COLUSA AND GLENN GROUNDWATER AUTHORITIES

Colusa Subbasin

Joint Technical Advisory Committee

GSP Development

May 13, 2021

Meeting Topics

- 4.a. Sustainable Management Criteria
  - –4.a.i. Chronic Lowering of Groundwater Levels
  - –4.a.ii Depletions of Interconnected Surface Water
- 4.b. Projects and Management Actions
- 5. Topics for June 11 Joint TAC Meeting

4.a. Sustainable Management Criteria Timeline

- Prior TAC Decisions
  - April 9, 2021
    - Sustainability Indicator #4: Degraded Water Quality
    - Sustainability Indicator #5: Land Subsidence
  - April 23, 2021
    - Sustainability Indicator #2: Reduction of Groundwater Storage
    - Groundwater Dependent Ecosystems
- May 13 (Today):
  - TAC Decision on MOs, MTs and URs for Sustainability Indicator #1: Groundwater Levels
  - Discussion of Sustainability Indicator #6: Depletions of Interconnected Surface Water
- June 11: TAC Decision on Sustainability Indicator #6: Depletions of Interconnected Surface Water
- July 16: Consultant Team releases draft Chapter 5 for review

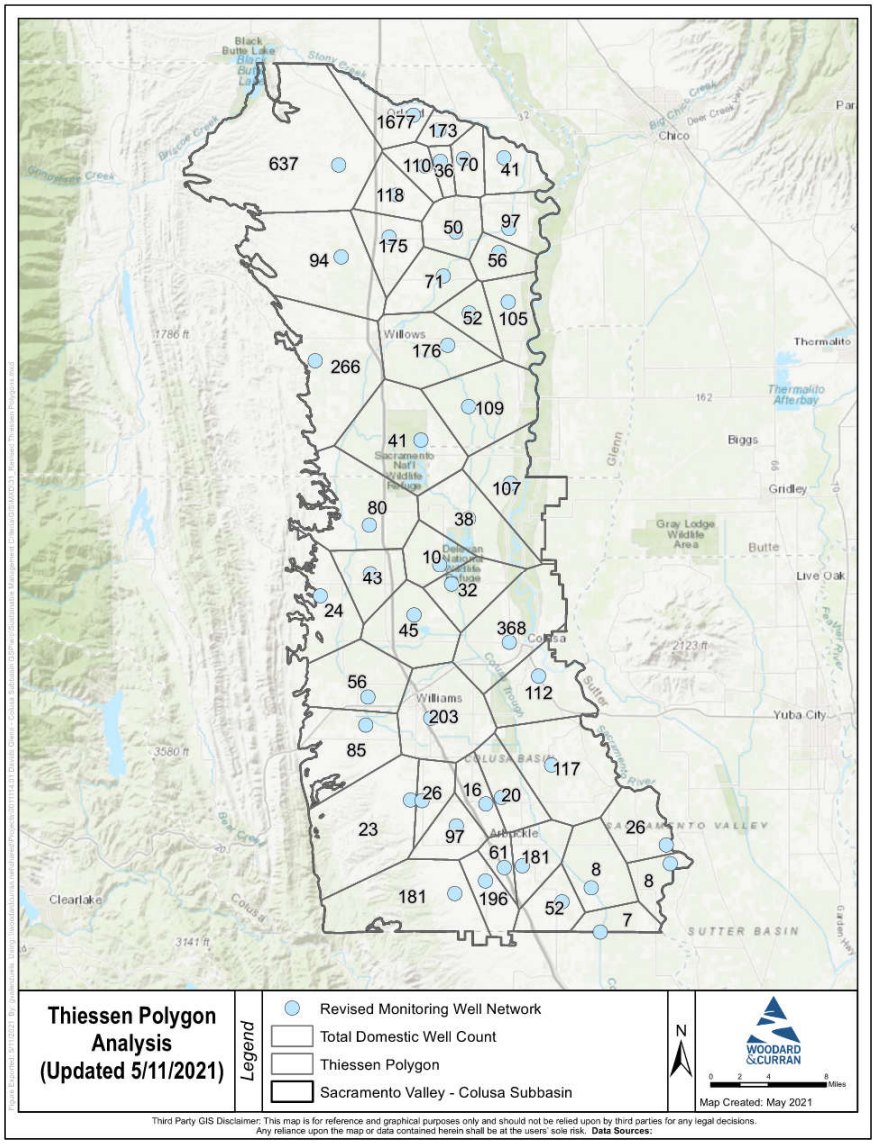
Key Terms and Definitions (23 CCR Section 351)

- Minimum Threshold (MT): The numeric value for each sustainability indicator used to define undesirable results at each representative monitoring site.
- Measurable Objective (MO): The specific, quantifiable goal for the maintenance or improvement of groundwater conditions.
- Undesirable Result (UR): Significant and unreasonable impacts to groundwater conditions occurring throughout the basin for the applicable sustainability indicators.

4.a.i. Sustainability Indicator #1: Chronic Lowering of Groundwater Levels

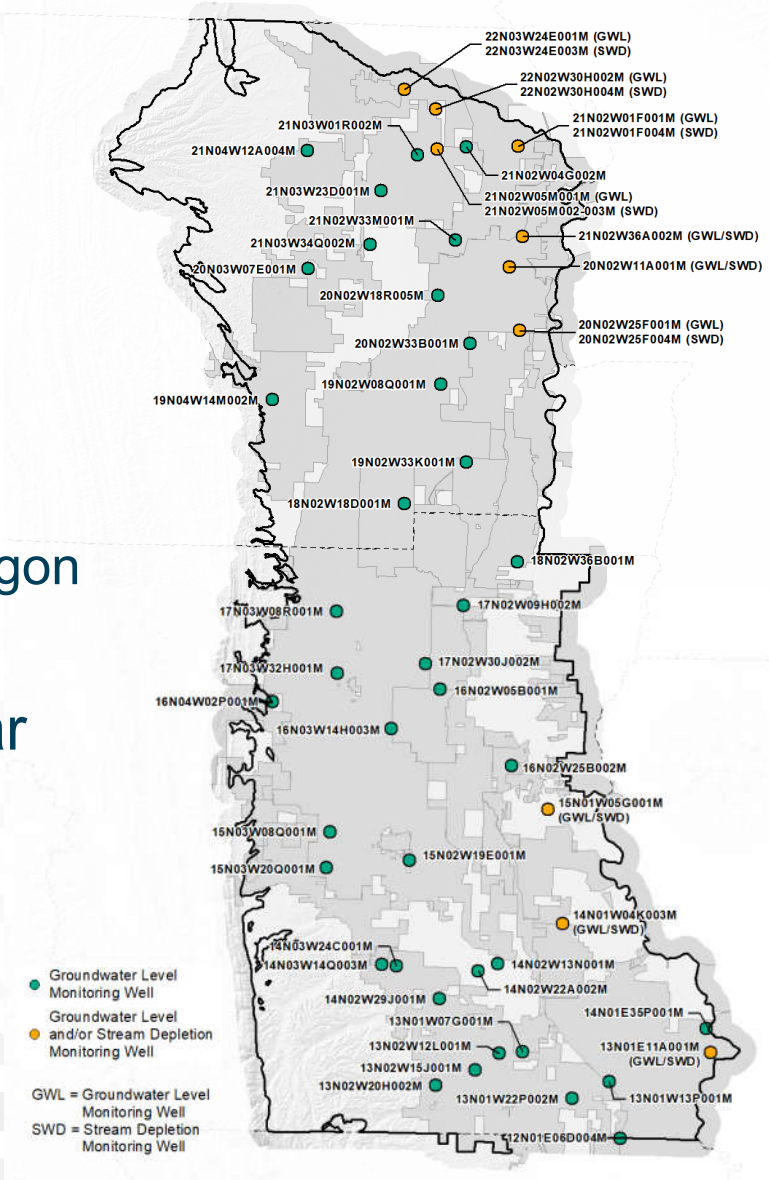
Approach

- Set MTs based on lower of historical low plus a percent range and percentile depth of nearby domestic wells
- Well depths used to set MTs in most areas
- Historical water levels used to set MTs in areas of greatest drawdown



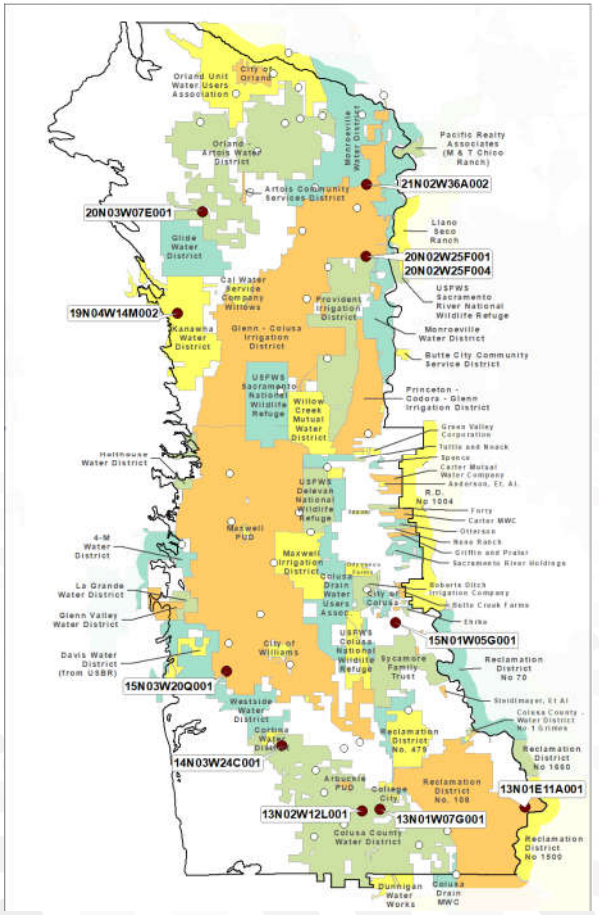
Chronic Lowering of Groundwater Levels

- MT = Lower of:
  - 20% or 50% of range below historical low,
  - The 20th percentile of shallowest domestic wells in the monitoring well's Thiessen polygon
- MO = Set as the mean of last 5 years available measurements; not a five-year rolling average

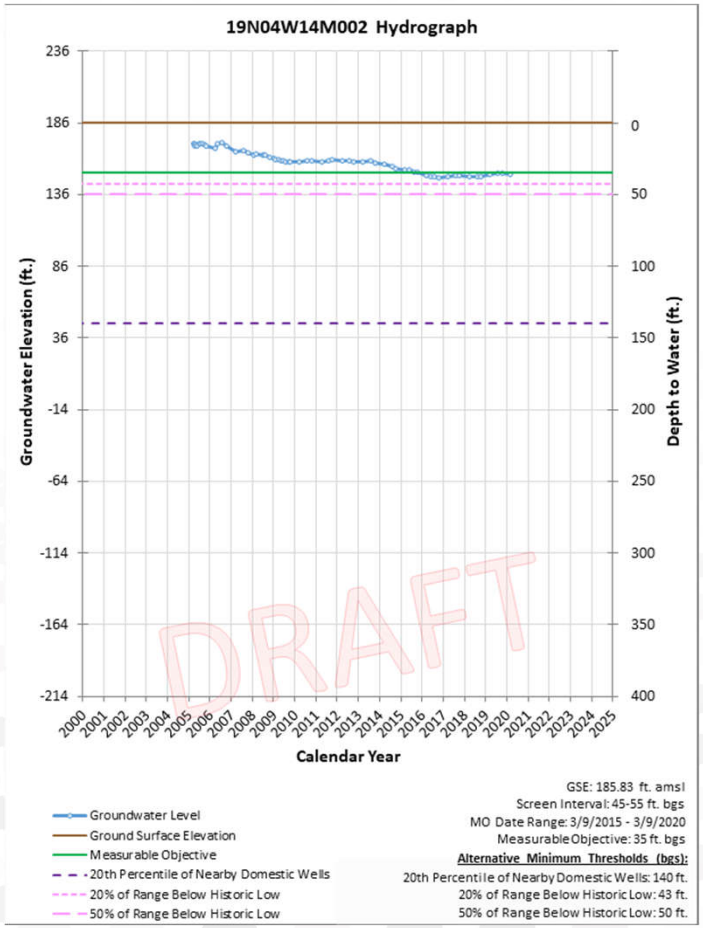


Representative Monitoring Network Examples

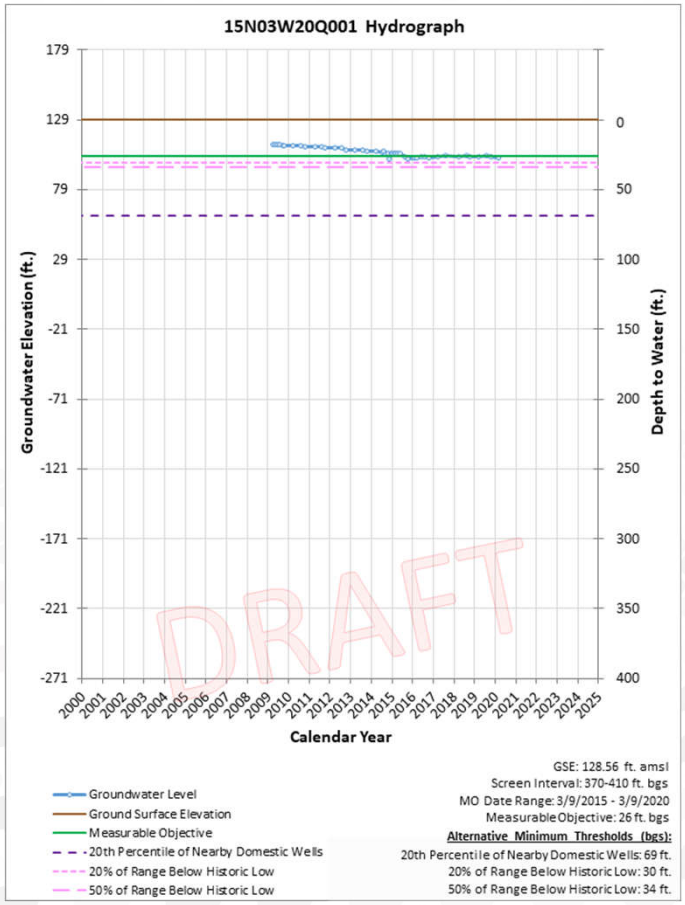
- Wells reflecting recent dry conditions
- Wells reflecting recent dry conditions and variability in surface water supply
- Wells near the Sacramento River

