Land Suitability Assessment for Multi-Benefit Land Repurposing in East Turlock Subbasin Groundwater Sustainability Agency

Stanislaus County Agricultural Advisory Board

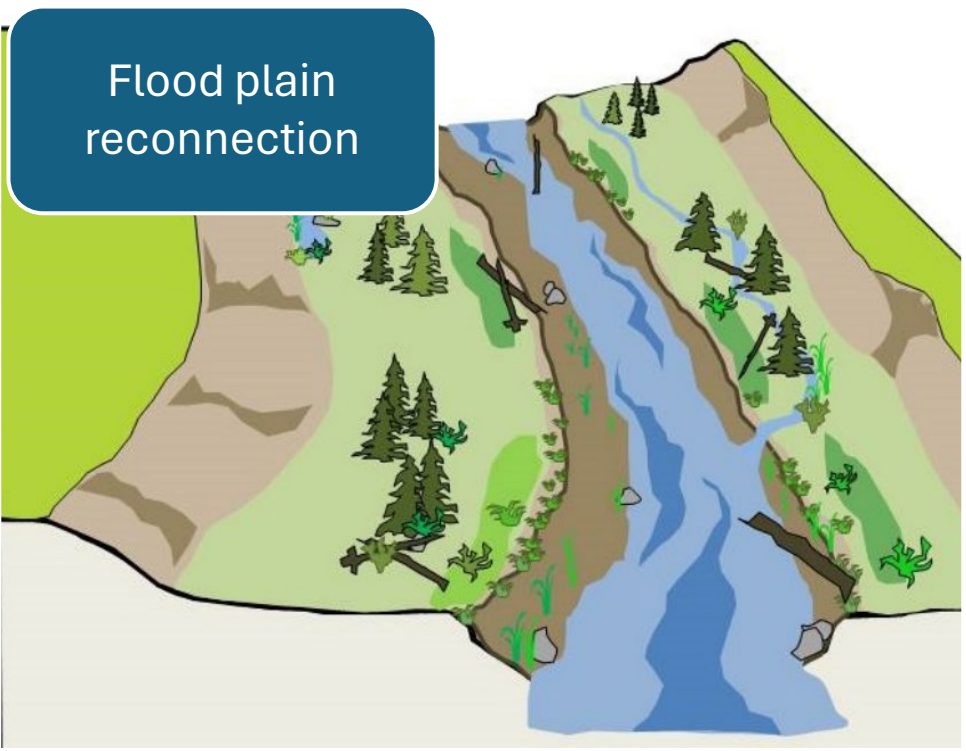
March 4, 2024

FORMATION ENVIRONMENTAL

Long-term Goal	Strategy	How
Reduce groundwater demand by repurposing ~20,000 acres of agricultural land	Repurpose with new, high-value land uses with low-water demand that integrate into the working landscape	Incentivize growers to implement repurposing strategies that deliver multiple benefits

If we have to repurpose land to non-irrigated use, where can we do it so it will have the ***most*** benefit and the ***least*** disruptive impact?

Flood plain reconnection



Retention ponds

3-year Fallowing between orchard plantings

Orchard swale re-wilding

Buffer zones around schools

Assessment Protocol

- Identified landscape characteristics and logistical considerations
- Found representative GIS data sets and products
- Iterative data processing and ground-truthing in case-study areas
- Identified suitable acreage for each practice
- Quantified potential water-budget impacts

Identified ~16,000 irrigated acres (24,000 total acres) for repurposing through these 5 practices

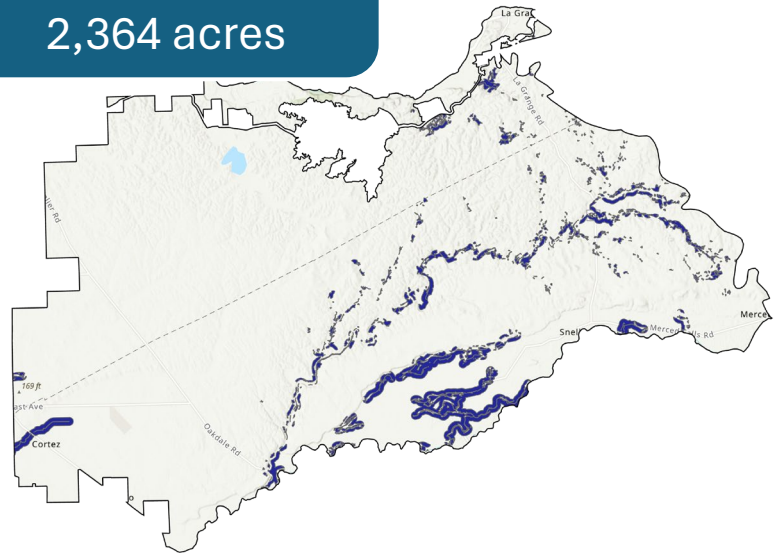
Water budget impacts
(preliminary analysis)

