Stanislaus County

Sustainable Groundwater Management Act

Non-District East Landowner Event

December 13, 2023

Agenda

1. Modesto Subbasin Water Year 2023

    Liz Elliott, Todd Groundwater

2. East Turlock GSA Turlock Subbasin Implementation Highlights

    Mike Tietze, East Turlock GSA

3. Stanislaus County Environmental Resources – Projects and Management Actions

    Christy McKinnon, Stanislaus Co.

4. Subsurface Recharge

    Mike Busby, LIDCO Inc.

Groundwater Conditions, Water Year 2023
Modesto Subbasin

Eastern Modesto Subbasin Landowner Workshop No. 2

December 13, 2023

TODD GROUNDWATER

AGENDA

- GSP Update Since We Last Met
- Groundwater Level Analysis, WY 2023
  - Sustainable Management Criteria
  - Hydrographs
- Putting the results in perspective

MW-9

GSP Update Since We Last Met

- March 2023: Second Annual Report submitted
- Spring 2023: Third GSP monitoring event
- Fall 2023: Fourth GSP monitoring event
- January 2024: DWR's GSP assessment due, two possible outcomes:
  - Approved
  - Incomplete: 180 days to revise the GSP based on DWR's comments
- April 2024: Third GSP Annual Report due

WY 2023 GSP Groundwater Level Monitoring

- Fall 2022, seasonal low groundwater levels
  - measured late October / early November
- Spring 2023, seasonal high groundwater levels
  - measured late February / early March
- During both monitoring events, groundwater elevations measured in 59 representative monitoring wells
- Groundwater levels were reported to DWR

MW-10

Definition of Undesirable Results

Chronic Lowering of Groundwater Levels

An undesirable result will occur when at least 33% of representative monitoring wells exceed the MT for a principal aquifer in three (3) consecutive Fall monitoring events.

Interconnected Surface Water

An undesirable result will occur on one of the rivers when 33% to 50% of the representative monitoring wells for that river exceed the MT in three (3) consecutive Fall monitoring events.

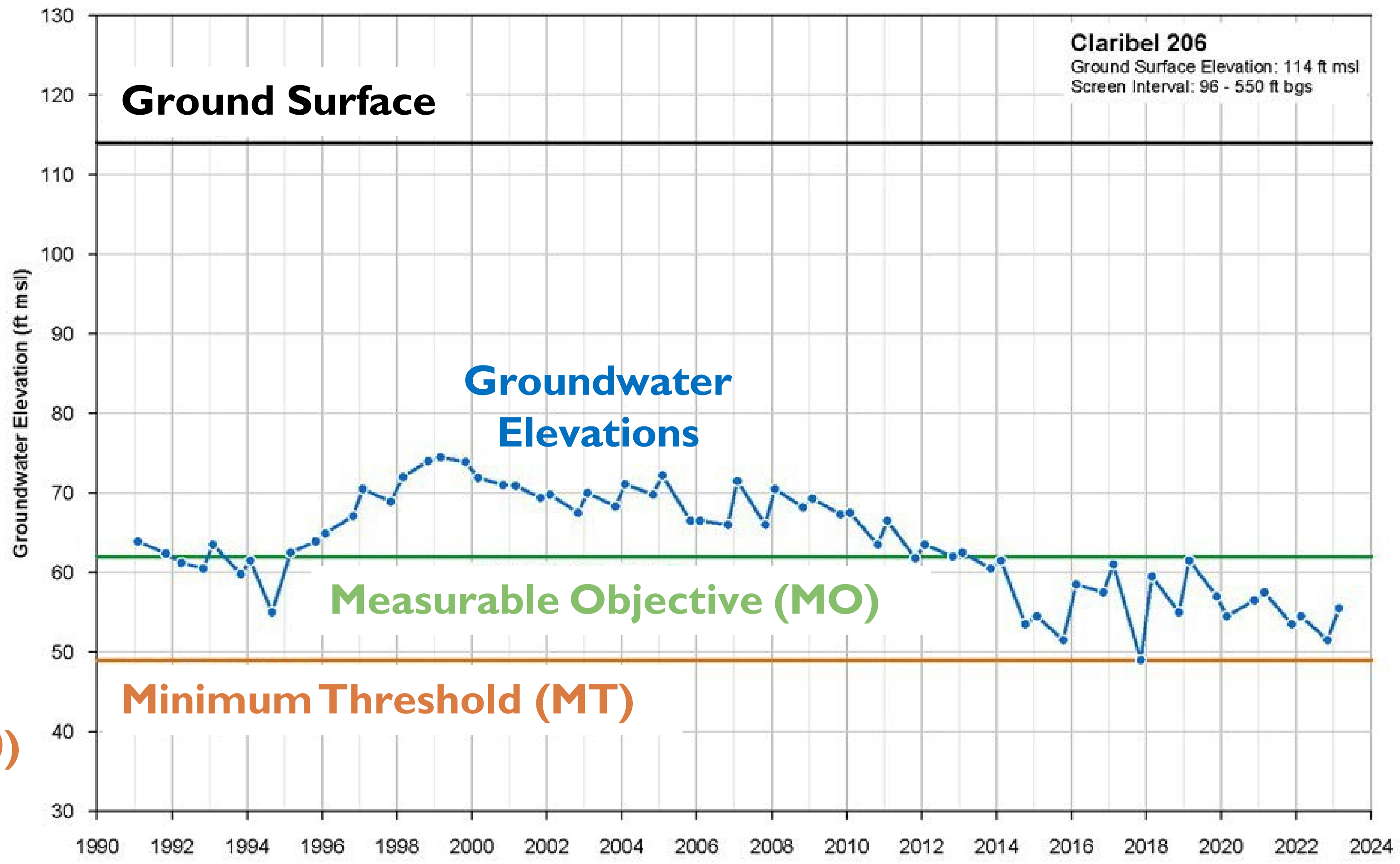
(33% on Stanislaus and Tuolumne rivers, 50% on San Joaquin River)

What Are Undesirable Results?

- Significant and unreasonable groundwater level declines such that water supply wells are adversely impacted in a manner that cannot be readily managed or mitigated. Adverse impacts may include:
  - Dry domestic wells
  - Higher pumping costs
  - Loss of capacity and well efficiency
  - Well failure
- Interconnected Surface Water: streamflow depletion, GDEs
- Inelastic land subsidence that affects land use or critical infrastructure

MINIMUM THRESHOLDS (MTS)

Example Hydrograph



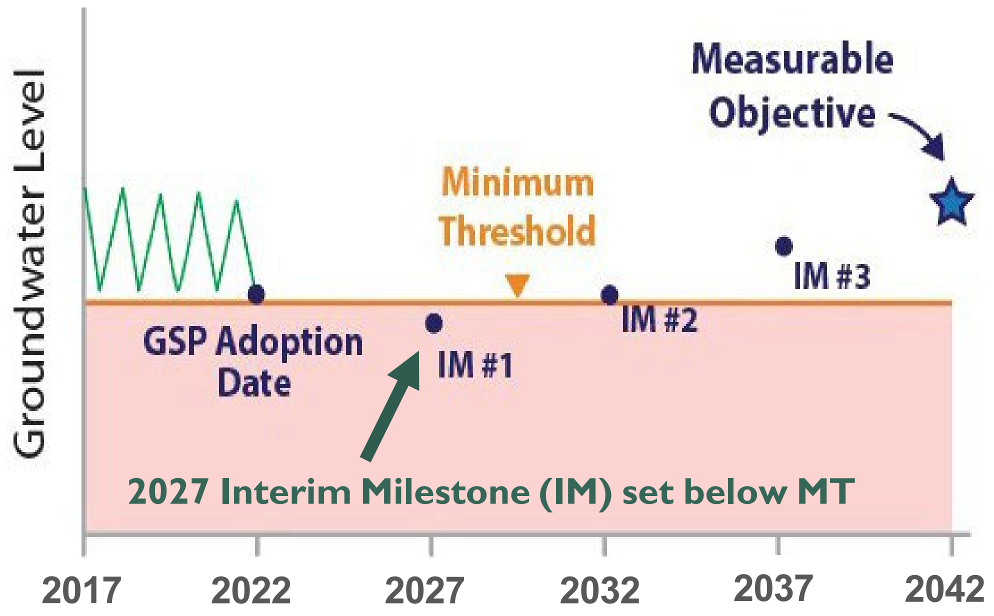
MO:
midpoint between MT and historical high

MT:
historical low (WY 1991 – WY 2020)

INTERIM MILESTONES (IMs)

- MT exceedances were anticipated
  - Persistent drought conditions
  - Water level declines expected to continue in eastern RMWs in short term
- Projects and Management Actions will take time to raise water levels above MTs
- Accordingly, 2027 IMs were designated below the MTs for some wells
- During WY 2023, no wells exceeded their IM

SGMA allows GSAs to define *Interim Milestones* as a "glide path" to sustainable management



Minimum Thresholds (MTs)

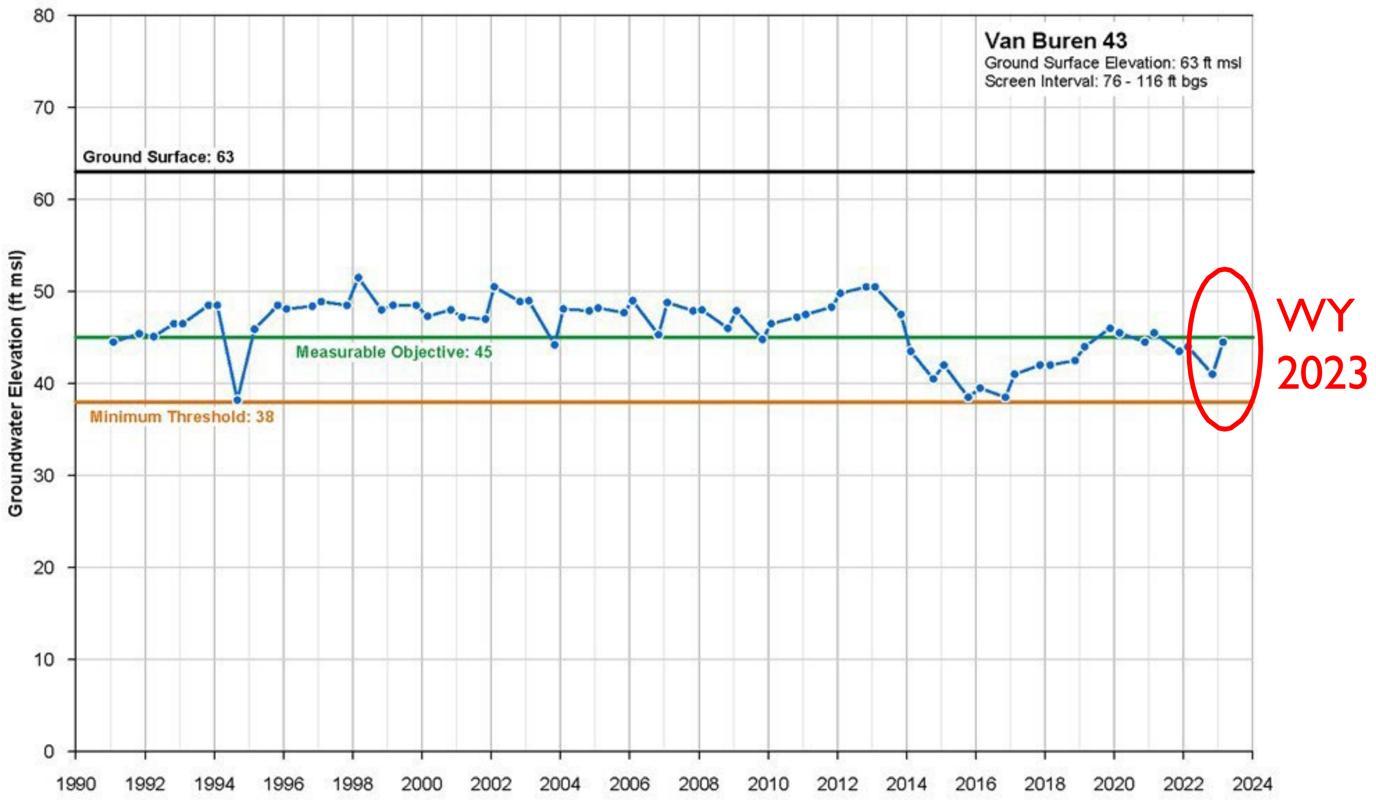
Chronic Lowering of Water Levels

	Fall 2022	Spring 2023
Western Upper Principal Aquifer		
Above MT	16	17
Below MT	1	0
Not Measured	0	0
% Below (includes measured wells)	6%	0%
Western Lower Principal Aquifer		
Above MT	4	5
Below MT	1	0
Not Measured	0	0
% Below (includes measured wells)	20%	0%
Eastern Principal Aquifer		
Above MT	16	25
Below MT	21	12
Not Measured	2	2
% Below (includes measured wells)	57%	32%

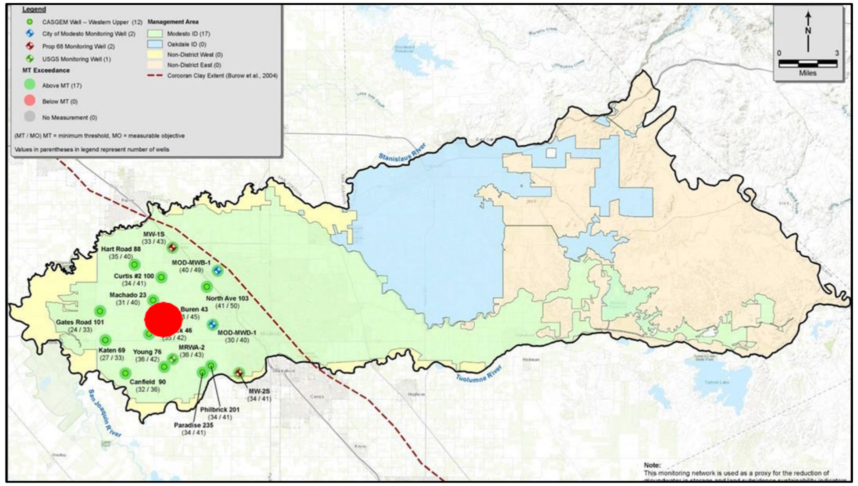
Interconnected Surface Water

	Fall 2022	Spring 2023
San Joaquin River		
Above MT	1	2
Below MT	1	0
Not Measured	0	0
% Below (includes measured wells)	50%	0%
Stanislaus River		
Above MT	2	6
Below MT	6	2
Not Measured	0	0
% Below (includes measured wells)	75%	25%
Tuolumne River		
Above MT	4	7
Below MT	5	2
Not Measured	1	1
% Below (includes measured wells)	56%	22%

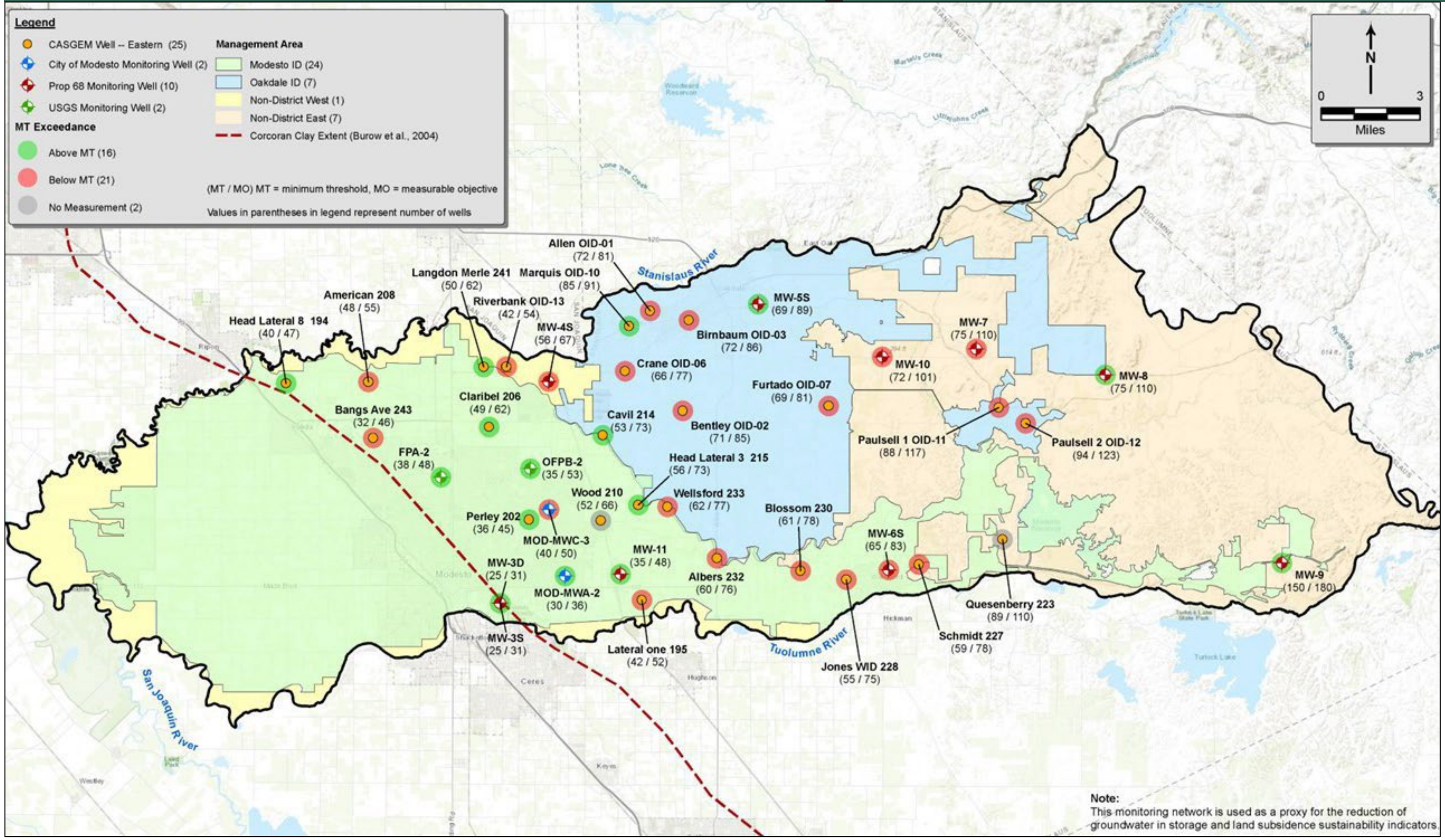
Hydrographs
Western Upper Principal Aquifer



- Water levels are stable in the west
- Water levels are above the MT
- Fall 2022 decline, Spring 2023 rebound
- Similar pattern in rest of Western Upper Principal Aquifer

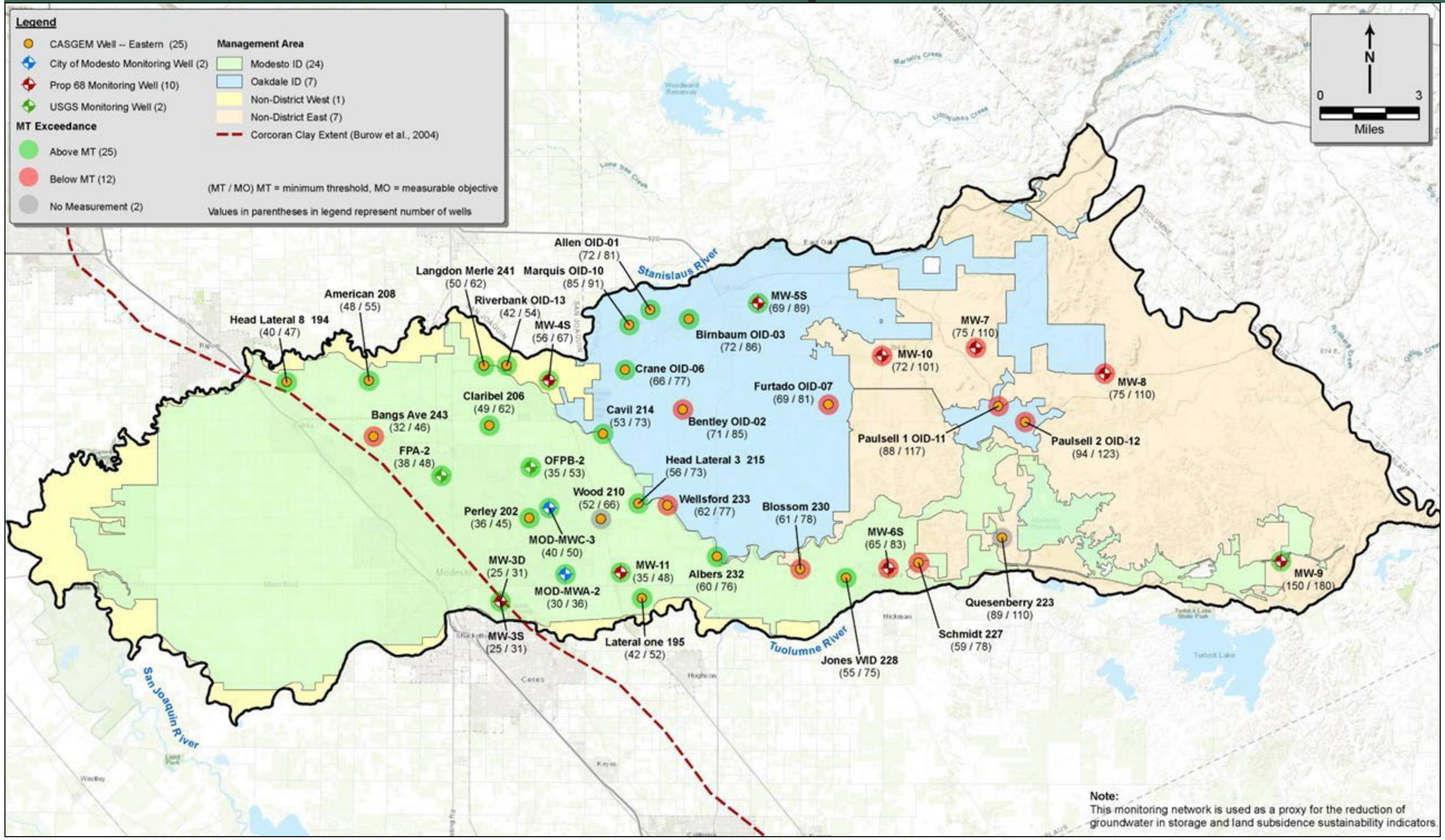


FALL 2022
EASTERN PRINCIPAL AQUIFER



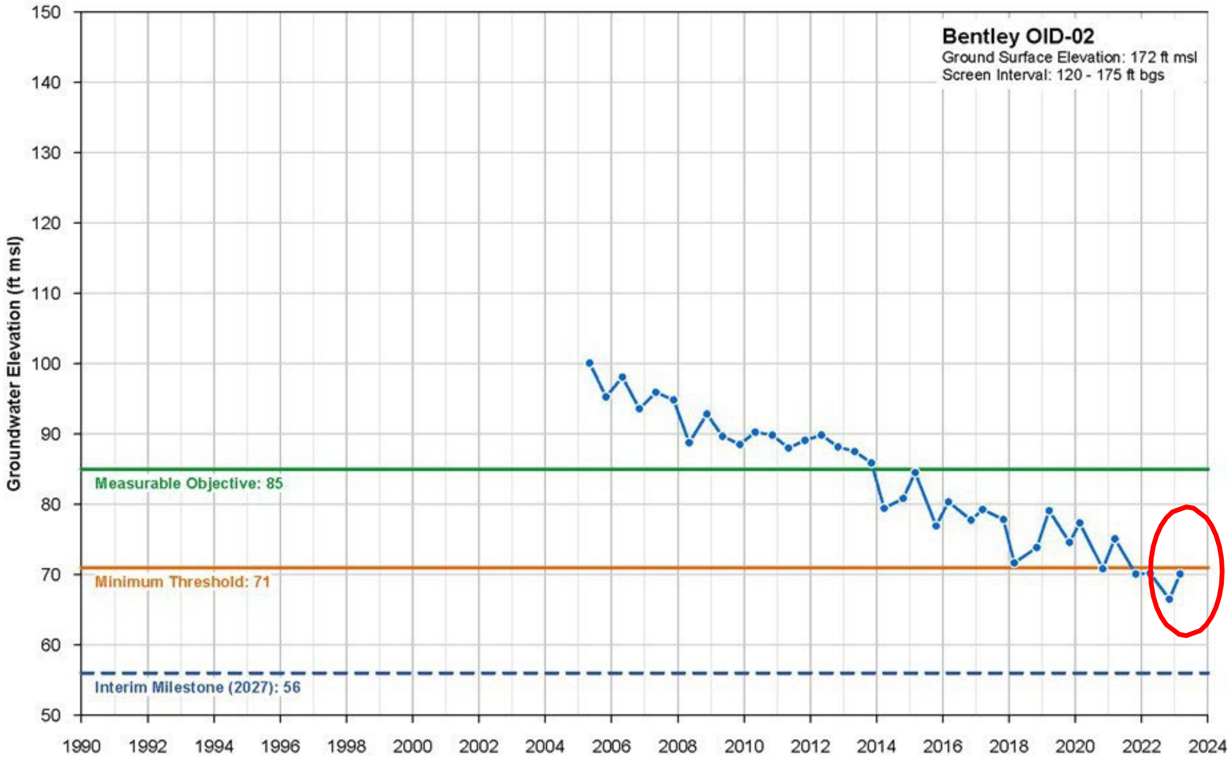
- Water levels continue to decline in east
- 57% wells exceed MT
  - 16 wells > MT
  - 21 wells < MT
  - 2 wells not monitored
- 14 wells have IMs (all above)