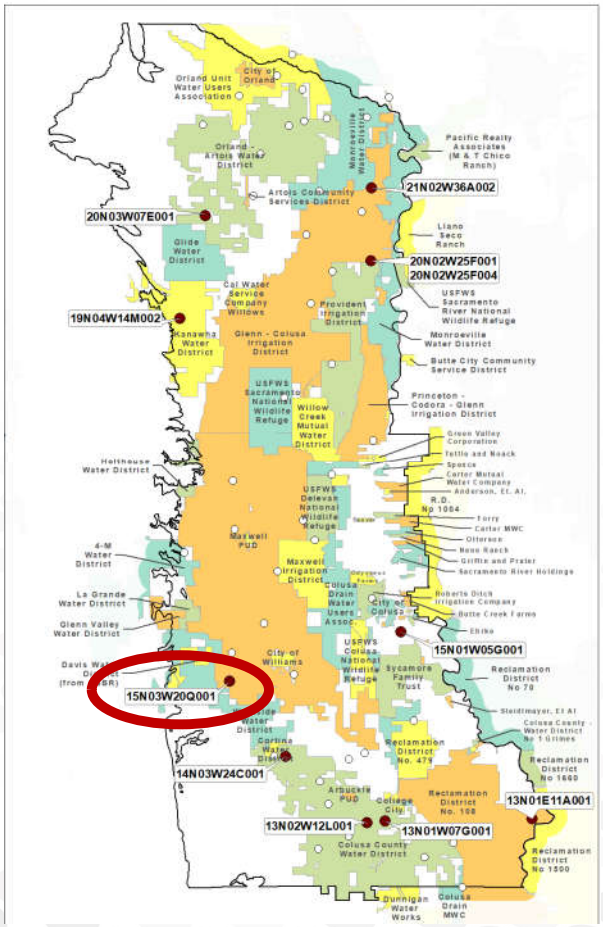


Wells Reflecting Recent Dry Conditions: Kanawha WD

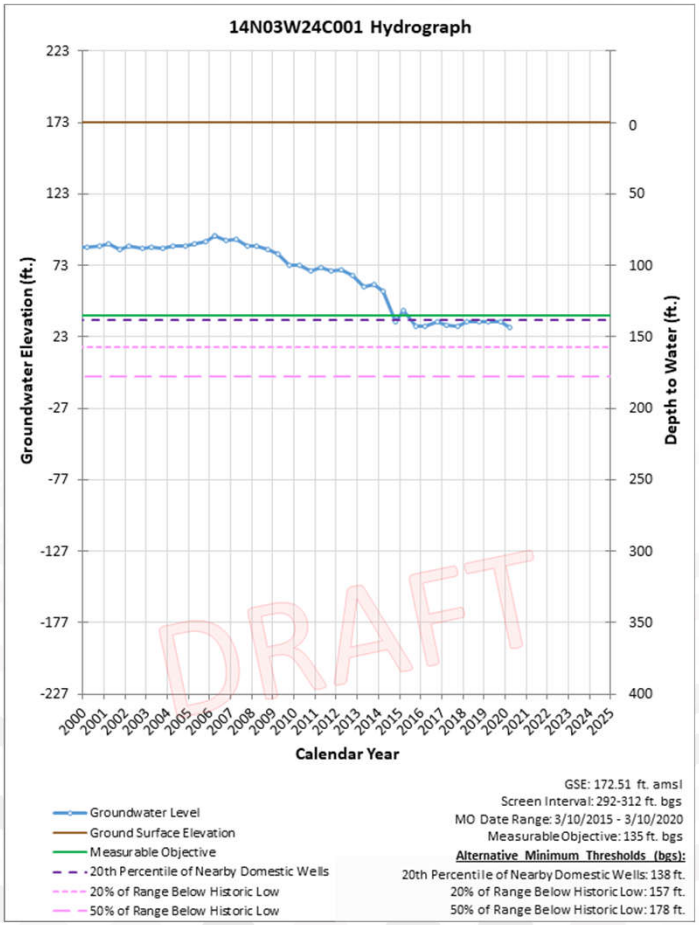


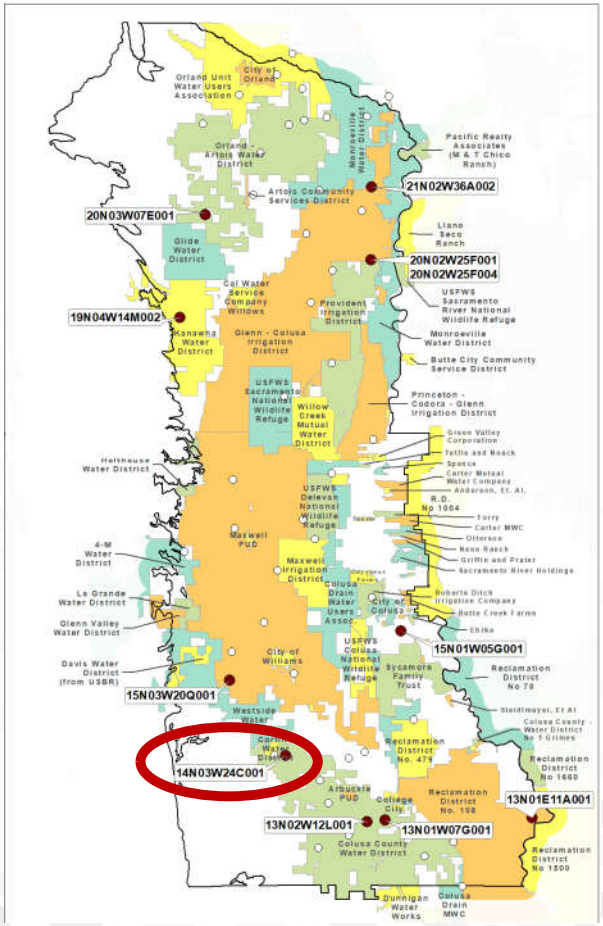
Wells Reflecting Recent Dry Conditions: GCID



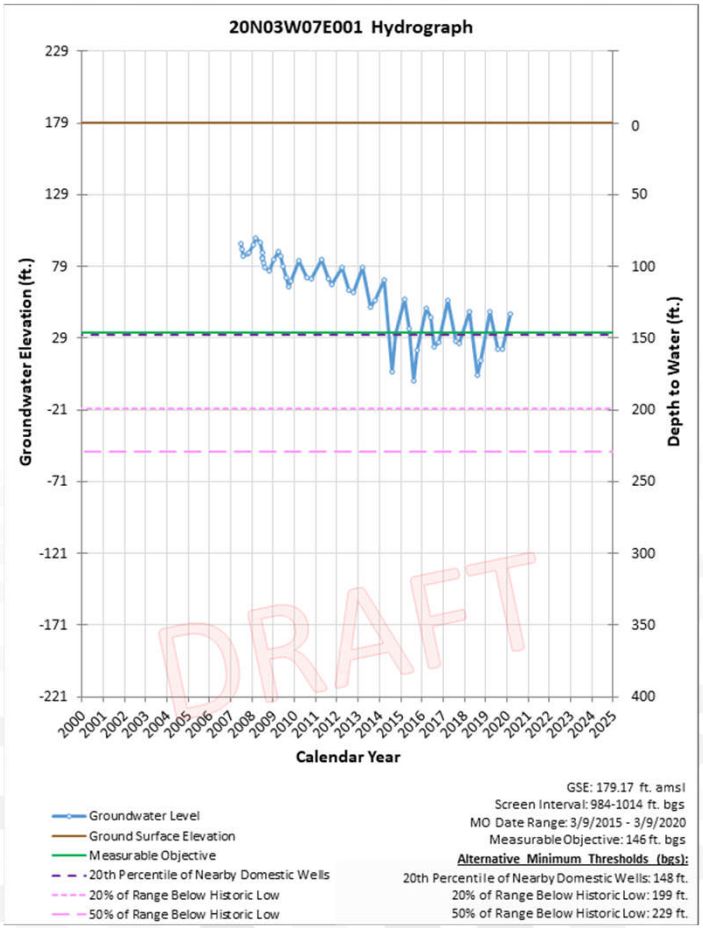


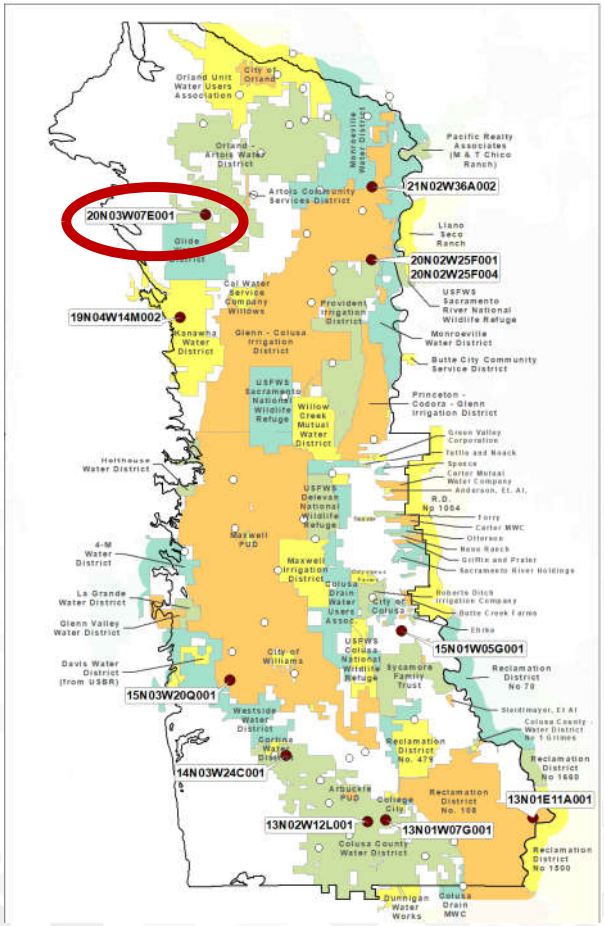
Wells Reflecting Recent Dry Conditions: Colusa County WD



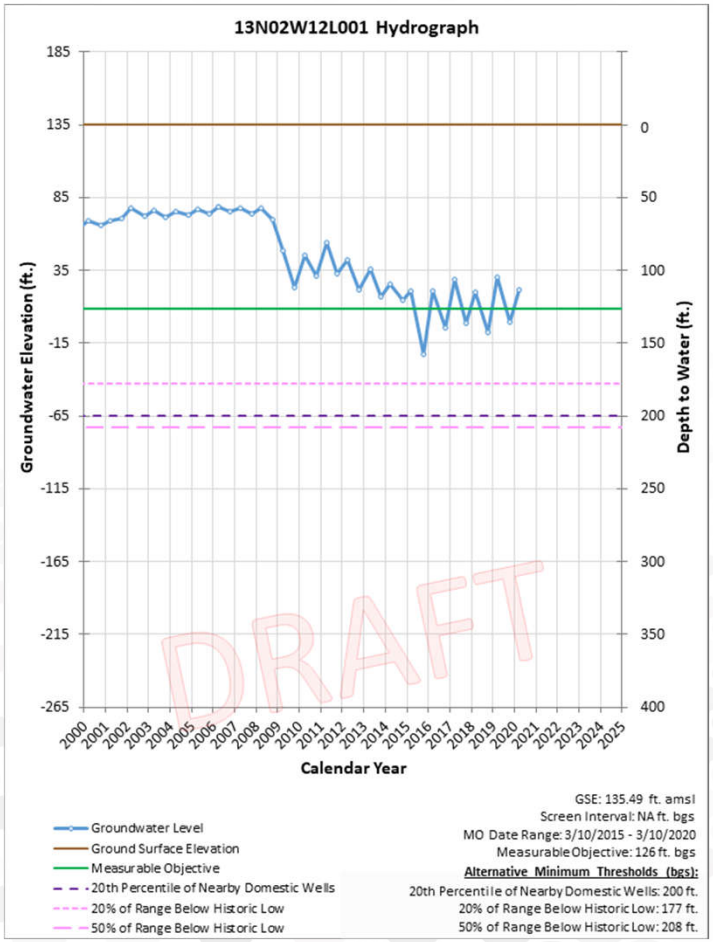


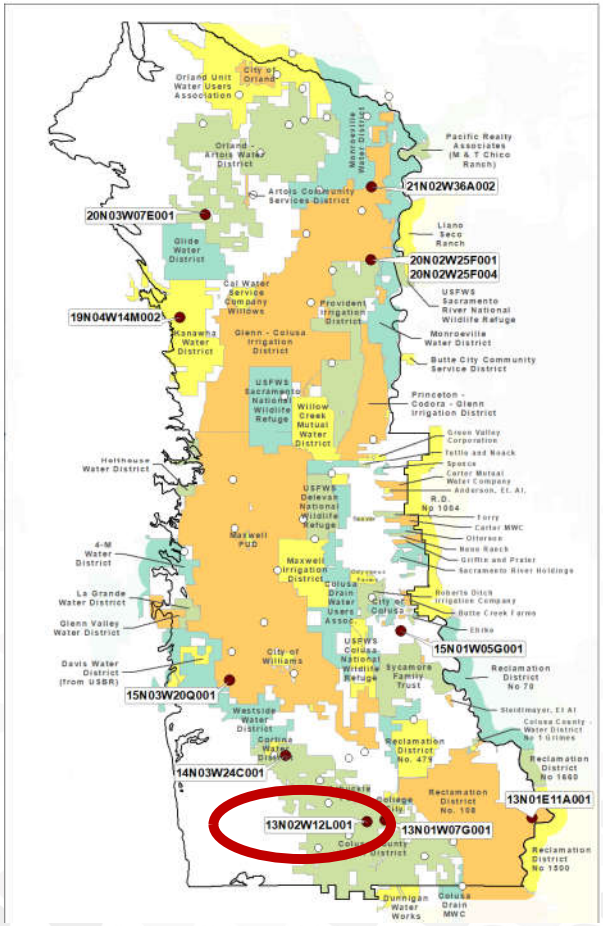
Wells Reflecting Recent Dry Conditions and Variability in Surface Water Supply: OAWD



