COLUSA AND GLENN GROUNDWATER AUTHORITIES

Colusa Subbasin

Joint Technical Advisory Committee

GSP Development

May 19, 2021

Meeting Topics

- 4.a. Sustainable Management Criteria
  - 4.a.i. 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, 2021
    - Sustainability Indicator #1: Chronic Lowering of Groundwater Levels
- May 19 (Today):
  - TAC Decision on MOs, MTs and URs for Sustainability Indicator #6: Depletions of Interconnected Surface Water
  - June 11 meeting as a fallback
- 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.

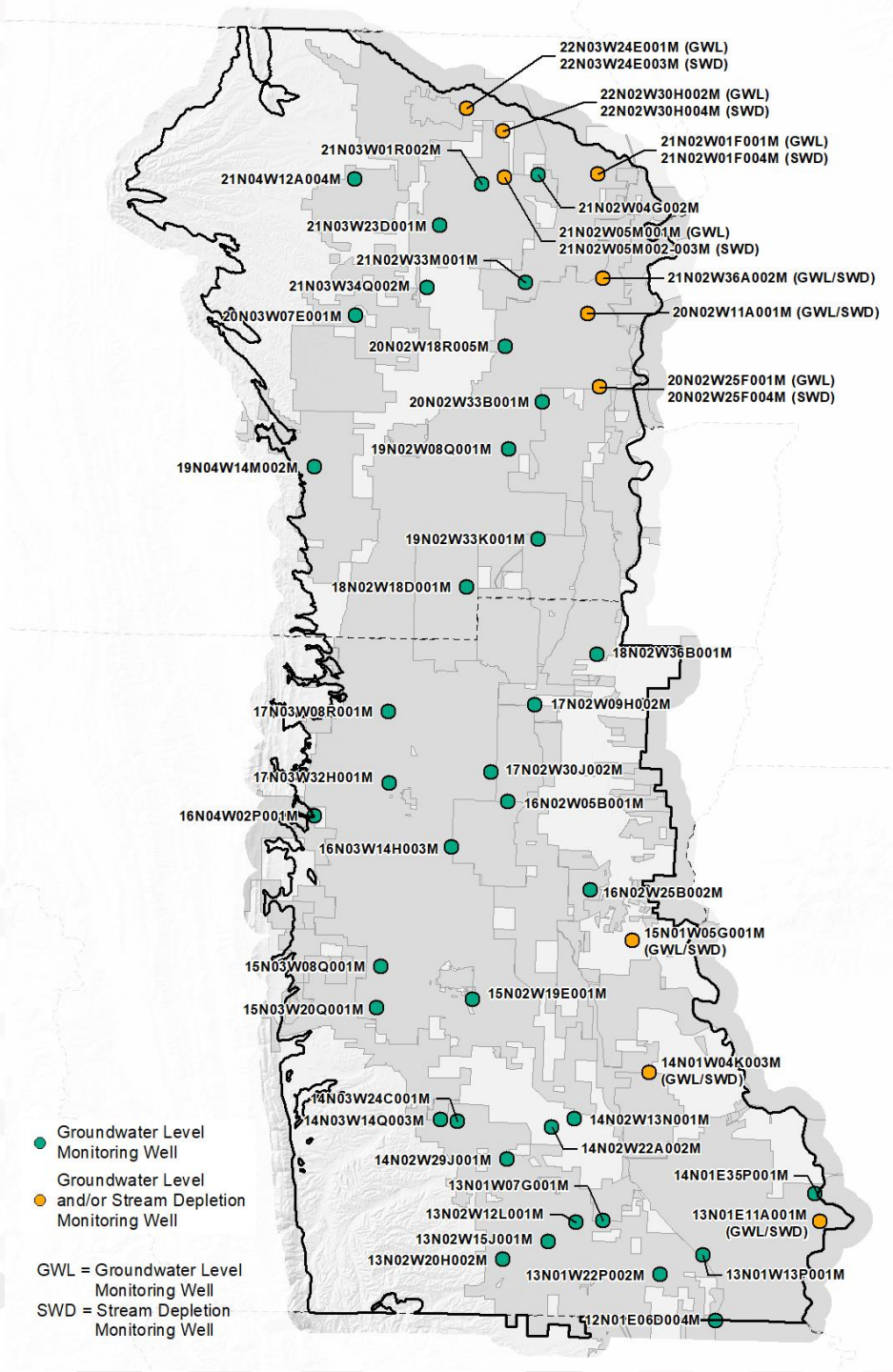
4.a.i. Sustainability Indicator #6: Depletions of Interconnected Surface Water