- ~ 50,000 acre-ft in reduced ET
- ~ 9,000 acre-ft available for direct recharge
- ~ 6,600 acre-ft available as in-lieu recharge

Multi-benefits

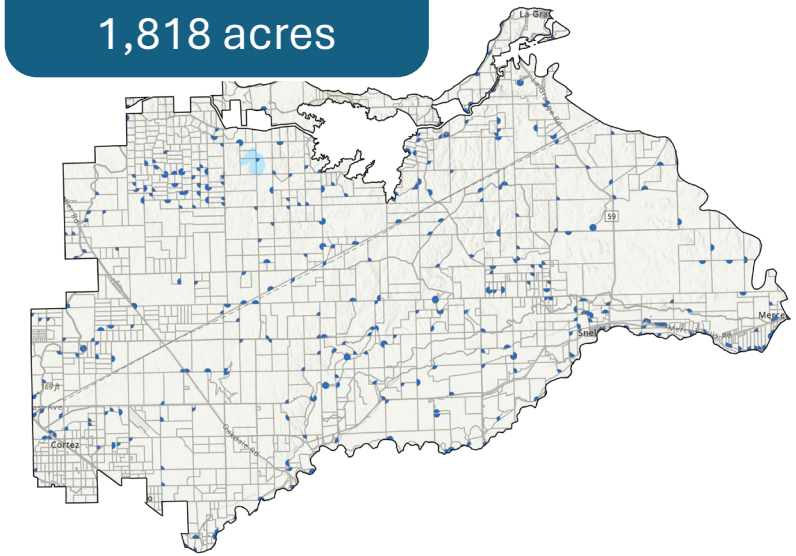
- Habitat enhancement/connectivity
- Protecting schools/DACs
- Neighbors working together
- Flood mitigation
- Reduce 'flashyness' of streams