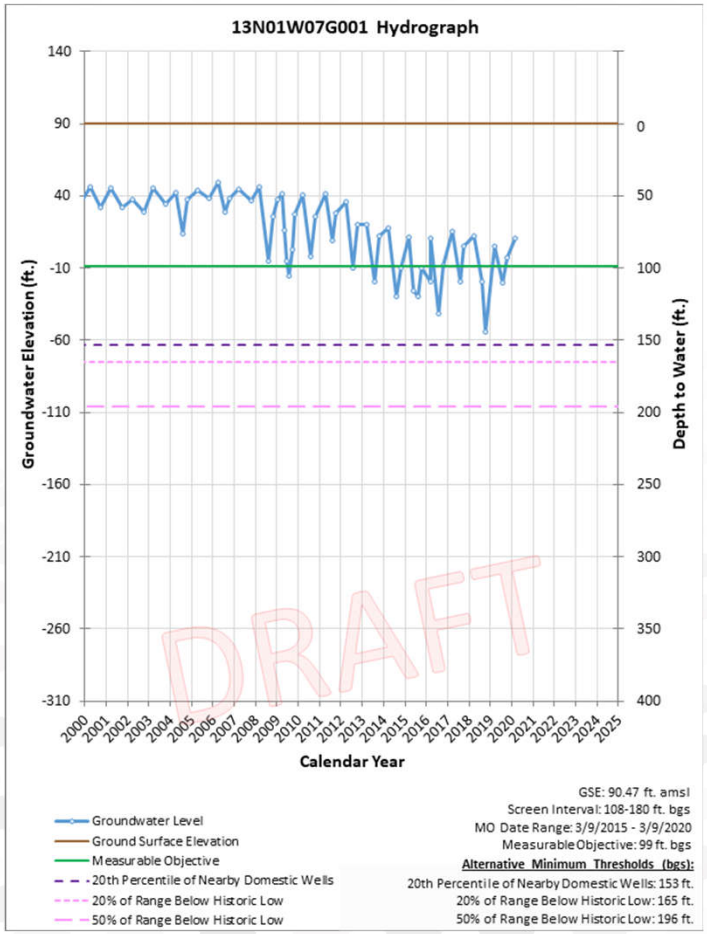


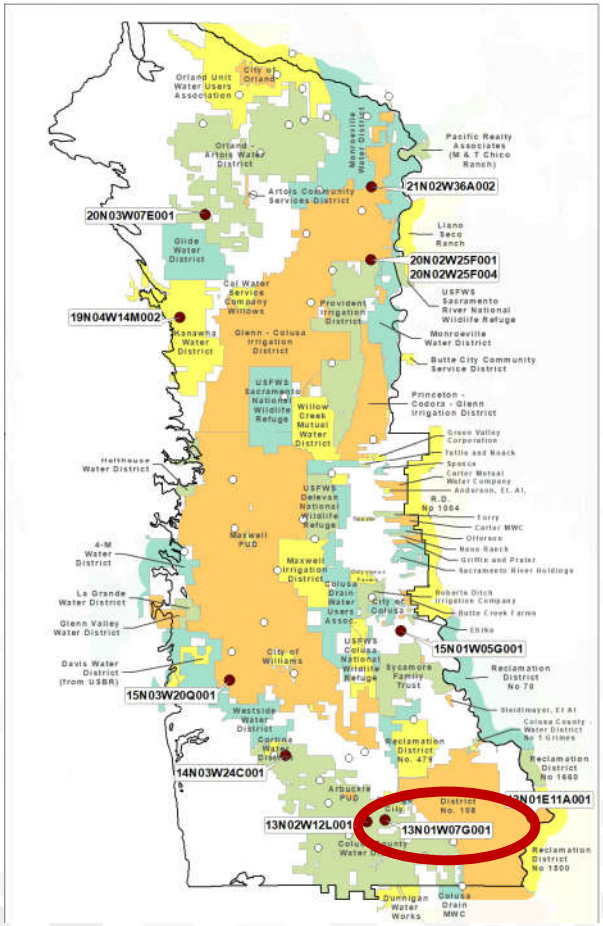
Wells Reflecting Recent Dry Conditions and Variability in Surface Water Supply: Colusa County WD



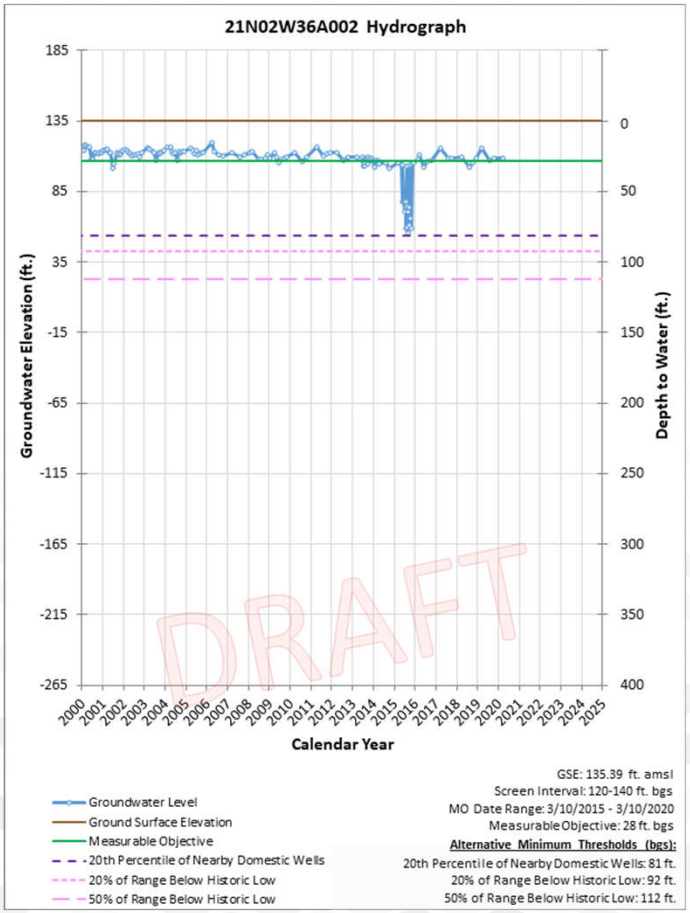


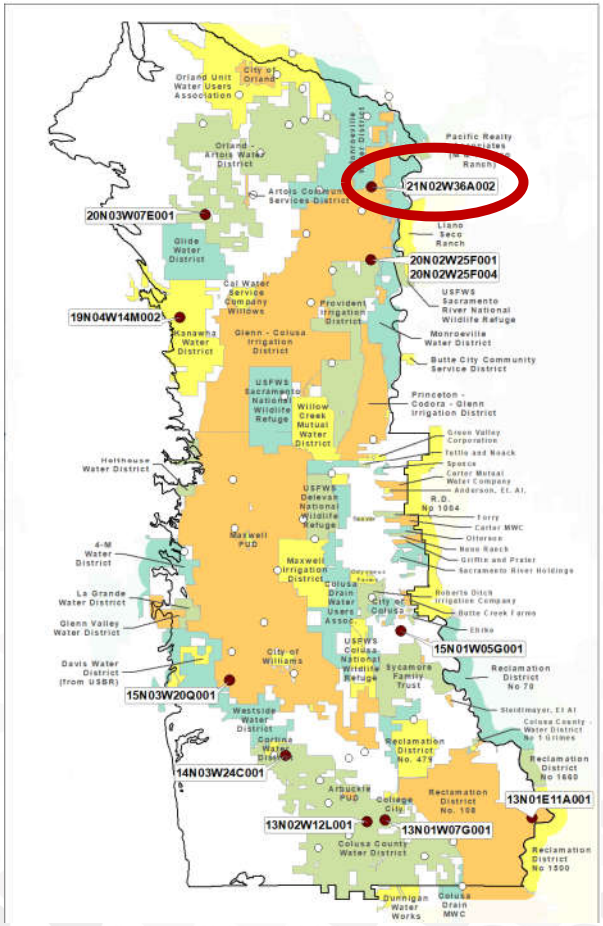
Wells Reflecting Recent Dry Conditions and Variability in Surface Water Supply : Colusa County WD



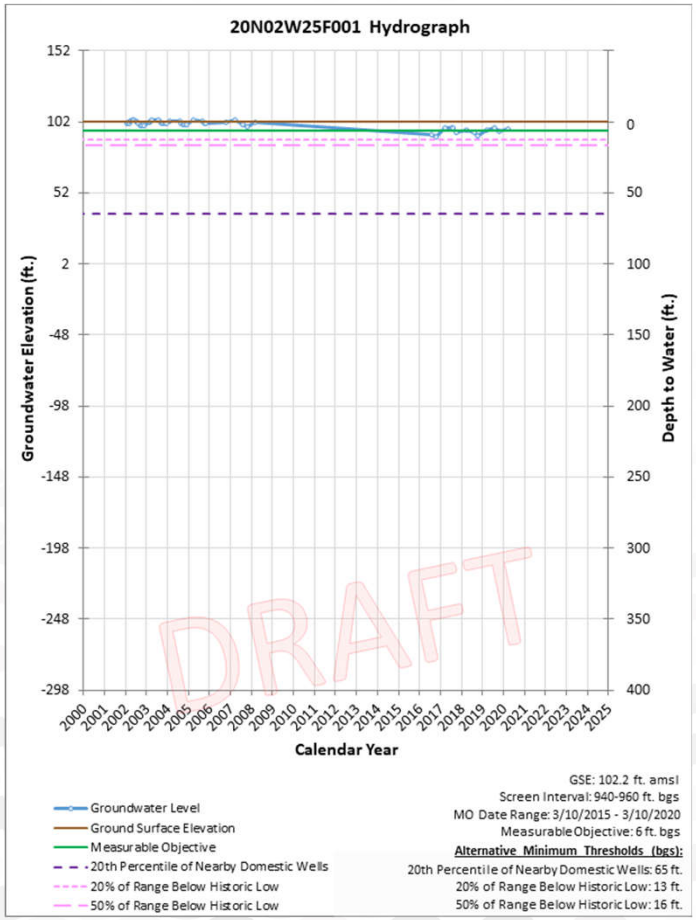


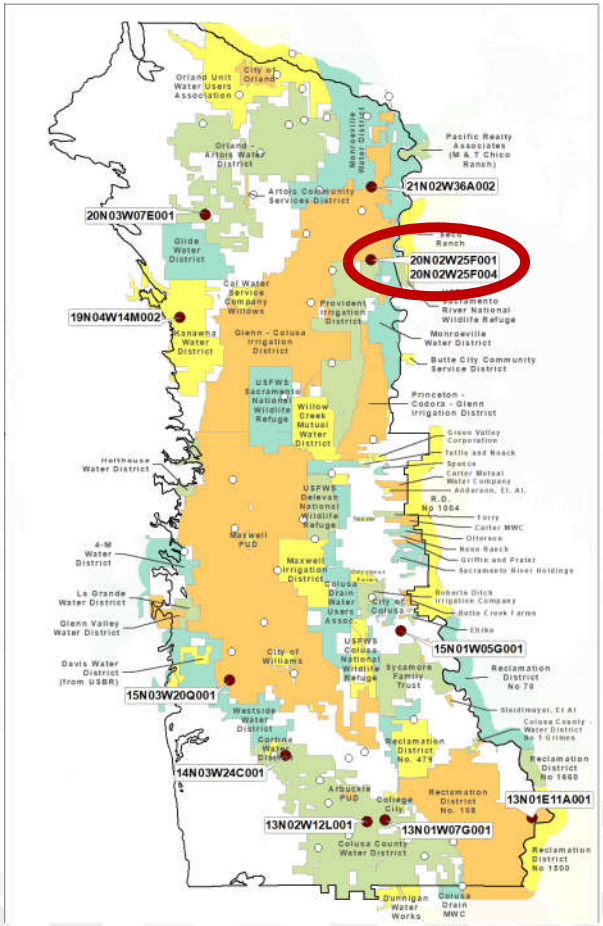
Wells near the Sacramento River: GCID



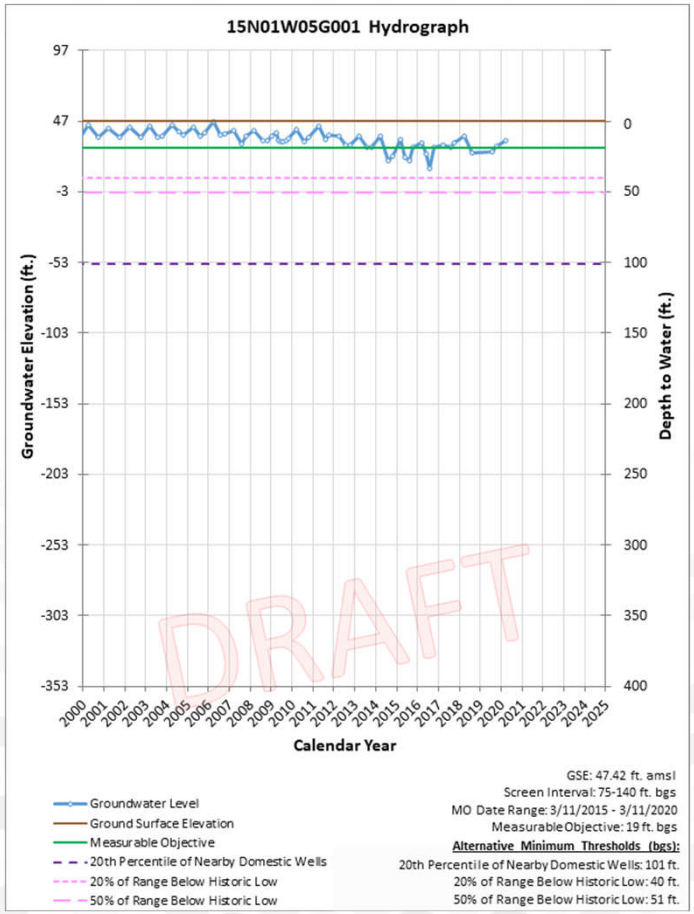


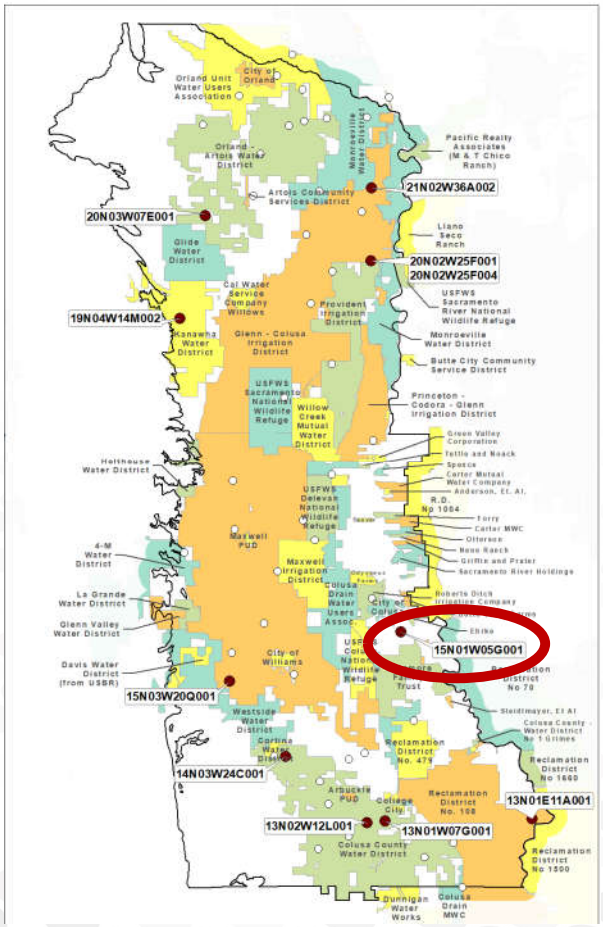
Wells near the Sacramento River: GCID/PID