SPRING 2023
EASTERN PRINCIPAL AQUIFER

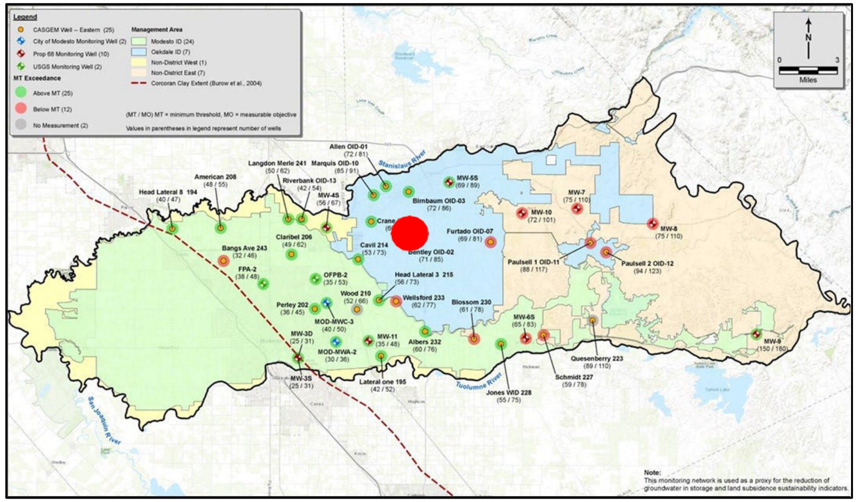


- 32% wells exceed MT
  - 25 wells > MT
  - 12 wells < MT
  - 2 wells not monitored
- 14 wells have IMs (all above)

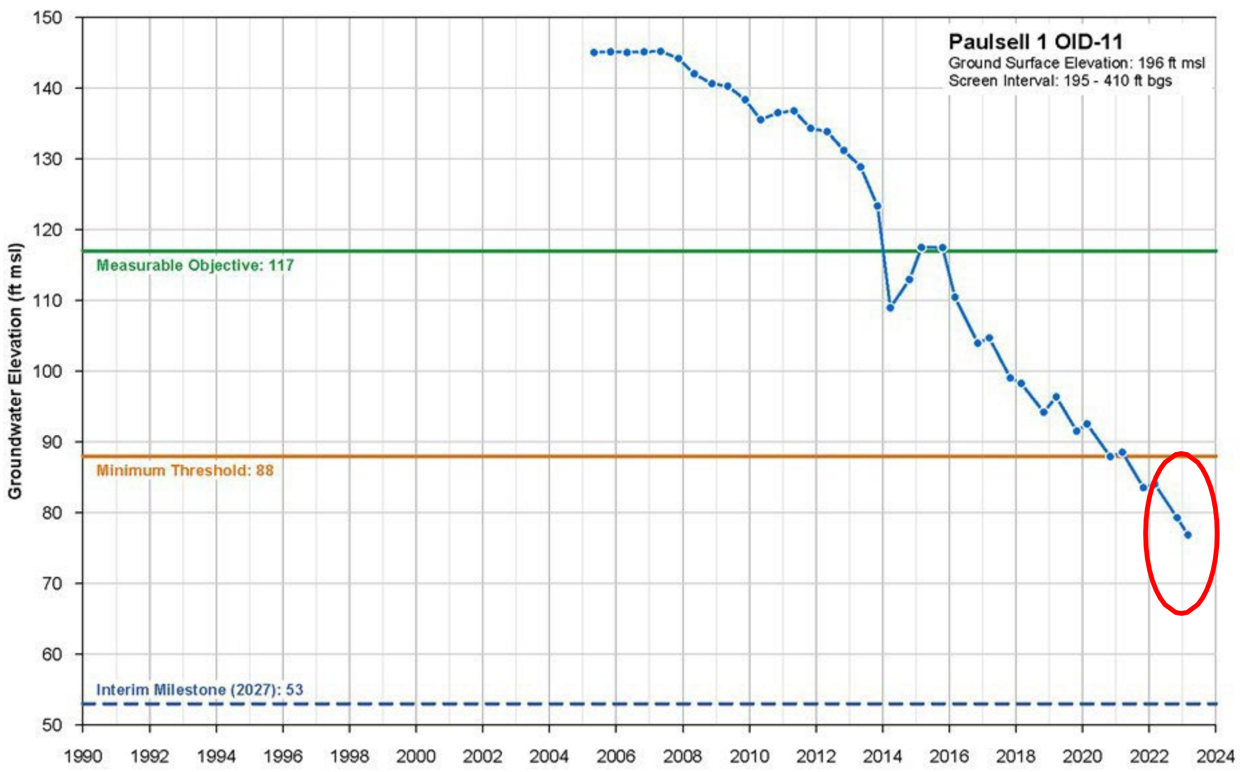
Hydrographs
Eastern Principal Aquifer



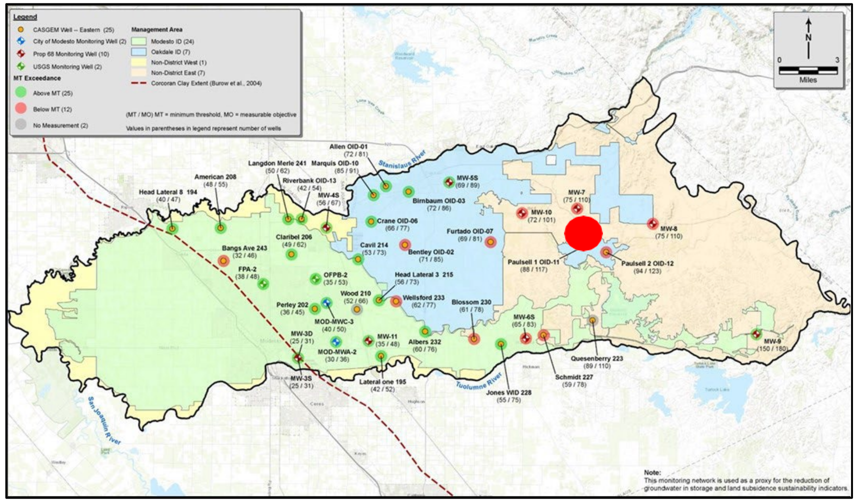
- WY 2023 water levels below MT
- Decreasing water levels since first measurement in 2005
- Similar declines in nearby wells



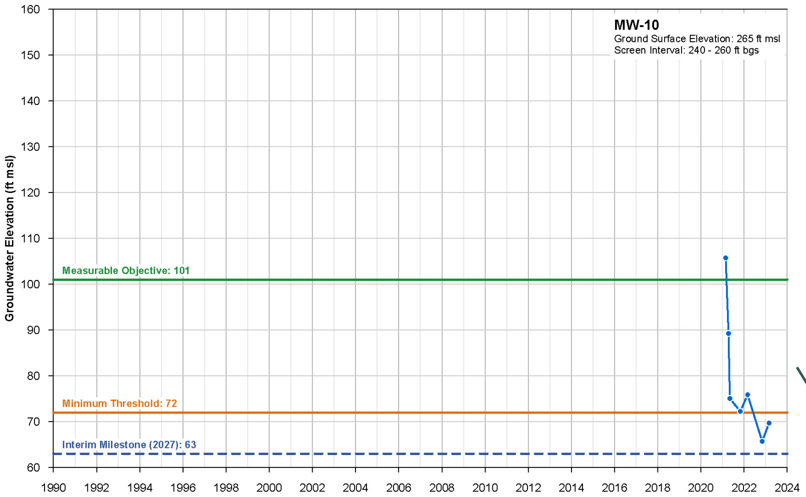
Hydrographs
Eastern Principal Aquifer



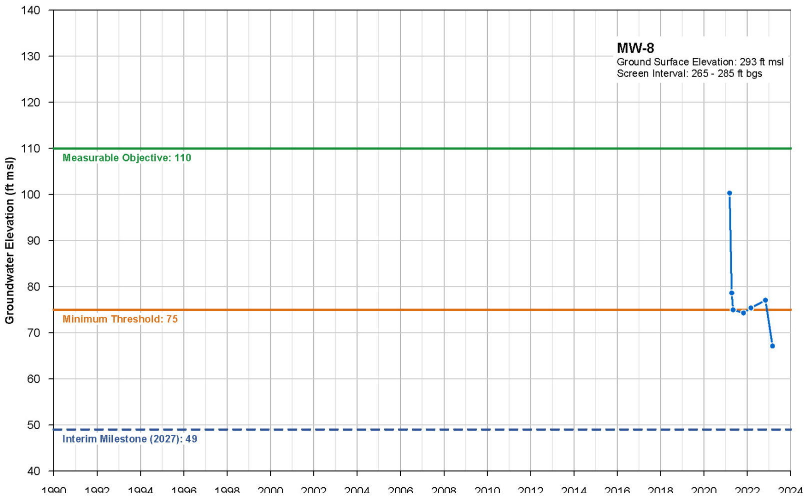
- WY 2023 water levels below the MT
- Eastern wells have highest rates of water level declines
- Declining water levels since 2008



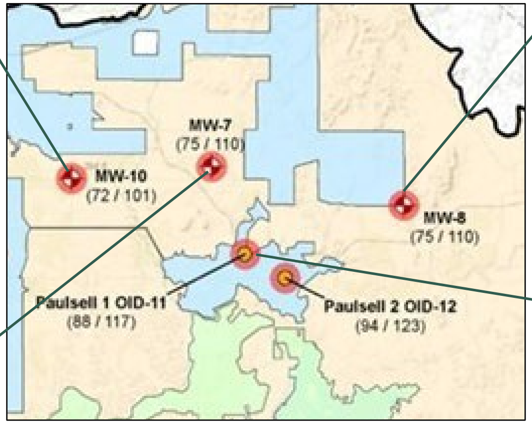
Eastern Principal Aquifer: a closer look

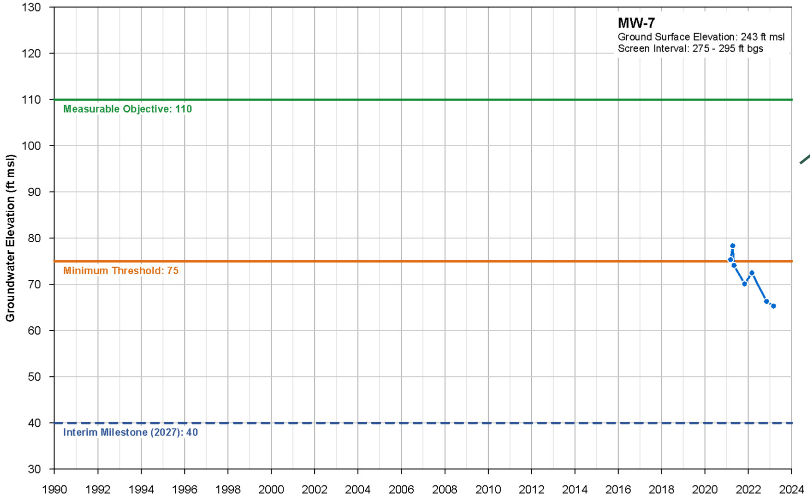


Water level decline, then rebound (consistent with most of Subbasin)



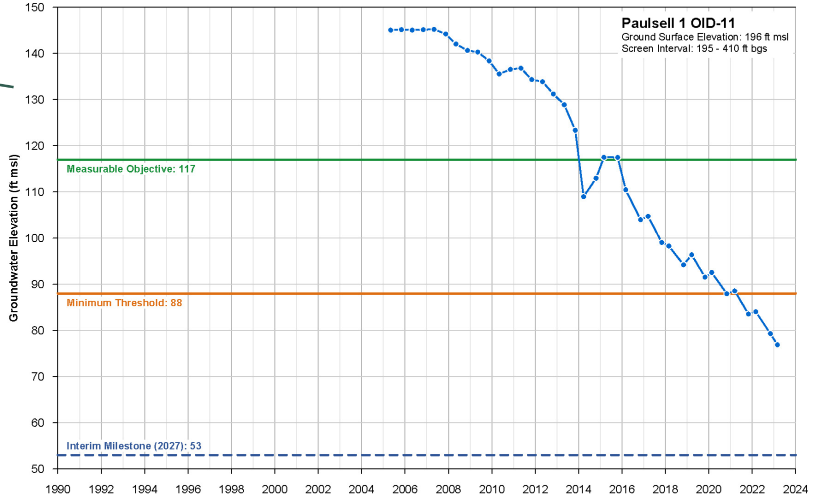
Fall 2022 increase, Spring 2023 decline (counterintuitive)





Continuous decline during WY 2023

- These wells are screened in the Mehrten Formation.
- Appears to be a stress within the Mehrten Formation east of MW-10 during the Spring 2023 monitoring event.



Continuous decline during WY 2023 (Paulsell-2 has a similar trend)

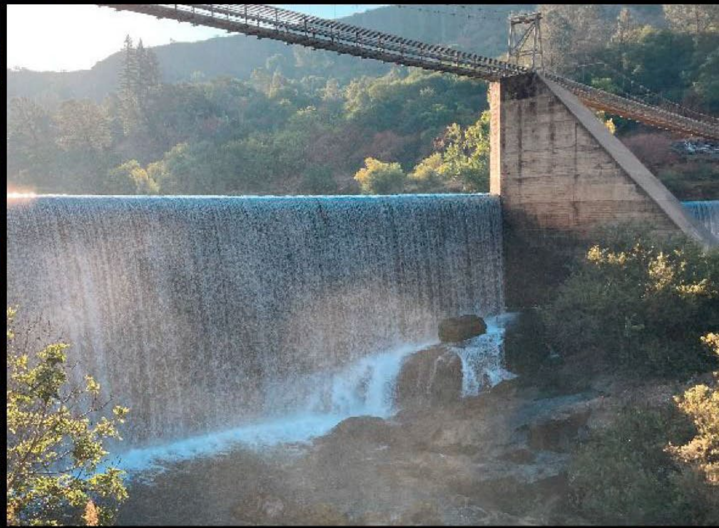
Putting These Results in Perspective

- Fall 2022 monitoring event occurred after two consecutive critically dry years (WY 2021 and WY 2022). Observed water level declines are not surprising.
- Fall 2022 monitoring event is the first Fall event that counts towards undesirable results.
- Undesirable results have not been triggered.
  - Requires 33% exceedances in 3 consecutive Fall events for Chronic Lowering of GW
  - Requires 33% to 50% exceedances in 3 consecutive Fall events for ISW
- No wells are below interim milestones (IMs)
- Keep an eye on the number of wells with MT exceedances in the Eastern Principal Aquifer and along the river boundaries

Stanislaus County

STANISLAUS AND TUOLUMNE RIVERS GROUNDWATER BASIN ASSOCIATION • GROUNDWATER SUSTAINABILITY AGENCY •

QUESTIONS?



Workshop for Modesto Subbasin Non-District Land Owners

Update on the East Turlock Subbasin GSA Project and Management Action

December 13, 2023

Topics

Introduction and Background

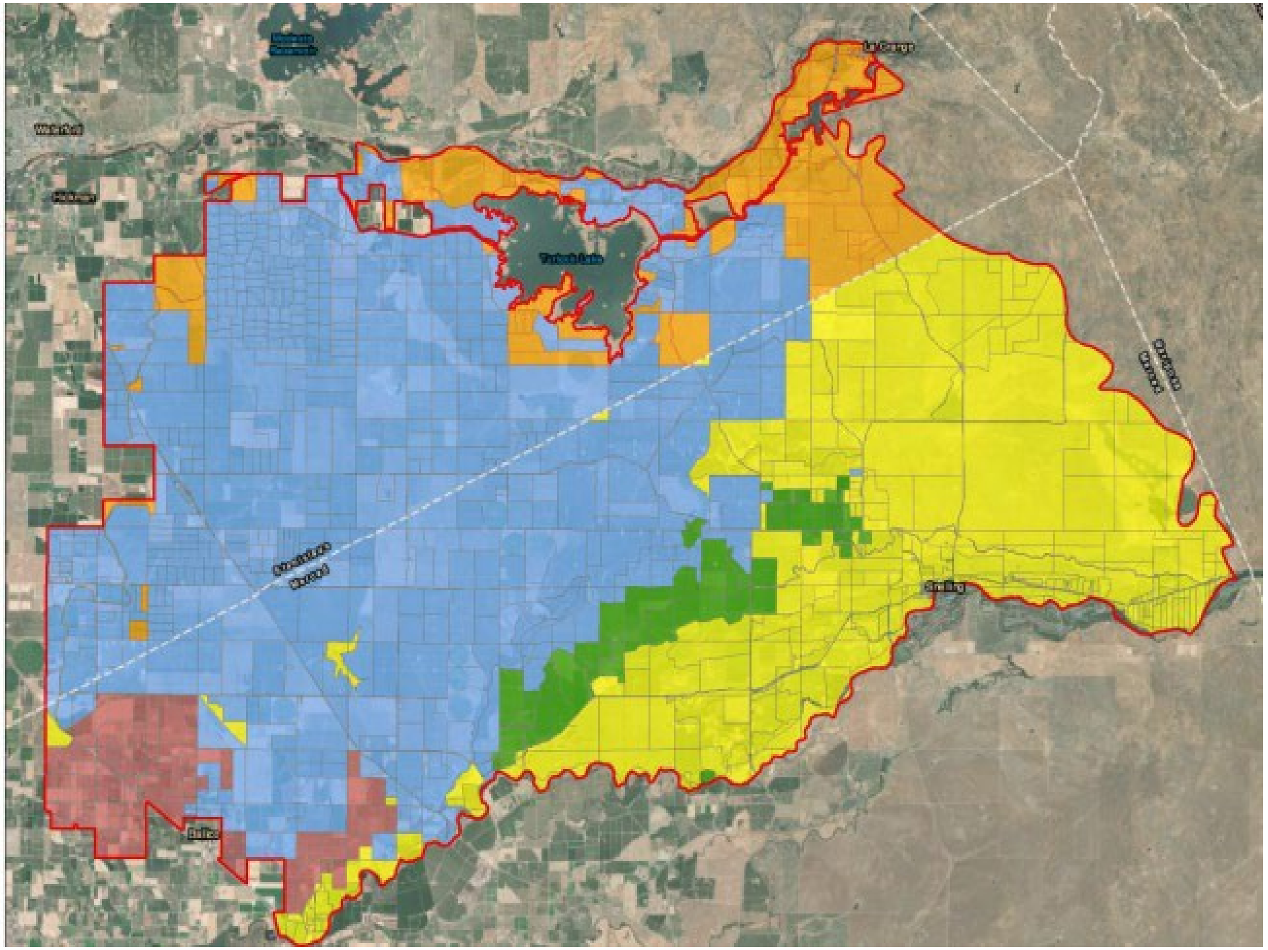
Approach

Multi-Benefit Land Repurposing Program

Pumping Management Framework

INTRODUCTION AND BACKGROUND

WHO WE ARE

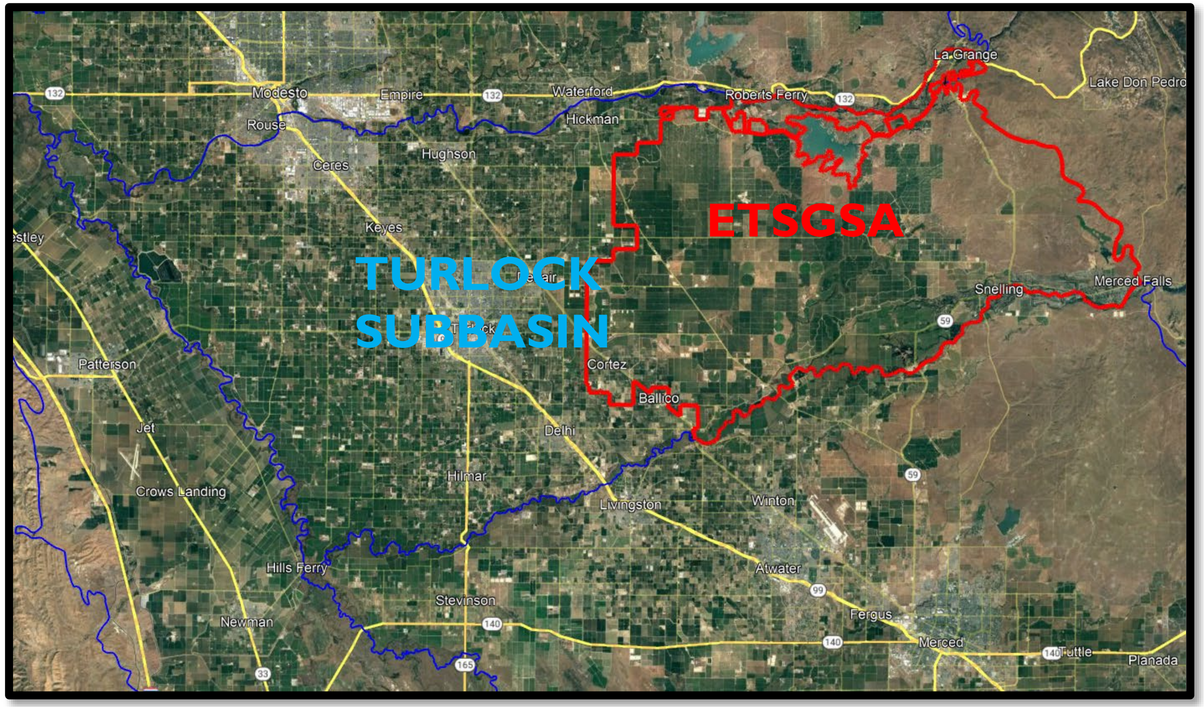


East Turlock Subbasin Groundwater Sustainability Agency JPA

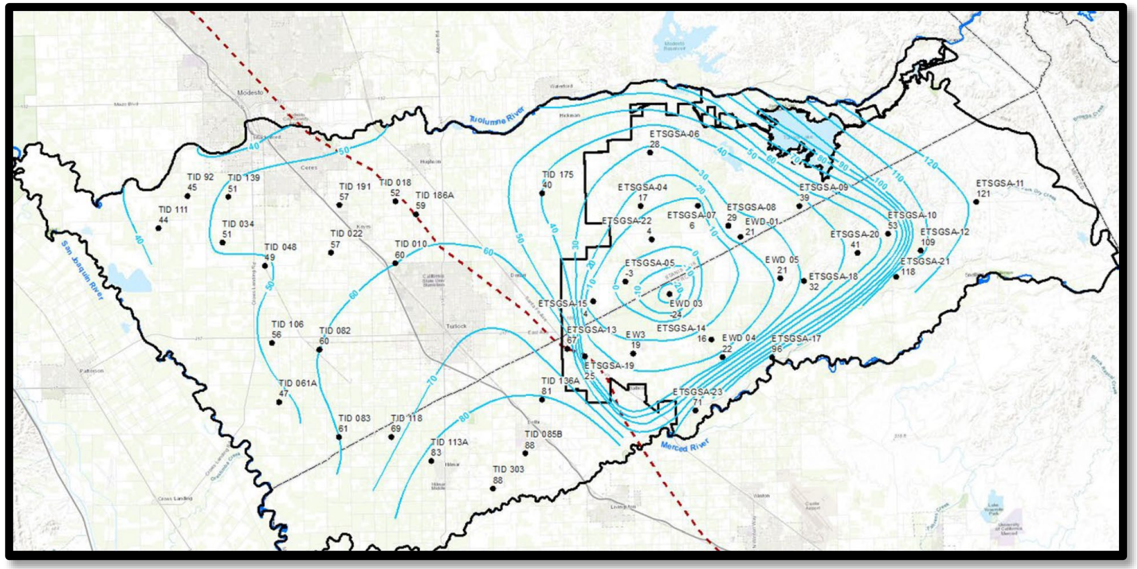
- ✓ Eastside Water District
- ✓ Ballico-Cortez Water District
- ✓ Merced Irrigation District
- ✓ Merced County
- ✓ Stanislaus County

One GSP adopted and being implemented jointly with West Turlock Subbasin GSA

Location and Overview



- Current groundwater demand exceeds long-term sustainable yield
- Large cone of depression under eastern subbasin
- Little opportunity for more surface water delivery or recharge

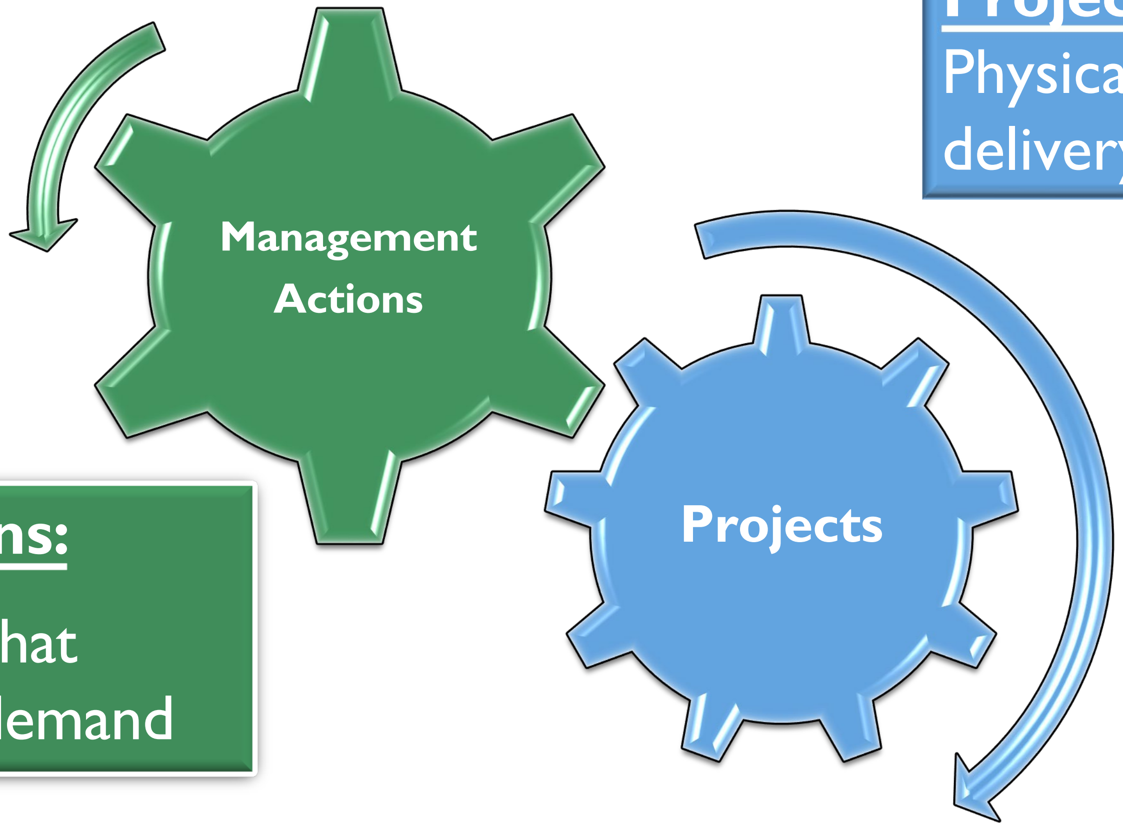


- Over 90,000 acres of high value agricultural land, mostly nuts and vines
- Depends mostly on groundwater

APPROACH

How will we Meet Subbasin Sustainability Goals?