Flood plain reconnection
2,364 acres

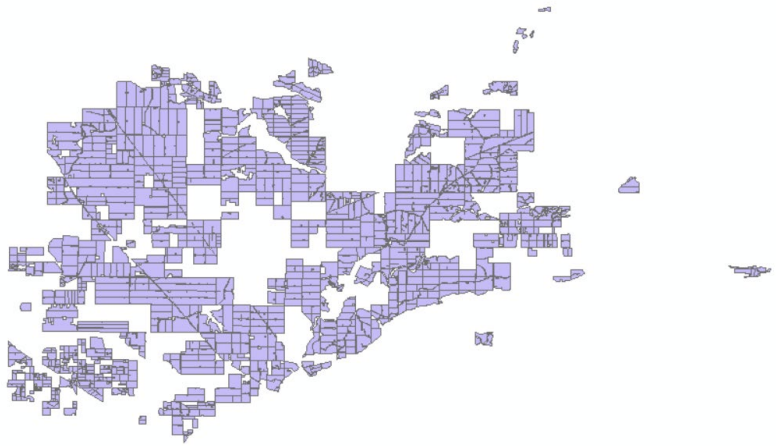


Retention ponds

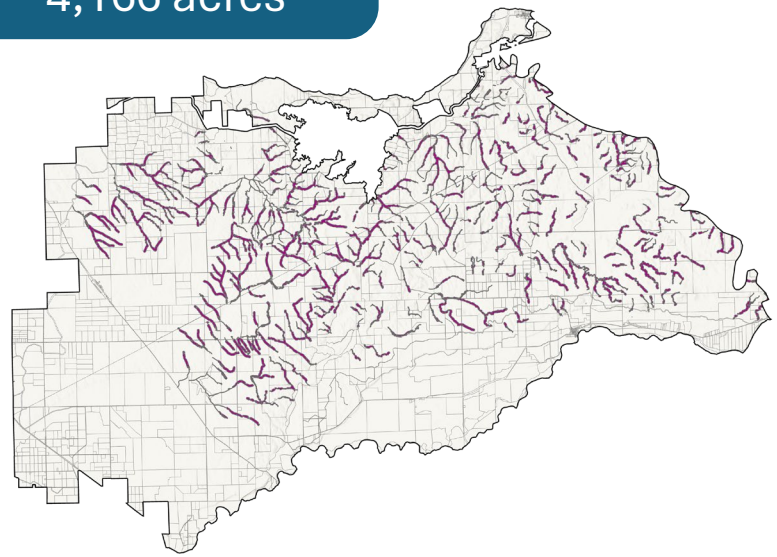
1,818 acres



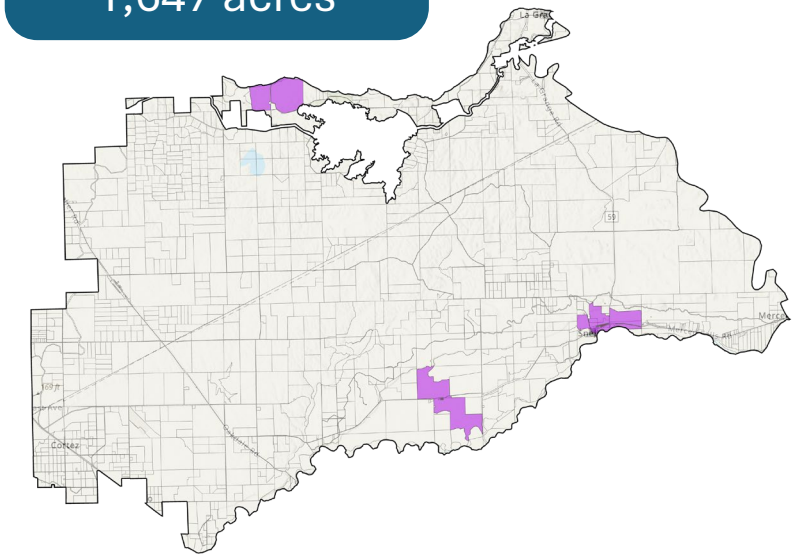
3-year Fallowing between orchard plantings
6,107 acres