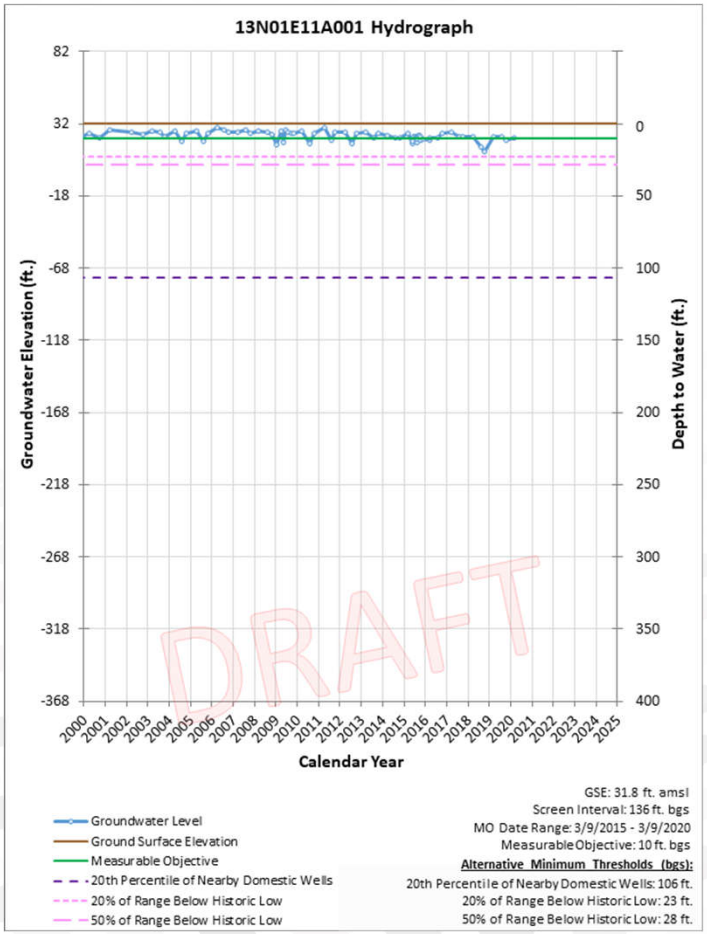


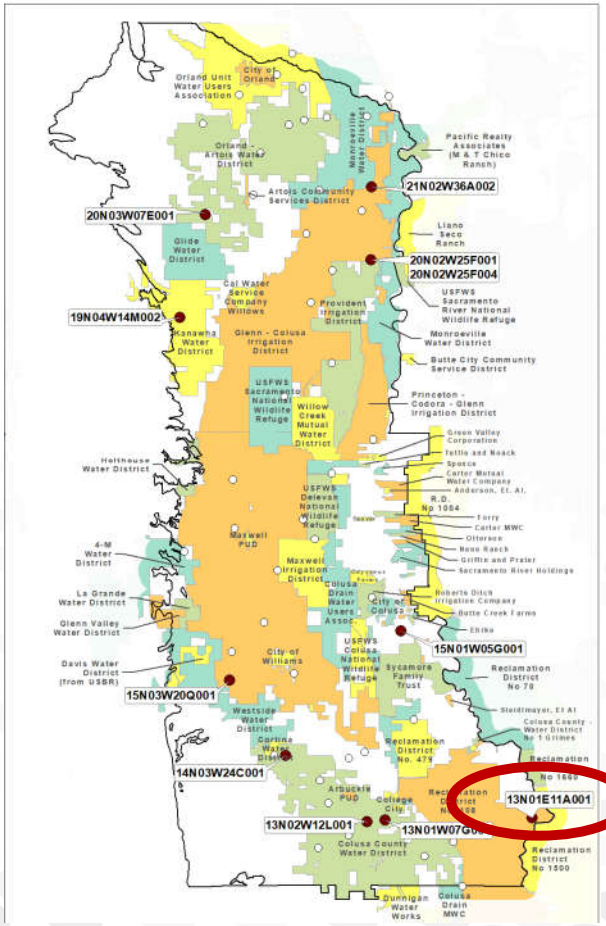
Wells near the Sacramento River: Colusa County "White Area"





Wells near the Sacramento River: RD108





Technical Team Recommendation for Groundwater Levels MTs and MOs

- MT = Lower of:
  - 20% or 50% of range below historical low, as selected by the Joint TACs and
  - The 20th percentile of shallowest domestic wells in the monitoring well's Thiessen polygon
- MO = Set as the mean of last 5 years available measurements; not a five-year rolling average
- Undesirable Result is detected when:
  - 25% (12 of 48 representative monitoring wells) fall below the minimum threshold for 24 consecutive months

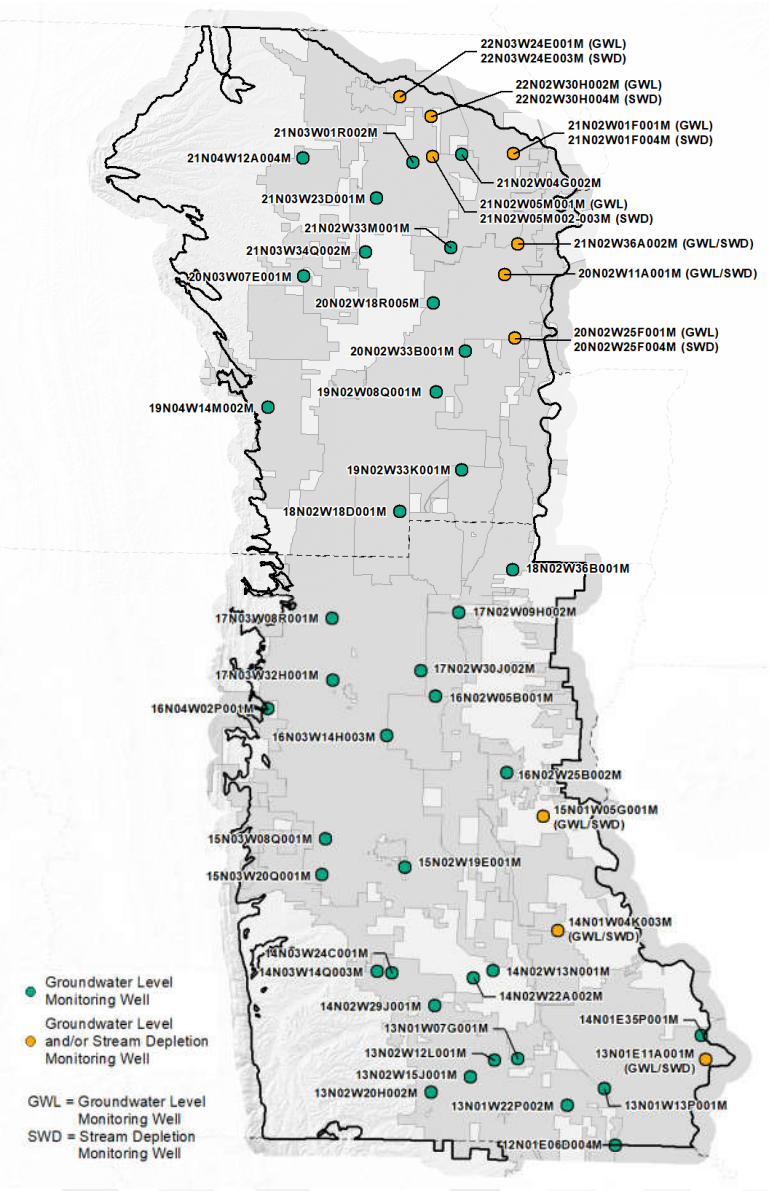
Proposed Action

The Joint TAC recommends that the GSA Boards adopt minimum thresholds and measurable objectives as described on the previous slide for the chronic lowering of groundwater levels sustainability indicator.

4.a.ii. Sustainability Indicator #6: Depletions of Interconnected Surface Water

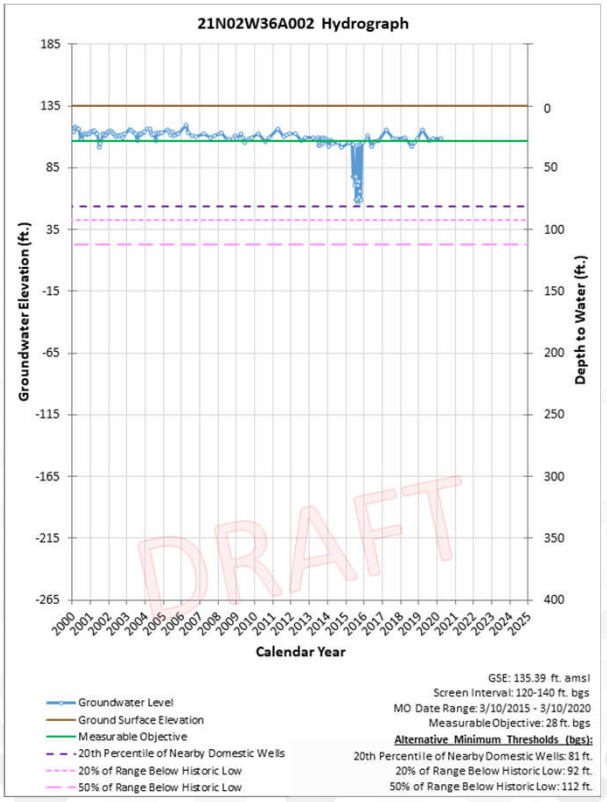
Interconnected Surface Water Monitoring Well Network

- Monitoring wells between 2,000 feet and five (5) miles from Interconnected Streams and less than 200 feet deep
- 11 qualifying wells (orange dots; one location has two well completions)
- Example wells shown on the following slides