Technical Team Draft Recommendation for Interconnected Surface Water MOs and MTs

- Measurable Objective = Calculated as the average of the most recent 5 years of available measurements; not a five-year rolling average
  - All data included (no deletions of low water levels due to temporary pumping)
- Alternative Minimum Thresholds:
  1. The observed Fall 2015 groundwater level (on the date closest to October 15), OR
  2. 20% of the historical range in groundwater levels below the observed Fall 2015 groundwater level (depth to water), OR
  3. 10 feet below the observed Fall 2015 groundwater level (depth to water), OR
  4. Some combination of 1-3.
- Undesirable Result:
  - 25% (3 of 10 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.

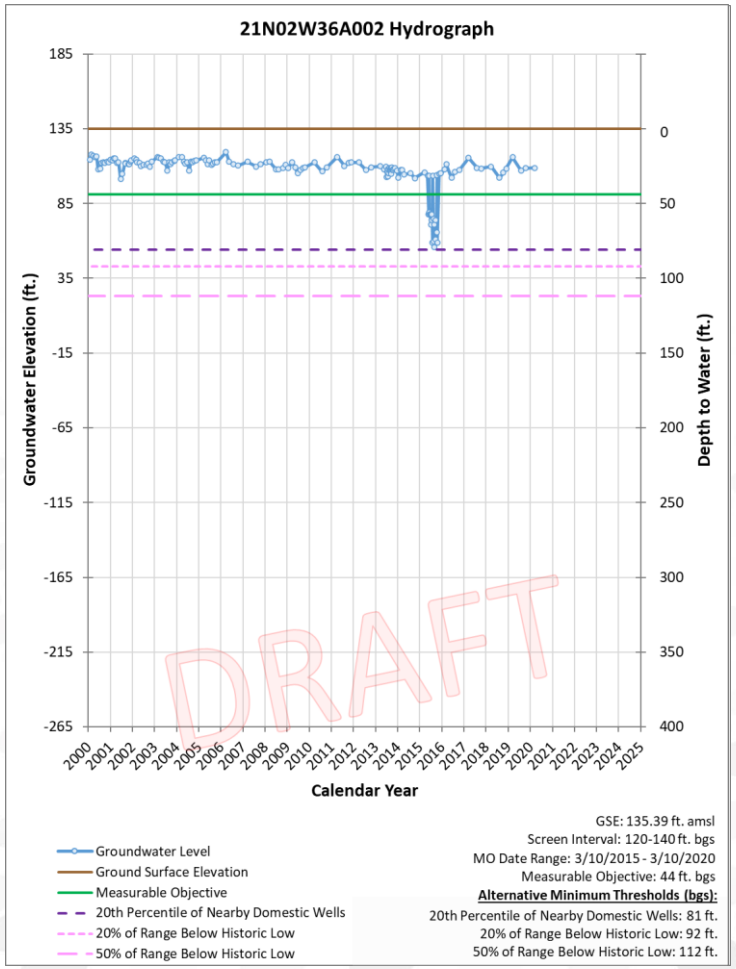
Interconnected Surface Water Monitoring Well Network

- Monitoring wells between 2,000 feet and five (5) miles from Interconnected Streams and less than 200 feet deep
- 10 qualifying wells (orange dots)
- Example wells shown on the following slides



