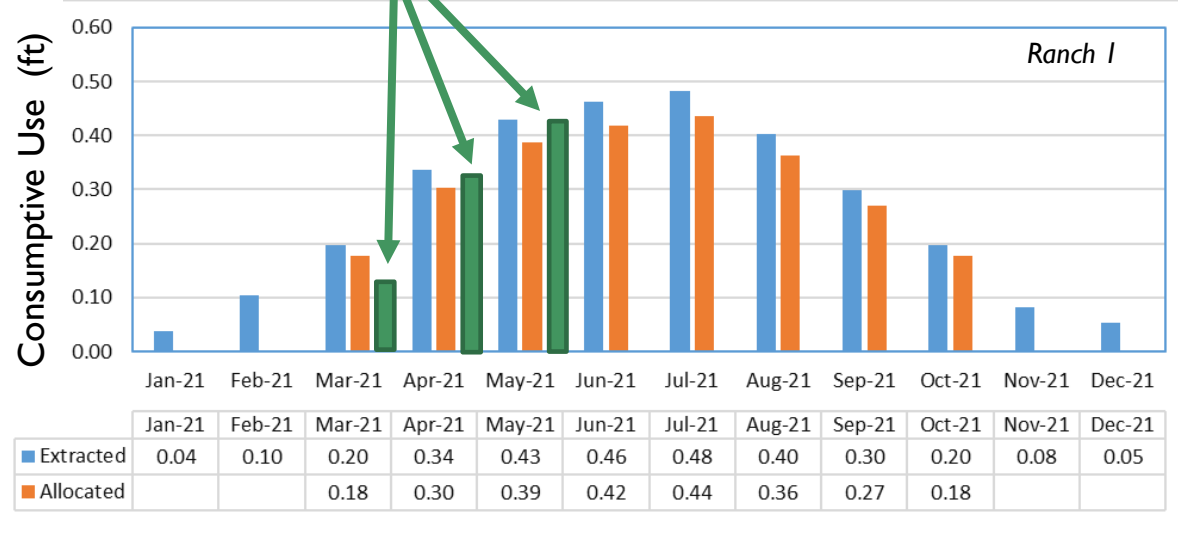
Average Monthly ET and Weighted Pumping Targets