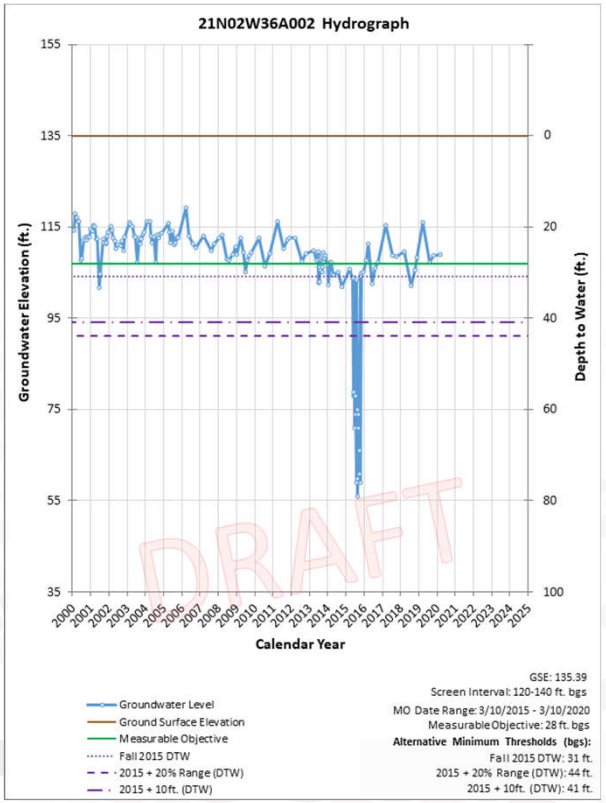


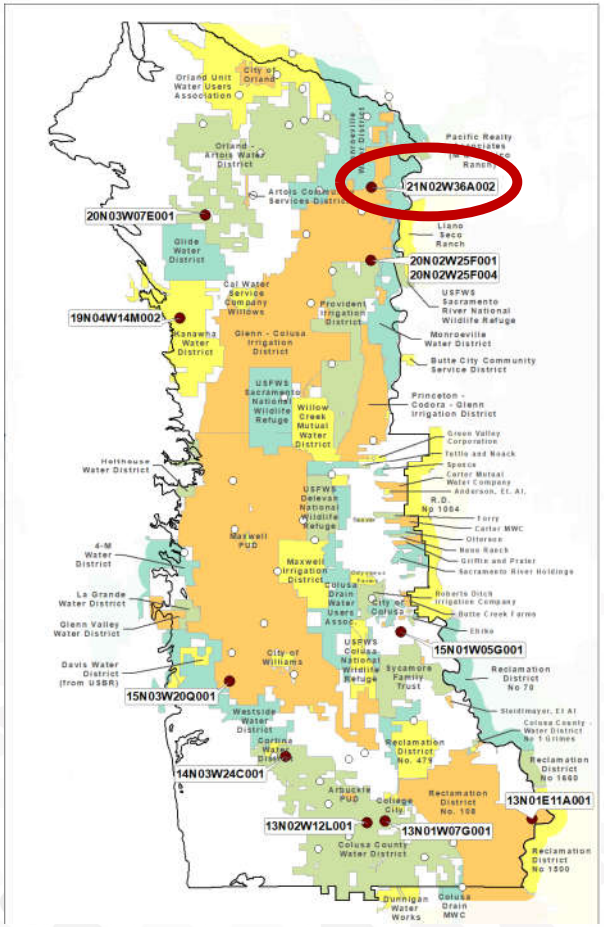
Comparison of MTs: GCID

Groundwater Level MTs



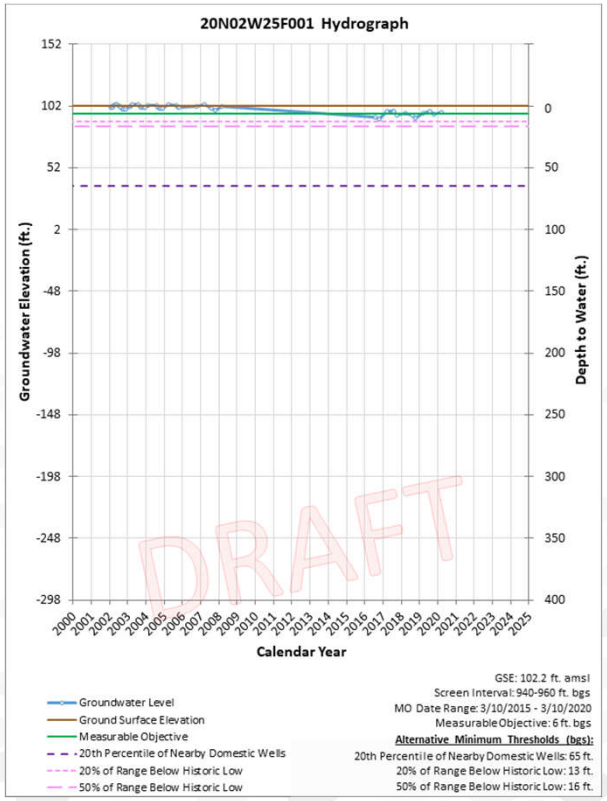
Interconnected Surface Water MTs



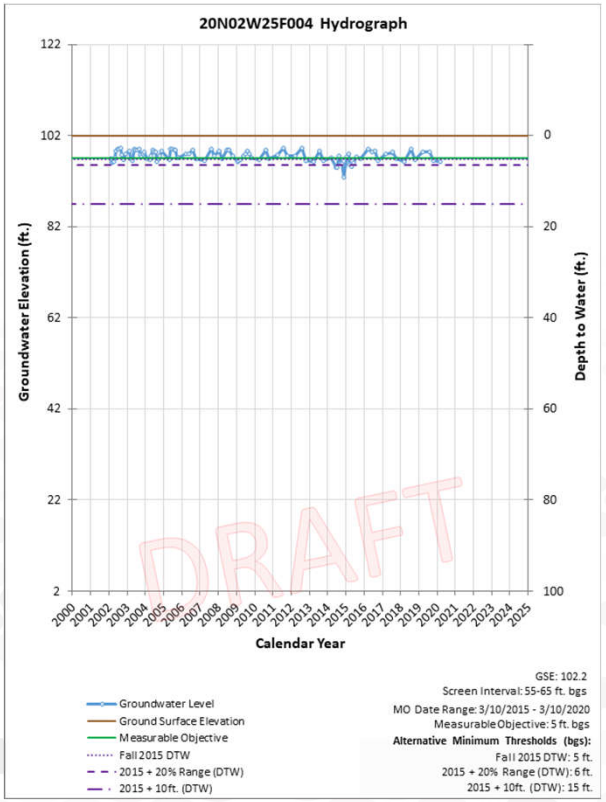


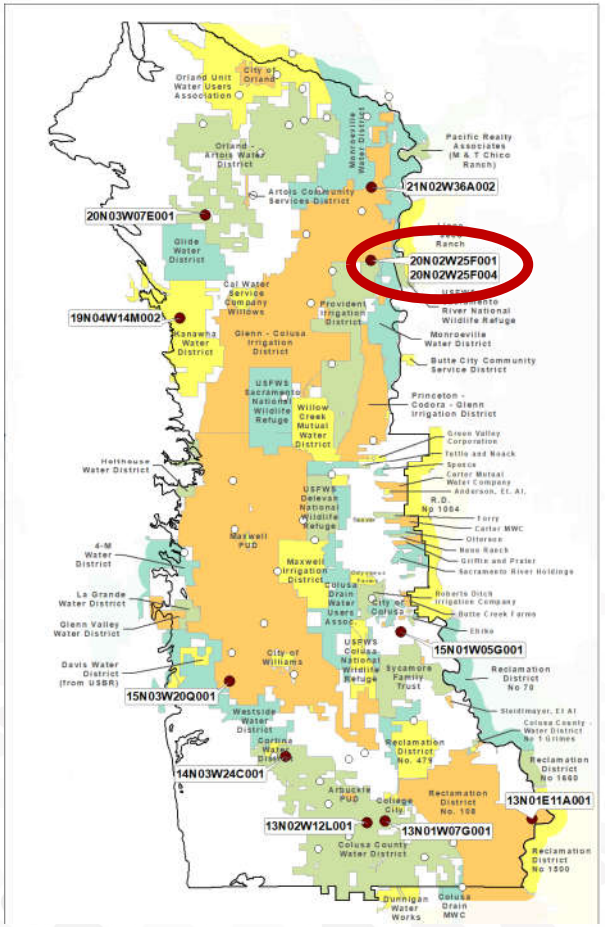
Comparison of MTs: GCID

Groundwater Level MTs



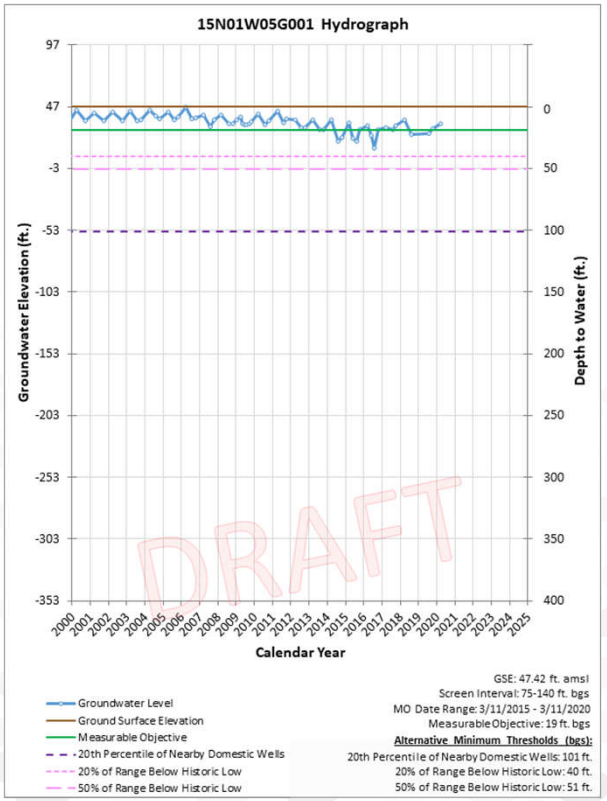
Interconnected Surface Water MTs



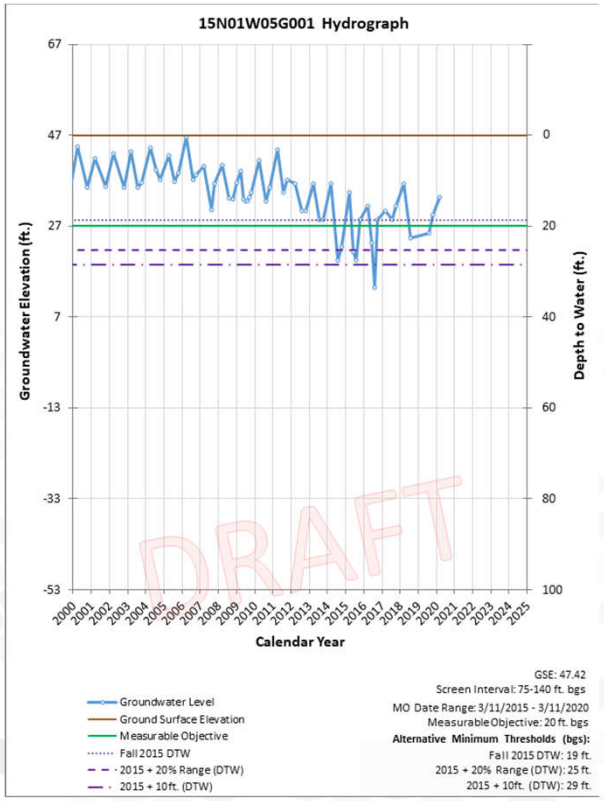


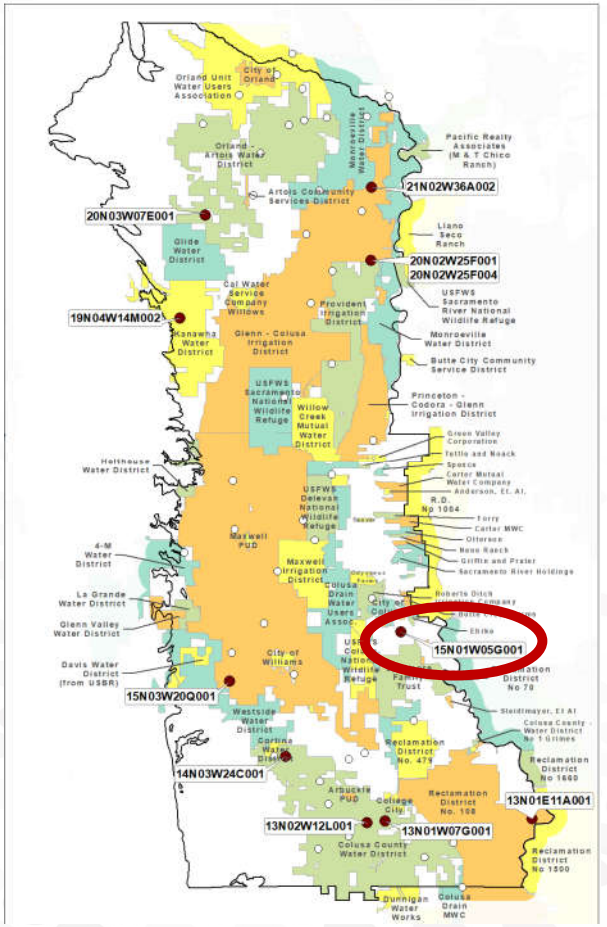
Comparison of MTs: Colusa County White Area

Groundwater Level MTs



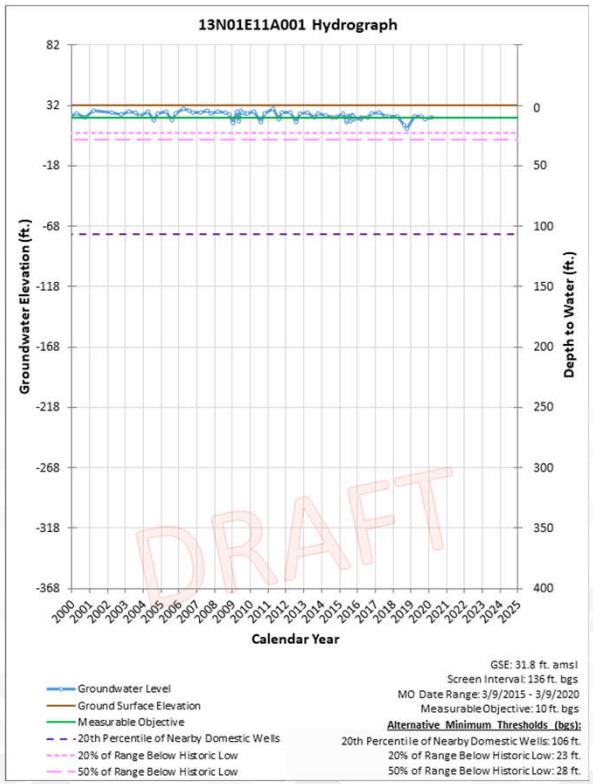
Interconnected Surface Water MTs



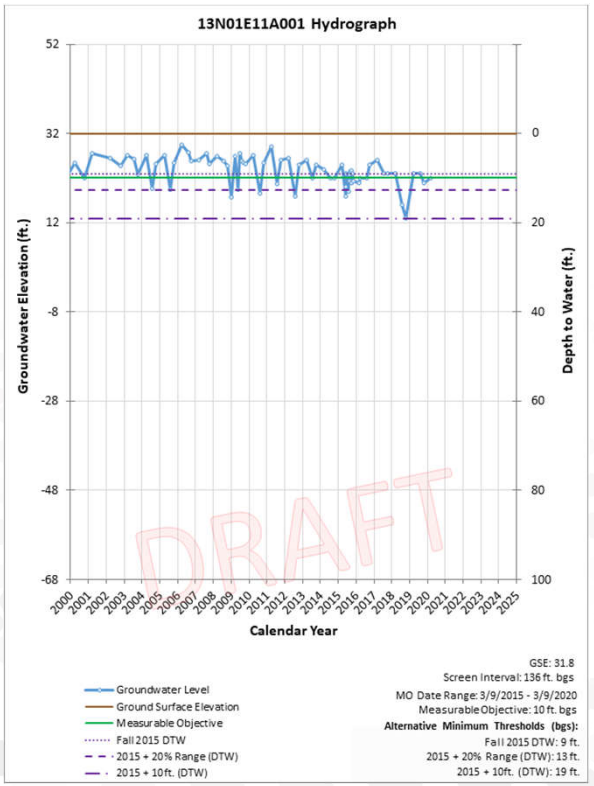


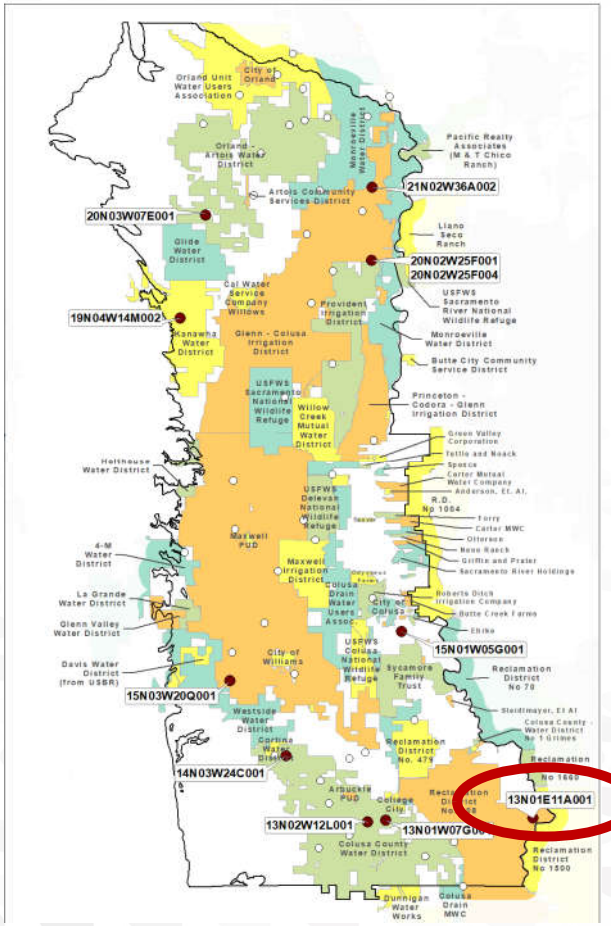
Comparison of MTs: RD108

Groundwater Level MTs



Interconnected Surface Water MTs





Technical Team Draft Recommendation for Interconnected Surface Water MTs and MOs

- Alternative MTs:
  1. The observed Fall 2015 groundwater level
  2. 20% of the historical range in groundwater levels below the observed Fall 2015 groundwater level (depth to water)
  3. 10 feet below the observed Fall 2015 groundwater level (depth to water)
- MO = Set as the mean of last 5 years available measurements; not a five-year rolling average
- Undesirable Result:
  - 25% (2 to 3 of 11 representative monitoring wells) fall below the minimum threshold for 24 consecutive months (same rationale as for lowering of groundwater levels)
- Data gaps and necessary improvements to the network will be documented in the GSP.

Draft Proposed Action (for June 11)

The Joint TAC recommends that the GSA Boards adopt minimum thresholds and measurable objectives as described on the previous slide for the depletion of interconnected surface water sustainability indicator.

Discussion

4.b. Projects and Management Actions (PMAs)

PMAs Updates and Discussion Items

- PMA schedule and process
- Modeling of westside in-lieu recharge projects
- Demand reduction economic analysis
- Westside watersheds (time permitting)

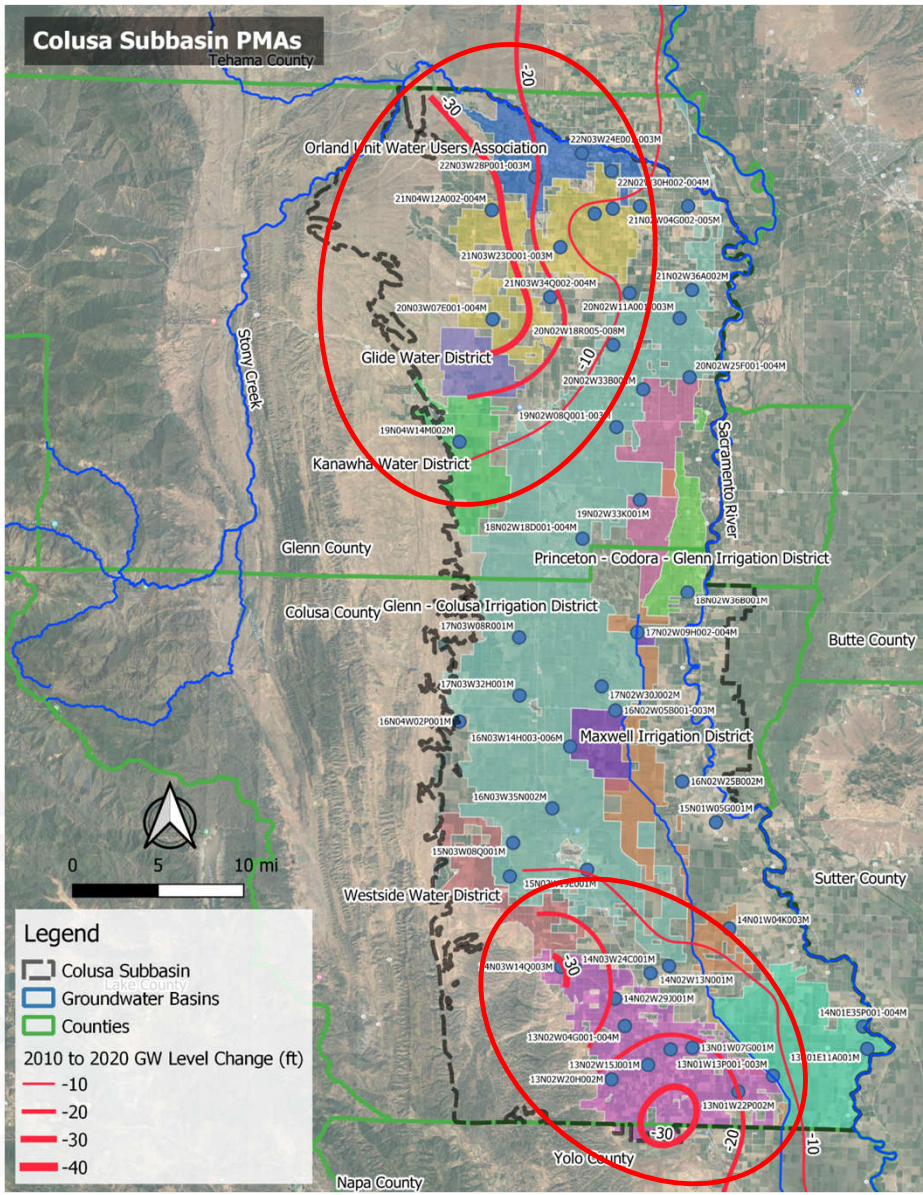
PMA Submittal Schedule and Process

- June 18 submittal cutoff for July 16 draft Chapter 6
- August 2 submittal cutoff for August 31 draft GSP
- PMAs submitted after cutoff dates will be added to list
  - Must pass technical screening
  - Described in lesser detail
  - Sponsors encouraged to provide as much detail as possible
- Ongoing opportunities over 20-year GSP implementation period to add PMAs
  - Possible online PMA submittal process (like IRWM process)
    - TAC review/screening
    - GSA Board approval
  - Periodic list updates to incorporate approved PMAs
- Bottom line: the door remains continuously open to PMAs