Comparison of MTs: GCID

Groundwater Level MTs



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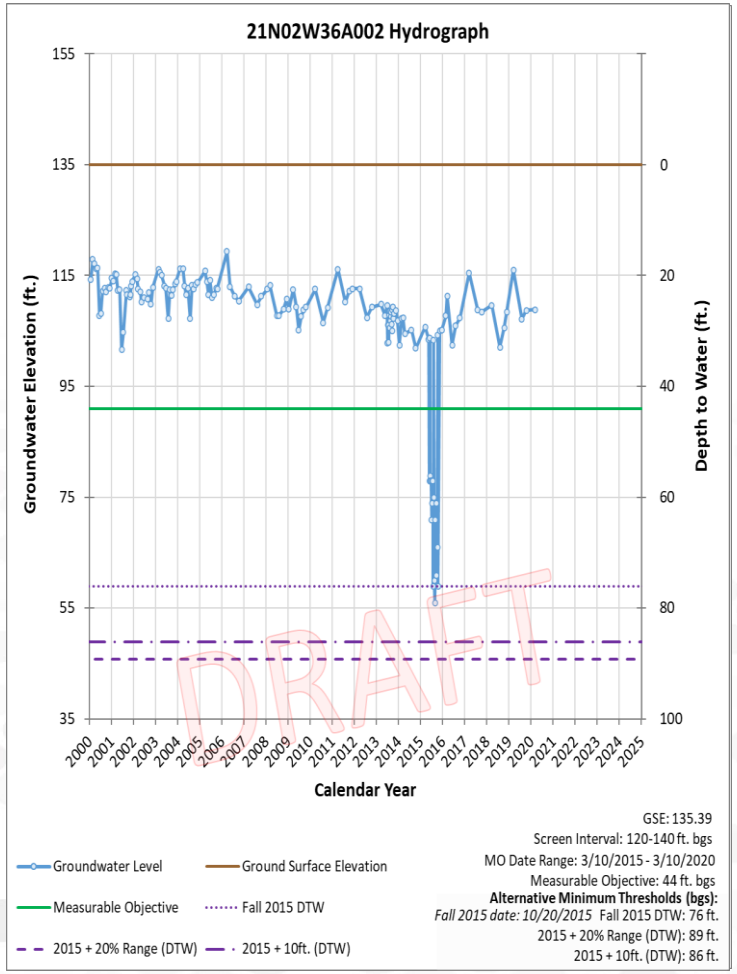