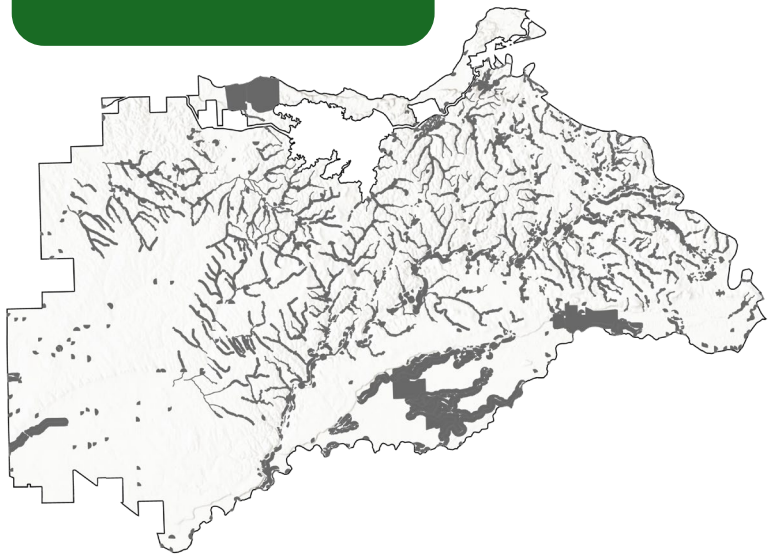
Orchard swale re-wilding
4,166 acres



Buffer zones around schools
1,647 acres

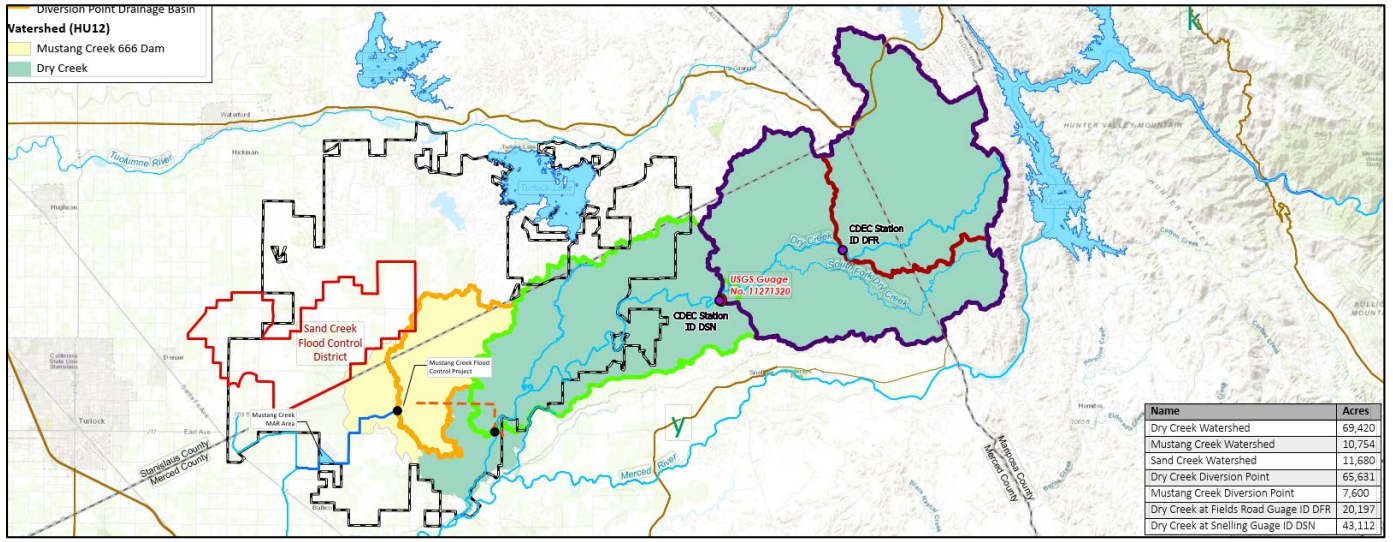


16,102 total acres repurposed

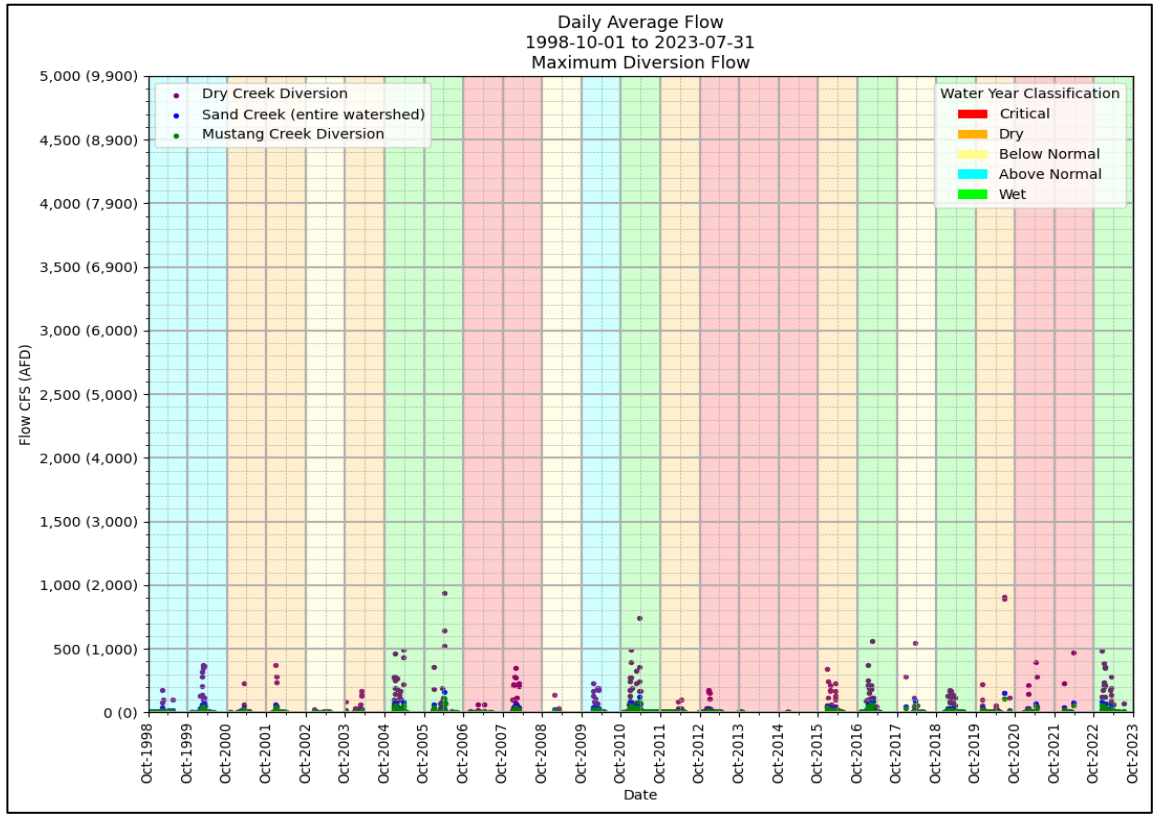


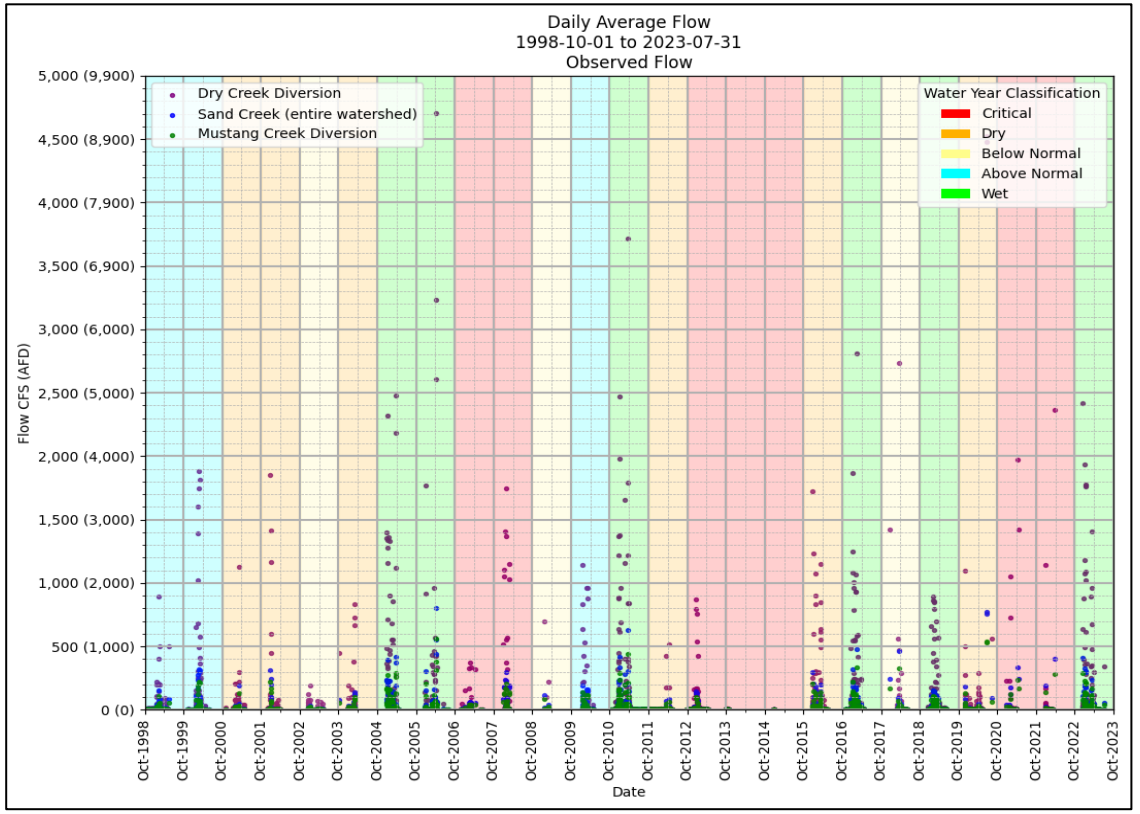
Hydrologic Analysis

- Three creeks; flashy & ephemeral
- On average, significant stream flow occurs 15 days per year