Modeling of Westside In-Lieu Recharge Projects

Areas with Sustainability Concerns

- Orland-Willows Westside
- Williams-Arbuckle Westside



Average 2010 to 2020 change in GW level. Source: https://sgma.water.ca.gov/webgis/?appid=SGMADataViewer#gwlevels

Westside In-Lieu Recharge Projects

- OAWD In-lieu Recharge: additional 25TAF/yr SW in all but critical years (annual average 20 TAF/yr)
- CCWD In-lieu Recharge: additional 30TAF/yr SW in all but critical years (annual average 24 TAF/yr)
- Basis for comparison: 50-year projected future conditions with 2070 climate change
  - Without projects (baseline)
  - With projects
  - Focus on net recharge

Preliminary OAWD Water Budget Results: Average Annual Volumes in AF

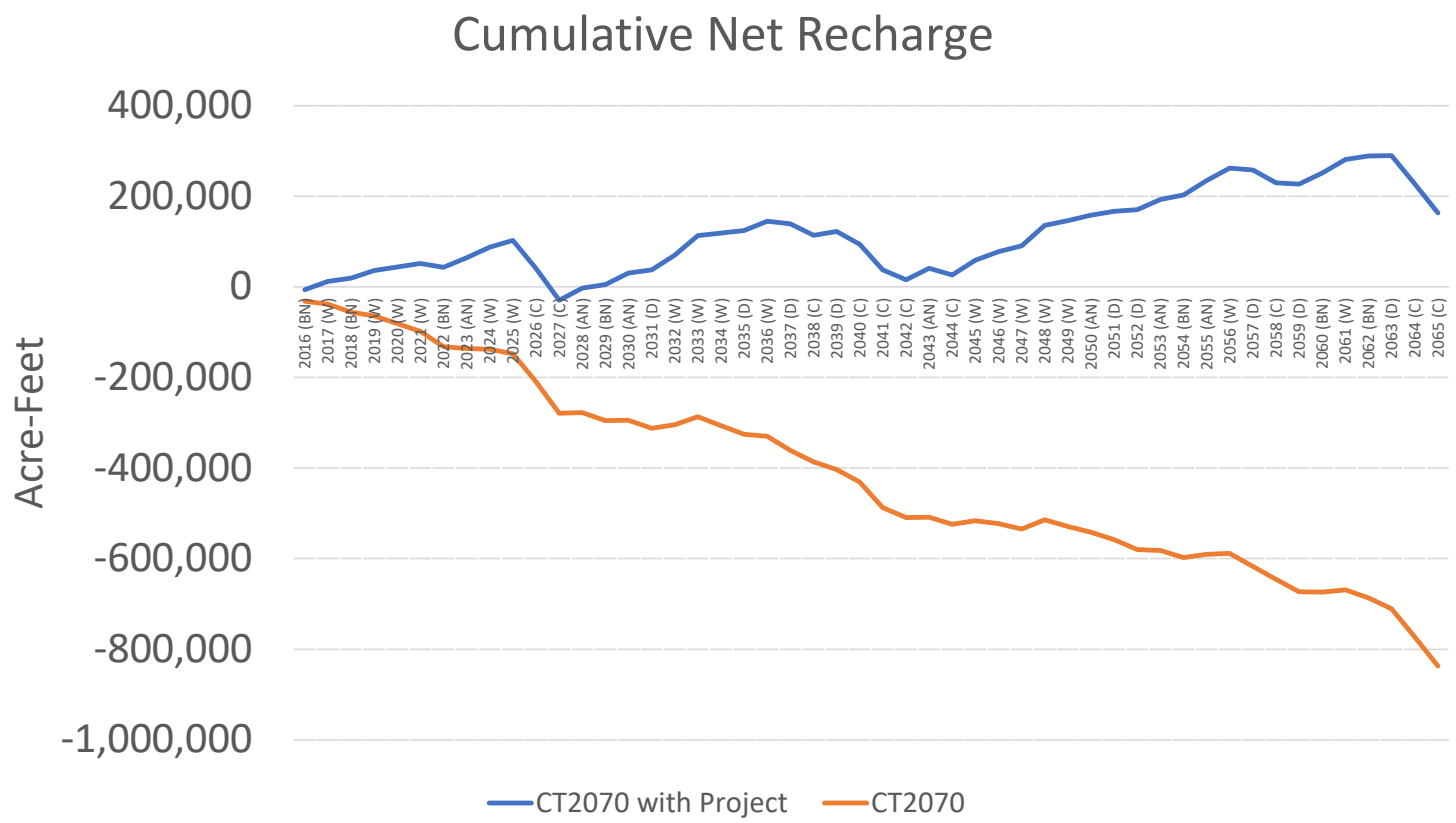
Surface Water System

Condition	SW Diversions	GW Pumping	Percolation	Net Recharge
2016-2065 with 2070 Climate Change (Baseline Without Project)	48,026	62,067	45,324	-16,742
2016-2065 Baseline with 2070 Climate Change with Project	68,025	42,047	45,314	3,267
Difference	19,999	-20,020	-10	20,010

Groundwater System

Condition	Percolation	Subsurface Inflow (net)	Groundwater Pumping	Change in Storage
2016-2065 with 2070 Climate Change (Baseline Without Project)	45,331	15,671	62,067	-1,064
2016-2065 Baseline with 2070 Climate Change with Project	45,321	-3,479	42,047	-205
Difference	-10	-19,150	-20,020	860

Preliminary OAWD Cumulative Net Recharge (2016-2050)



Preliminary CCWD Water Budget Results: Average Annual Volumes in AF

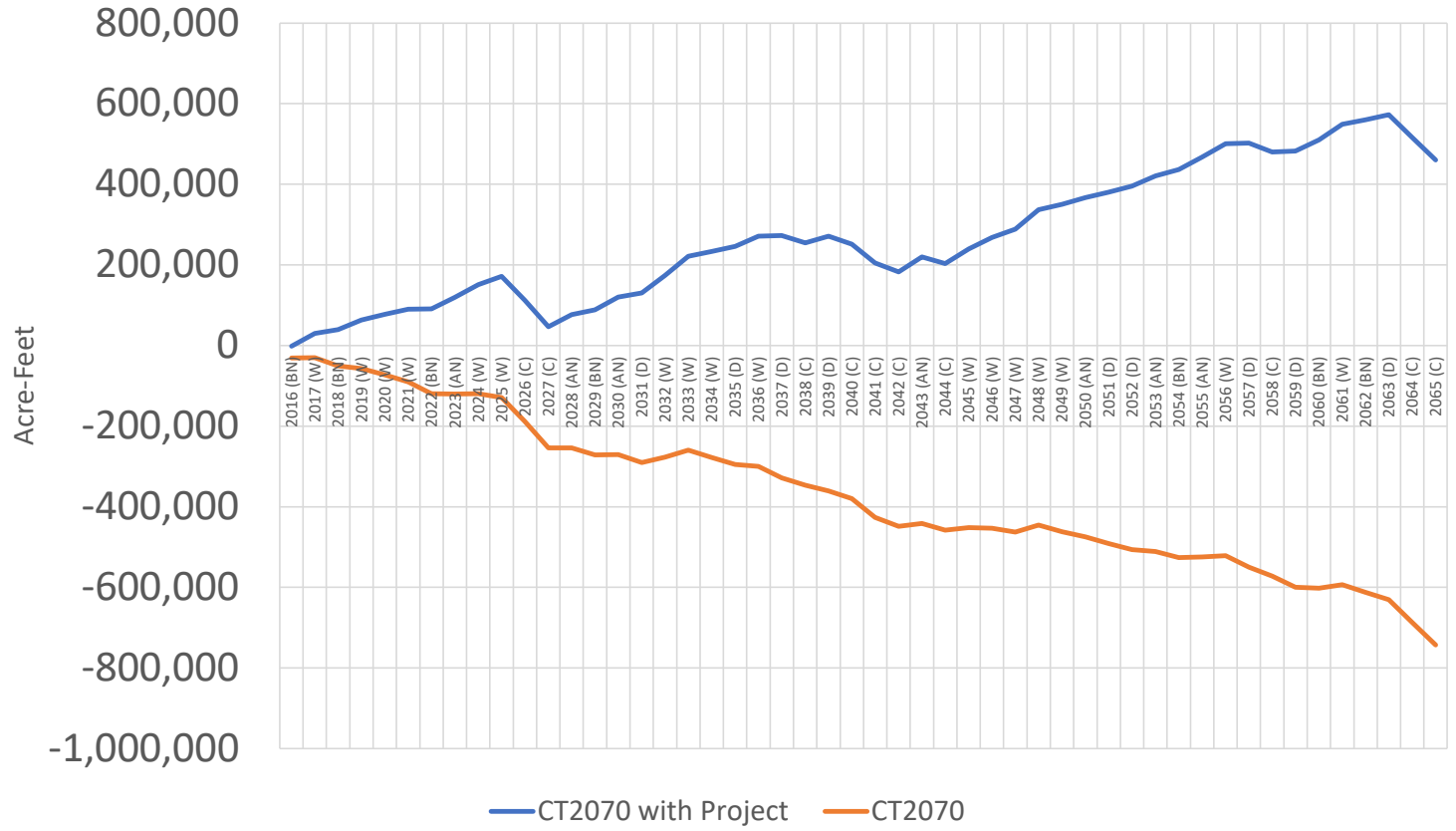
Surface Water System

Condition	Surface Water Diversions	Groundwater Pumping	Percolation	Net Recharge
2016-2065 with 2070 Climate Change (Baseline Without Project)	65,859	63,314	48,460	-14,854
2016-2065 Baseline with 2070 Climate Change with Project	89,859	39,220	48,417	9,198
Difference	24,000	-24,095	-43	24,052

Groundwater System

Condition	Percolation	Subsurface Inflow (net)	Groundwater Pumping	Change in Storage
2016-2065 with 2070 Climate Change (Baseline Without Project)	48,541	13,297	63,314	-1,476
2016-2065 Baseline with 2070 Climate Change with Project	48,498	-9,507	39,220	-228
Difference	-43	-22,804	-24,095	1,248

Preliminary CCWD Cumulative Net Recharge (2016-2050)



Preliminary Observations Regarding Westside In-Lieu Recharge Projects

- Projects provide substantial benefits to groundwater conditions
- Benefits accrue within and adjoining the recharge area
- Additional evaluation
  - Effects on groundwater levels
  - Effects on streamflow depletion
  - Surface water availability
  - Economics

Demand Management Economic Analysis

Demand Management Economic Analysis

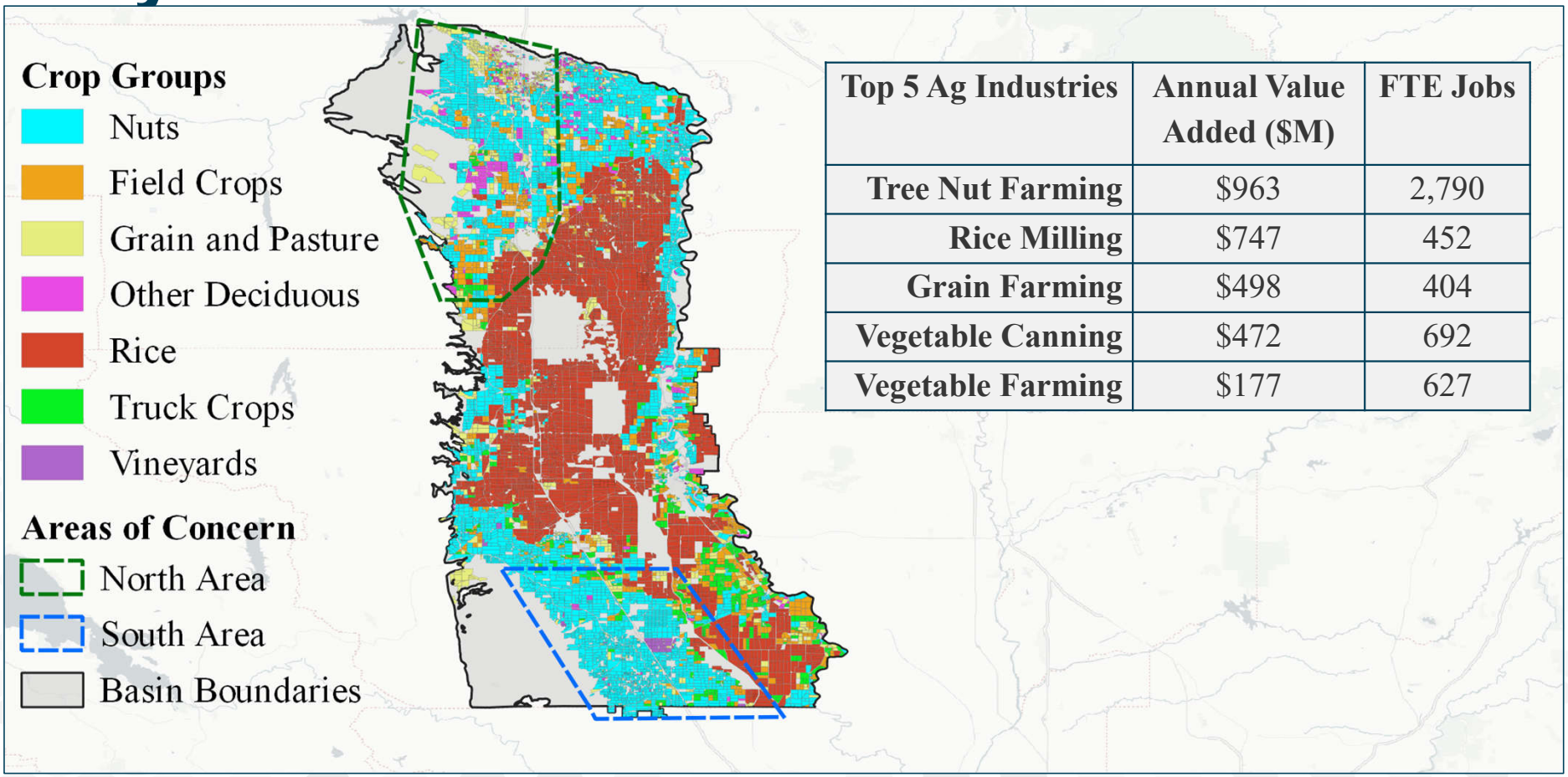
- Allocation (pumping limits)
- Allocation + water market
- Land repurposing programs
- Fees/financial incentive programs