- Multi-Benefit Land Repurposing
- Targeted Fallowing
- Pumping Management and Fees



Projects:
Physically constructed water delivery and recharge projects

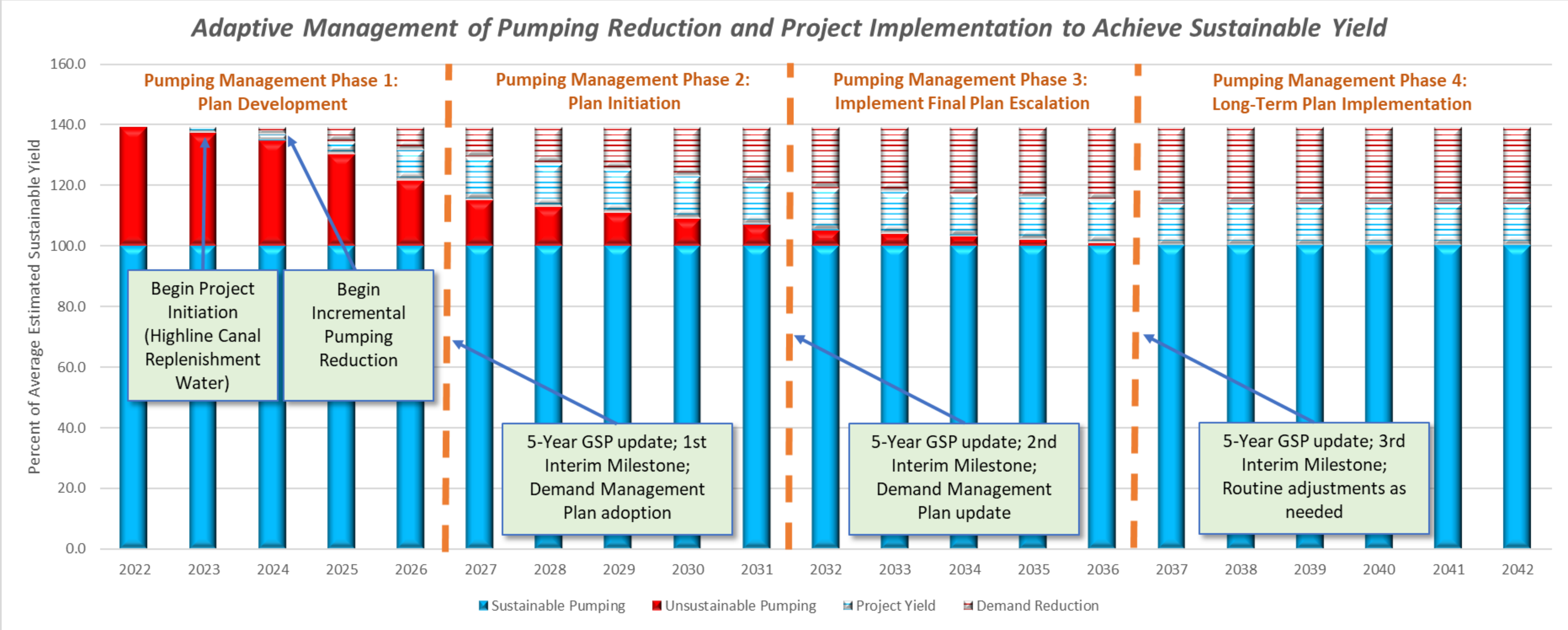
- In Lieu Recharge Projects using District Water
- Direct Recharge Projects using District Water
- Dispersed Stormwater Recharge or Storage

Management Actions:

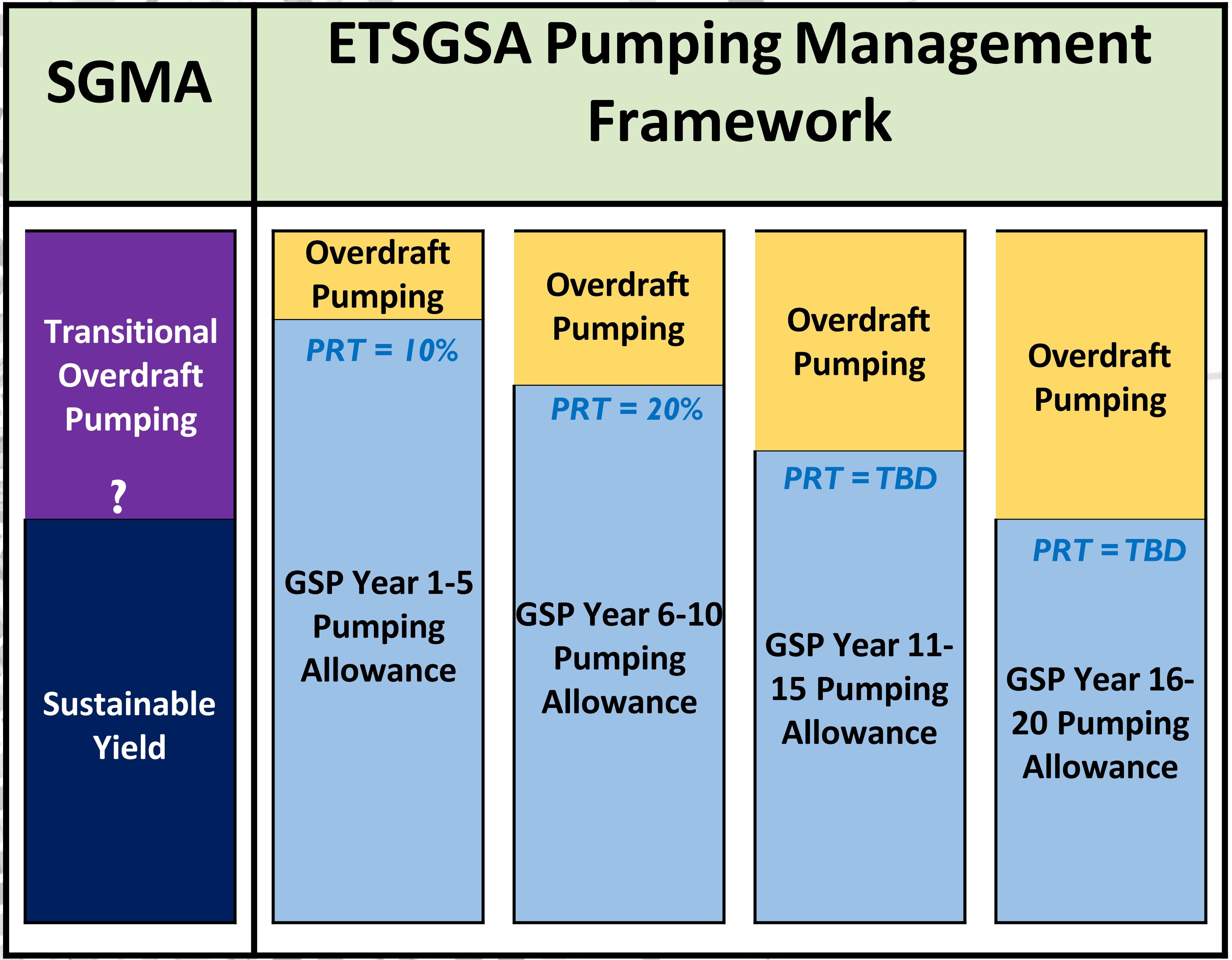
Programs or policies that reduce groundwater demand

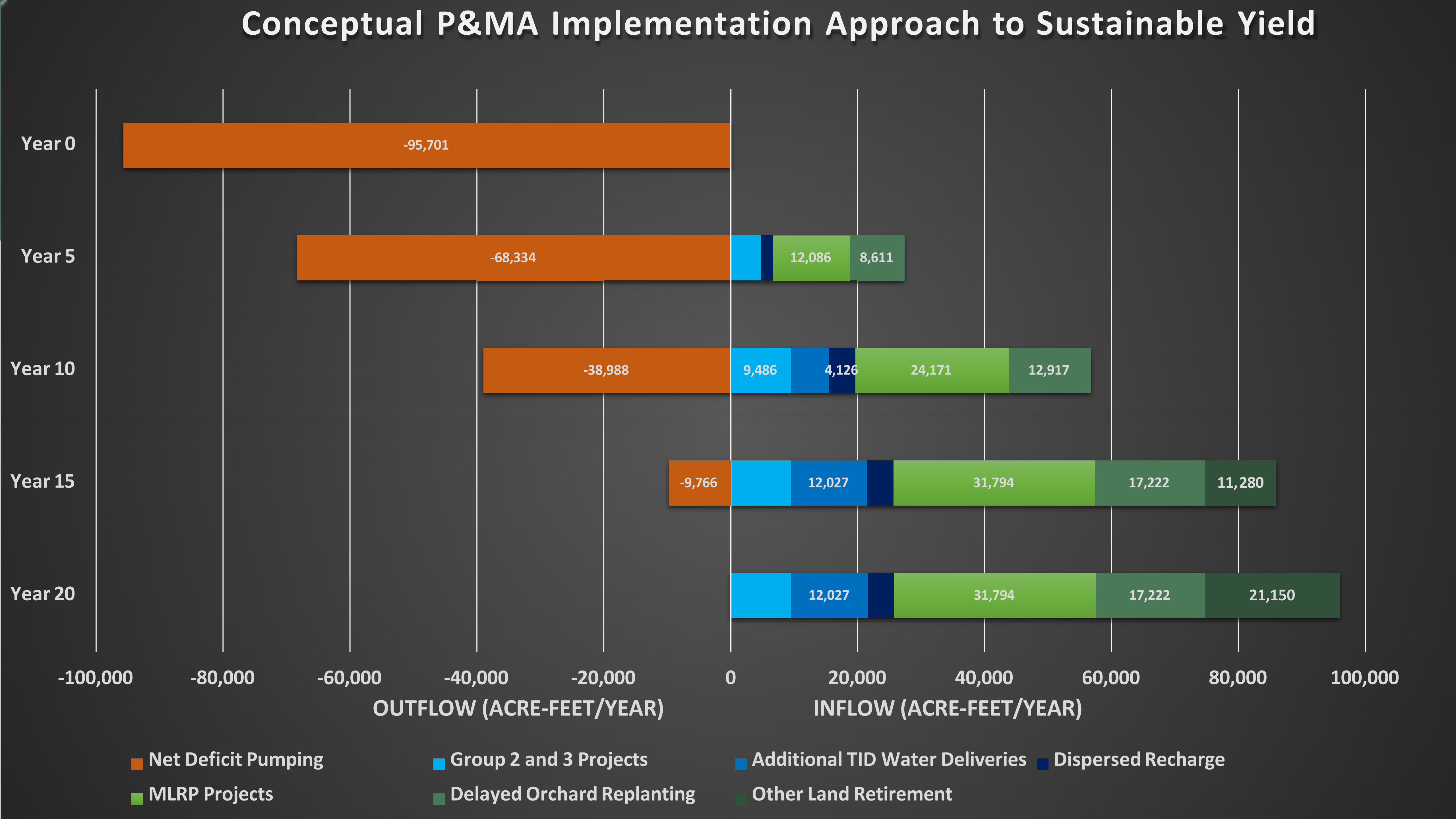
ADAPTIVE MANAGEMENT IMPLEMENTATION STRATEGY

Adaptive Management Strategy



PUMPING REDUCTION STRATEGY

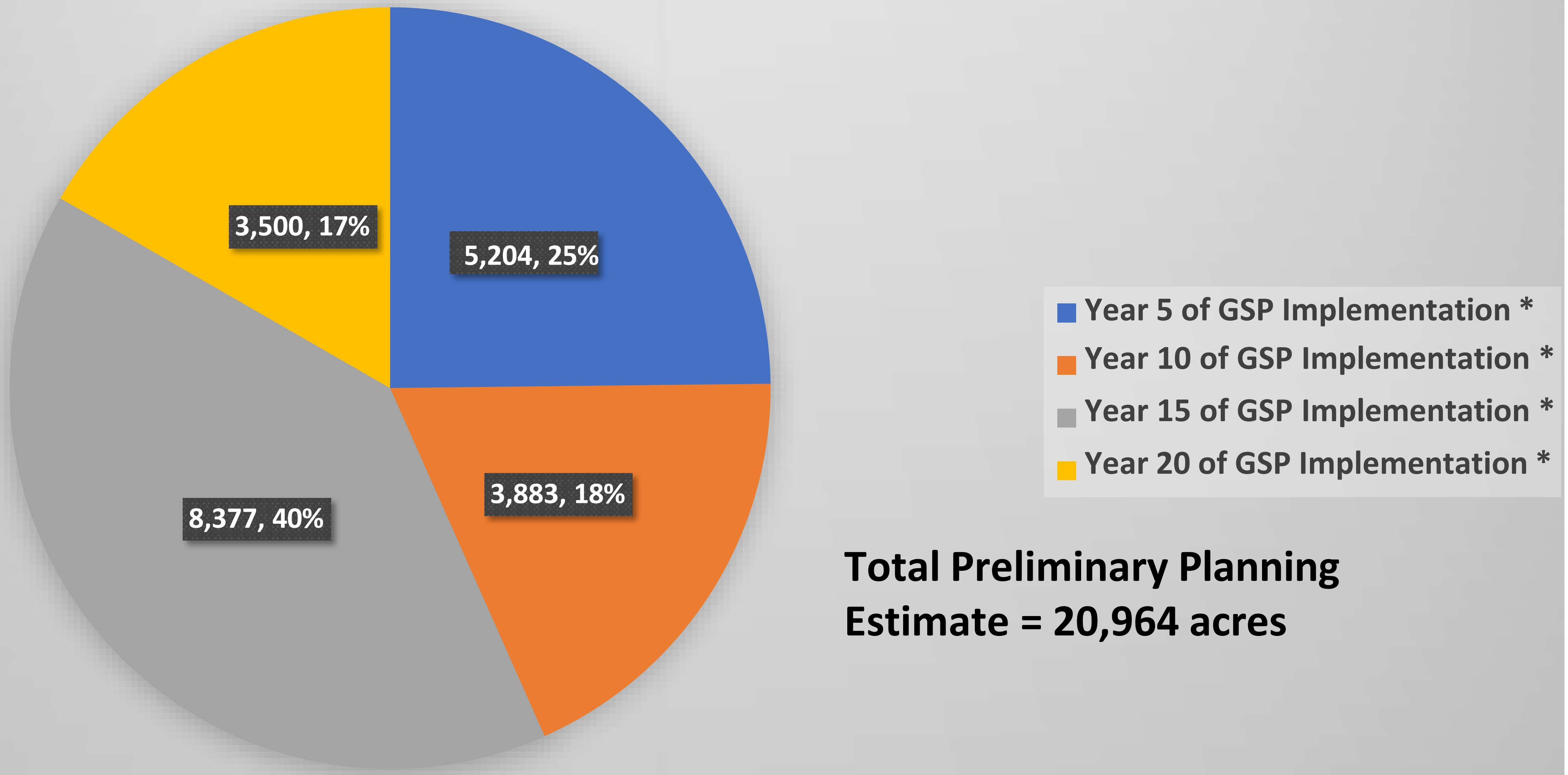



Conceptual P&MA Implementation Approach to Sustainable Yield
Year 0
Year 5
Year 10
Year 15
Year 20
-95,701
-68,334
12,086
8,611
-38,988
9,486
4,126
24,171
12,917
-9,766
12,027
31,794
17,222
11,280
12,027
31,794
17,222
21,150
-100,000
-80,000
-60,000
-40,000
-20,000
0
20,000
40,000
60,000
80,000
100,000
OUTFLOW (ACRE-FEET/YEAR)
INFLOW (ACRE-FEET/YEAR)
Net Deficit Pumping
Group 2 and 3 Projects
Additional TID Water Deliveries
Dispersed Recharge
MLRP Projects
Delayed Orchard Replanting
Other Land Retirement

MULTI-BENEFIT LAND REPURPOSING PROGRAM

Acres of Land Converted to Non-Irrigated Use in ETSGSA to Achieve Sustainable Yield

(Preliminary Planning Estate)



Total Preliminary Planning Estimate = 20,964 acres

LAND REPURPOSING VISION:

What does sustainable agriculture look like in a post-SGMA era?

Re-imagine integrated agricultural land use planning:

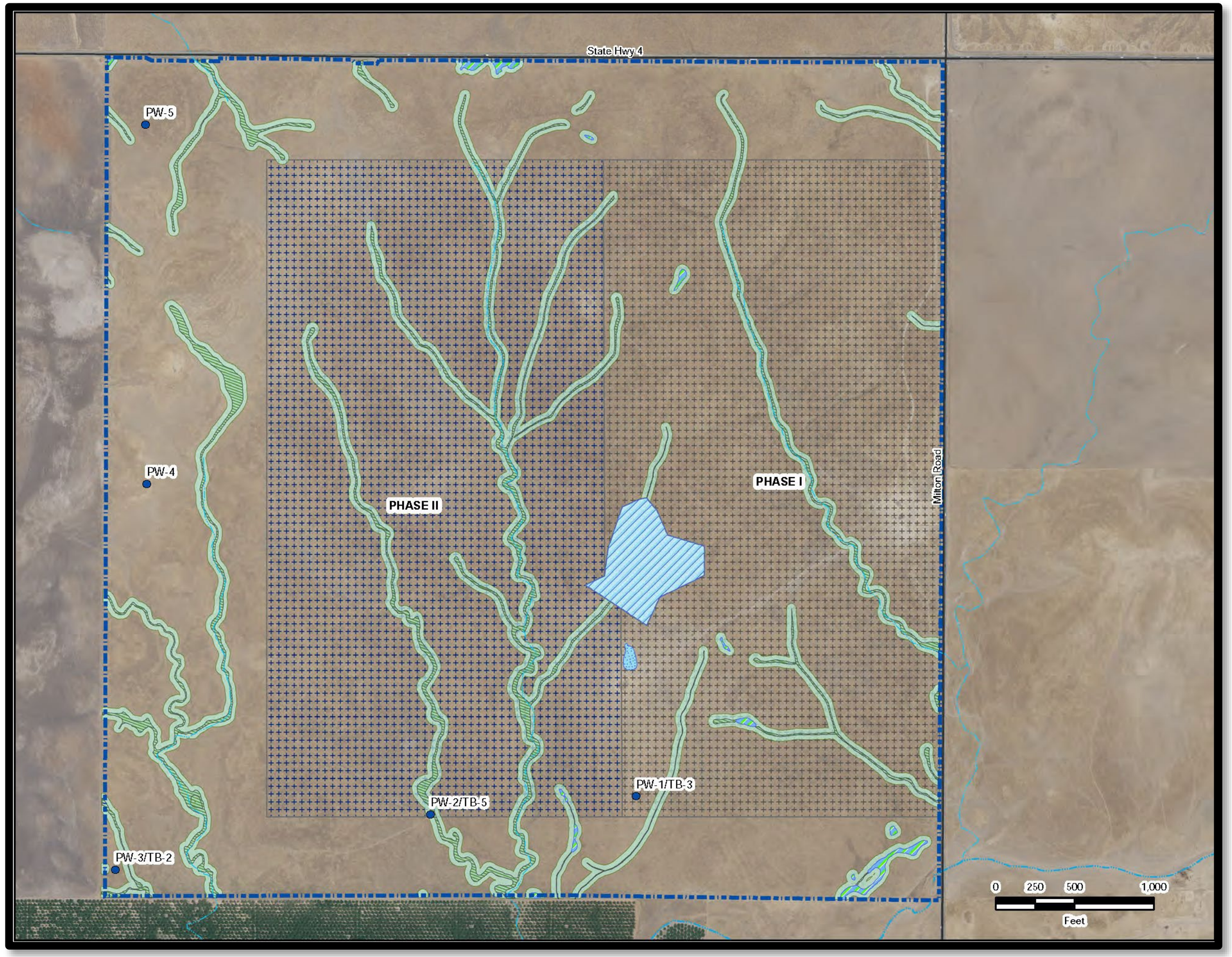
- ✓ Build a multi-benefit strategy around sustainable groundwater resource management.
- ✓ Focus on a strategy that preserves high value agricultural land for the benefit of the local communities, local economies, and the environment.
- ✓ Integrate land repurposing into working agricultural operations and landscapes.
- ✓ Prioritize strategies that provide high-value benefits such as water resources, community and environmental benefits.
- ✓ Promote grower-implemented solutions for increased return on investment and long-term success.

STRATEGY

- *Menu of options that can be implemented by growers to re-imagine their operations*
- *Standard specifications for regional implementation*
- *Programmatic permitting*
- *Incentive payments leading to long-term change*

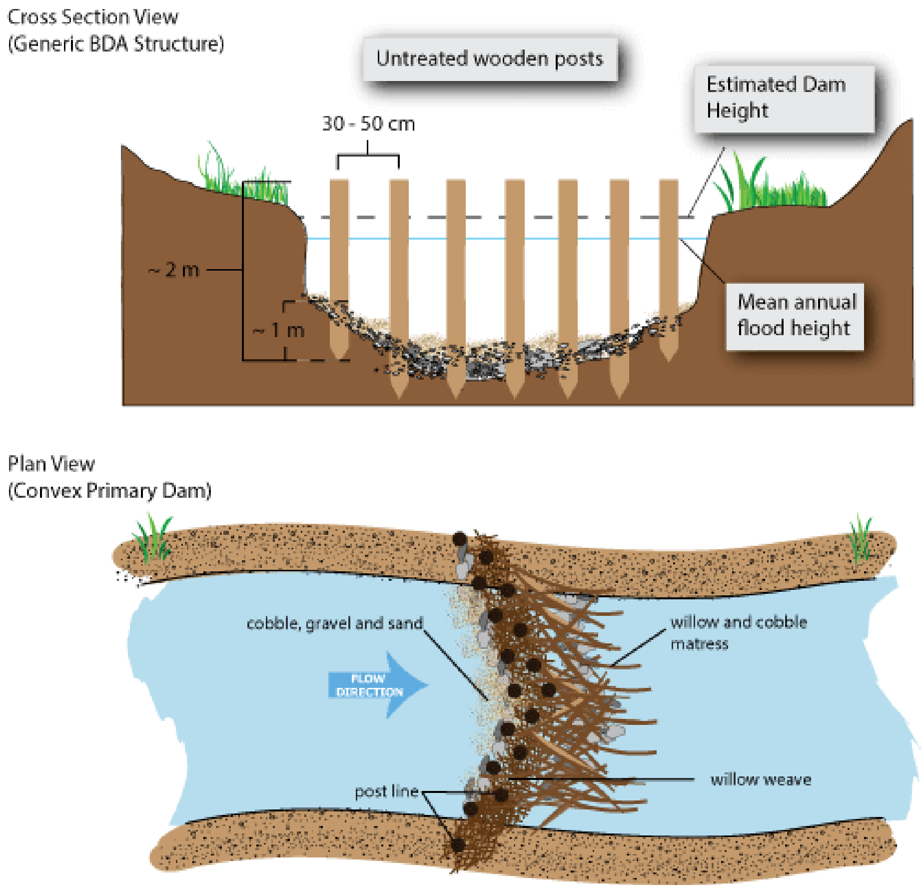
END USE BENEFITS	Increased Recharge	Decreased Demand	Water Quality	Habitat Benefits	Flood Risk Reduction	Climate Change Resilience	Disadvantaged Community	Sustainable Agriculture
Orchard Swale Rewilding								
Floodplain Reconnection								
Cover Cropping								
Riparian Habitat Restoration								
Recharge or Storage Basins								
Hedgerows								
Recropping, Dry Land Cropping								
Solar Pumping Plants								