- Supplies available for recharge diversion 91% of years



Name	Acres
Dry Creek Watershed	69,420
Mustang Creek Watershed	10,754
Sand Creek Watershed	11,680
Dry Creek Diversion Point	65,631
Mustang Creek Diversion Point	7,600
Dry Creek at Fields Road Guage ID DFR	20,197
Dry Creek at Snelling Guage ID DSN	43,112





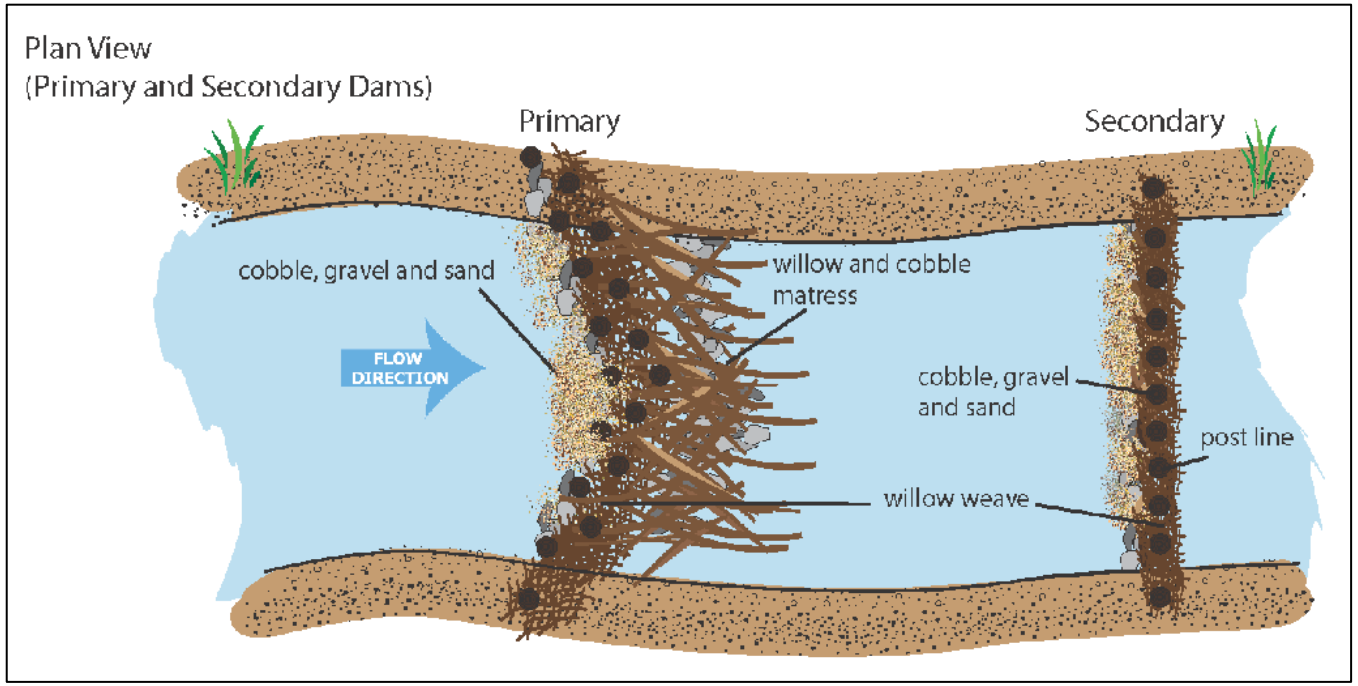
Supplies Available for Diversion under 90/20 Rule