- An economic analysis was developed to establish the cost of a general demand management program in the Colusa Subbasin under two example scenarios

Demand Management Costs

- The following scenarios were developed for the Colusa Subbasin:
  1. Demand management targeted broadly across the entire Subbasin
  2. Demand management targeted to two specific regions, near OAWD and CCWD areas
- Each scenario considers a generic demand management program that would reduce crop ETAW, without specifying program details
  - Costs are for temporary (annual) demand reduction
- The cost of demand management is defined as the loss in net return to farming, expressed on a per AF basis
  - Net returns reflect current crop market conditions
  - Secondary impacts are not considered
  - The administrative cost of a demand management program is not considered

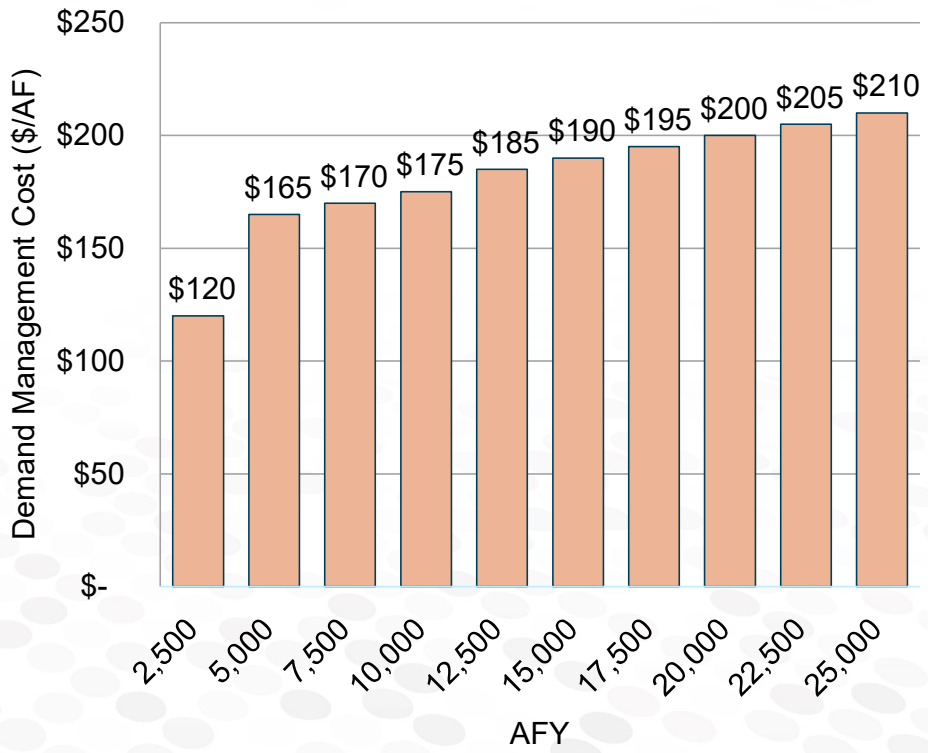
Colusa Subbasin Demand Management Analysis



Top 5 Ag Industries	Annual Value Added ($M)	FTE Jobs
Tree Nut Farming	$963	2,790
Rice Milling	$747	452
Grain Farming	$498	404
Vegetable Canning	$472	692
Vegetable Farming	$177	627

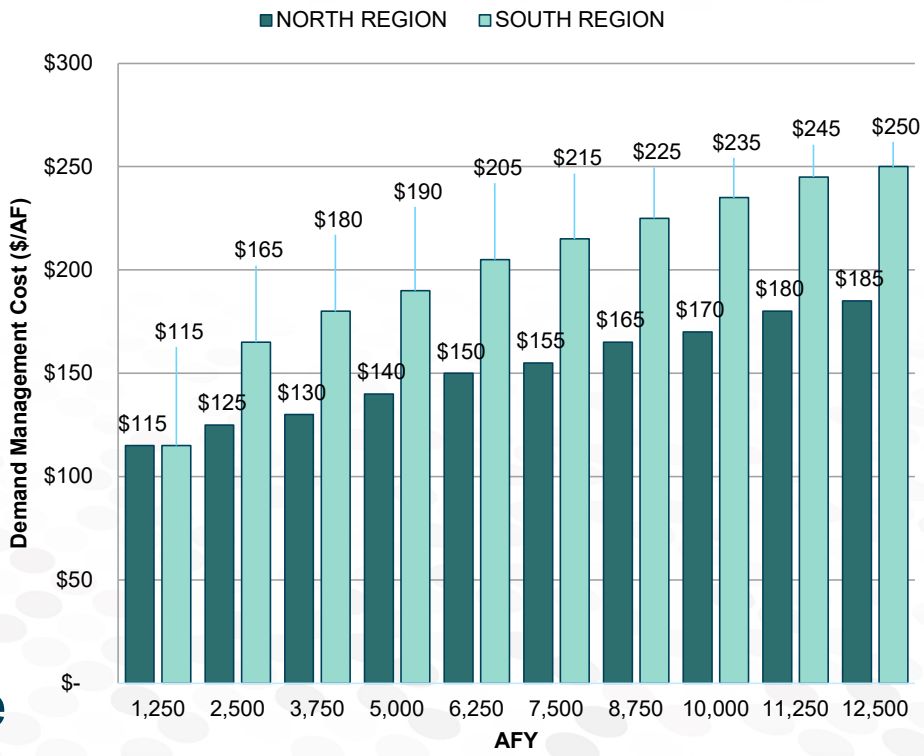
Subbasin-wide Demand Management

- Demand management applied to the entire Subbasin
- Hypothetical range from 2,500 to 25,000 AFY
  - Costs increase from $120 to just over $200 per AF
- Costs reflect the lowest loss in net return under current market conditions



Demand Management Applied to North and South Regions

- Demand management applied to northern and southern regions (individual)
- Hypothetical range from 1,250 to 12,500 AFY
  - Costs increase from $115 to $250 per AF in the southern area and up to $185 per AF in the northern area
- Cost difference illustrates the variability in the value of water (cost of demand management) across the Colusa Subbasin



Demand Management Summary

- The cost of demand management in the Colusa Subbasin depends on the timing, location, and scale of such a program
- Since a demand management program is not being considered at this time, two scenarios were developed to illustrate the range of costs to support broader evaluation of PMAs
- Demand management costs for a program that would reduce groundwater pumping by up to 25,000 AFY are between $115 and $250 per AF
  - Demand management program costs increase with the scale of the program
  - Costs do not include program implementation or administration

Discussion

Westside Watersheds (time permitting)

Westside Watersheds

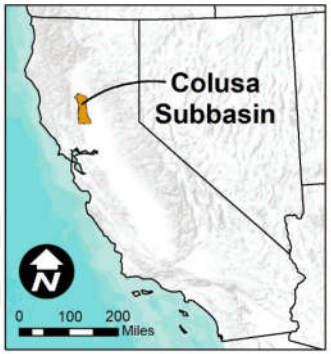
Map Features

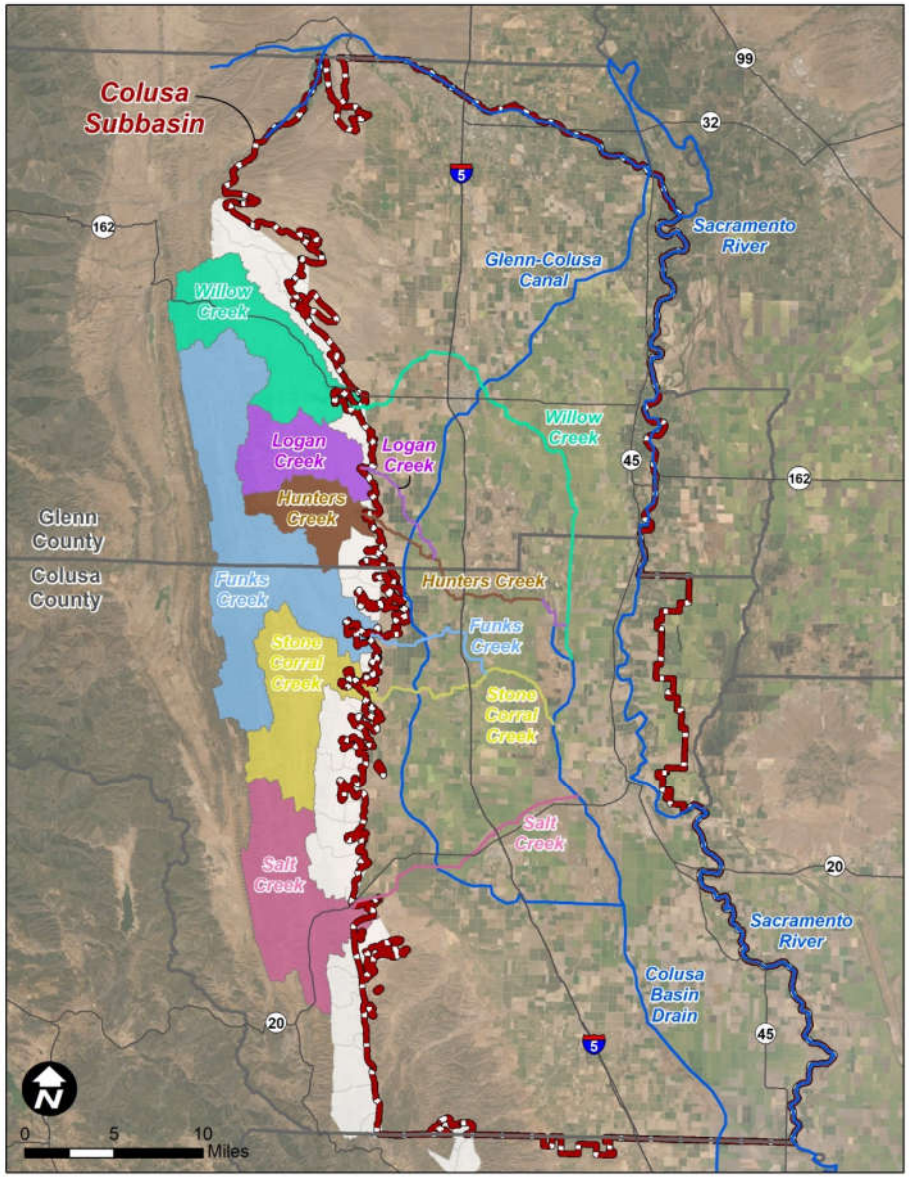
- Highways
- Primary Waterways
- County Boundaries
- Colusa Subbasin

Small Watersheds

- Willow Creek
- Logan Creek
- Hunters Creek
- Funks Creek
- Stone Corral Creek
- Salt Creek
- Other Small Watersheds
- Willow Creek Watershed
- Logan Creek Watershed
- Hunters Creek Watershed
- Funks Creek Watershed
- Stone Corral Creek Watershed
- Salt Creek Watershed

Creek Name	Watershed Area (ac)
Hunters Creek	12,417
Logan Creek	16,223
Stone Corral Creek	25,995
Willow Creek	28,515
Salt Creek	30,894
Funks Creek	56,812

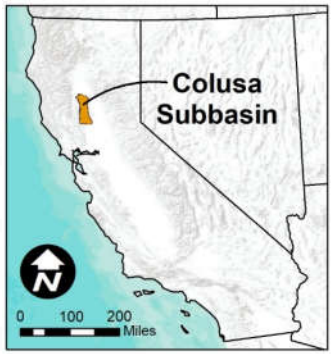




5/13/2021

Westside Watersheds

Creek Name	Watershed Area (ac)
Hunters Creek	12,417
Logan Creek	16,223
Stone Corral Creek	25,995
Willow Creek	28,515
Salt Creek	30,894
Funks Creek	56,812

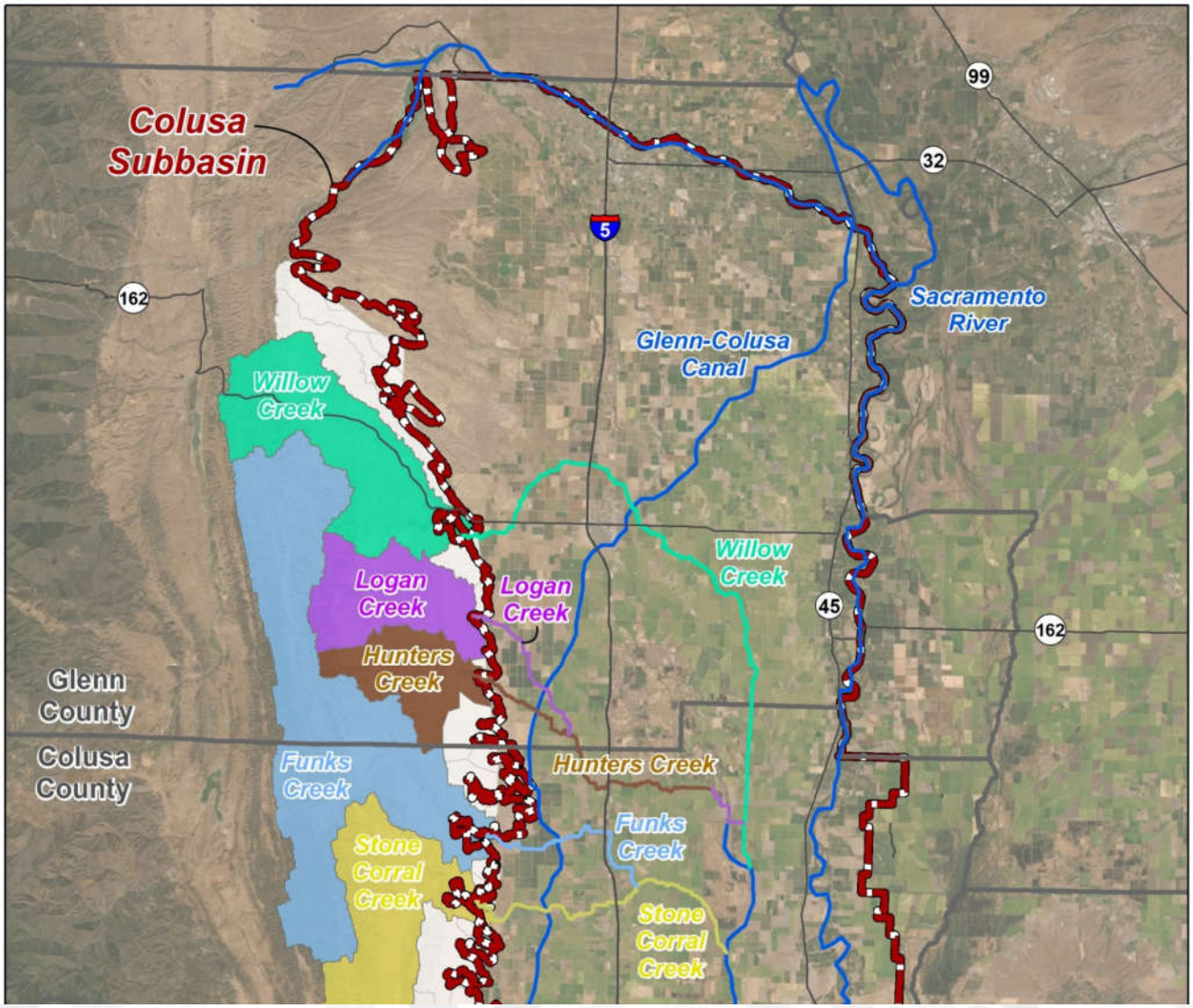


Map Features

- Highways
- Primary Waterways
- County Boundaries
- Colusa Subbasin

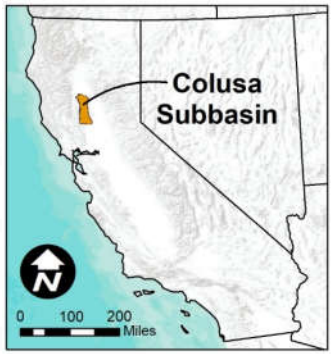
Small Watersheds

- Willow Creek
- Logan Creek
- Hunters Creek
- Funks Creek
- Stone Corral Creek
- Salt Creek
- Other Small Watersheds
- Willow Creek Watershed
- Logan Creek Watershed
- Hunters Creek Watershed
- Funks Creek Watershed
- Stone Corral Creek Watershed
- Salt Creek Watershed