ORCHARD SWALE REWILDING

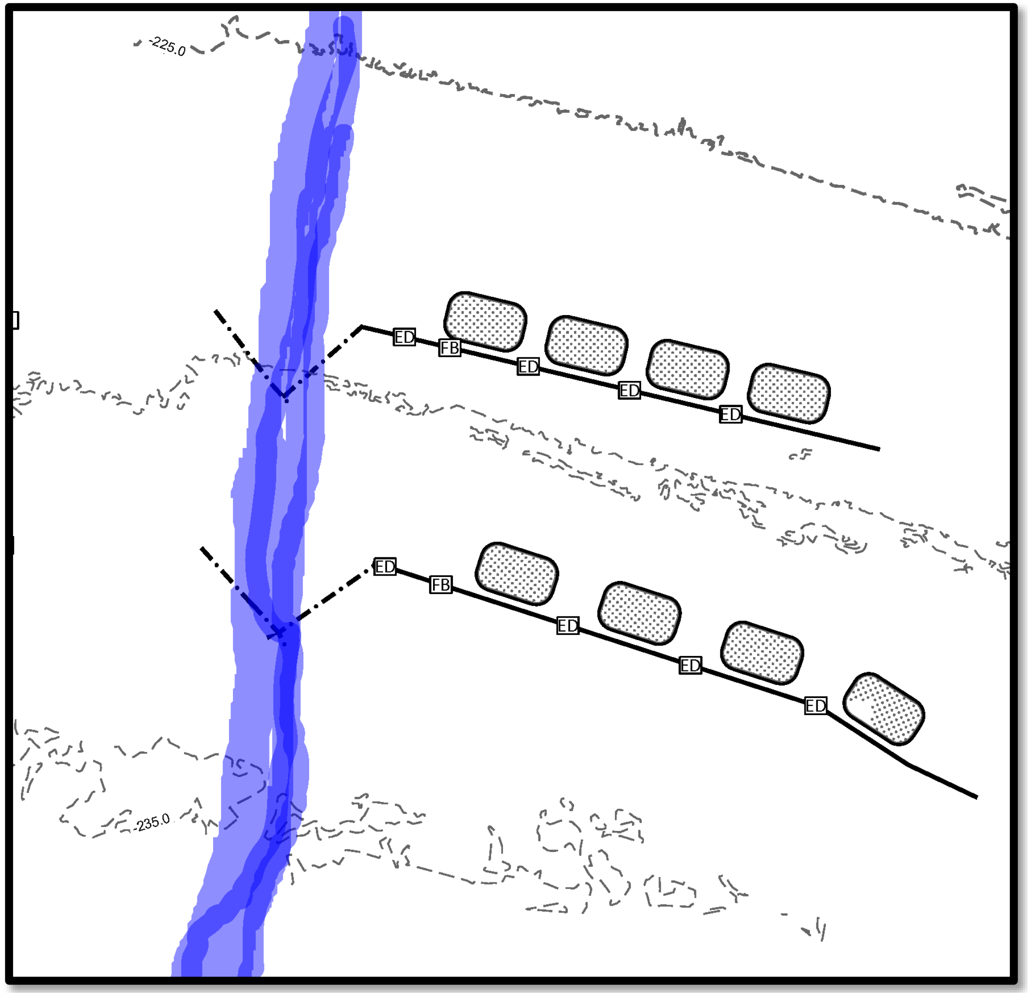


- About10% of area of orchards in rolling foothill terrain
- Typically lower yield trees
- Decreases groundwater demand
- Surface modification with check dams and earth buds retains runoff and promotes seasonal wetlands
- Improves water quality
- Attenuates storm runoff
- Promotes recharge; however, impeding soil layers often present

FLOOD PLAIN RECONNECTION



FLOOD PLAIN RECONNECTION



- Lower reaches of local creeks run across sandy soil; stable isotope analysis indicates significant recharge
- Beaver Dam Analogs (BDAs) retain and spread water onto the floodplain;Approach accentuates natural processes
- Decreases groundwater demand
- Promotes recharge
- High quality habitat
- Improves water quality
- Attenuates flood intensity

Project or Management Action	GSA Cost per acre-ft net Recharge
Direct and In Lieu Recharge Projects	
Replenishment Water In Lieu Recharge Projects	$ 20.00
Off-Season Water Direct Recharge Projects	$ 110.00
Additional Replenishment Water	$ 135.00
Land Repurposing for Replenishment Water Storage	$ 177.30
Dispersed Recharge and Storage Projects	$ 103.73
Demand Reduction Management Actions	
Swale Rewilding	$ 177.10
Floodplain Reconnection and Rewilding	$ 183.25
Fallow orchards for three years prior to replanting	$ 118.20
Other permanent land fallowing or repurposing to non-irrigated use	$ 177.30

PUMPING MANAGEMENT

Rules & Regulations Support Prop 218

Supports justification of ratepayer benefits from land-based assessment

Pumping Management Framework

Who is eligible? How are pumping fees and thresholds set? Opt in/out; Appeals

Measuring Groundwater Use

How will groundwater use be monitored?

Supports implementation of volume-based pumping fees

Water Accounting

Accounting methods & types of credits (i.e. intentional recharge)

Operational Rules

Pooling, carryover rules, transfers, etc.

Penalties & Appeals

Enforcement mechanisms and appeals

Guiding Objectives

Maintain/adopt incentives that decrease groundwater use

- Provide incentives to use surface water when available and avoid disincentives
- Provide incentives to decrease groundwater use
- Provide incentives for land repurposing to non-irrigated or recharge use

Maintain equity

- Keep charges proportional to benefits
- Avoid creating special benefit classes

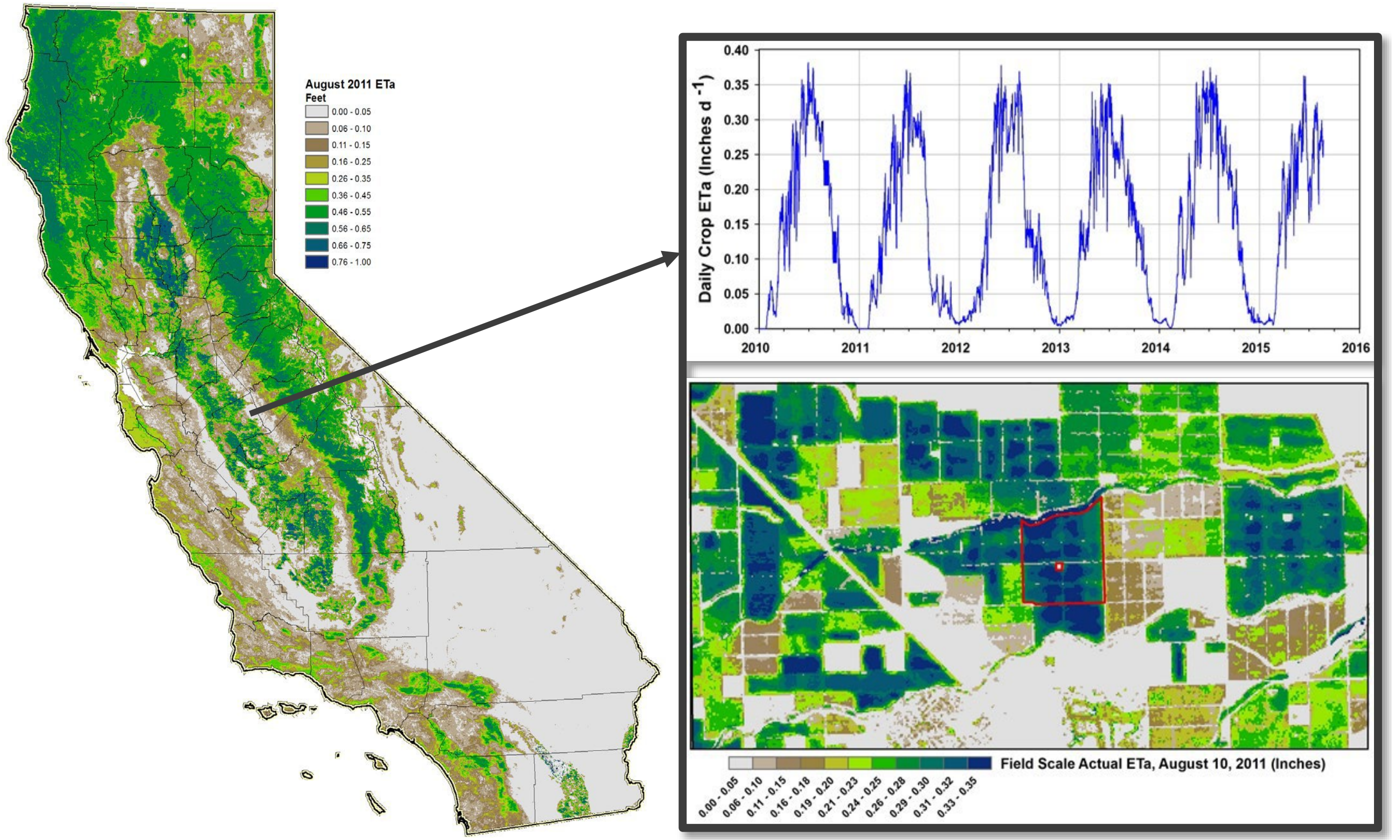
Keep it simple

- Avoid complex charges or special rules
- Avoid creation of special benefit zones, if possible

Maintain Flexibility

- Adopt rules that allow flexibility such as pooling, trading and carry over
- Measurement using ET with option for metering

HOW ARE WE USING ET DATA?



- We need to establish baseline of groundwater use to measure against
- Satellite-based ET is our best way to estimate historical consumptive use
- CalETa is a readily available dataset developed for DWR that maps daily actual ET from 2003 – 2021 at the field scale

HOW ET IS MEASURED?

Image Processing

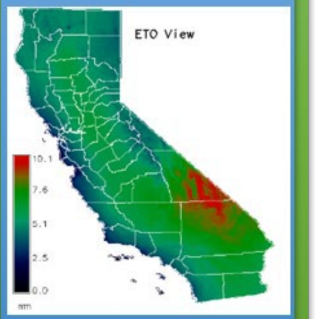
- Automated Imagery Download (Landsat & MODIS)
- Automated Cloud Screen
- Conversion to Surface Reflectance
- Derive Physical & Biophysical Variables

Climate / Weather

Conditions at Satellite Overpass

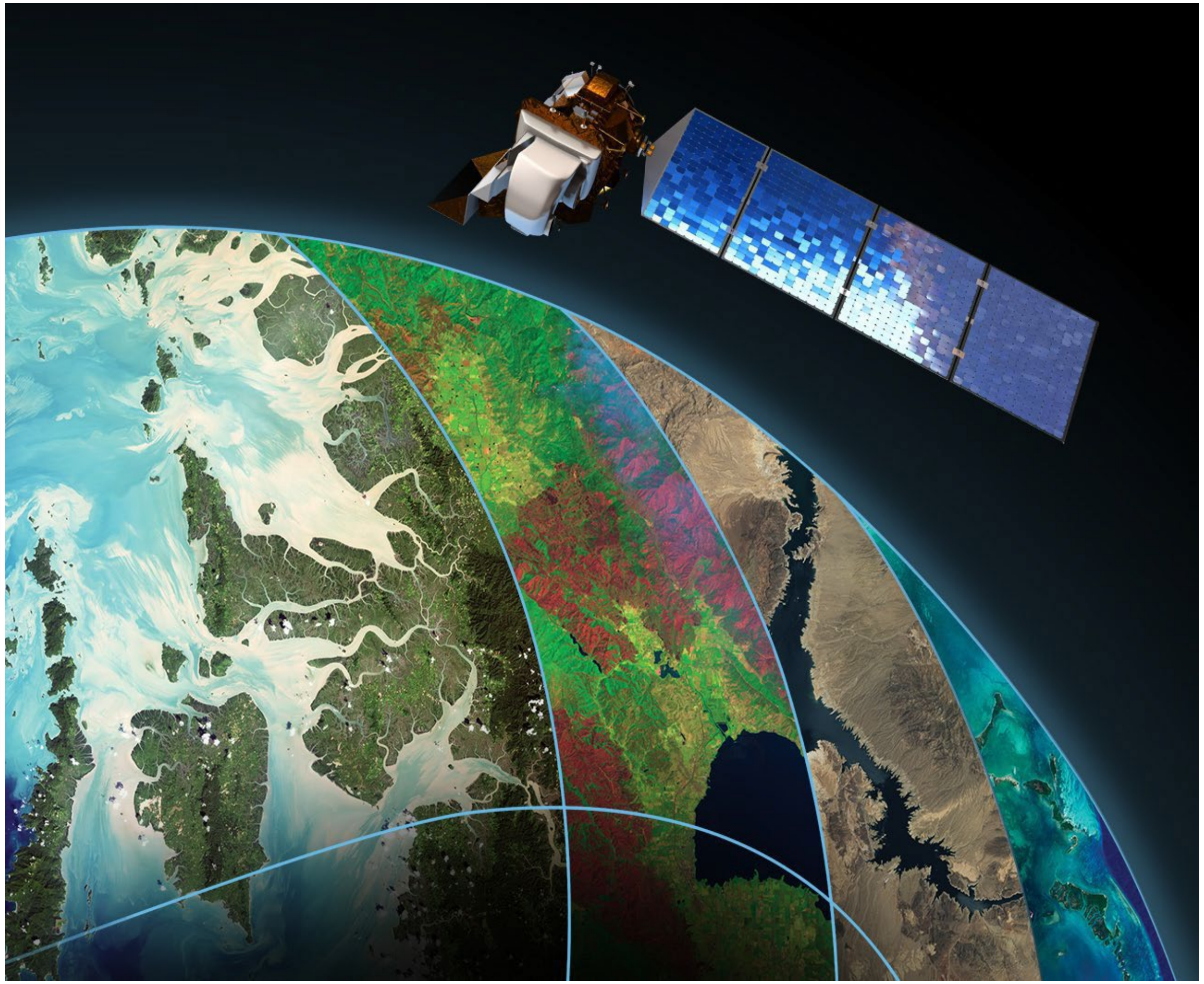
- Solar Radiation
- Air Temperature
- Relative Humidity
- Wind Speed
- Reference ET

Spatial CIMIS: Daily Reference ET

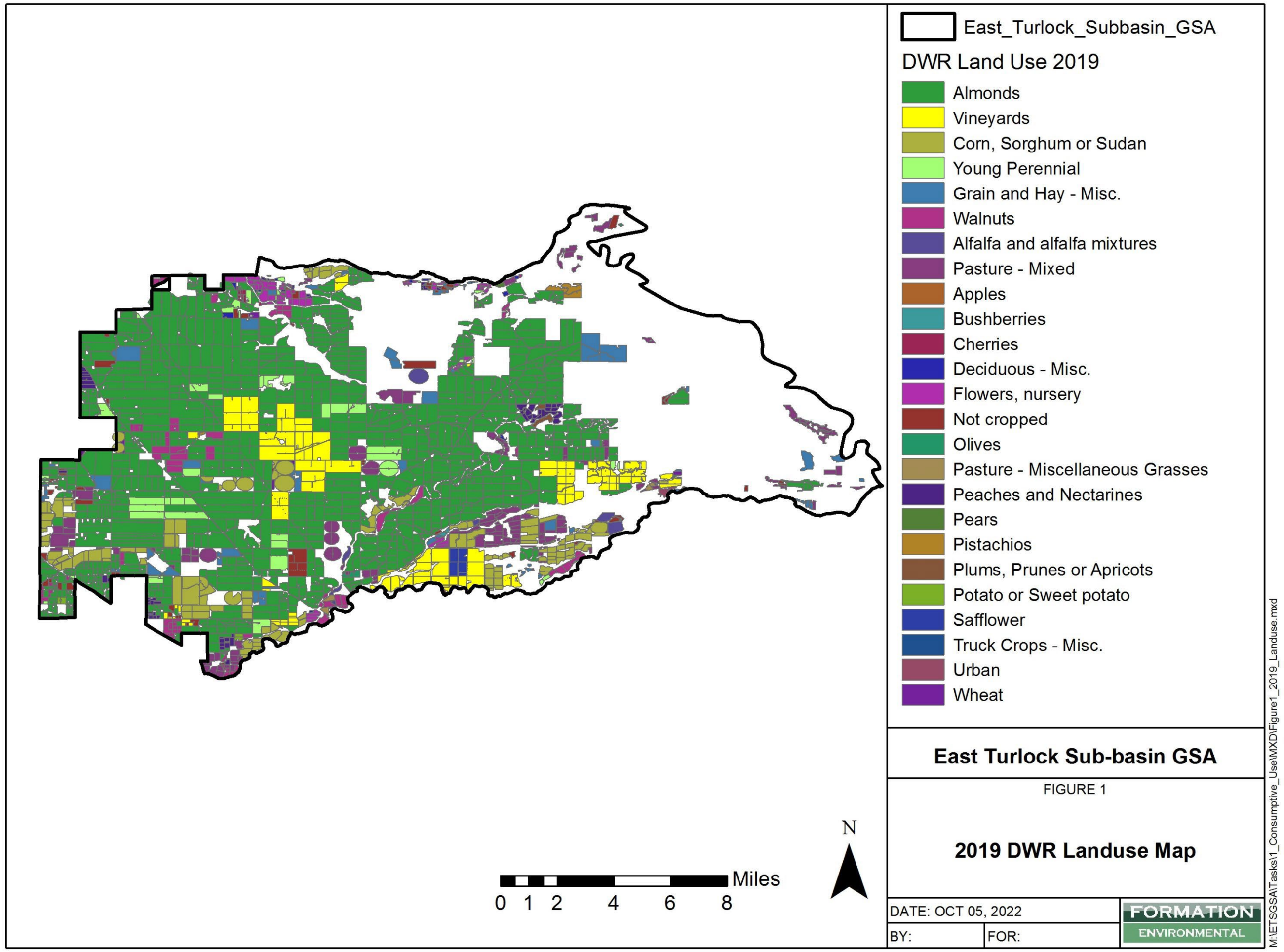


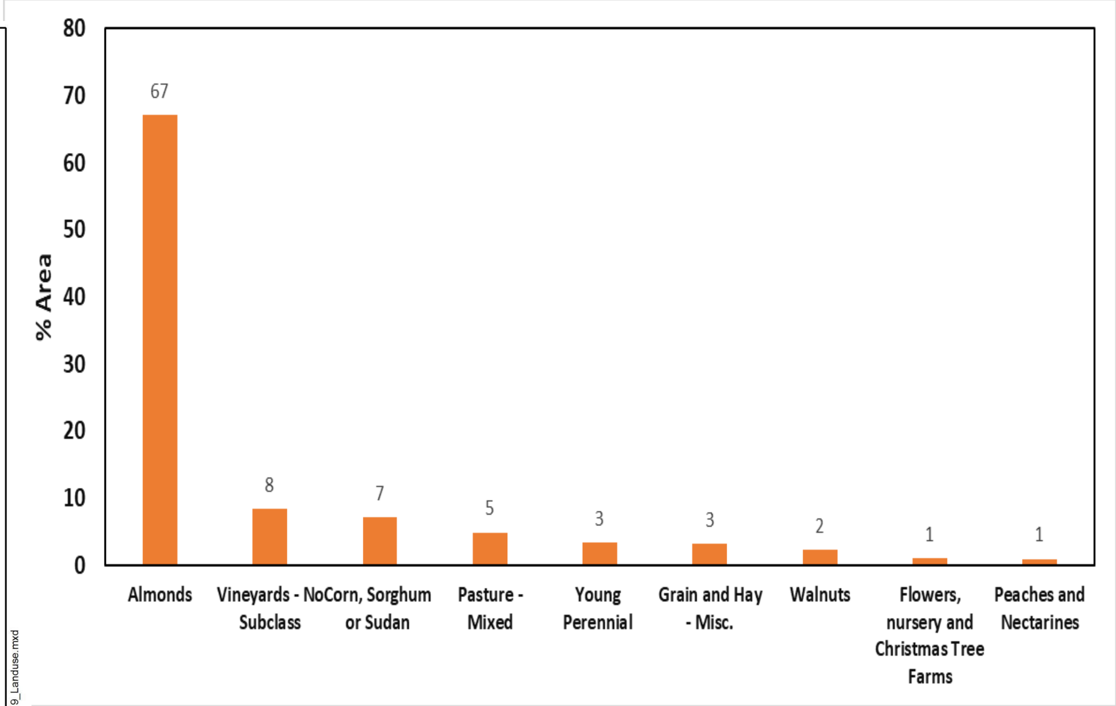
Surface Energy Balance Equation

Daily ETa (Statewide; 30 meter resolution)



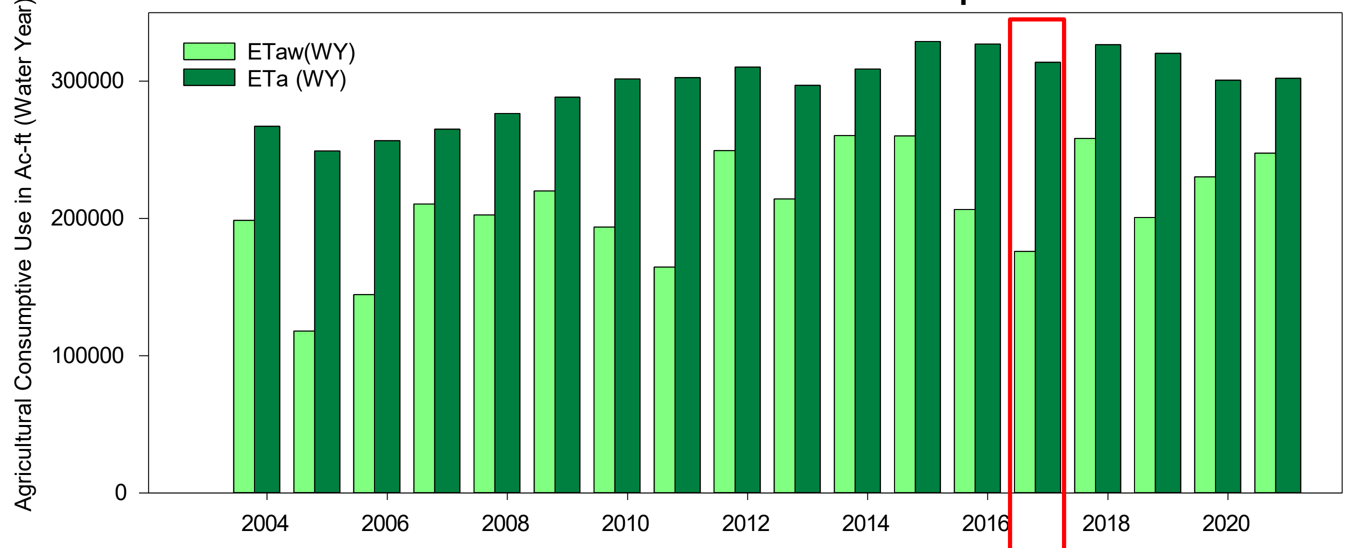
Baseline Land Use and Cropping Data (2019)



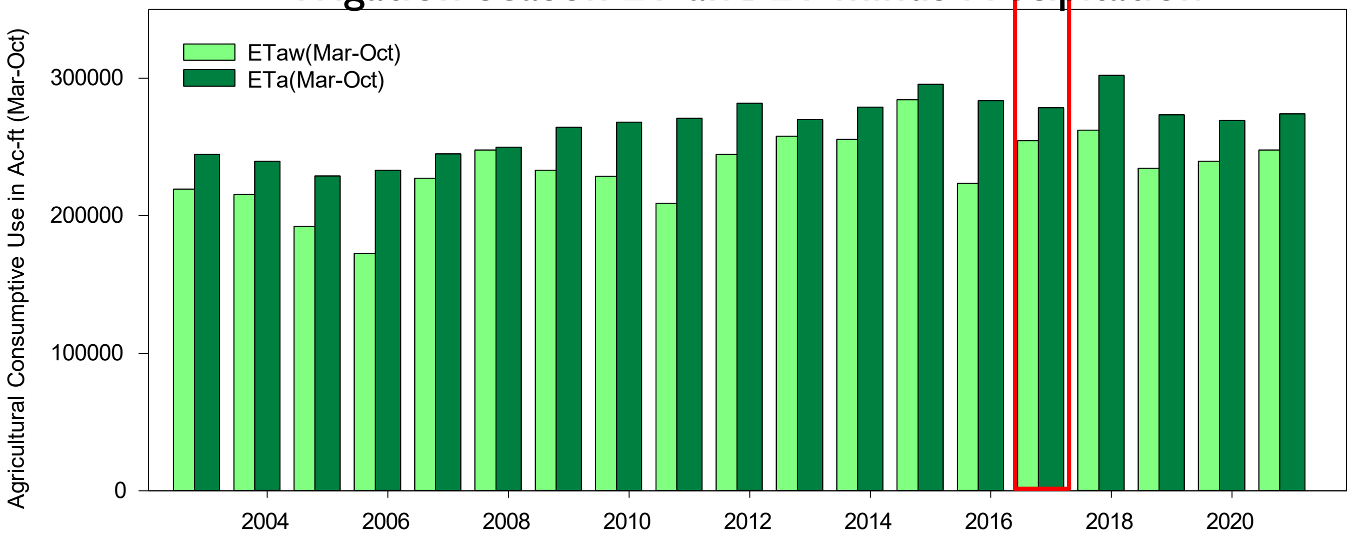


Total Irrigated Land: ~ 85,000 acres
Top Nine Crops: ~ 83,000 acres (98%)
Perennial Crops: ~ 72,000 acres (84%)
Almonds: ~ 57,000 acres (67%)