Example Ranch Portfolio



Pilot Program Reporting Approach

Actual ET measurements added on a monthly basis



Tracking of Actual Monthly ET Consumptive Use

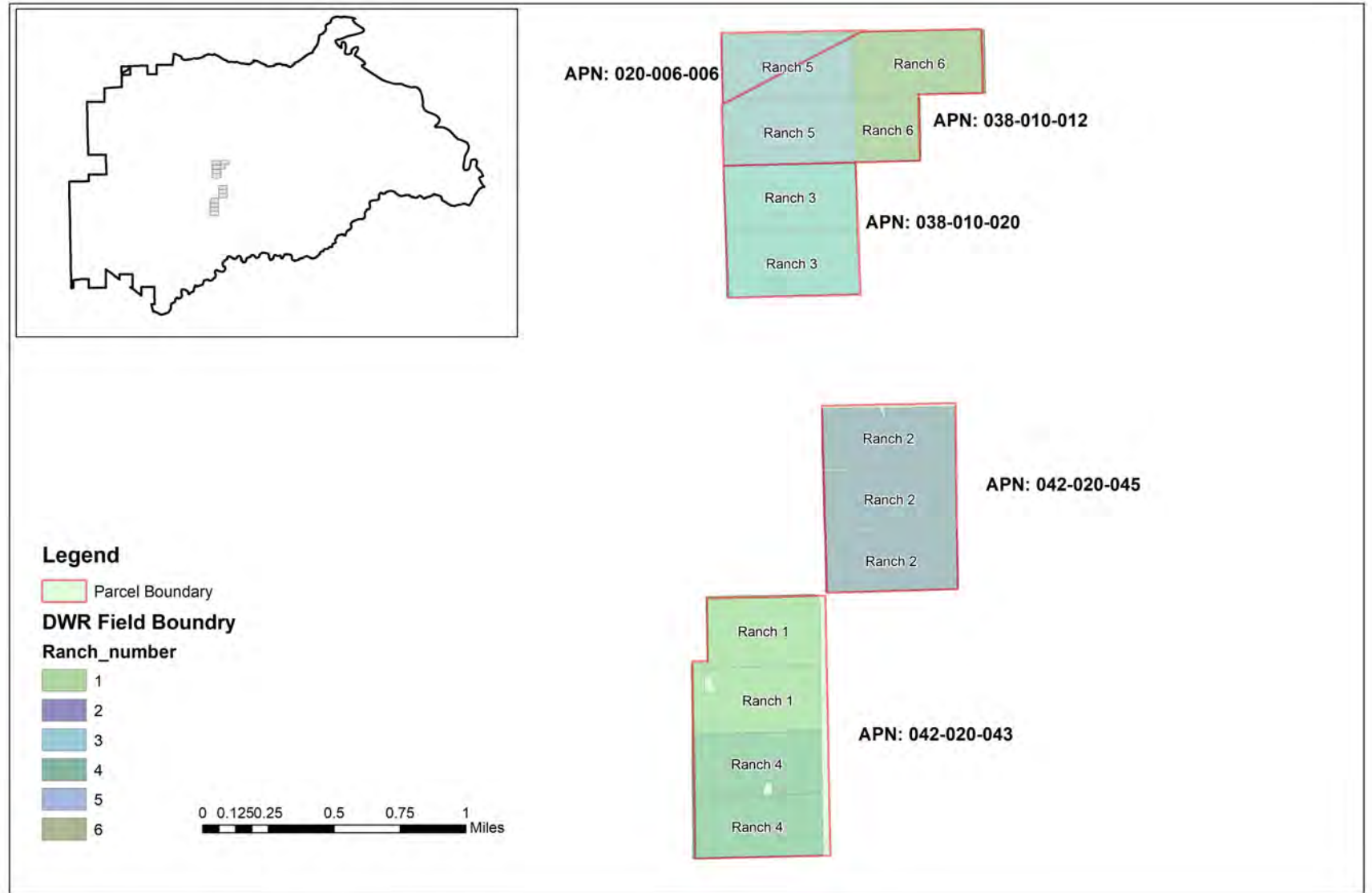
Monthly Report Contents

- ET by parcel (APN), DWR- mapped fields and aggregated fields (ranches)
- ET map and charts for enrolled parcels
- Historical monthly and annual averages
- Weighted monthly and total annual pumping targets (in ET units)
- Year to date monthly actual and total forecast year-end pumping (in ET units)
- Current and forecast credit or deficit (in ET units)