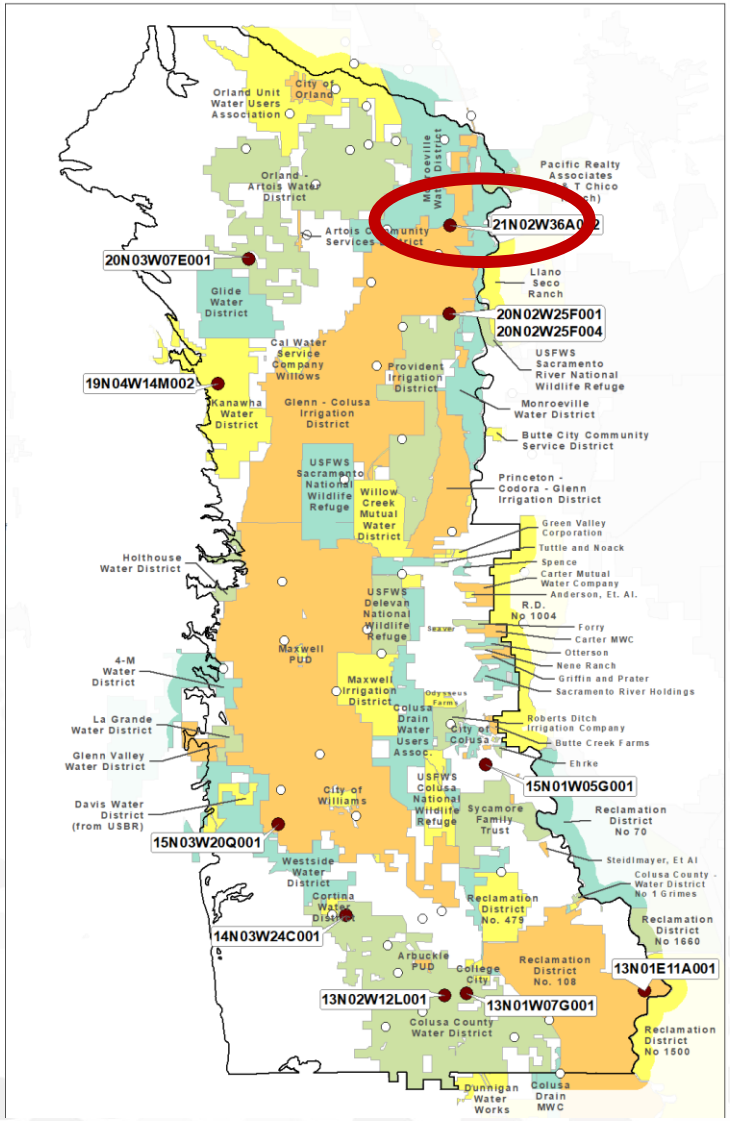

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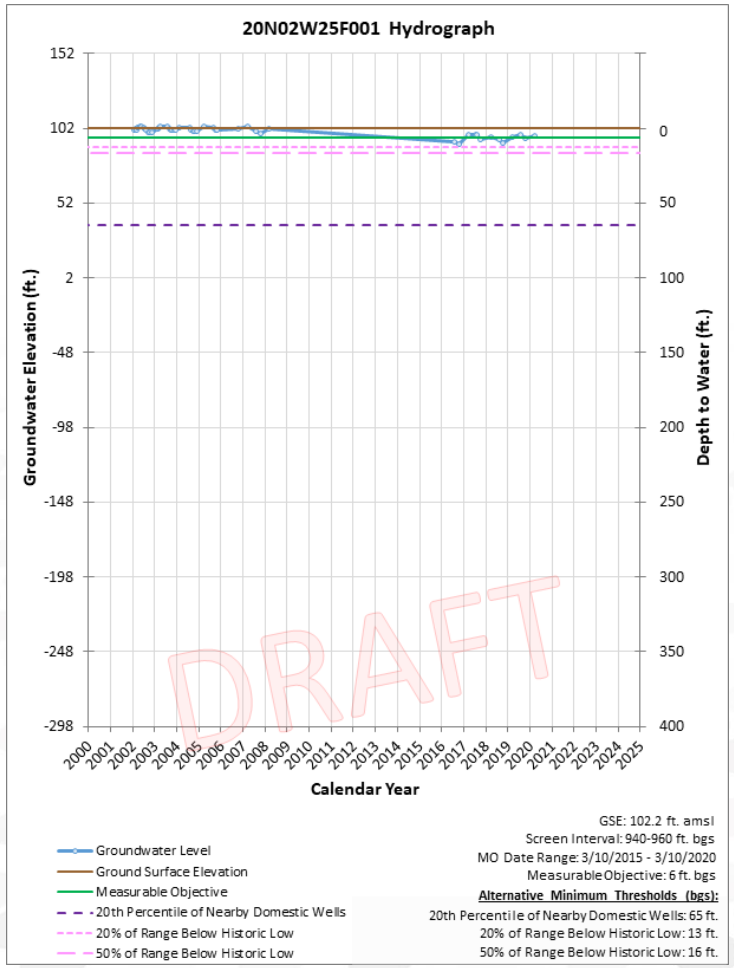