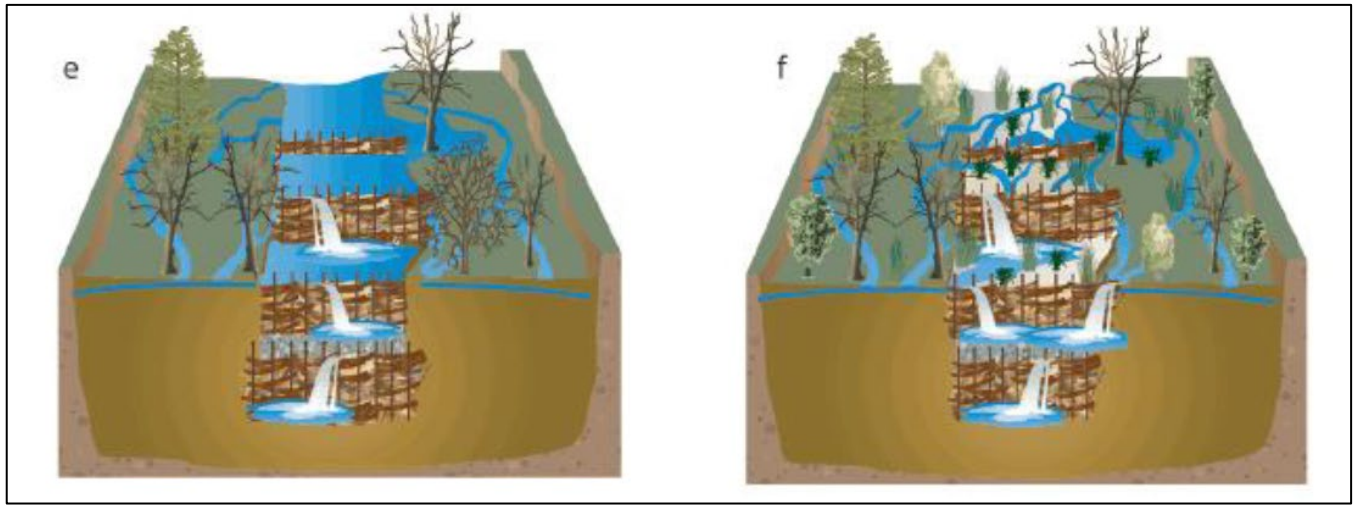
Creek	Dec - Mar	Apr - May	Total
Mustang Creek	288	25	313
Sand Creek	425	37	462
Dry Creek	2,496	217	2,713
Total	**3,209**	**279**	**3,488**

- Gravity diversion to seasonal recharge basins/aquatic habitat ponds on repurposed floodplain
- Pump diversion to storage for irrigation/in lieu recharge where possible
- Assumes 200 cfs total diversion capacity; No storage or recharge limitation

Recharge Benefits from Floodplain Reconnection

- Increased wetted stream area, depth and duration through Beaver Dam Analogs
- Increased recharge through floodplain restoration/ reconnection
- Habitat and flood attenuation benefits

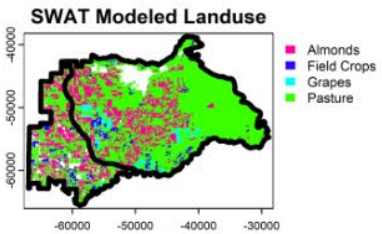




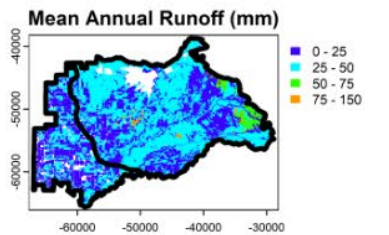
Identifying suitable locations for retention ponds & Quantifying water available for direct and in-lieu recharge