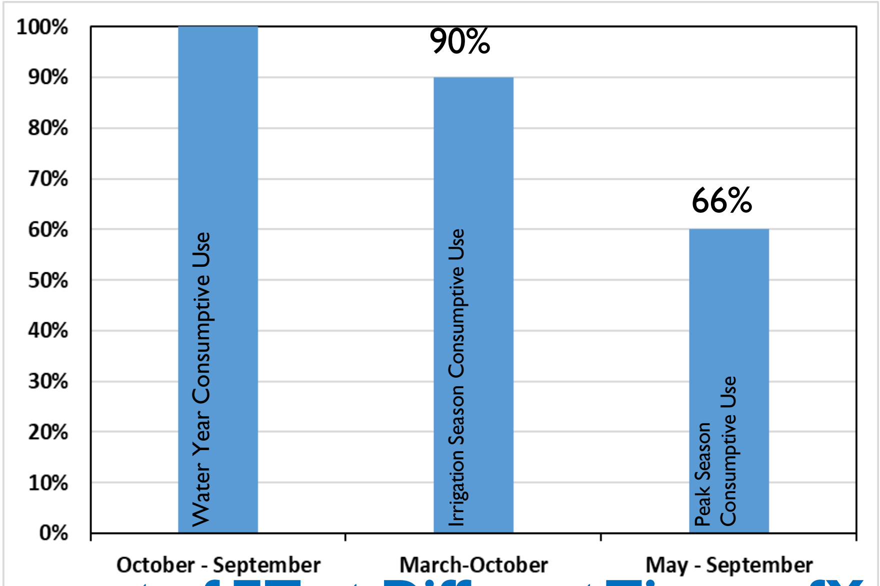
Annual ET and ET minus Precipitation



Irrigation Season ET and ET minus Precipitation

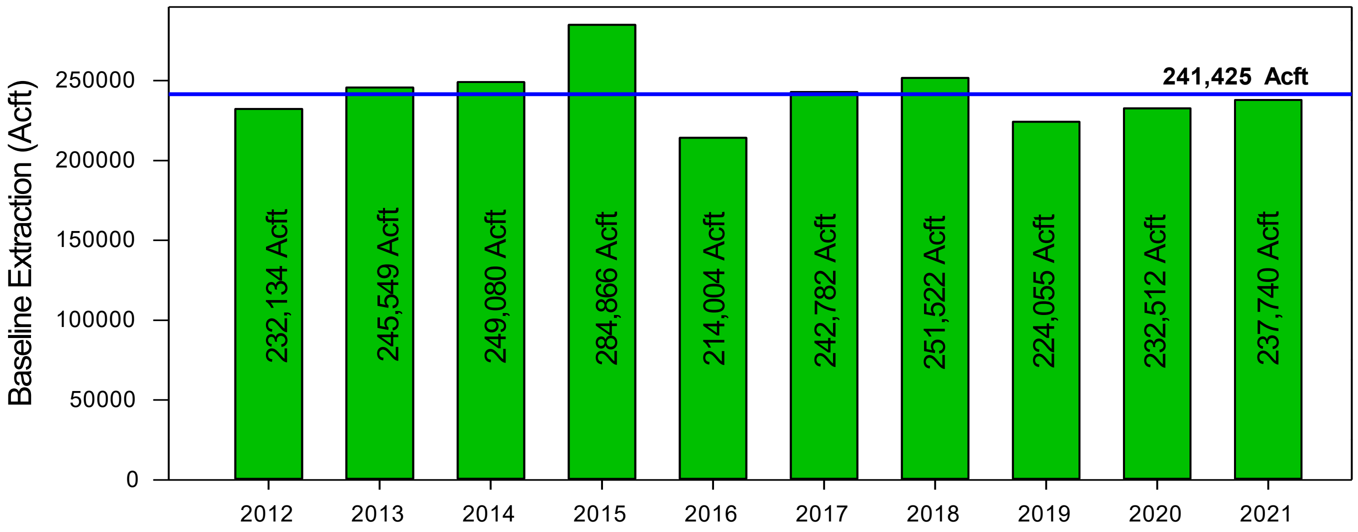


- ET includes water from irrigation and precipitation
- Annual ET includes precipitation, runon and runoff
- We want to use ET as a tool to estimate GW pumping, so our focus is the irrigation season

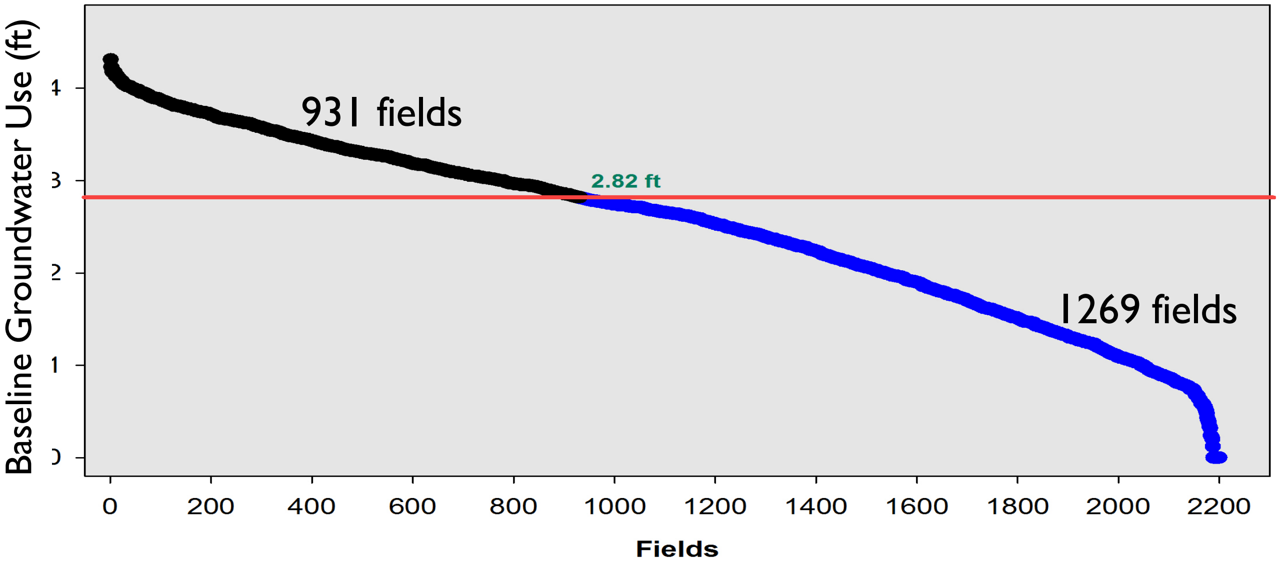


Percent of ET at Different Times of Year

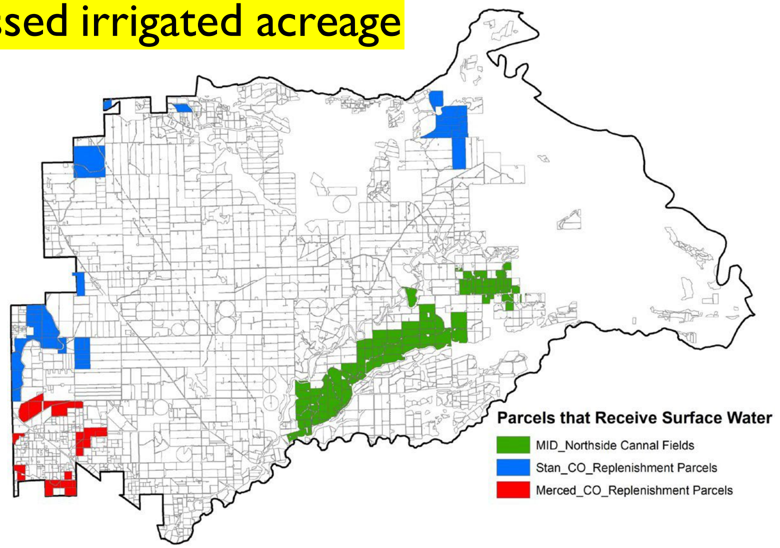
Baseline Groundwater Use



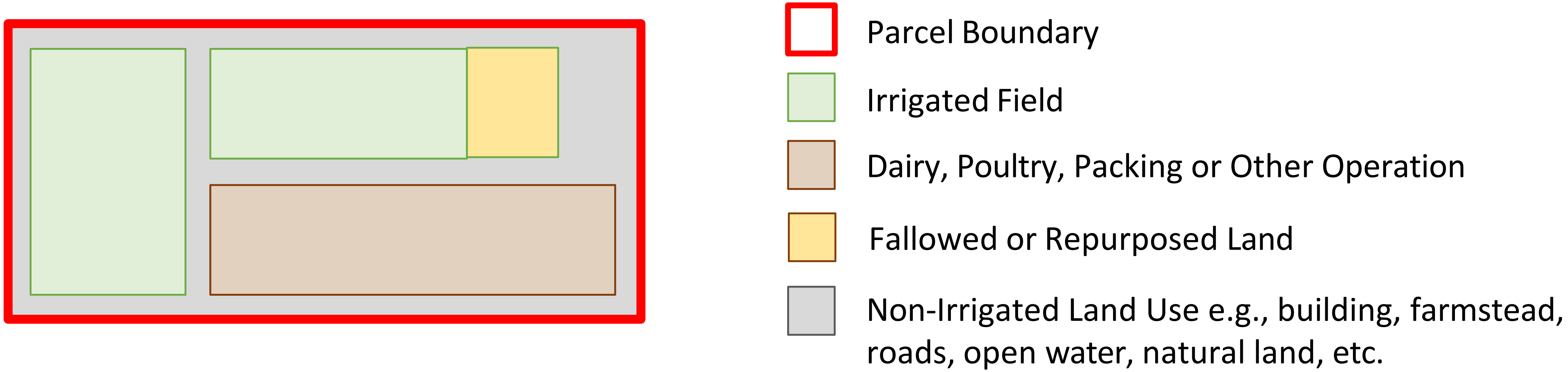
Average Baseline ET for all parcels designated as irrigated (Mar – Oct)
= 241,425 AF/year
Equivalent Groundwater Use
= 2.82 ft/year (33.8 in/year)
Approximate Surface Water Deliveries
= 12,000 AF/year



Numbers may change slightly due to refinement of assessed irrigated acreage



Groundwater Use Calculation Considerations



- **Groundwater Use Base Tier (AF) =**
  (Baseline – Reduction Target) x (Assessed Parcel Acres)
- **Reduction Target =** 10% in Years 1 – 5; 20% in Years 6 - 10
- **Groundwater Use Calculation (AF) =**
  ([ET of Irrigated Field 1] x [Field 1 Acres]) + ([ET of Irrigated Field 2] x [Field 2 Acres]) + (Calculated or Measured GW Use of Dairy or Poultry Operation)

GROUNDWATER USE CALCULATION

Groundwater Use = **ET Consumptive Use** minus **Precipitation** minus **Surface Water Deliveries**

<u>PROPOSED RULES & REGULATIONS</u>

- Analysis for irrigation season (March – October) to minimize precipitation effects
- Precipitation subtracted at full value
- Surface water deliveries subtracted (MeID, TID and diversions)
- Calculated using Land IQ ET data with options for metering
- Compared to Base Tier to Calculate Base Fees and Overdraft Fees

Parallel Schedules: Prop 218, Pumping Management, and MLRP

Land-Based Assessment	Prop 218 Workshop #1 (Dec 2023)	Adopt Report, Send Ballots (Jan 2023)	Implementation (April 2024)
Volume-Based Fee	Prop 218 Workshop #2 (April 2024)	Adopt Report, Send Ballots (June 2024)	Implementation (2025)
Policies, Rules & Regulations	Draft Pumping Management Framework (Dec 2023)	Workshops (Dec 2023, Jan 2024 and Nov 2024)	Final Adoption (Dec 2024)
GSA Groundwater Accounting Portal	Pilot Study, Data Gathering (Jan 2024)	RFP (Q1 2024)	GSA-Wide Trial (Q2/Q3 2024)
MLRP Implementation	Plan Development (Q4 2023 – Q4 2024)	MLRP Adoption (Q1 2025)	Implementation (Q2 2025 – Q2 2027)


Questions?

Modesto Groundwater Subbasin Goals and Groundwater Sustainability Plan Implementation Tools

Stanislaus County Department of Environmental Resources

Groundwater Resources Division

Modesto Subbasin Non-District Landowner Event #2

Presented by: Christy McKinnon, Water Resources Manager

December 13, 2023

Modesto Subbasin GSP Goals

Sustainable Yield

A basin's "sustainable yield" is "the maximum quantity of water…that can be withdrawn annually from a groundwater supply without causing an undesirable result." (Water Code Section 10727 (v).)

Subbasin Sustainable Yield = 267,000 AFY

Out of District Lands Baseline = 230,000 AFY

Out of District Lands Sustainable Yield = 183,000 AFY

To reach sustainability without projects a pumping reduction of 47,000 AF or %58 would be needed to reach sustainability

Implementation of all surface water projects appears to meet the sustainability goals of the subbasin

Tools

* Projects

- OID Paulsell Lateral Expansion Project
- MID Long Term Groundwater Replenishment Program
- GSP Modeling shows that with regional cooperation and beneficiary commitment we may not need demand management

* Management Actions

- Demand management programs to reduce subbasin overdraft will be implemented as necessary to achieve subbasin goals

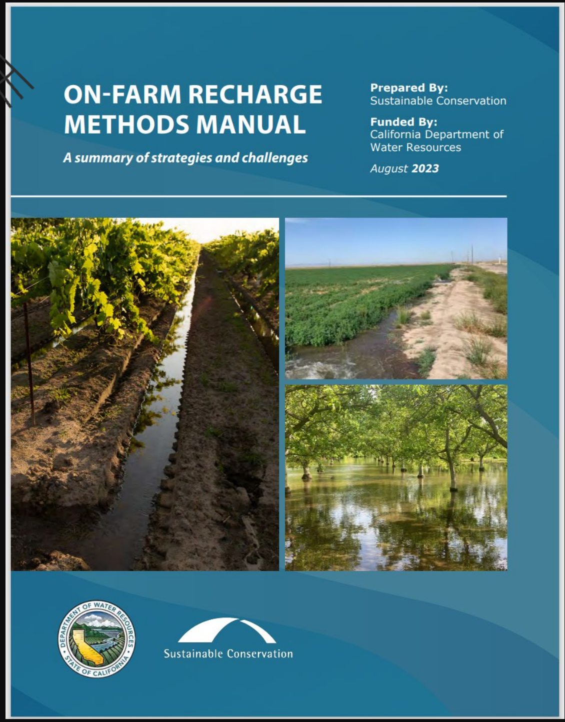
* Minimum Threshold Exceedance Plan

- To evaluate trends in declining water levels
- Assess the need for further necessary action

* Conservation Efforts

- Water Conservation Measures
- Water Efficient Irrigation

* Recharge Opportunities



https://suscon.org/wp-content/uploads/2023/08/Recharge-Methods-Manual_Case-Studies_2023.pdf

Stanislaus County Water Advisory Committee (WAC)

"To evaluate the status of the groundwater resources of Stanislaus County in order to identify and develop programs and practices that ensure a reliable and sustainable groundwater supply for the benefit of its citizens, present and future, and to make recommendations to the County Board of Supervisors to adopt public policy that empowers such identified actions."

Thank you!!

https://www.stancounty.com/er/groundwater/

cmckinnon@envres.org

LIDCO INC.
FARM DRAINAGE & RECHARGE SYSTEMS

Reverse Tile Drains and Other Recharge Techniques

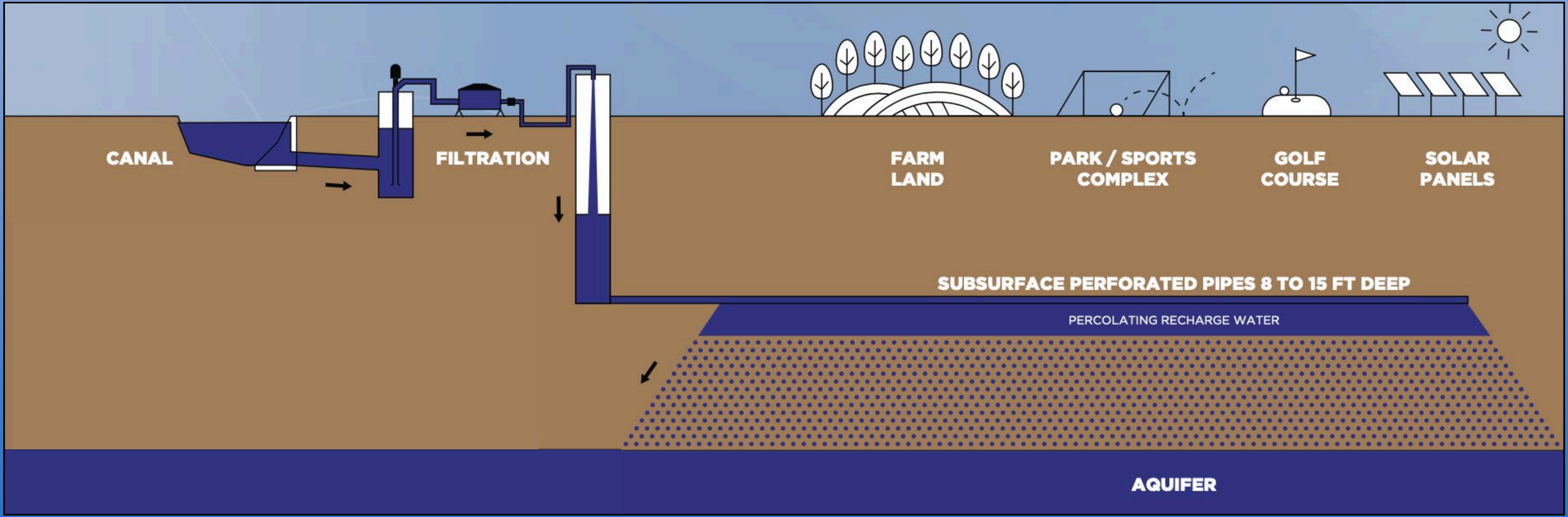
Mike Busby PG EIT
Geologist and Engineer


Curtis Lutje
Laurel Ag & Water


Glenn Drown
LIDCO

Tile Recharge

Also known as Reverse Tile Drain and Subsurface Recharge



Profile View

Is Recharge an Option for You?

1) Access to surface water for recharge?

   When?   (are trees dormant or growing season)

   How long?

   How often?

Is Recharge an Option for You?

1) Access to surface water for recharge?
   - When? (are trees dormant or growing season)
   - How long?
   - How often?

2) Is ground suitable for recharge?

Is Recharge an Option for You?

1) Access to surface water for recharge?

    When? (are trees dormant or growing season)

    How long?

    How often?

2) Is ground suitable for recharge?