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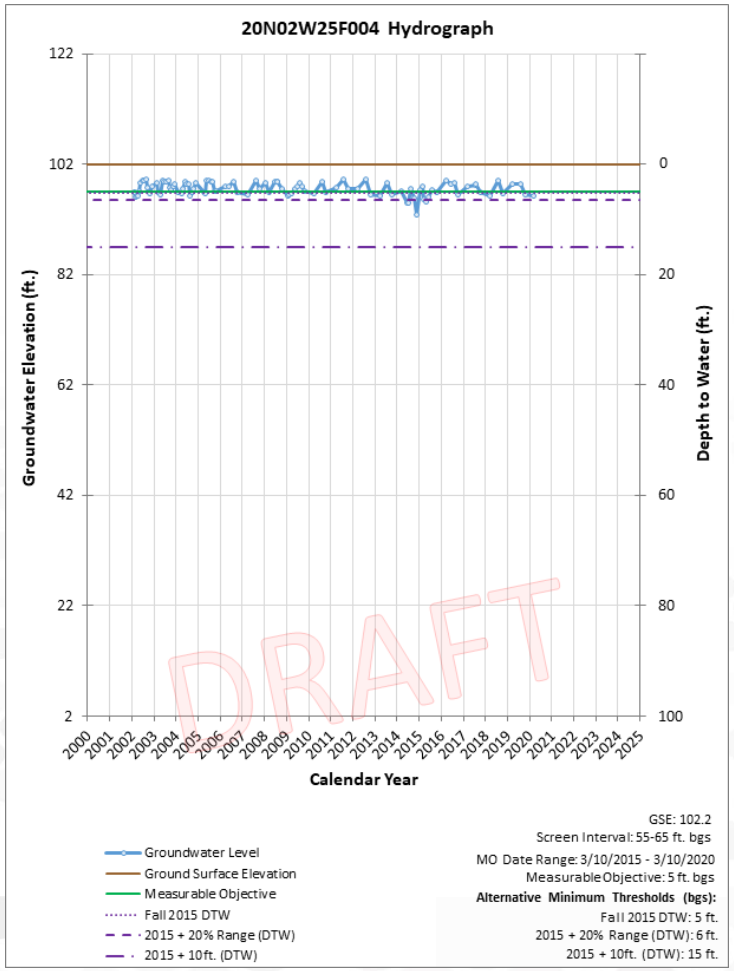
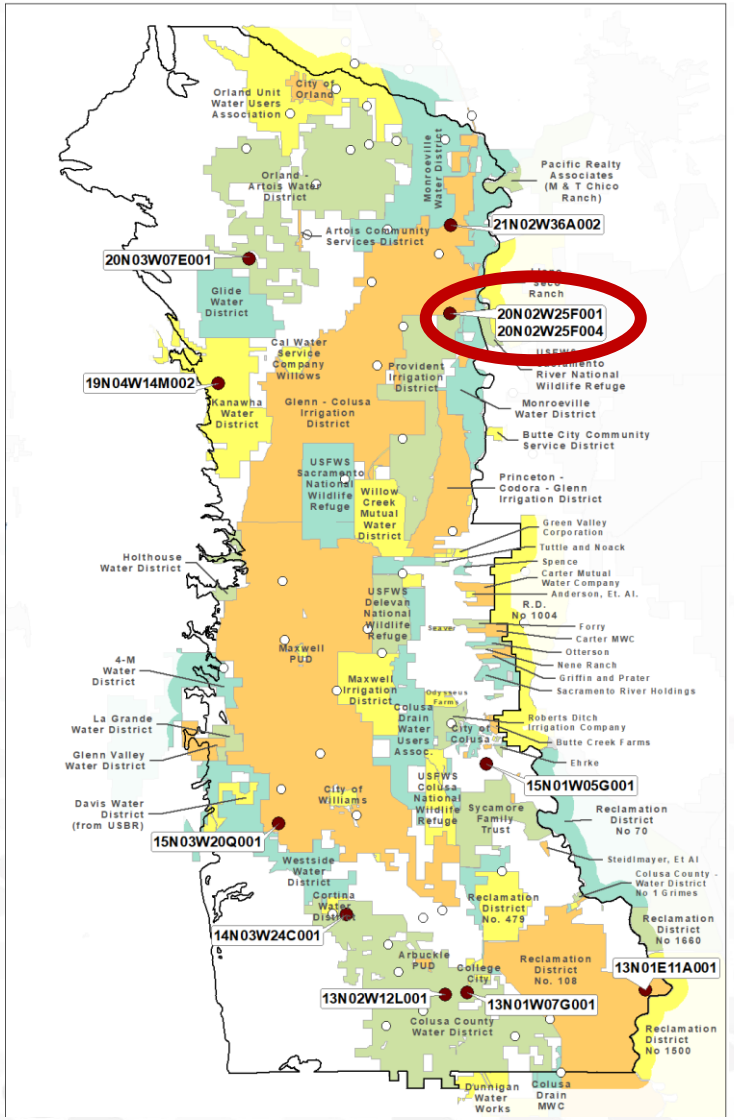
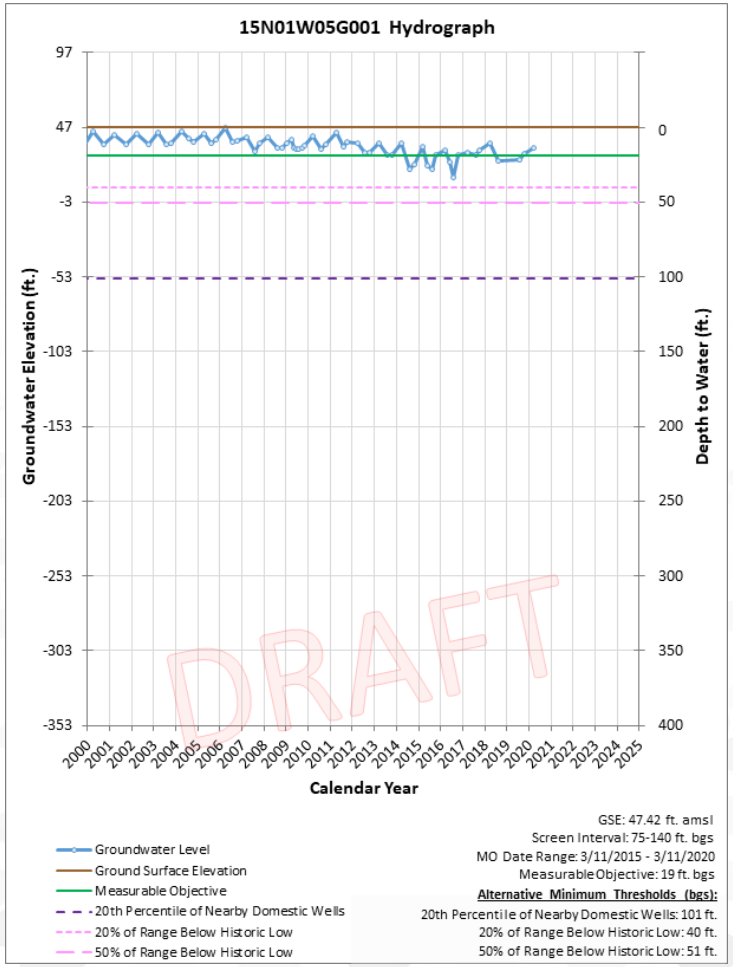