GSA boundary

CV-SWAT



Runoff potential



Spatial analysis with NHDFlowlines and DEM

Direct Recharge (West)	5,000 AF
In-lieu Recharge (East)	15,000 AF
90 ponds suitable for Direct Recharge	600 acres
274 ponds suitable for In-lieu Recharge	1,951 acres

2,660 AF Direct Recharge

6,662 AF In-lieu Recharge

**CV-SWAT = Central Valley Soil and Water Assessment Tool*
Hydrological model considering
- *CIMIS precipitation,*
- *NRCS soil data,*
- *DWR Land use*
- *NASA DEM*

Simulates runoff using NRCS Curve Number approach

Other demand-reduction options

- Cover cropping
- Irrigation efficiency
  - CropManage from UCCE
  - ET forecasting from National Weather Service
  - Almond Board’s Irrigation Calculator

Cover cropping water budget impacts

	← Confidence level →		
Water budget components	Low	Medium	High
Inflow	Increased fog & dew capture		Increased infiltration (40%)
Storage	Increased percolation	Increased soil water storage	
Outflow		Increased ET	Decreased runoff (40%)

Available Data and Tools to Support Irrigation Management and Maximize Irrigation Efficiency

- CropManage integrates:
  - **Environmental data** (CIMIS, NRCS soil data)
  - **Crop water and N models** based on research from UCCE, Almond Board, others
  - **Available monitoring data** (flow meters, soil moisture sensors, ET stations, soil test, tissues analyses)
  - **User input** (historical management, planning practice implementation)
  - ***Provides recommendations for irrigation and fertilization rates and timing based on factors listed above***
  - Local technical assistance available at UCCE Modesto
  - 25-30% savings in fertilizer N and applied water demonstrated in the Central Coast – ongoing efforts for demonstrations in the Central Valley

Upcoming training

SIGN UP TODAY!

HTTPS://SURVEYS.UCANR.EDU/SURVEY.CFM?SURVEYNUMBER=42205

Thursday, March 14th, 2024
12:30 PM – 5:00 PM

UCCE Stanislaus County,
Harvest Hall, Room E, 3800
Cornucopia Way, Modesto, CA
95358

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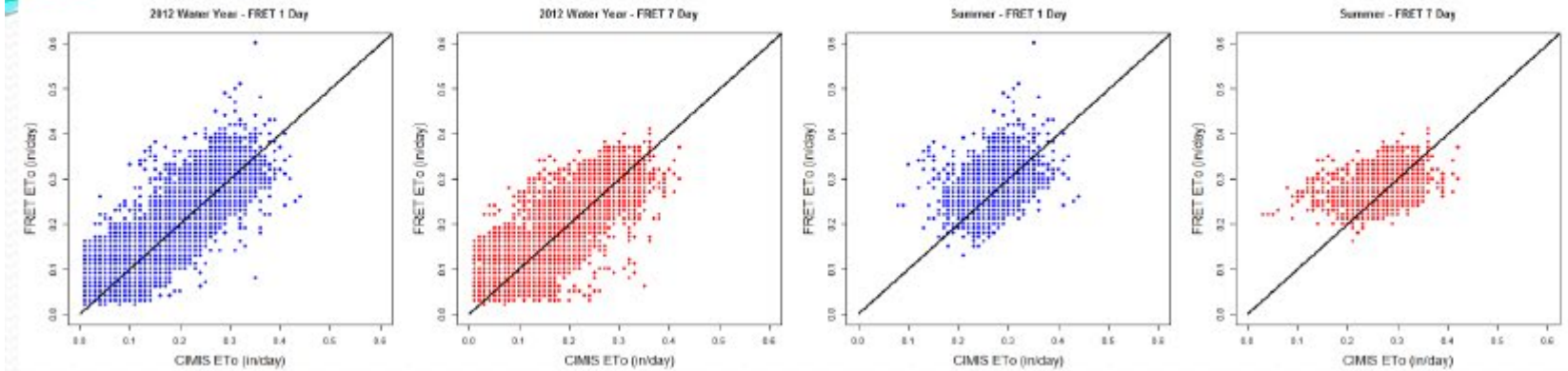
RSVP BY: March 12th, 2024