Westside Watersheds

Creek Name	Watershed Area (ac)
Hunters Creek	12,417
Logan Creek	16,223
Stone Corral Creek	25,995
Willow Creek	28,515
Salt Creek	30,894
Funks Creek	56,812

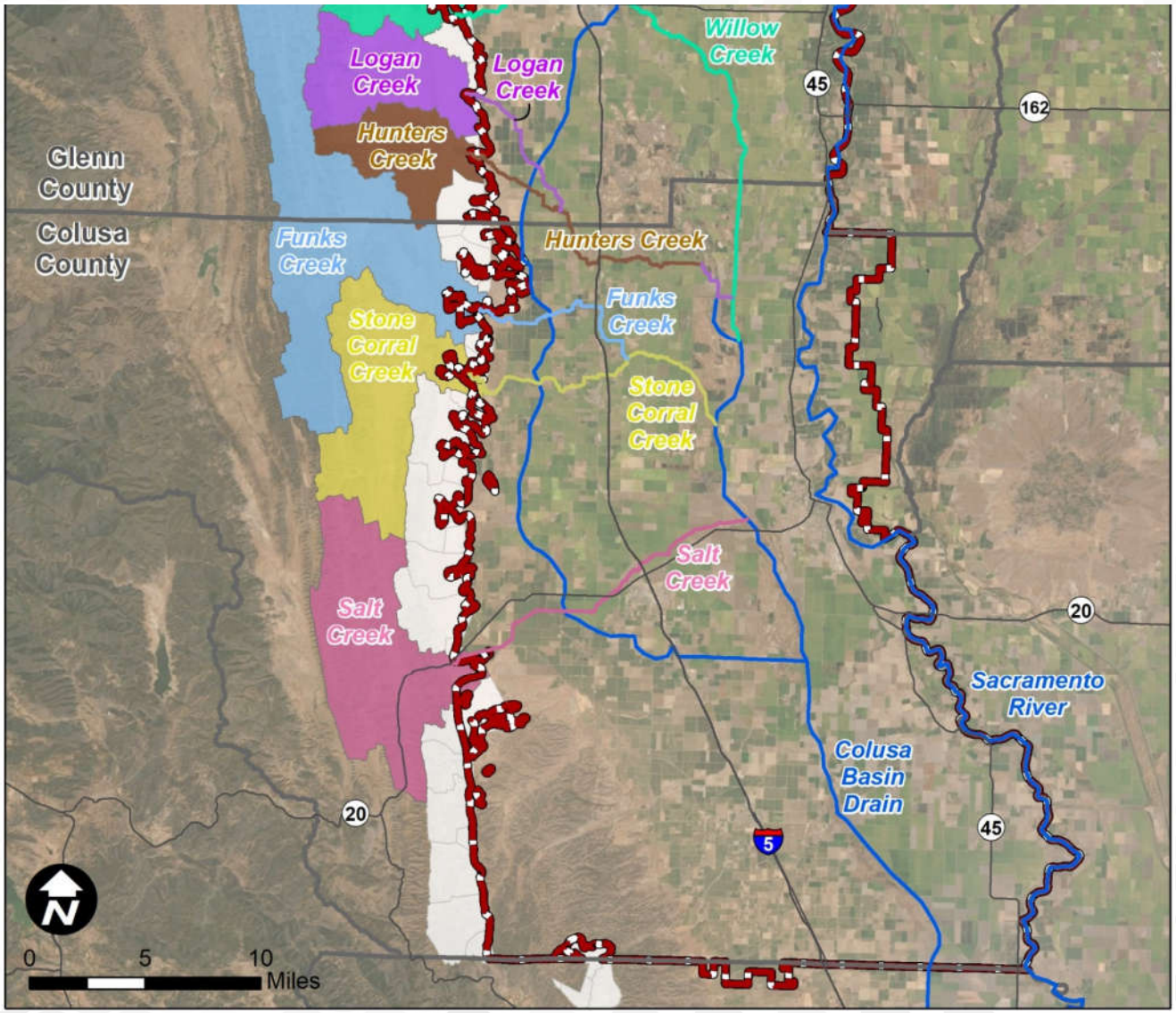


Map Features

- Highways
- Primary Waterways
- County Boundaries
- Colusa Subbasin

Small Watersheds

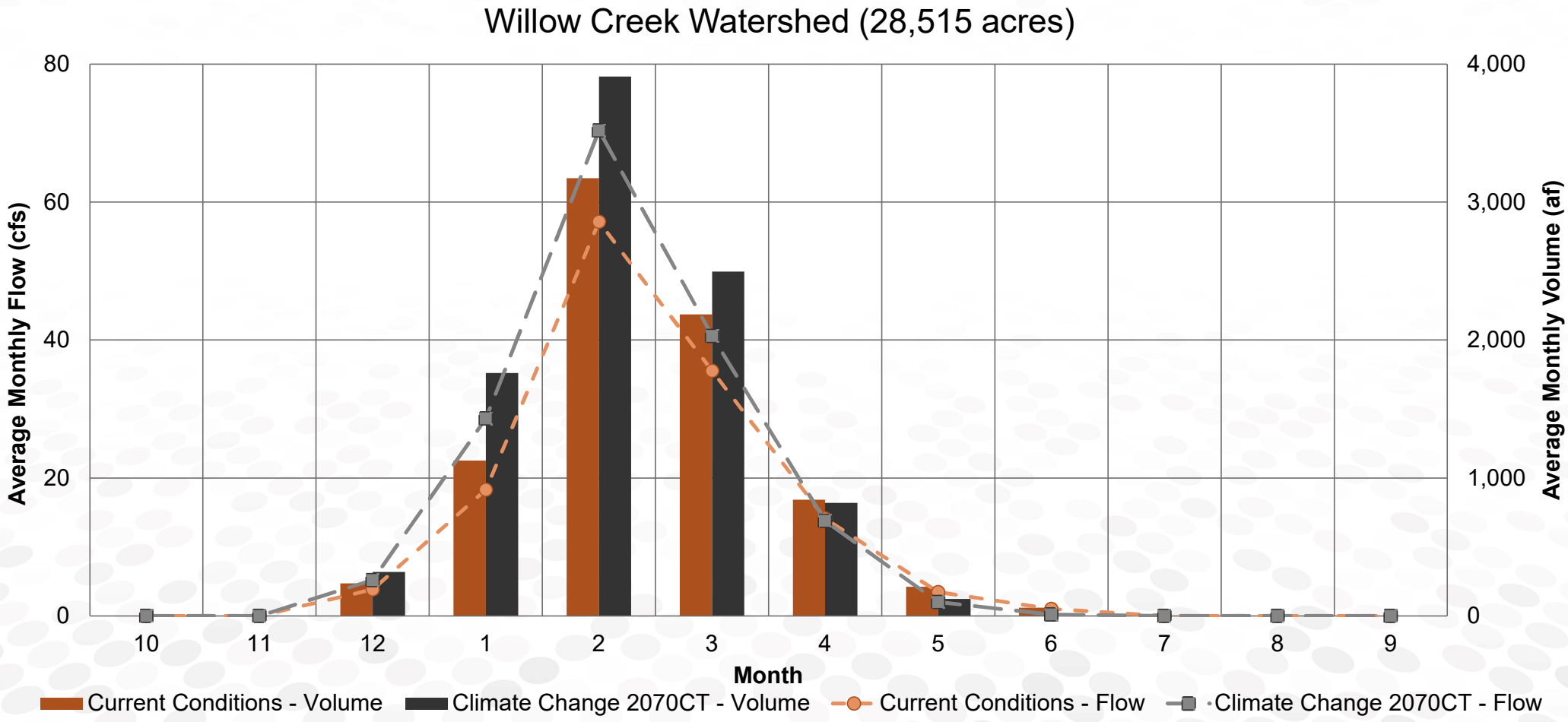
- Willow Creek
- Logan Creek
- Hunters Creek
- Funks Creek
- Stone Corral Creek
- Salt Creek
- Other Small Watersheds
- Willow Creek Watershed
- Logan Creek Watershed
- Hunters Creek Watershed
- Funks Creek Watershed
- Stone Corral Creek Watershed
- Salt Creek Watershed



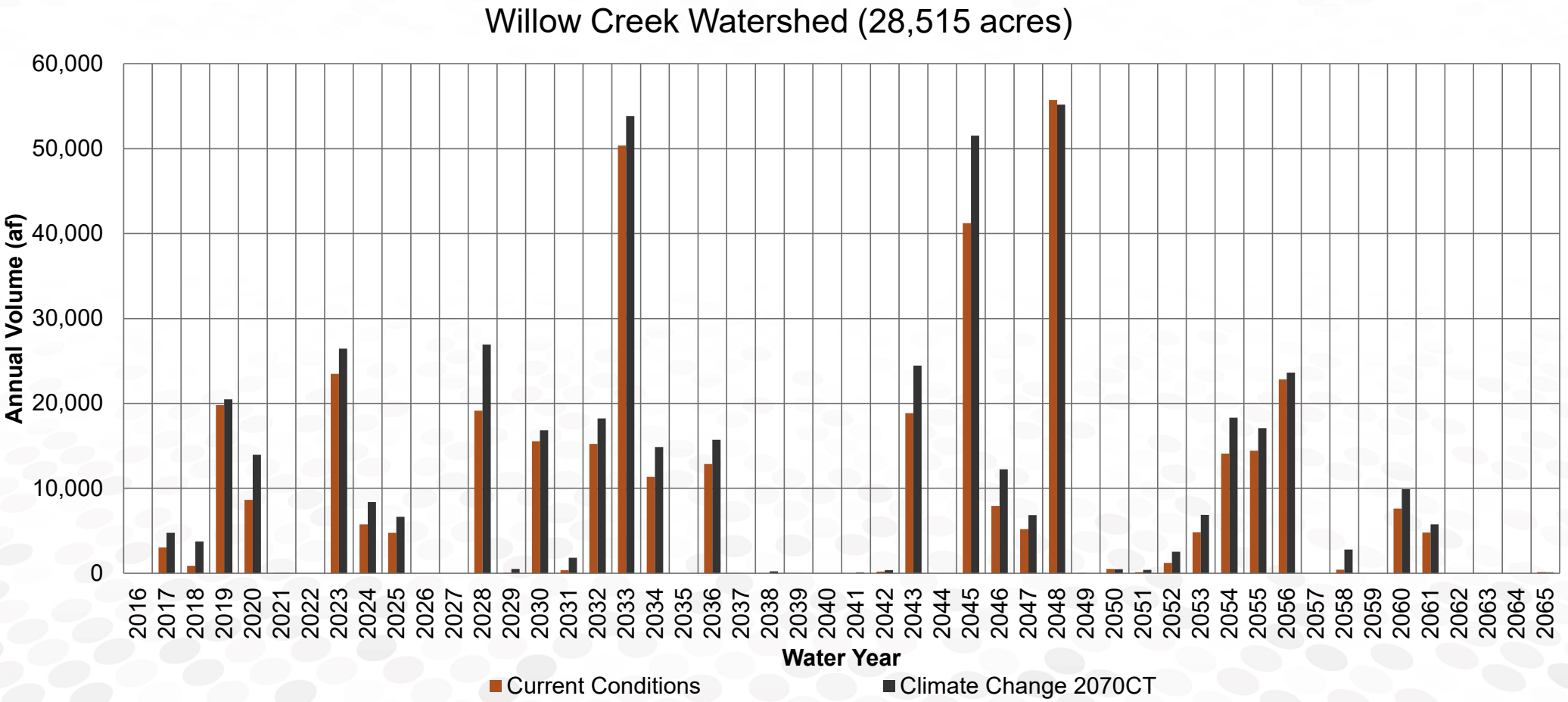
Westside Watersheds

- Very little measured flow data
- Used simulated rainfall-runoff from C2VSimFG-Colusa model for analysis

Westside Watersheds



Westside Watersheds



Westside Watersheds

Total volume available for recharge from all six watersheds, based on assumed maximum flow thresholds using average monthly flow (i.e. flows above the threshold will not be diverted).

Current Conditions

Maximum Flow Threshold	December	January	February	March	April	May	June	**Total**
Flow = 20 cfs	286	589	386	523	459	324	68	**2,635**
Flow = 40 cfs	406	1,266	979	1,575	1,281	507	68	**6,082**
Flow = 60 cfs	406	1,817	1,590	2,770	1,854	628	181	**9,246**
Flow = 80 cfs	499	2,571	1,970	3,699	2,432	708	181	**12,061**
Flow = 100 cfs	615	3,462	2,467	5,252	2,961	927	181	**15,865**

Future Conditions 2070 CT

Maximum Flow Threshold	December	January	February	March	April	May	June	**Total**
Flow = 20 cfs	286	543	424	610	383	152	26	**2,423**
Flow = 40 cfs	317	1,388	1,071	1,588	1,219	261	52	**5,895**
Flow = 60 cfs	382	1,859	1,517	2,417	1,934	261	52	**8,421**
Flow = 80 cfs	464	2,809	1,985	4,442	2,352	501	52	**12,605**
Flow = 100 cfs	464	3,595	3,128	5,665	2,876	501	52	**16,281**

Westside Watersheds Initial Observations

- Flow volumes are significant relative to needs to improve water budgets
- Timing of flows suitable for direct recharge, not in-lieu
- Potential further planning (potential PMAs)
  - Monitoring to characterize flows and sediment loads
  - Analysis of water rights
  - Recharge capacity near streams

Discussion

Topics for June 11, 2021 TAC Meeting

- Cap off SMC discussion
  - Final TAC decision on streamflow depletion MOs, MTs, and UR
- PMA Update
  - Current project list
  - Sample detailed project description
  - Sample simplified project description