Comparison of MTs: Colusa County White Area

Groundwater Level MTs



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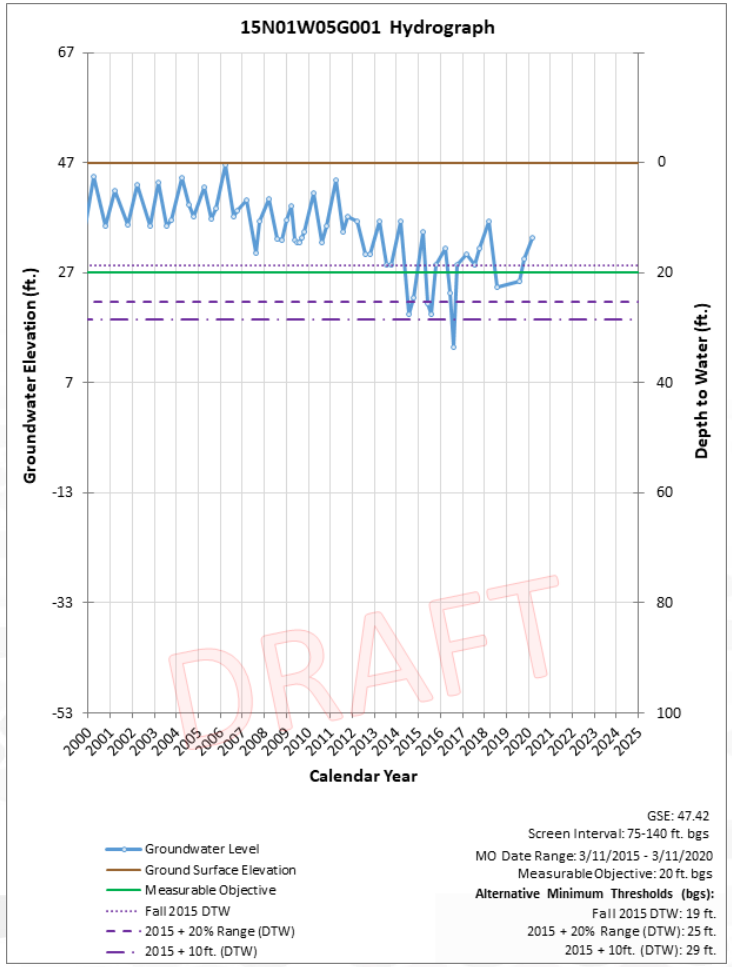