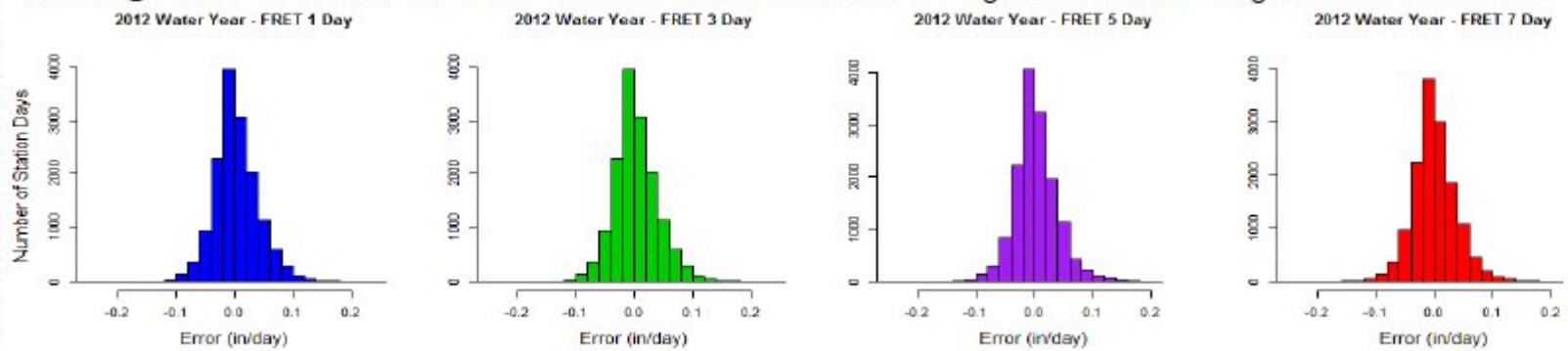
Available Data and Tools to Support Irrigation Management and Maximize Irrigation Efficiency

- **National Weather Service Forecasted Reference ET**
  - Informed by local weather monitoring network, other key data
  - Provides spatially explicit forecasts (2.5 km grid) for today, 3-day, 5-day,7-day
  - Investigating integrating into CropManage
  - Could be packaged and delivered in weekly reports for growers. Could also include:
    - NRCS soil data on water storage capacity
    - Published crop coefficient and field-specific Kc based on historical satellite ET
    - Anticipated runtime based on irrigation system, distribution uniformity
    - Other

Water year and summer period scatter plot comparisons of CIMIS station and FRET ET_o.



Histograms of difference between FRET forecast ET_o and CIMIS ET_o for all stations



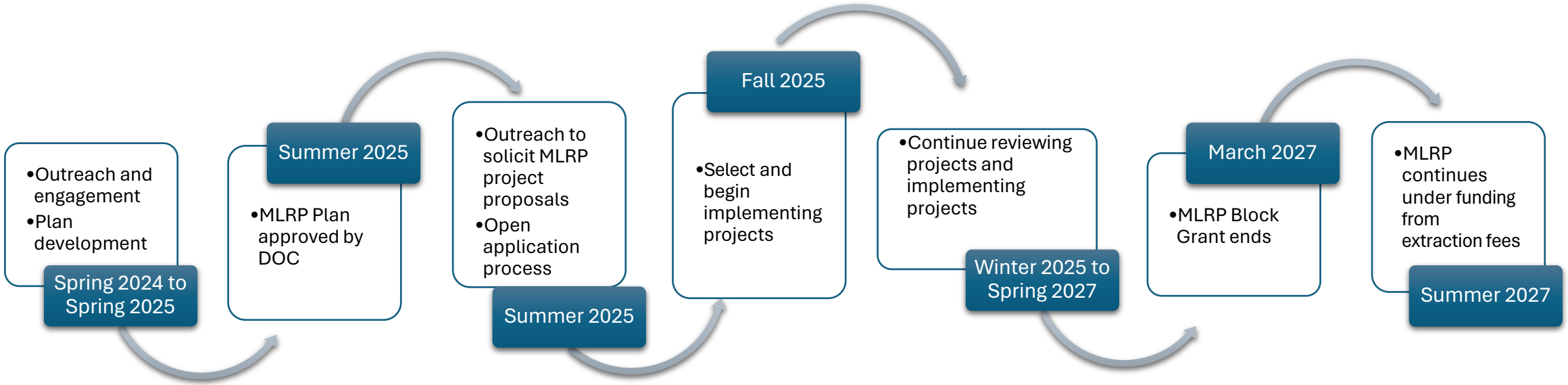
> 80% of FRET values within 0.05 in/day of CIMIS station ET_o for all forecast periods.

FRET has slight +ve bias wrt CIMIS station ET_o, increased bias in summer

Available Data and Tools to Support Irrigation Management and Maximize Irrigation Efficiency

- **Almond Board Irrigation Calculation**
  - Available through California Almond Stewardship Platform (CASP)
    - Referenced throughout the ABC's "Almond Irrigation Continuum"
  - Considers CIMIS data, irrigation system info
  - Intermediary between less informed approaches and CropManage (or similar)

Anticipated MLRP Timeline




Questions?