Grower Data Report Setup

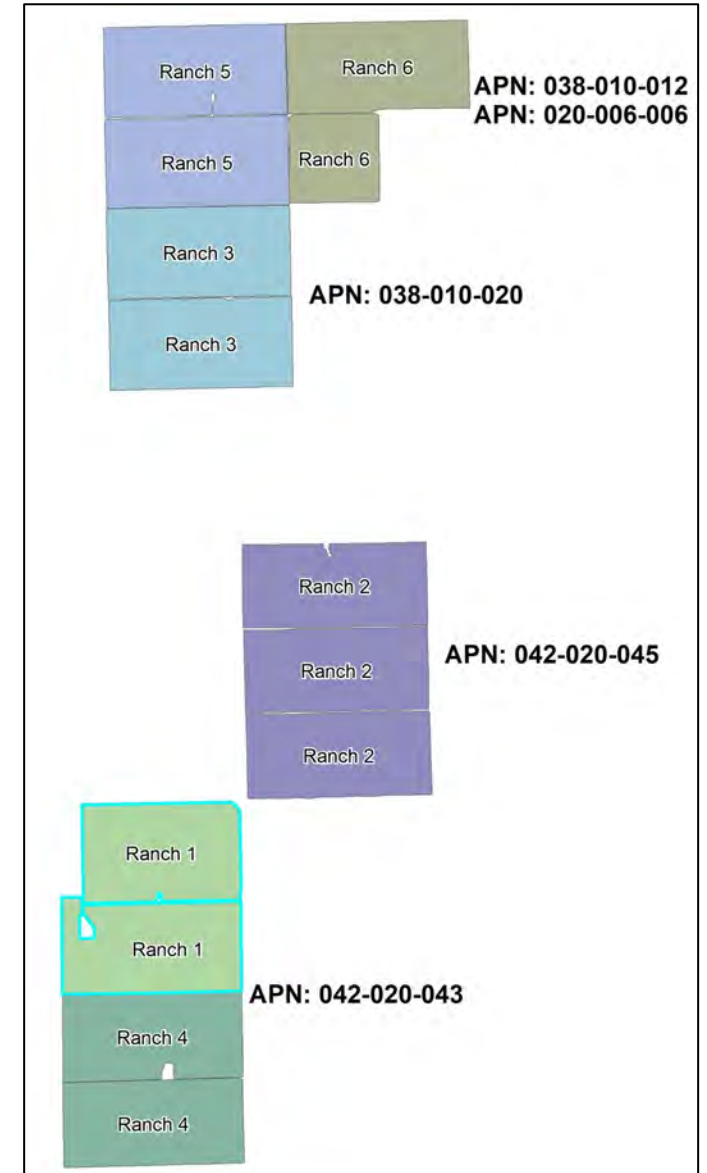
Area Breakdown

- Compliance assessed, reported and forecast at the APN level
- Data breakdown by DWR “Field” and “Ranches” (aggregated fields) to support interpretation
- Potential breakdown by irrigation block and metered well service area is possible
- Will need to develop crosswalks between different area types



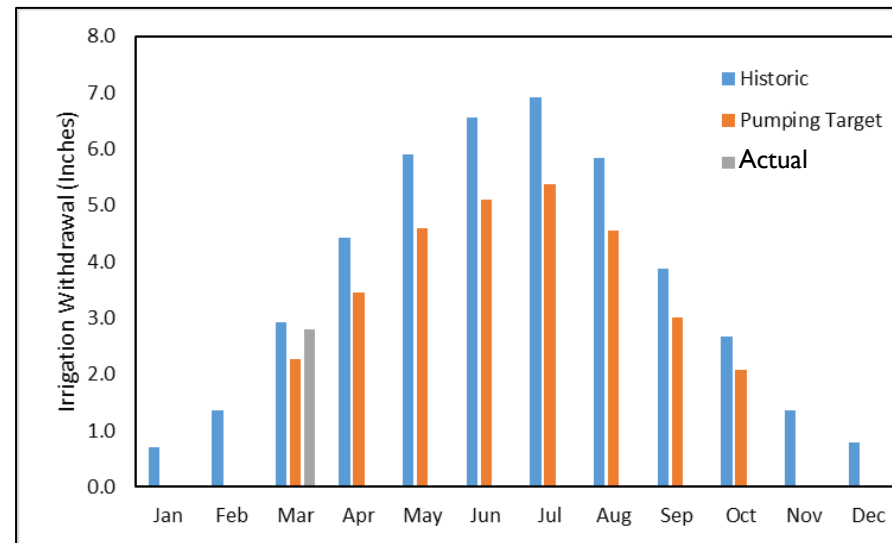
Dashboard for Grower 'X'

Ranch Number	I (Two Fields)
APN	042-020-043
Acres	150.6
Crop	Almond
Irrigation Method	Drip
Historic Irrigation Season (March-October) Water Consumption	39.1 inches (491 AF)
Pumping Target (Annual)	30.4 inches (381 AF)
Actual Used to date (example made up value)	2.8 inches (35 AF)



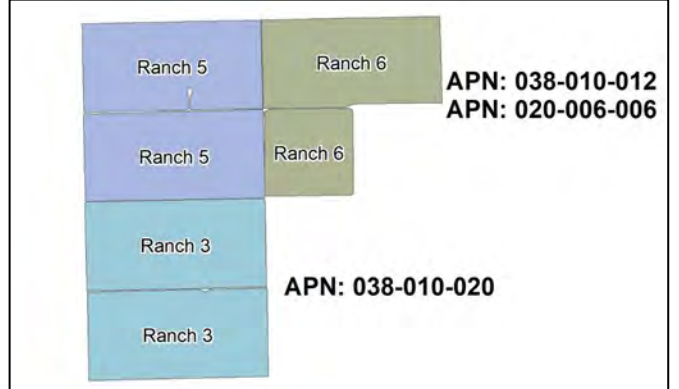
	Historic (Inches)	Pumping Target (Inches)	Utilized (inches)
Jan	0.7		
Feb	1.4		
Mar	2.9	2.3	2.8
Apr	4.4	3.4	
May	5.9	4.6	
Jun	6.5	5.1	
Jul	6.9	5.4	
Aug	5.8	4.5	
Sep	3.9	3.0	
Oct	2.7	2.1	
Nov	1.4		
Dec	0.8		
Annual Cumulative		30.4	2.8