3) Choose a recharge method

    How will this impact surface activities, e.g. farming practices

Managed Aquifer Recharge (MAR) Options

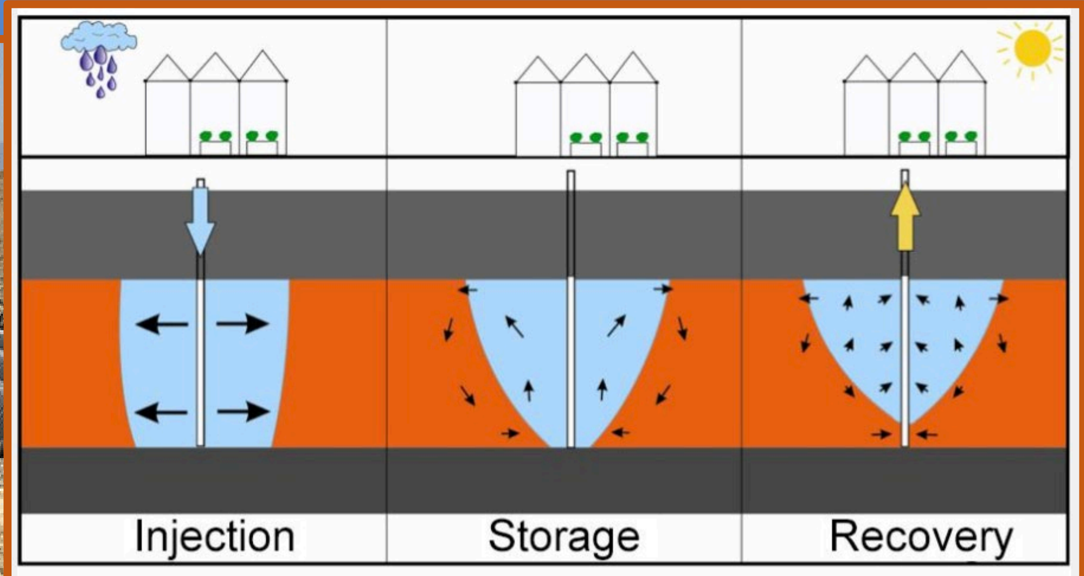
Managed Aquifer Recharge (MAR) Options

Managed Aquifer Recharge (MAR) Options

Managed Aquifer Recharge (MAR) Options

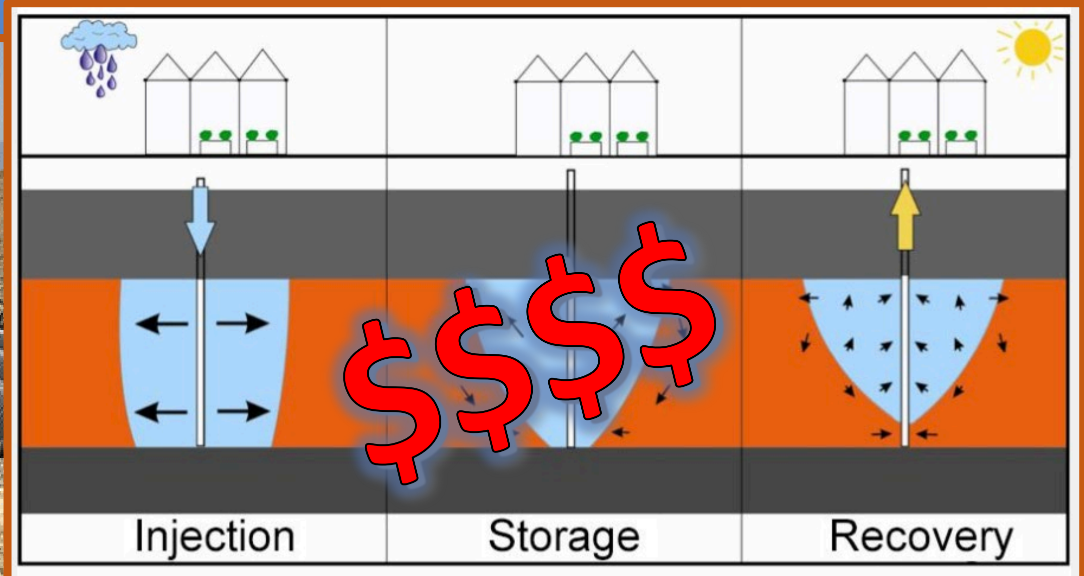
Managed Aquifer Recharge (MAR) Options

Aquifer Storage and Recovery (ASR) Wells

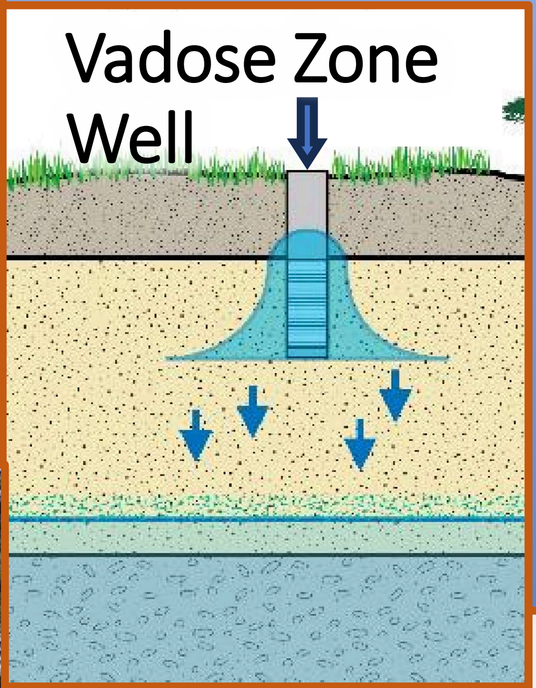


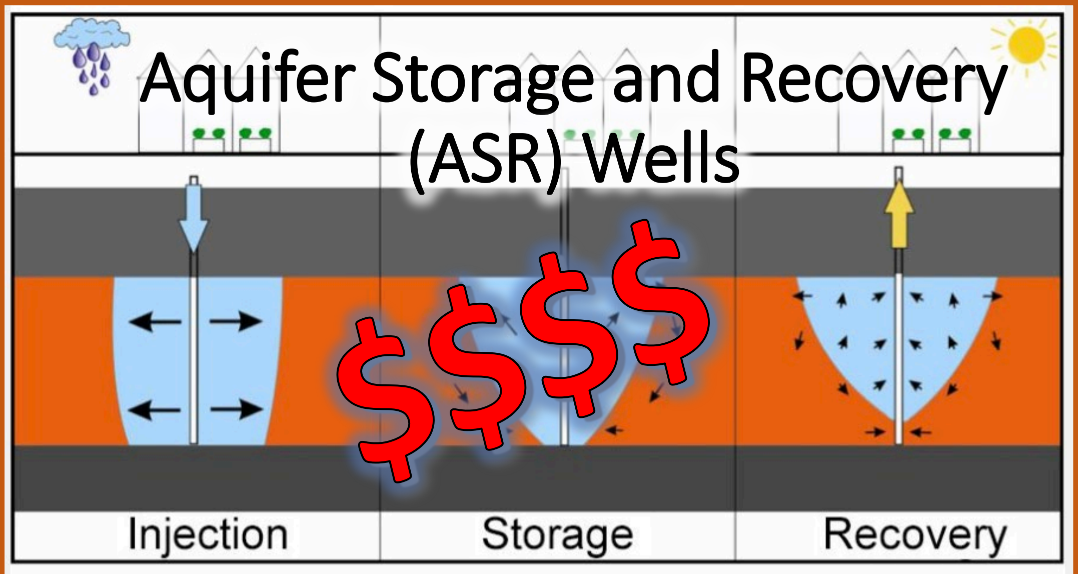
Managed Aquifer Recharge (MAR) Options

Aquifer Storage and Recovery (ASR) Wells

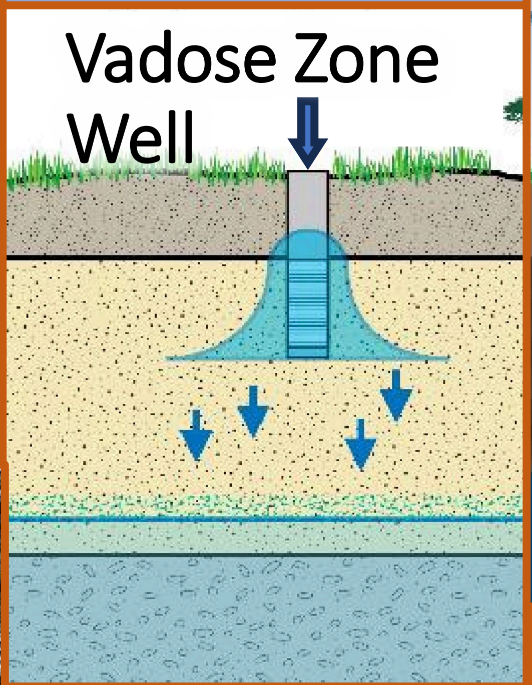


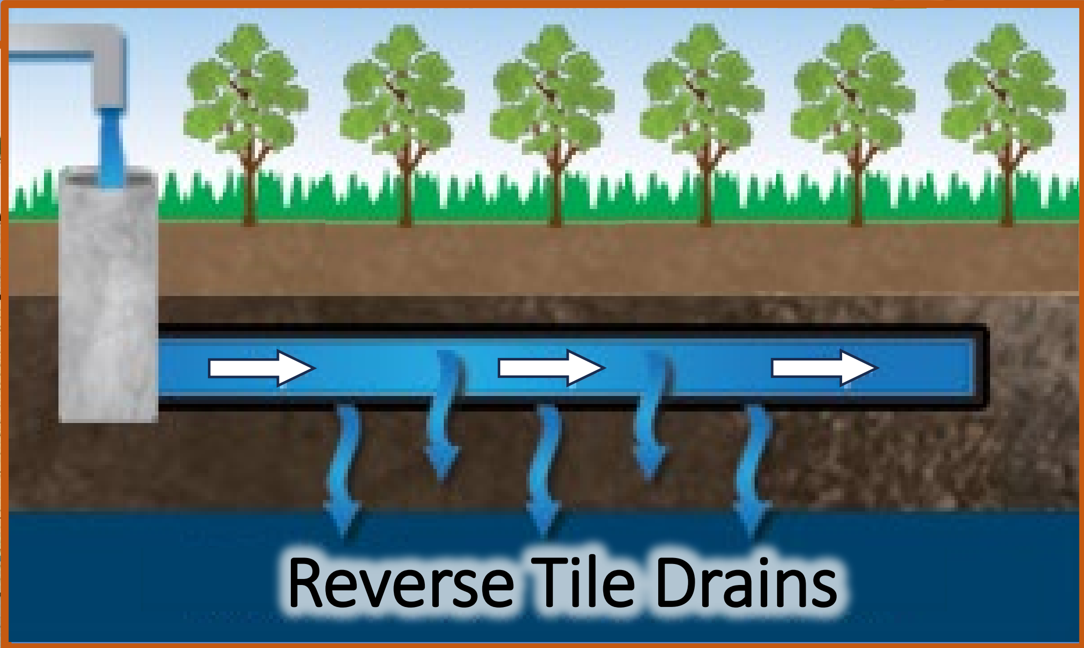
Managed Aquifer Recharge (MAR) Options

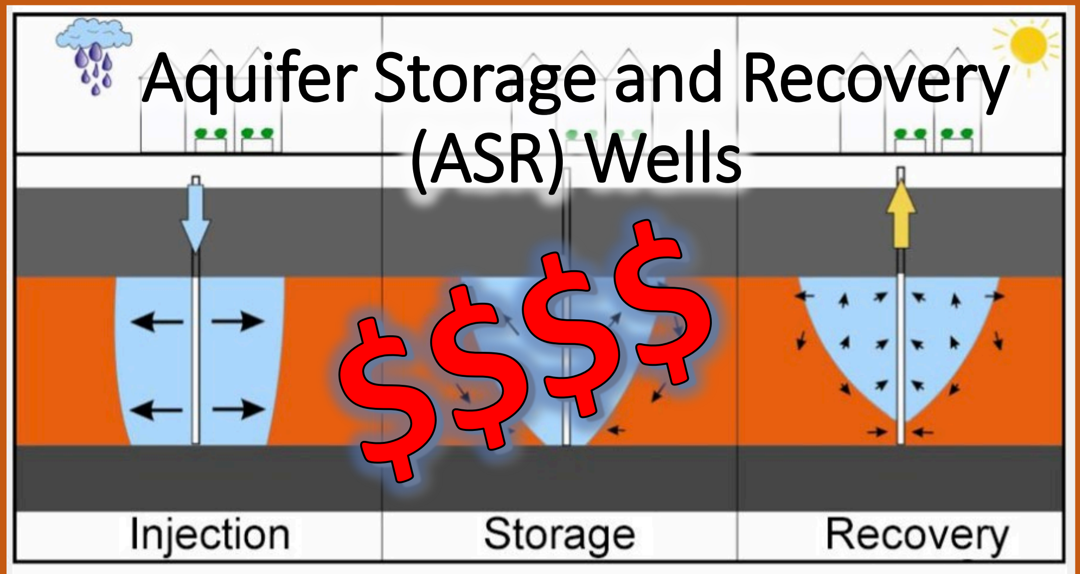


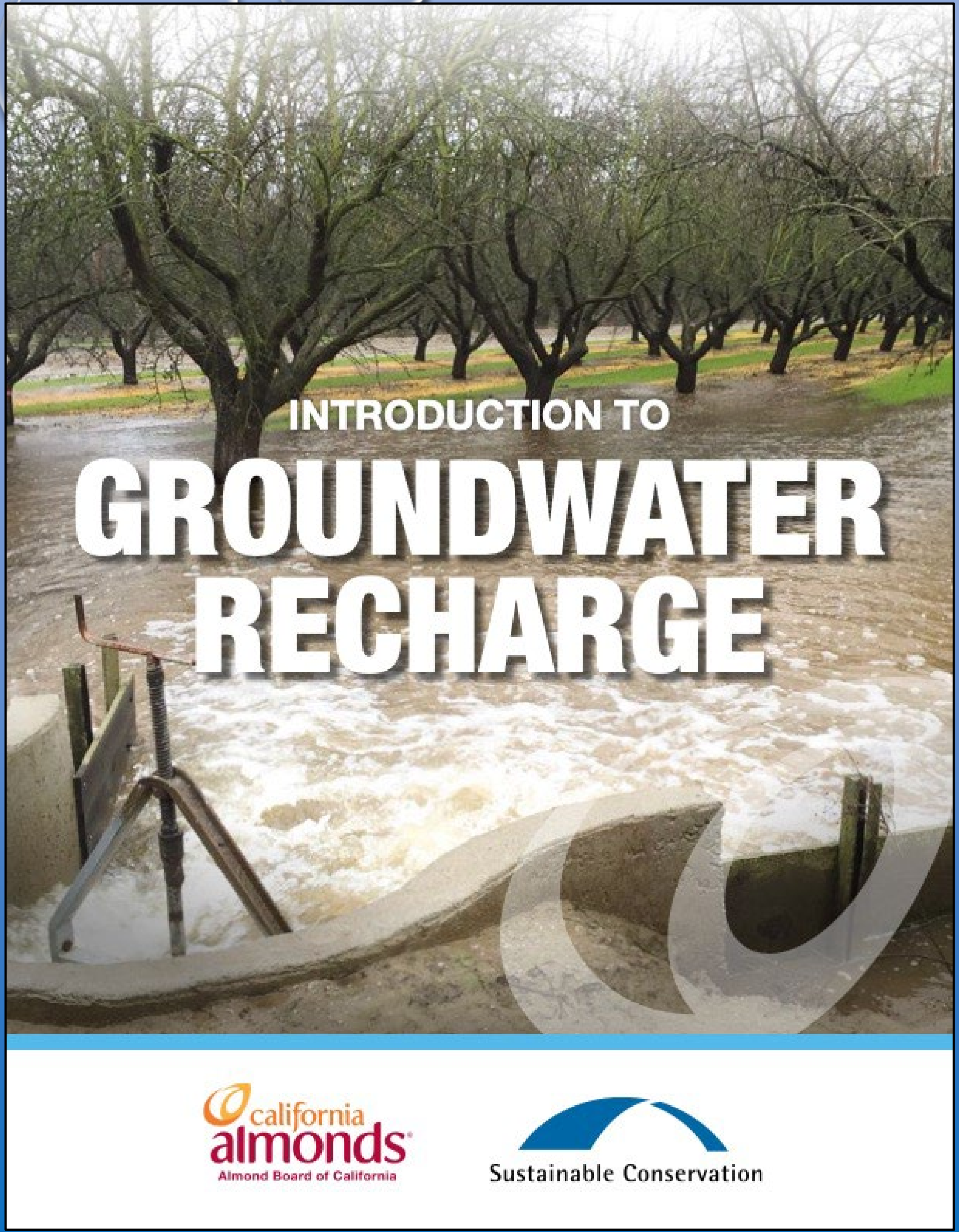


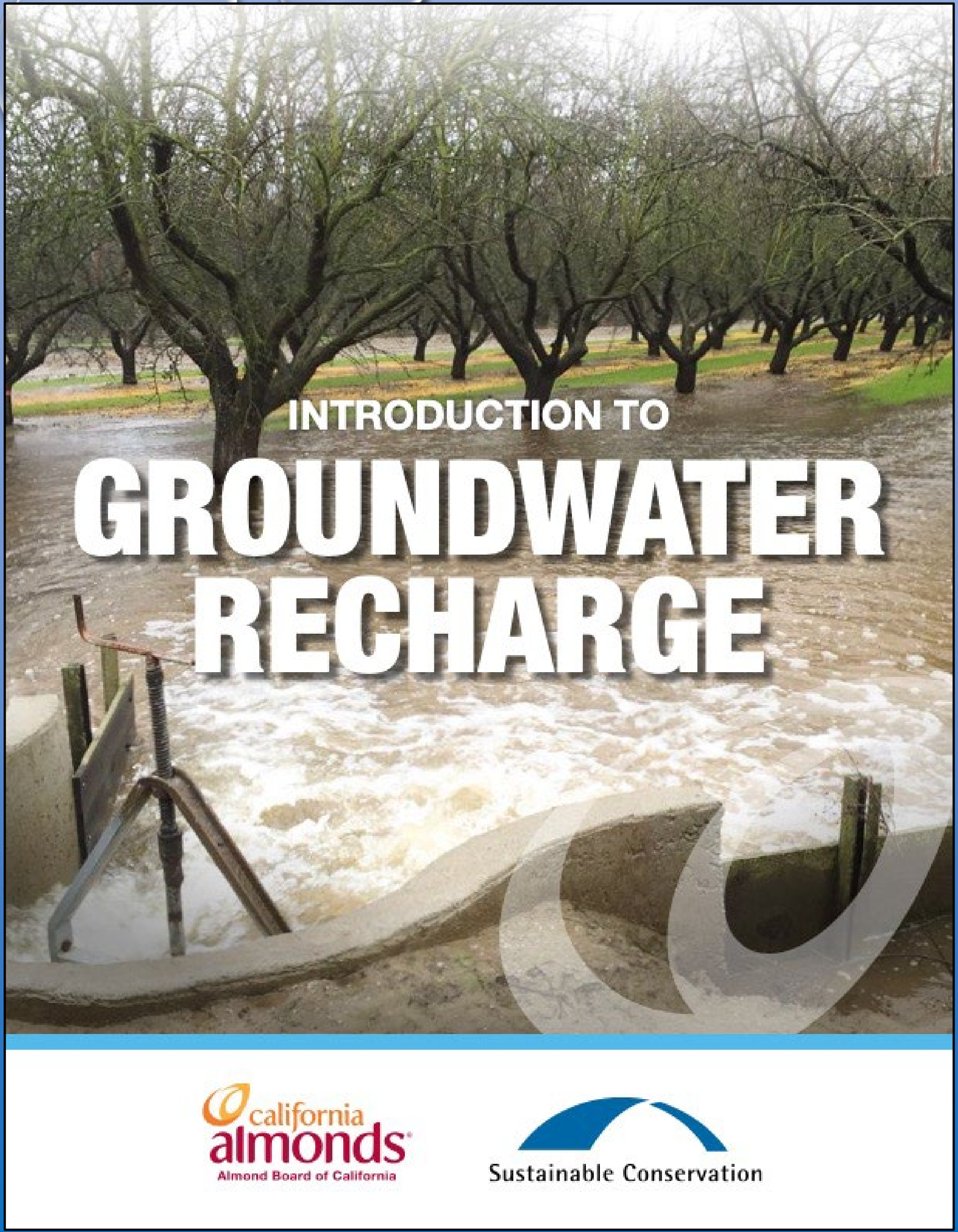
Managed Aquifer Recharge (MAR) Options



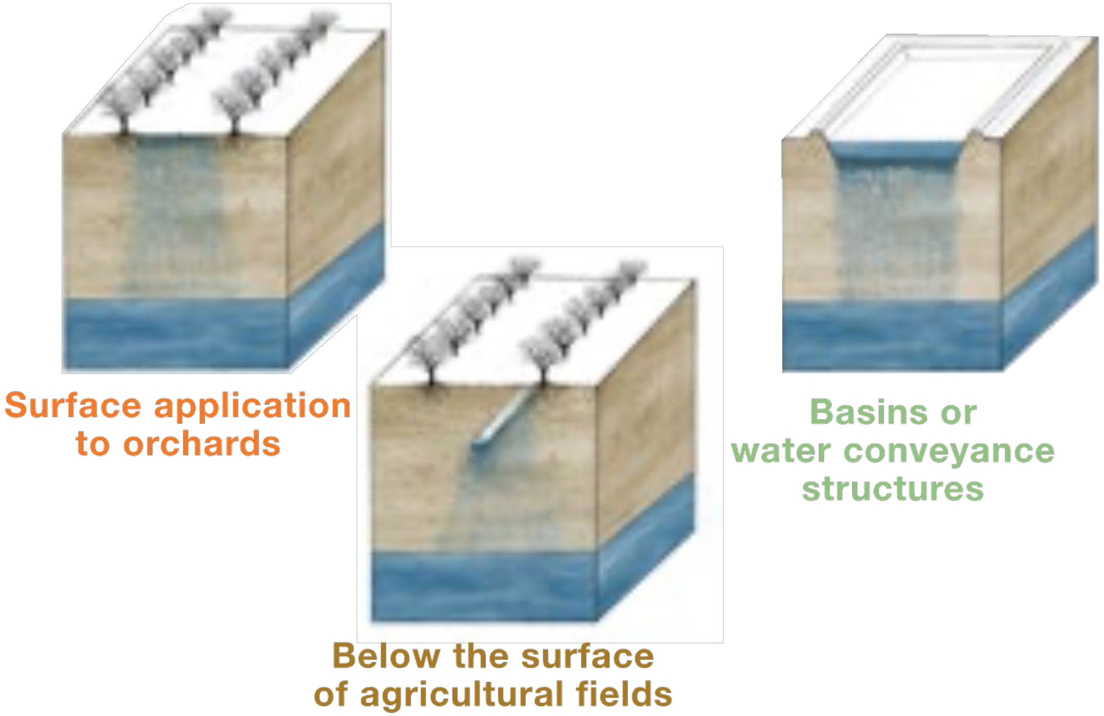





INTRODUCTION TO
GROUNDWATER RECHARGE
california almonds
Almond Board of California
Sustainable Conservation



RECHARGE METHODS COVERED IN THIS GUIDE



ON-FARM RECHARGE METHODS MANUAL

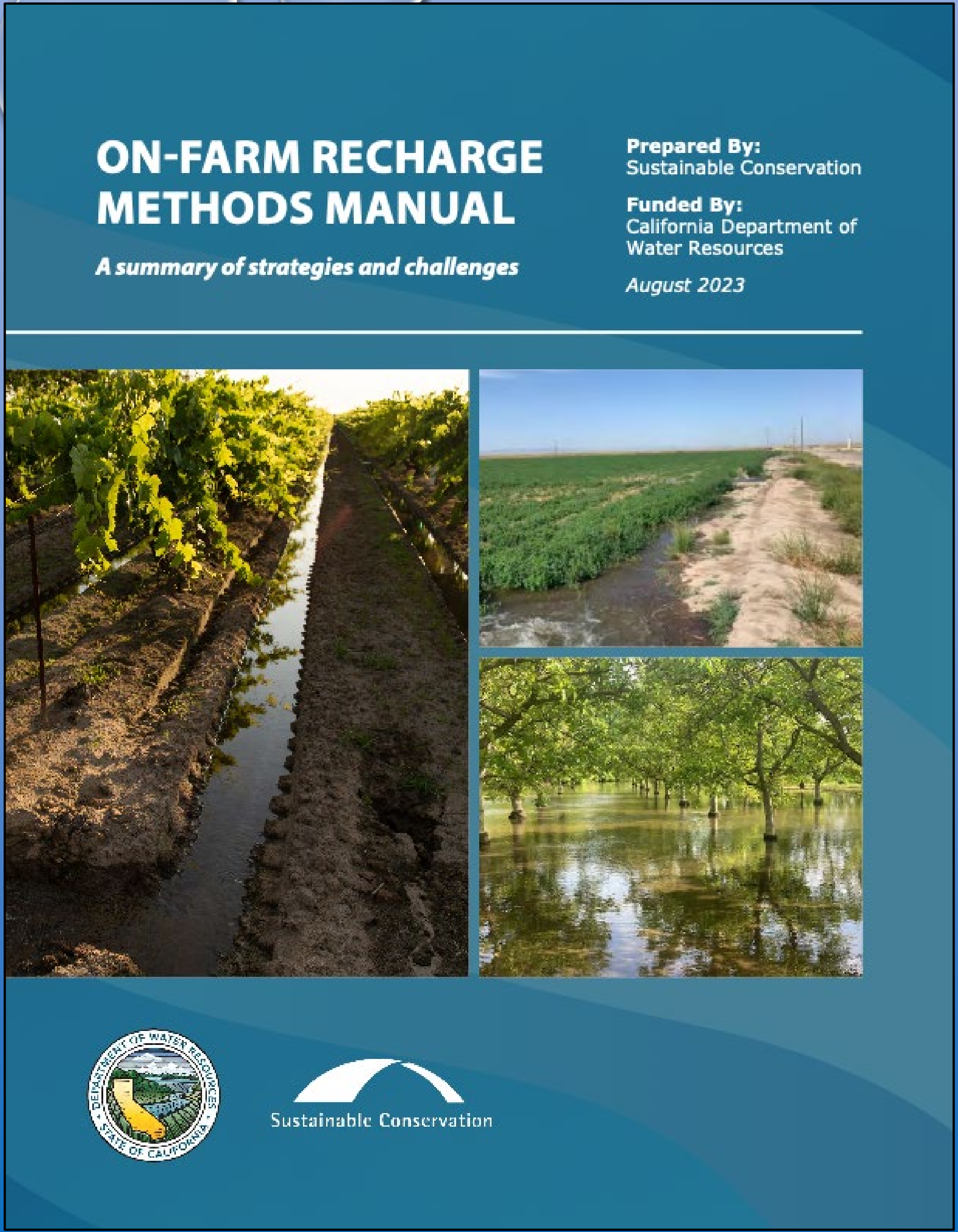
A summary of strategies and challenges

Prepared By:
Sustainable Conservation

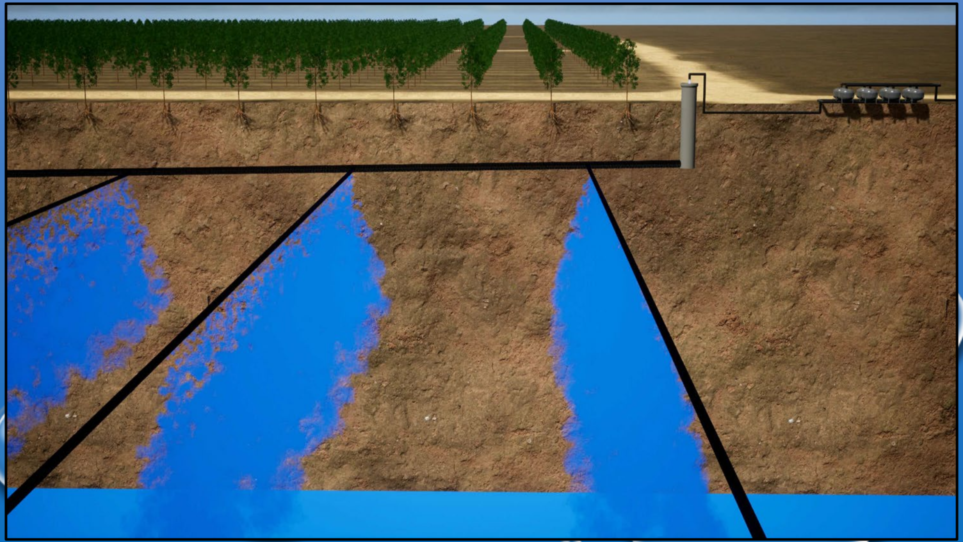
Funded By:
California Department of Water Resources

August 2023

Sustainable Conservation




18-acre on-farm recharge basin in Madera County



FloodMAR = On-Farm Recharge

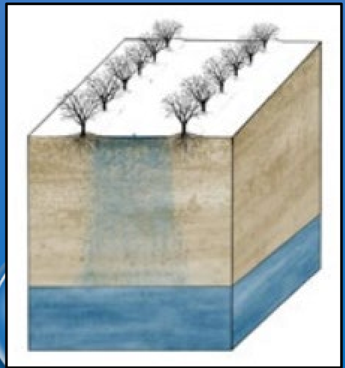
Advantages

Existing field
Can be least expensive
Keep land productive
Large in-flow rates

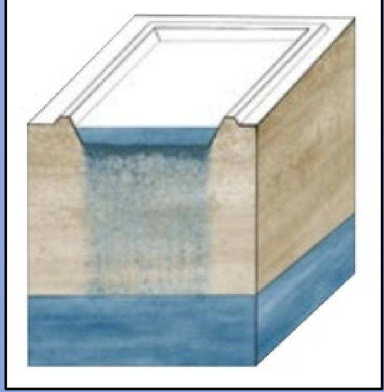
Challenges

Potential impact to crop
Limited dormant crops
Impacts cultural practices
- Timing and effectiveness of
  - Fertilizers
  - Pesticides
  - Weeds
  - Pruning
  - Disease management

Evaporative losses
Need relatively flat fields
Erosion potential



Recharge Basin



Challenges

No crops (typically)
- Land only for recharge – NOT productive

Maintenance
- Vector control – Mosquitoes
- Algae and Weeds
- Fencing
- Sediment accumulation

Need flat fields or terraced ponds
Evaporative losses
Expensive to build
Erosion potential

Advantages

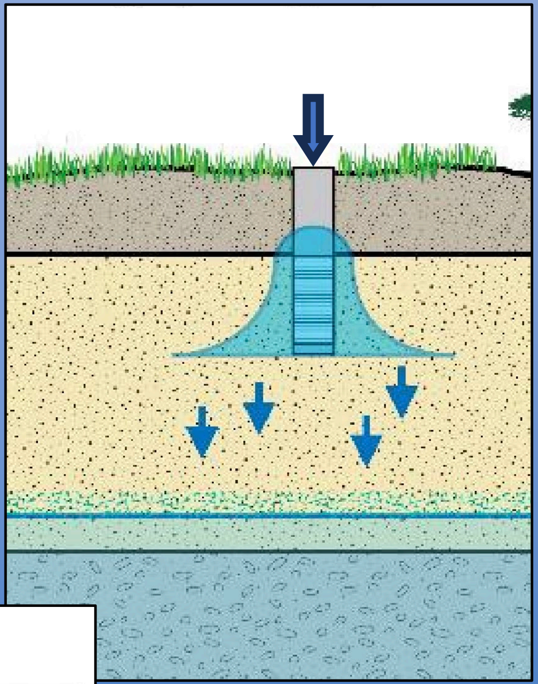
Large in-flow rates
- Flood control potential

Recharge year round
Visual satisfaction
Unlined canals or ditch
Wetlands and
- Environmental Benefit

Vadose Zone Wells

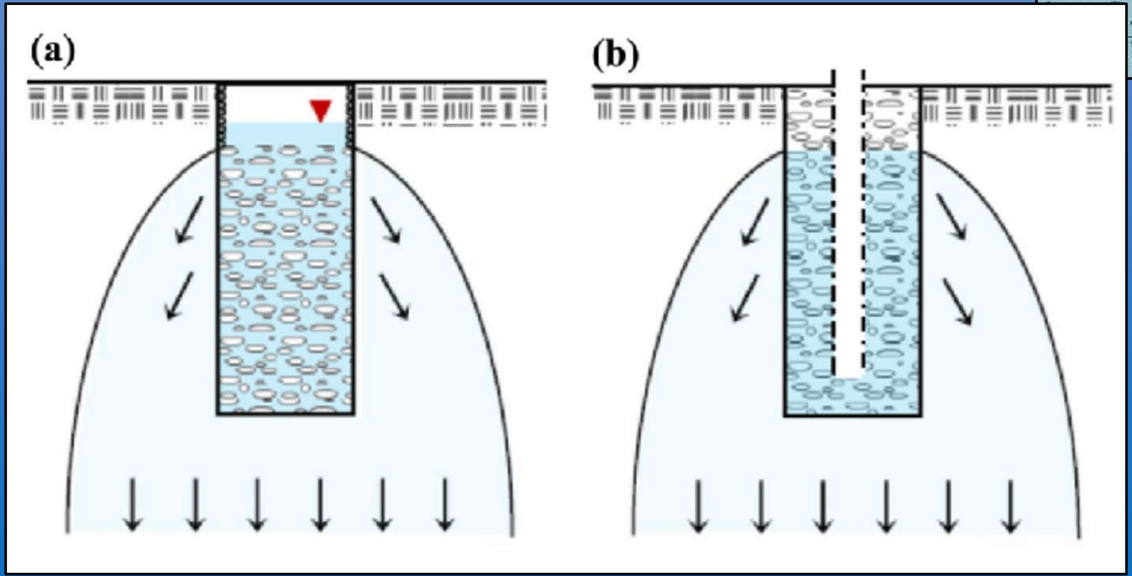
Advantages

Small Footprint
Recharge year round
Can get below near surface
    low permeability layers
No evaporative losses
No impact on farming
Relatively inexpensive



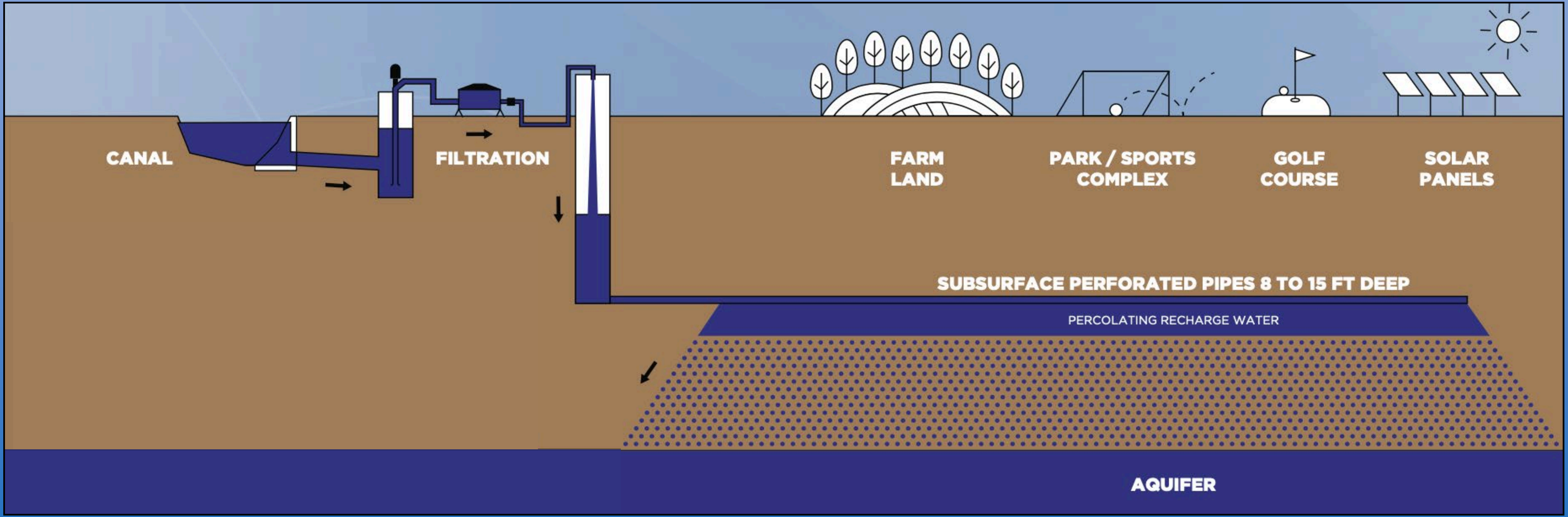
Challenges

Low flow rates,
    need multiple wells
Maintenance
    Plugging if no filtration
    Hard to maintain
    Replaced frequently



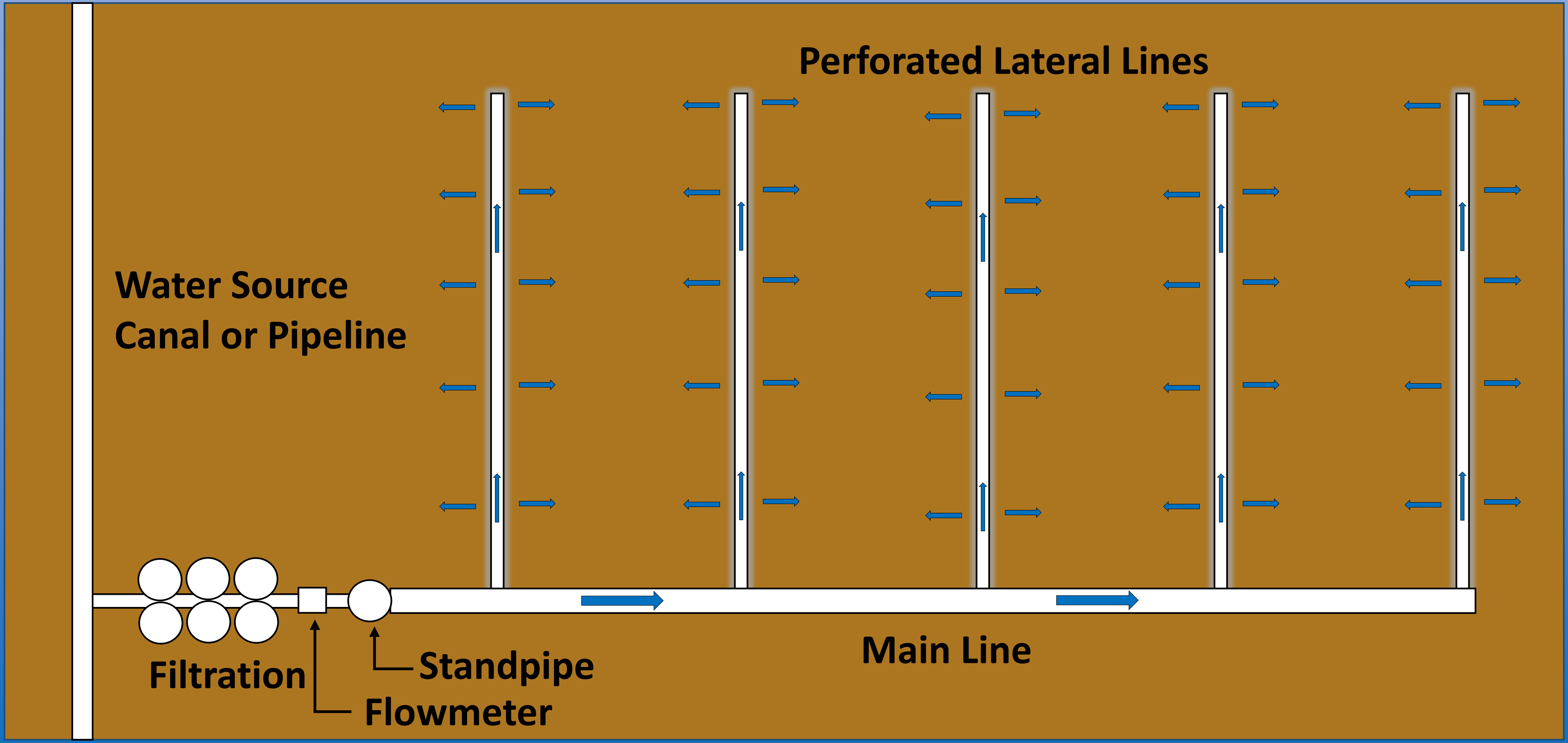
Tile Recharge

Also known as Reverse Tile Drain and Subsurface Recharge



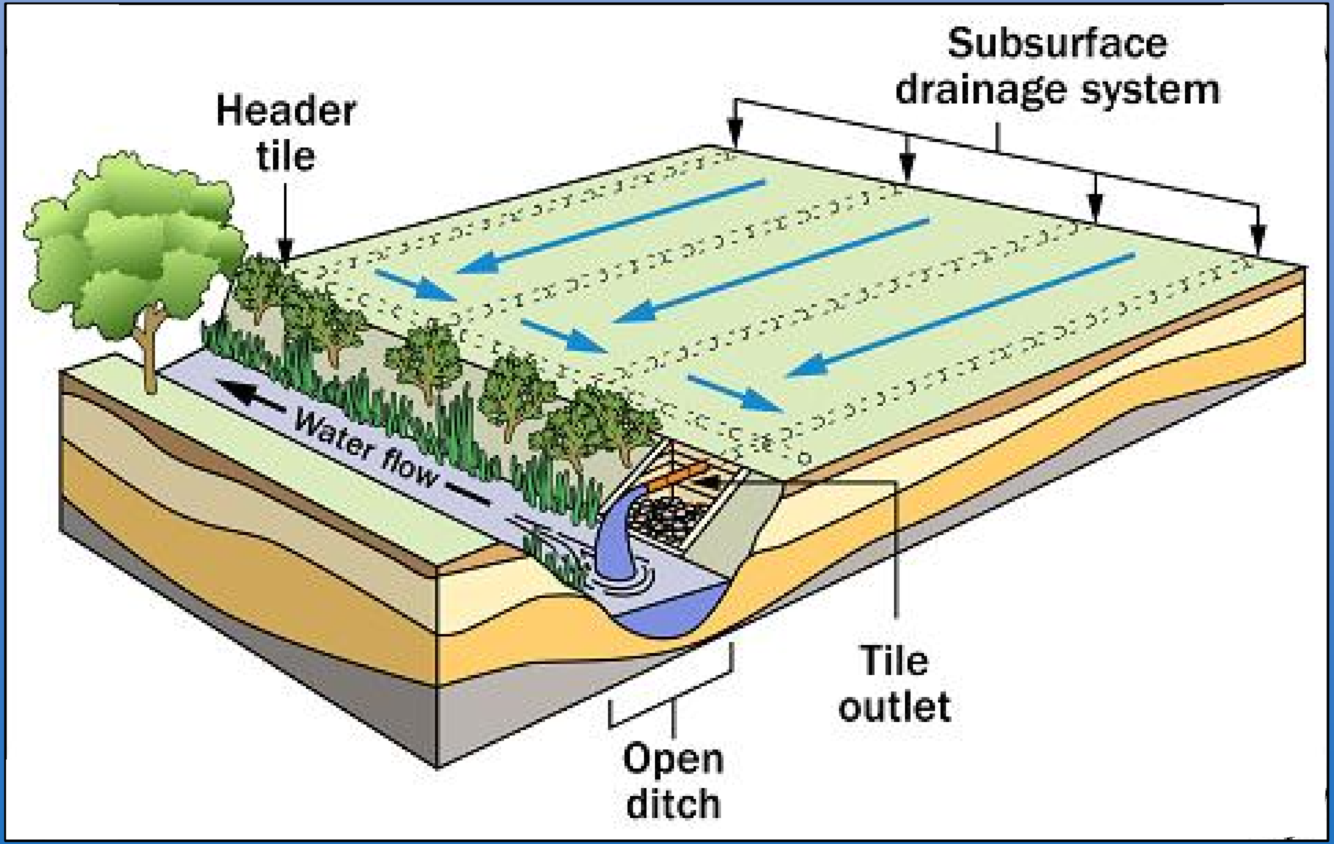
Profile View

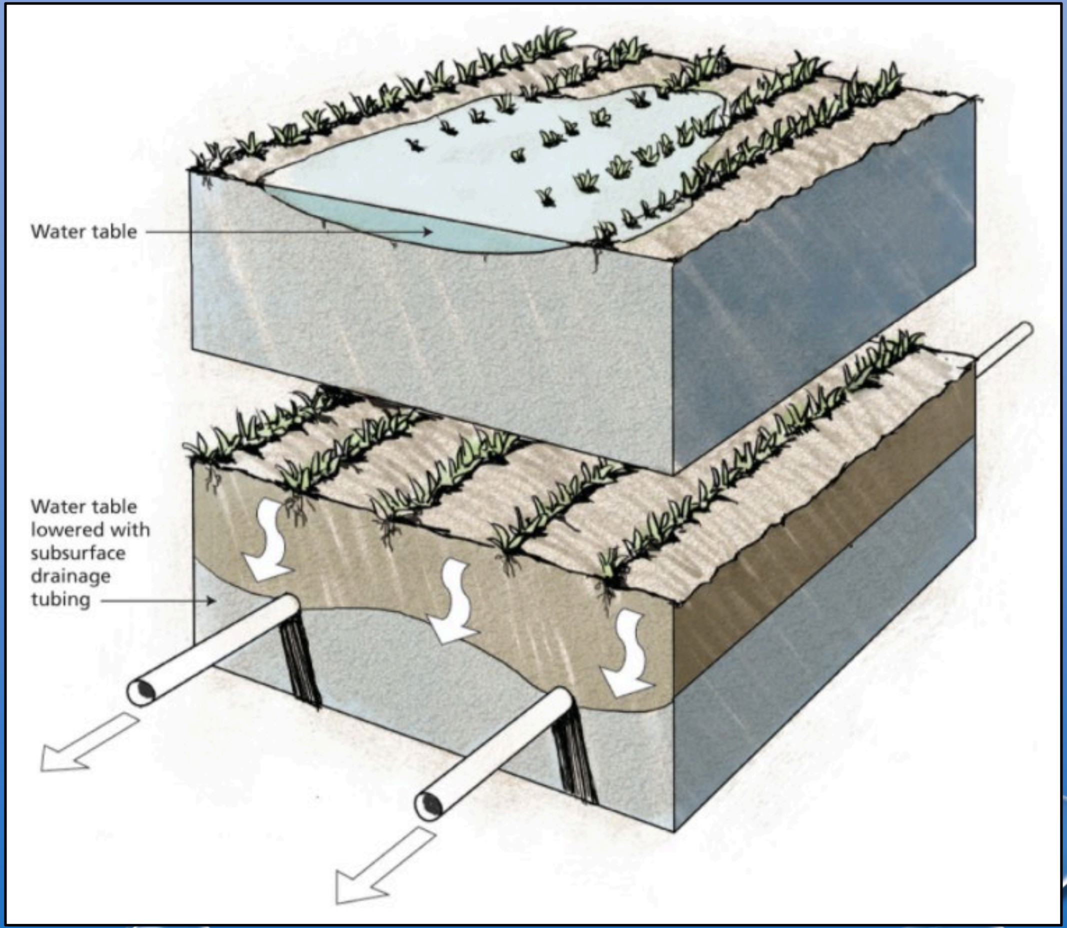
Tile Recharge System
Bird's Eye View




Tile Recharge
also known as
Reverse Tile Drainage

Tile Drainage – soil dewatering





HISTORY OF TILE DRAINAGE

200BC 1st use of Tile Drainage
Roman Empire, Clay terracotta tiles

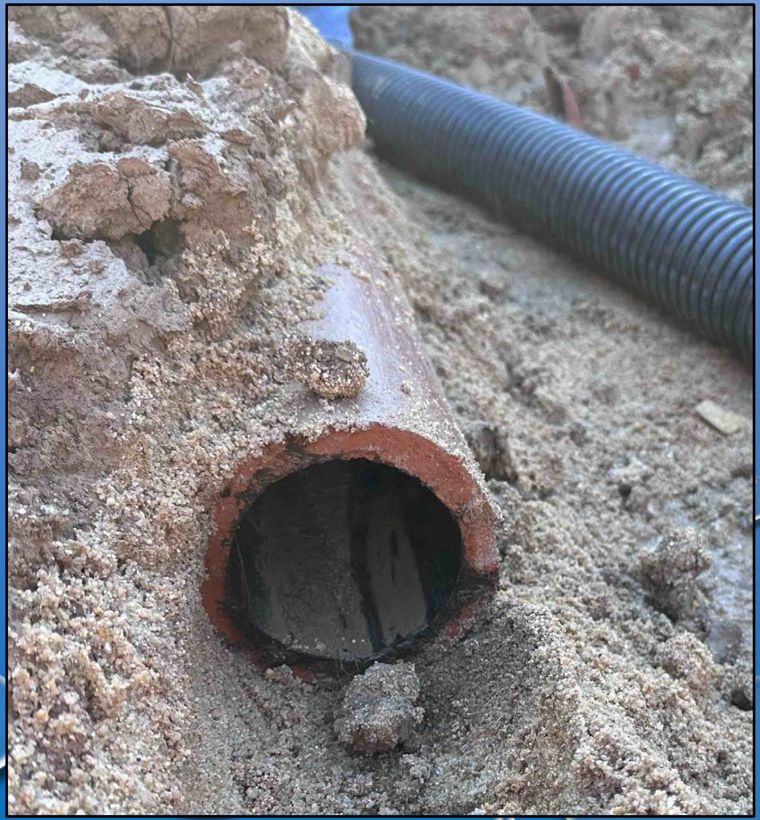
1838 1st used in United States

1860 Henry French wrote a book on farm drainage, nicknamed “French Drain”

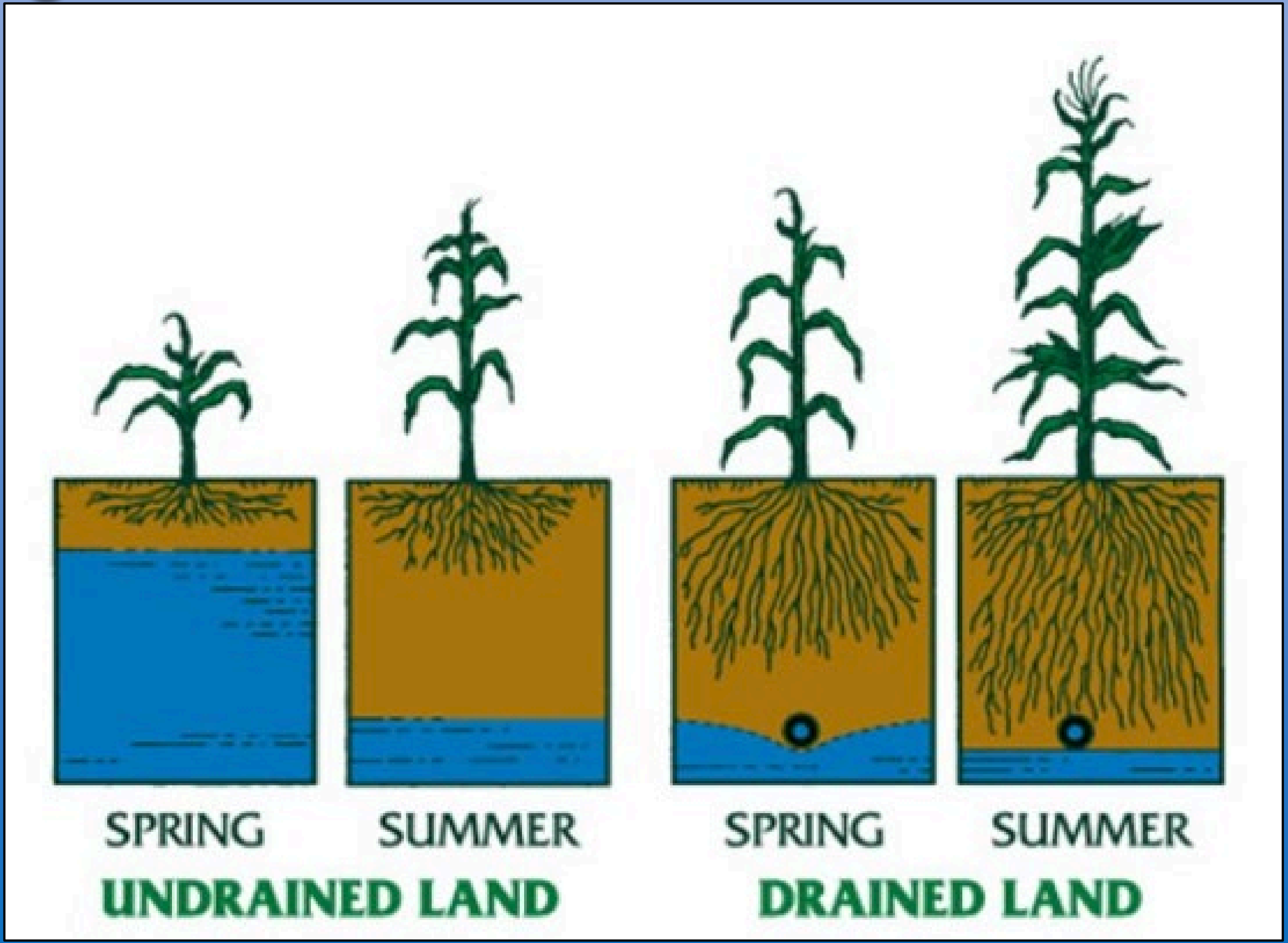
1960 Plastic corrugated perforated drainpipe

1960 Lidco starts install tile drainage

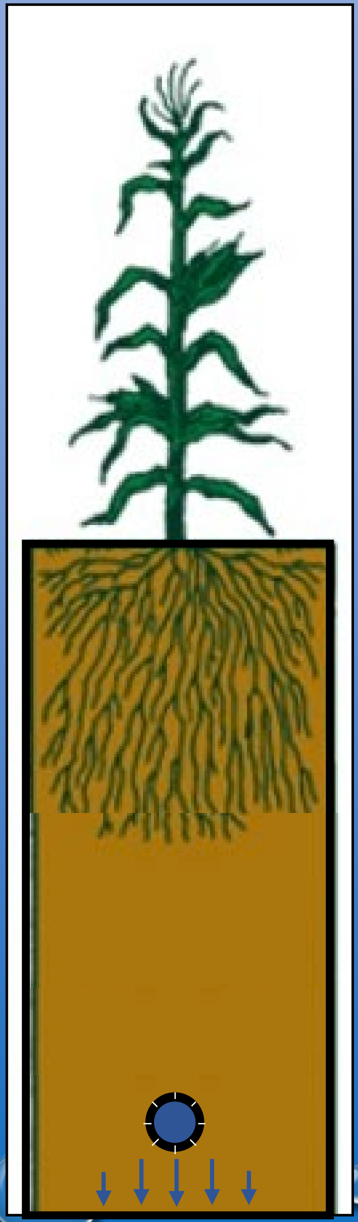
2017 Reverse Tile Drainage or Tile Recharge