EXAMPLE RANCH I



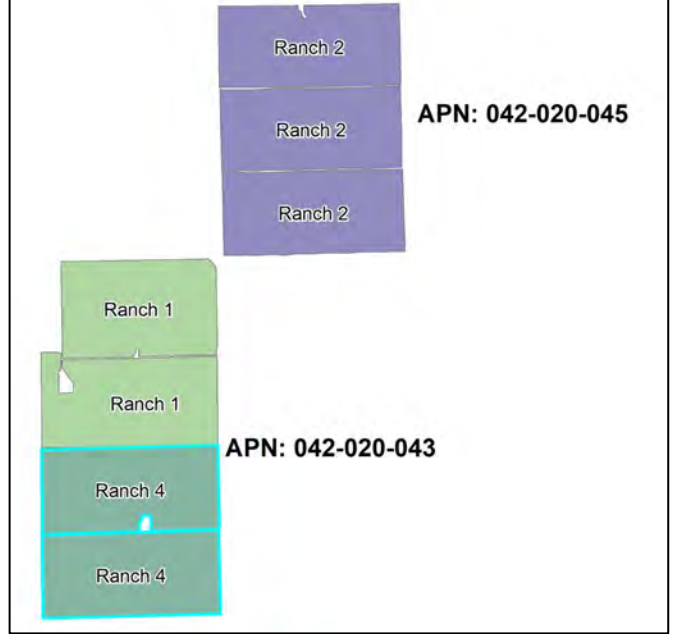
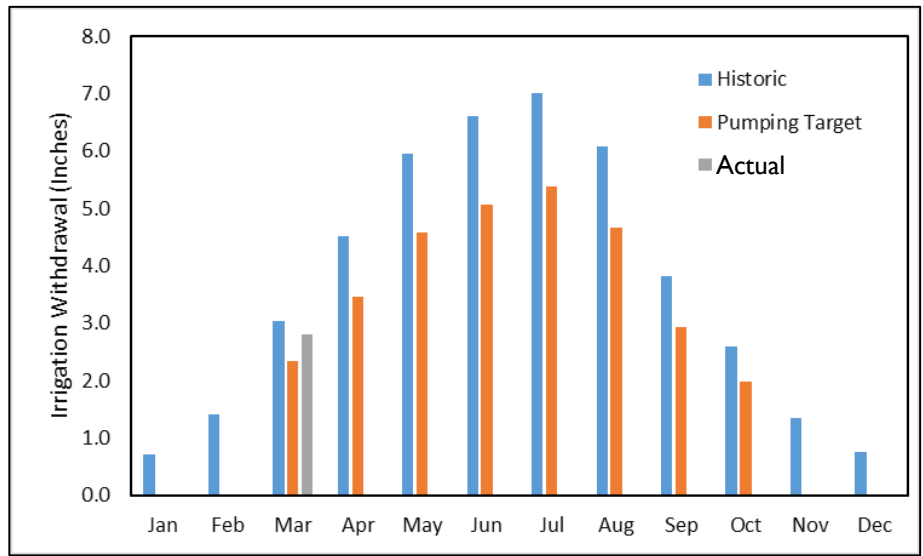
Dashboard for Grower 'X'

Ranch Number	4 (Two Fields)
APN	042-020-043
Acres	147.2
Crop	Almond
Irrigation Method	Drip
Historic Irrigation Season (March-October) Water Consumption	39.6 inches (486 AF)
Pumping Target (Annual)	30.4 inches (373 AF)
Actual Used till date (example made up value)	2.8 (34 AF)



	Historic (Inches)	Pumping Target (Inches)	Utilized (inches)
Jan	0.7		
Feb	1.4		
Mar	3.0	2.3	2.8
Apr	4.5	3.5	
May	6.0	4.6	
Jun	6.6	5.1	
Jul	7.0	5.4	
Aug	6.1	4.7	
Sep	3.8	2.9	
Oct	2.6	2.0	
Nov	1.4		
Dec	0.8		
Annual Cumulative		30.4	2.8

EXAMPLE RANCH 4



Dashboard for Grower 'X'

APN	042-020-043
Ranch Number	1 & 4 (Four Fields)
Acres	297.8
Crop	Almond
Irrigation Method	Drip
Historic Irrigation Season (March-October) Water Consumption	39.4 inches (977 AF)
Pumping Target (Annual)	30.4 inches (754 AF)
Actual Used till date (example made up value)	2.8 inches (69 AF)

	Historic (Inches)	Pumping Target (Inches)	Utilized (inches)
Jan	0.7		
Feb	1.4		
Mar	3.0	2.3	2.8
Apr	4.5	3.5	
May	5.9	4.6	
Jun	6.6	5.1	
Jul	7.0	5.4	
Aug	6.0	4.6	
Sep	3.8	3.0	
Oct	2.6	2.0	
Nov	1.4		
Dec	0.8		
Annual Cumulative	30.4		2.8
Projected Credit or Deficit			7 (173 AF)

EXAMPLE APN SUMMARY