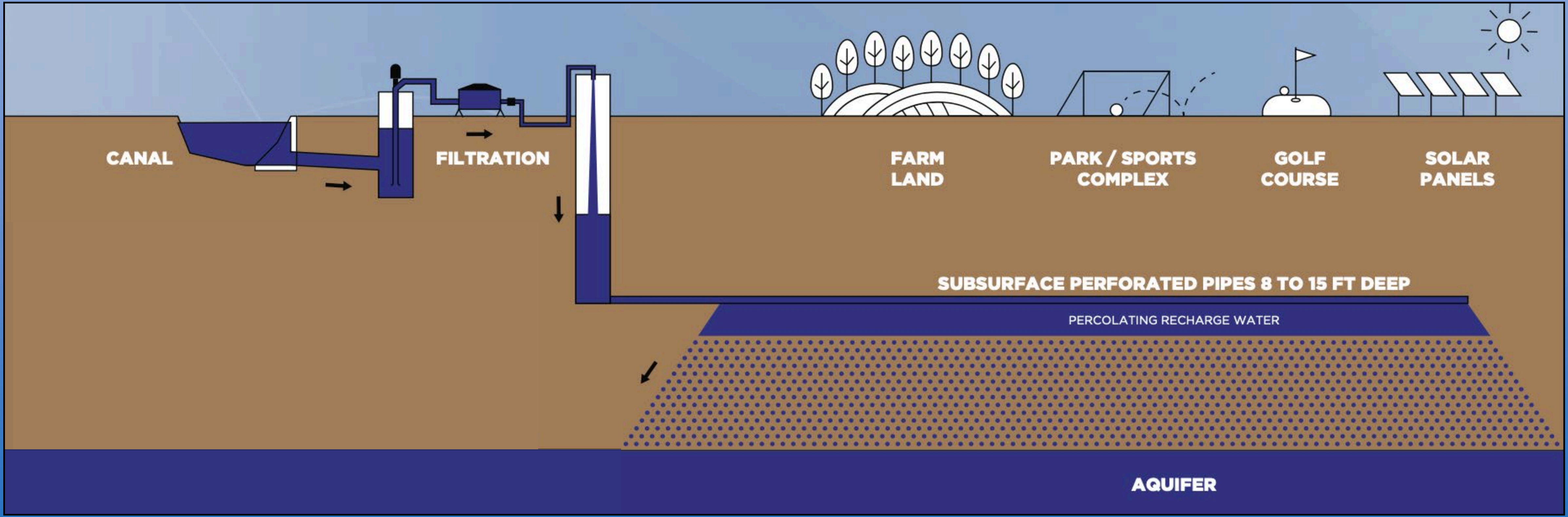
Tile Drainage



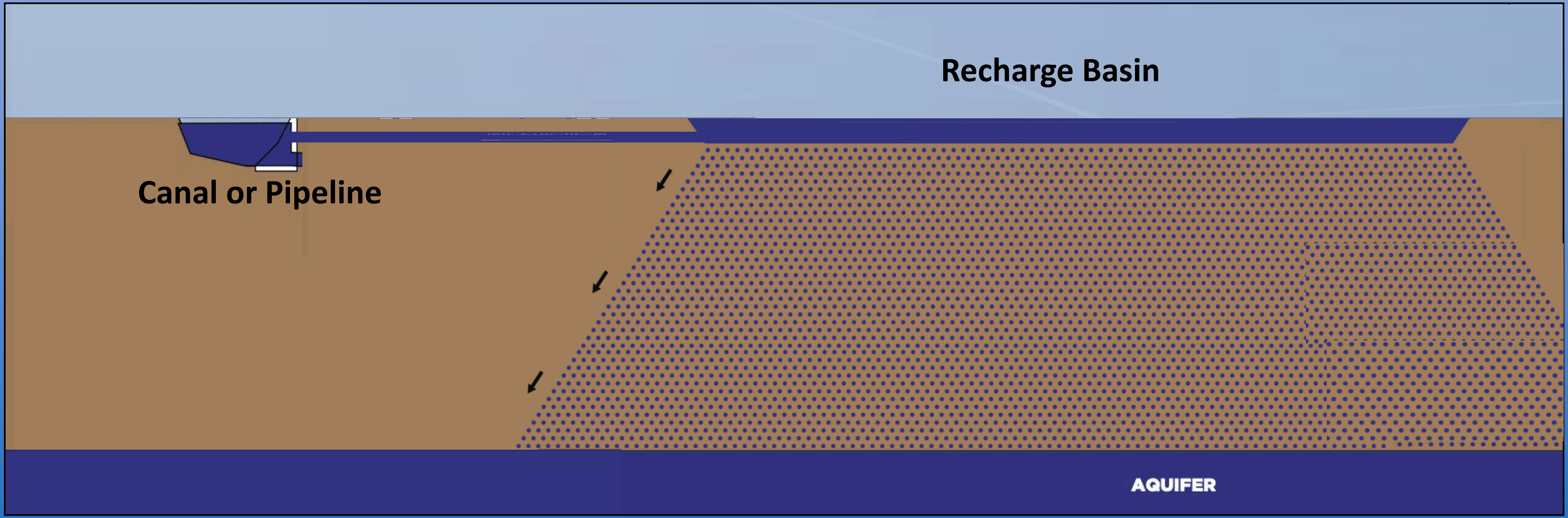
Tile Recharge



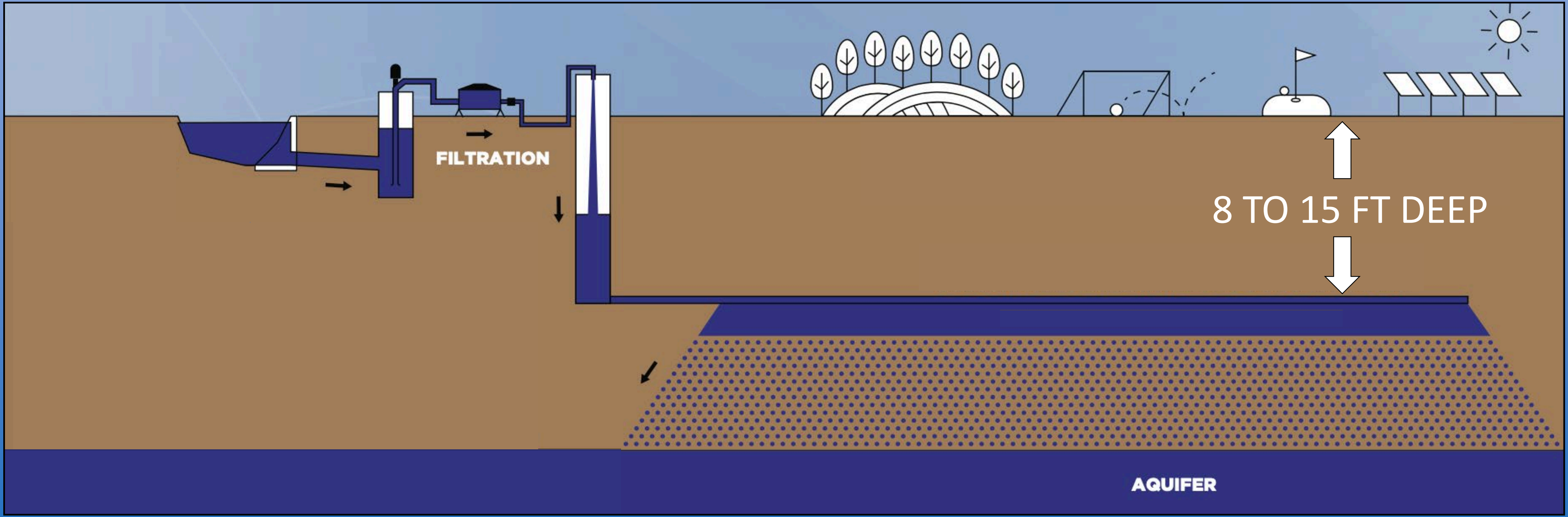
Tile Recharge System
Profile View



Spreading Basin
Profile View



Tile Recharge System
Profile View

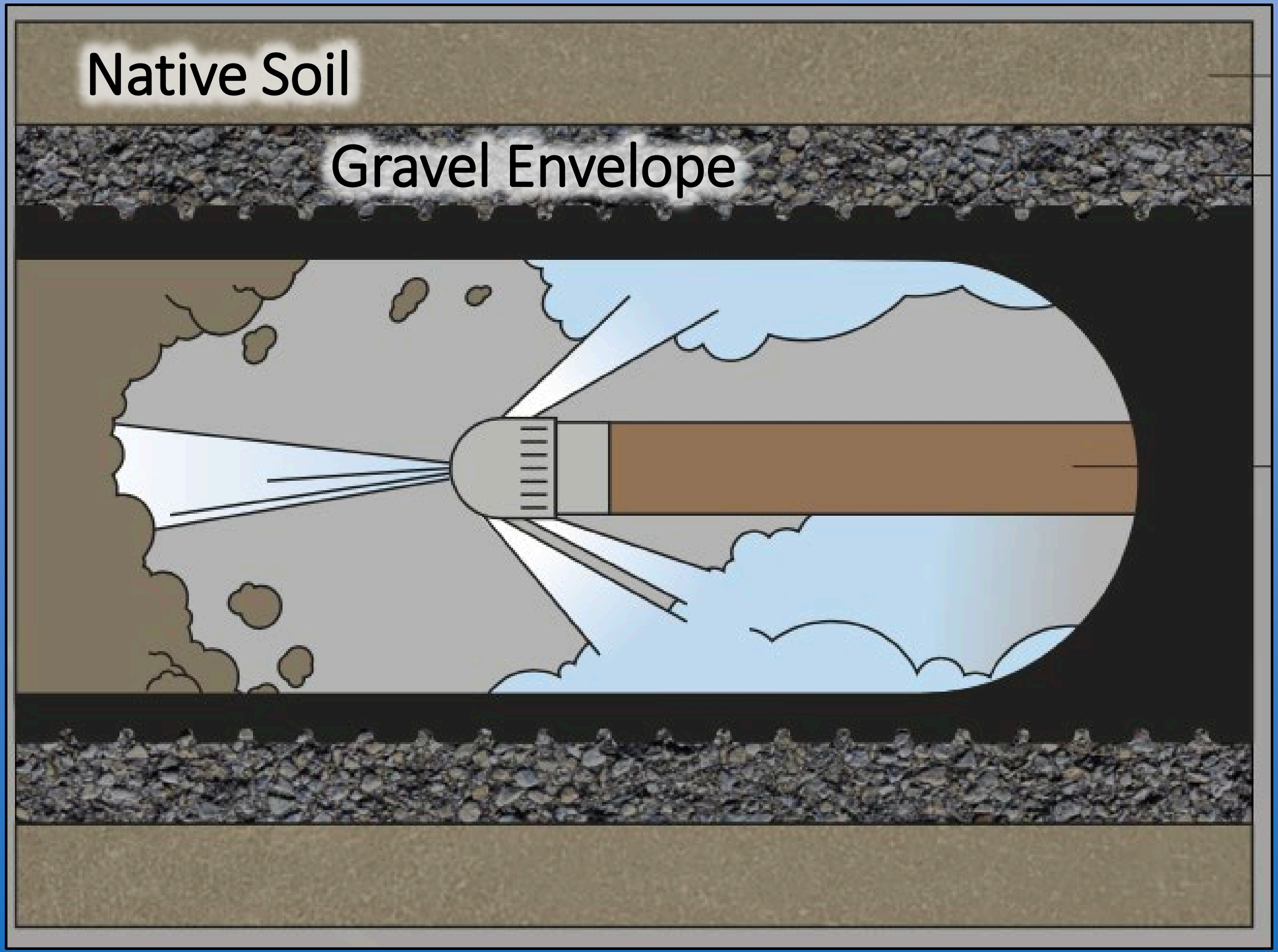


Installation of Tile Recharge


Inter-Drain
6050 DWHT
15


Filtration – Sand Media

Tile Cleaning with High-Pressure Water Jetting



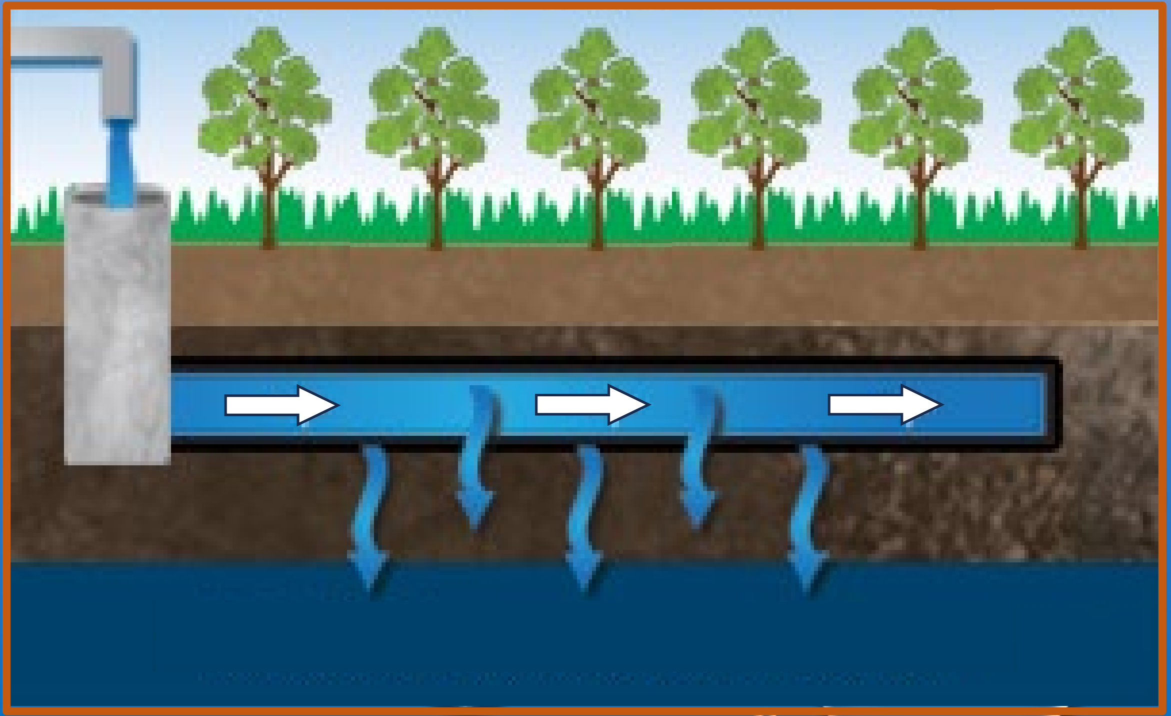
Reverse Tile Drainage
(Tile Recharge, Subsurface Recharge)

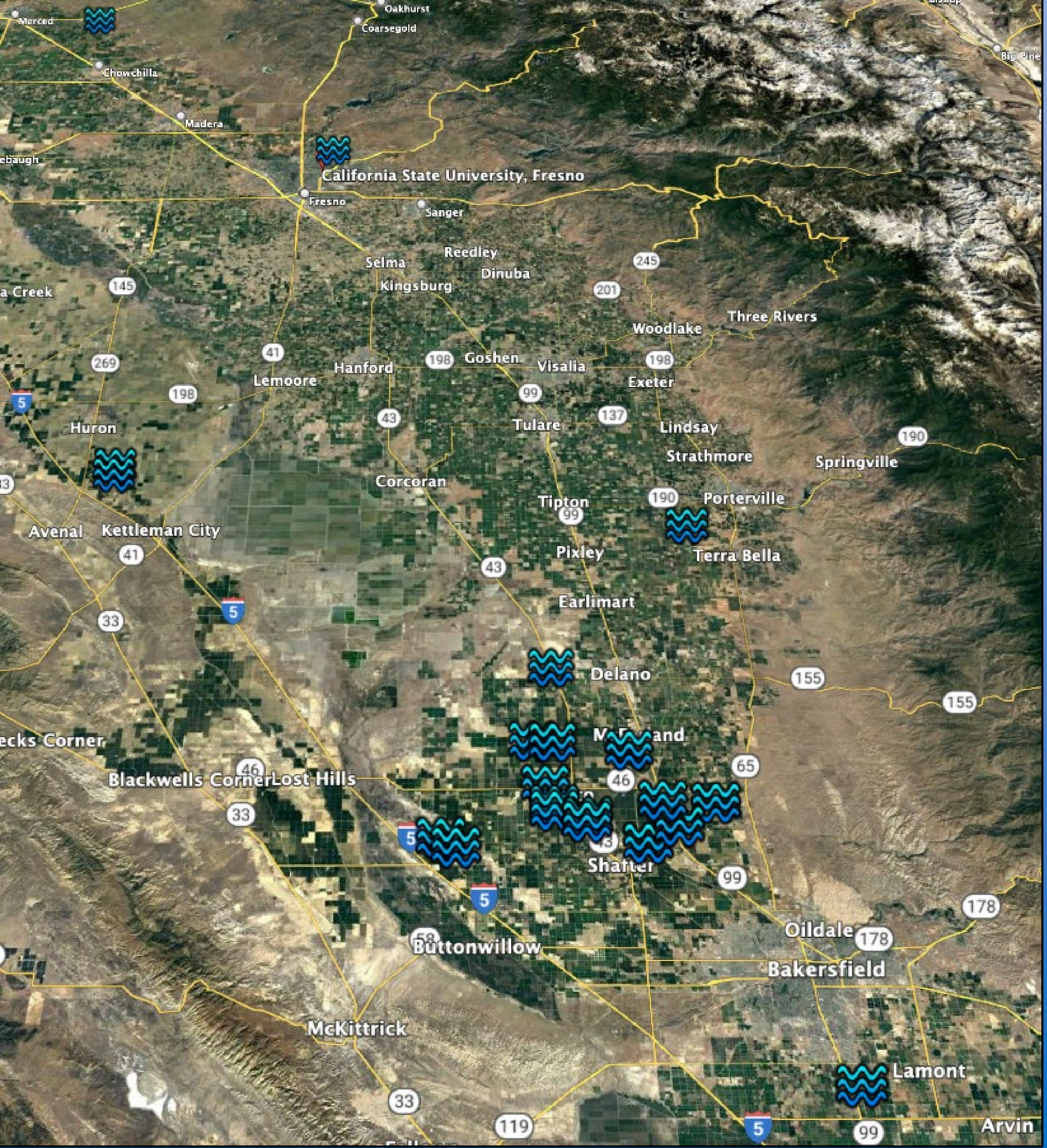
Advantages

No impact on farming
    Keep Land Productive
    No leaching nutrients and
        pesticides from surface
Recharge year round
Can get below near surface
    low permeability layers
No evaporative losses
Can install under a sloping field
Less expensive than basins

Challenges

Need Empty Field
Filtration
Clean lines every 5 to 10 yrs





Tile Recharge Systems

as of December 2023

Over 25 systems installed

Crops: Almonds, Grapes, Row Crops

Water Districts:
Westlands, SWID, Semi-Tropic, North Kern Water Storage District, Saucilito, Fresno ID, Merced ID, and Others

First system installed in 2017

Flow rates 200 gpm to 20,000 gpm
System size 2 cares to 500 acres

Case Study: M Farms
Installed 2023

6 x 4" Perforated Lateral Lines
Each 640 feet long

1 Standpipe & Main Line

2-acre Tile Recharge System

3,840 feet Perforated Lateral Line
Depth 10 ft to 11 ft

Flow Rate ~200 gpm

Case Study: M Farms
Installed 2023

Recharged
74 AF in 2023

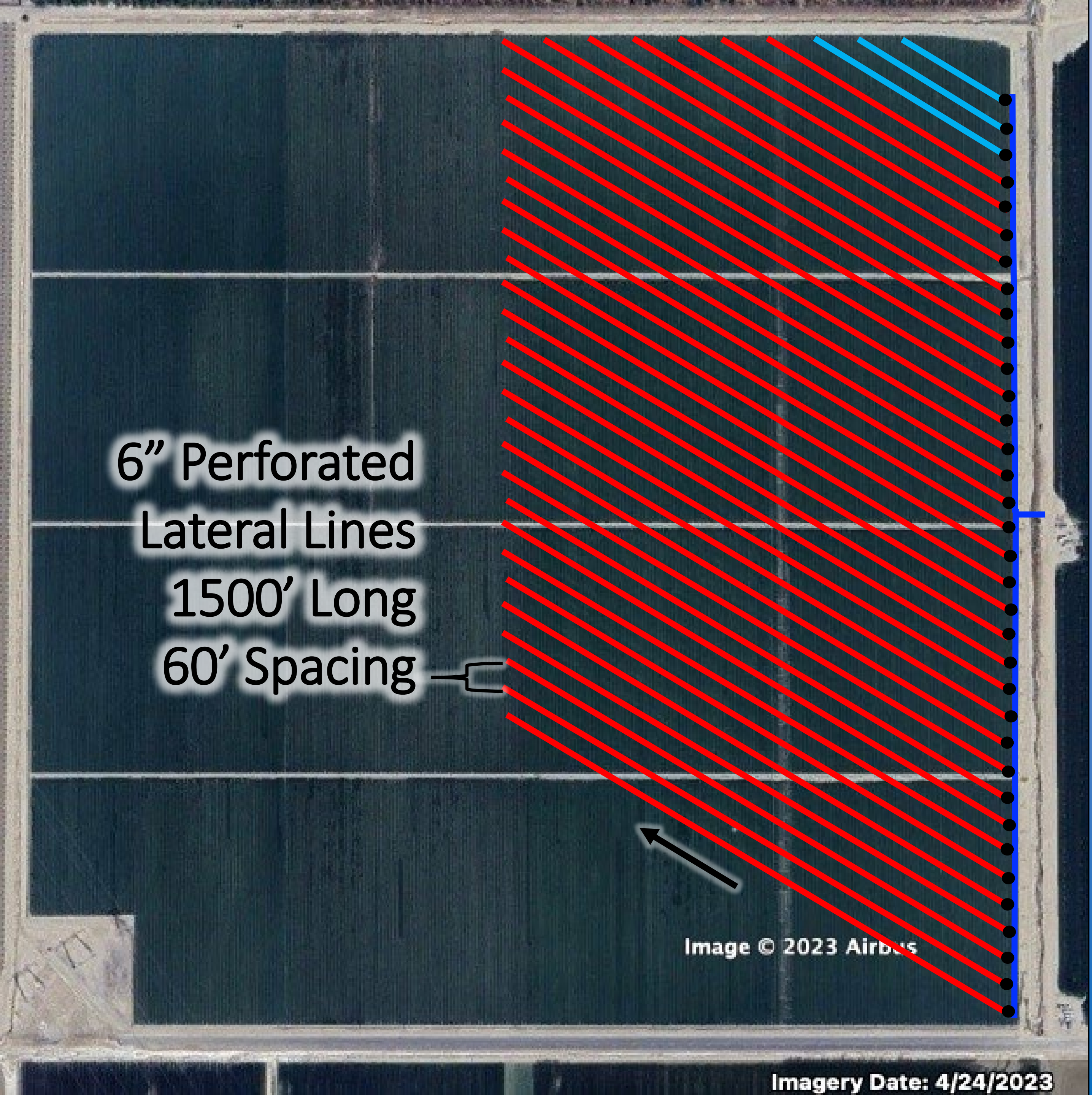
2-acre Tile Recharge System

3,840 feet Perforated Lateral Line
Depth 10 ft to 11 ft

Flow Rate ~200 gpm

6 x 4” Perforated Lateral Lines
Each 640 feet long

1 Standpipe & Main
Line



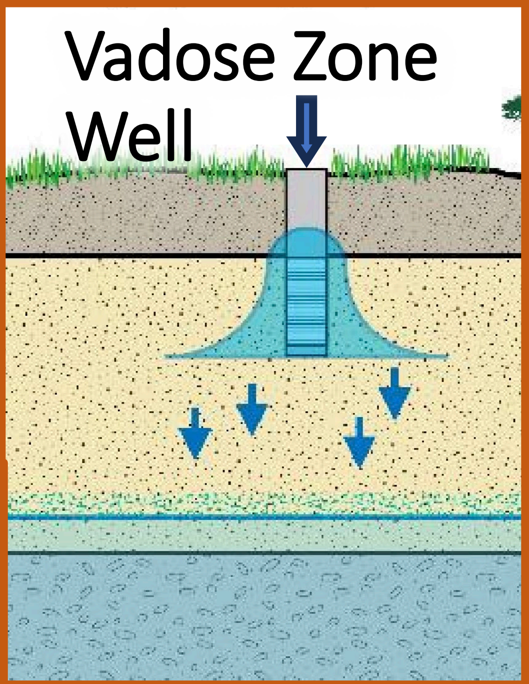
Case Study: D Farms
Installed 2022

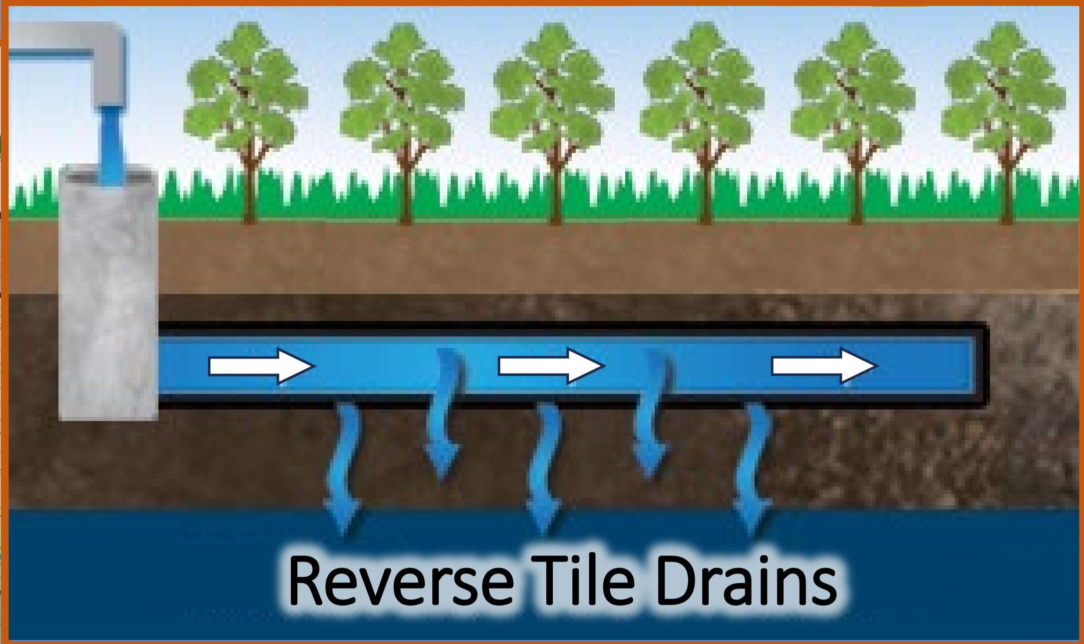
160-acre Field
62-acre Tile Recharge System
Row Crops

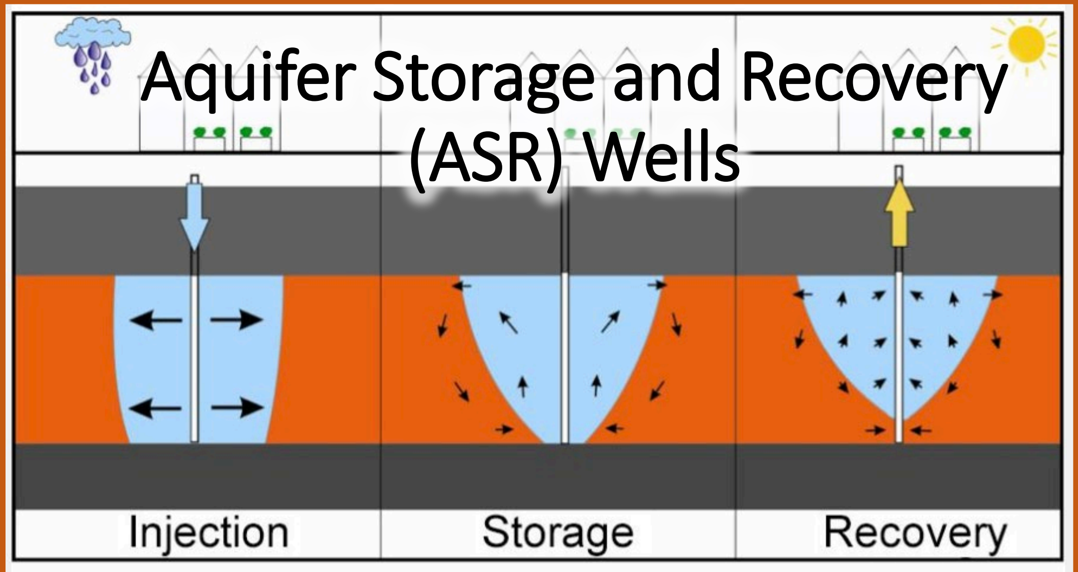
10.4 cfs or 4,650 gpm
20.5 AF/day

Recharged
>3300 AF in 2023

Managed Aquifer Recharge (MAR) Options







LIDCO INC.

FARM DRAINAGE &
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Tile Recharge

Securing Water for Tomorrow

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Question and Answer

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Eric Thorburn: ethorburn@oakdaleirrigation.com

Link to Online Survey:

https://www.surveymonkey.com/r/NDEWorkshop2