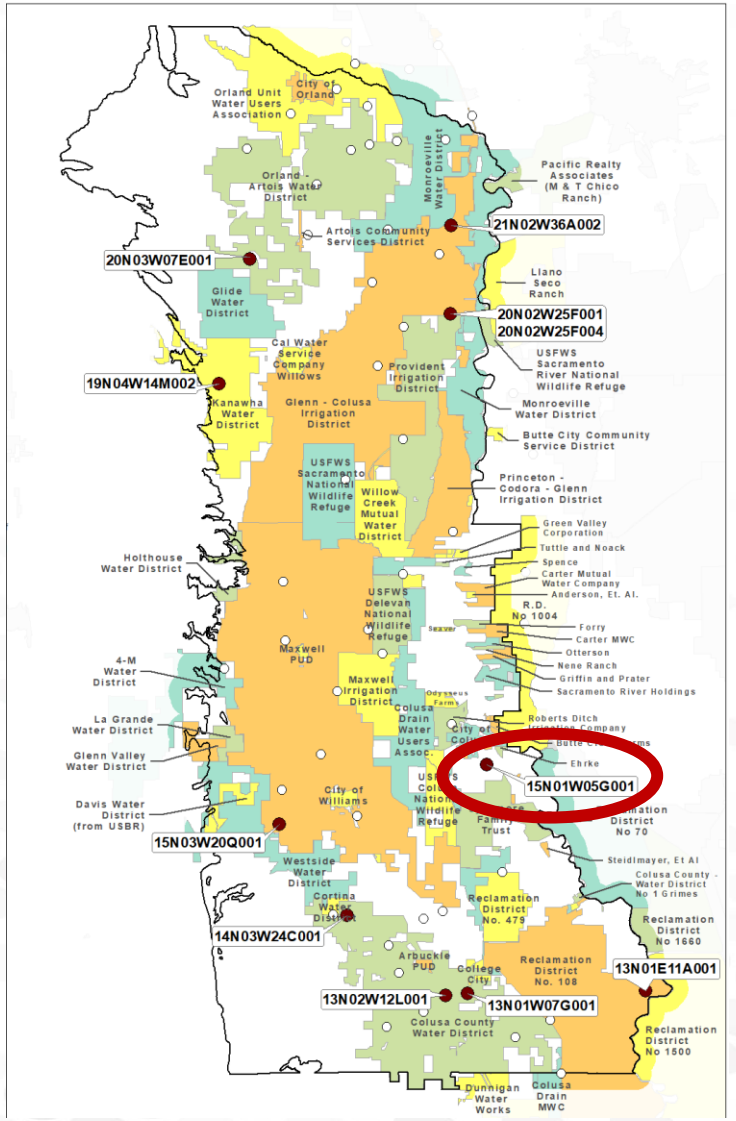
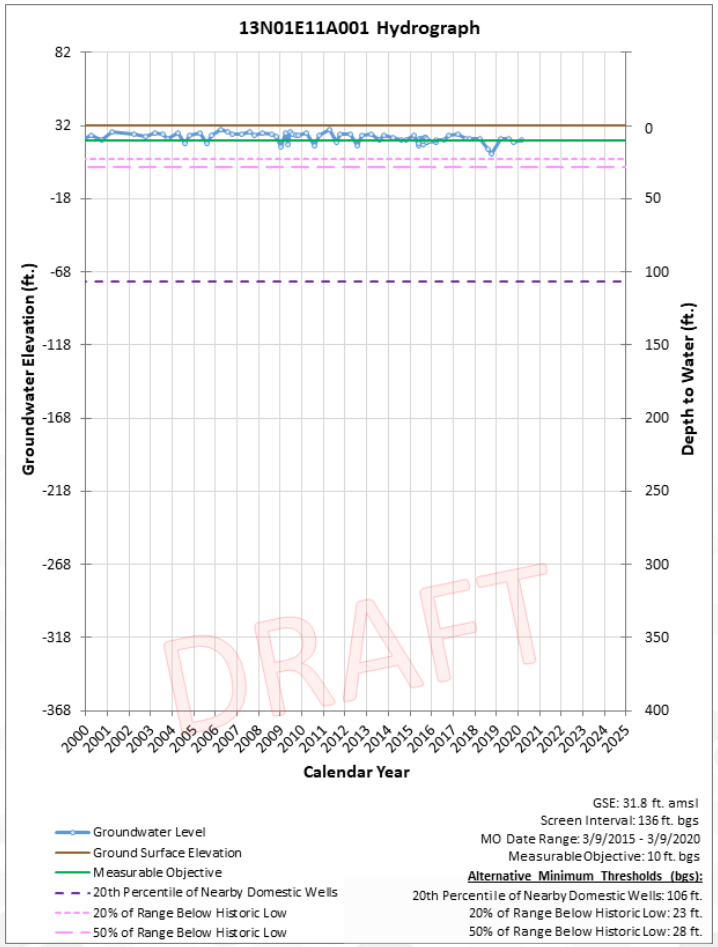




Comparison of MTs: RD108

Groundwater Level MTs



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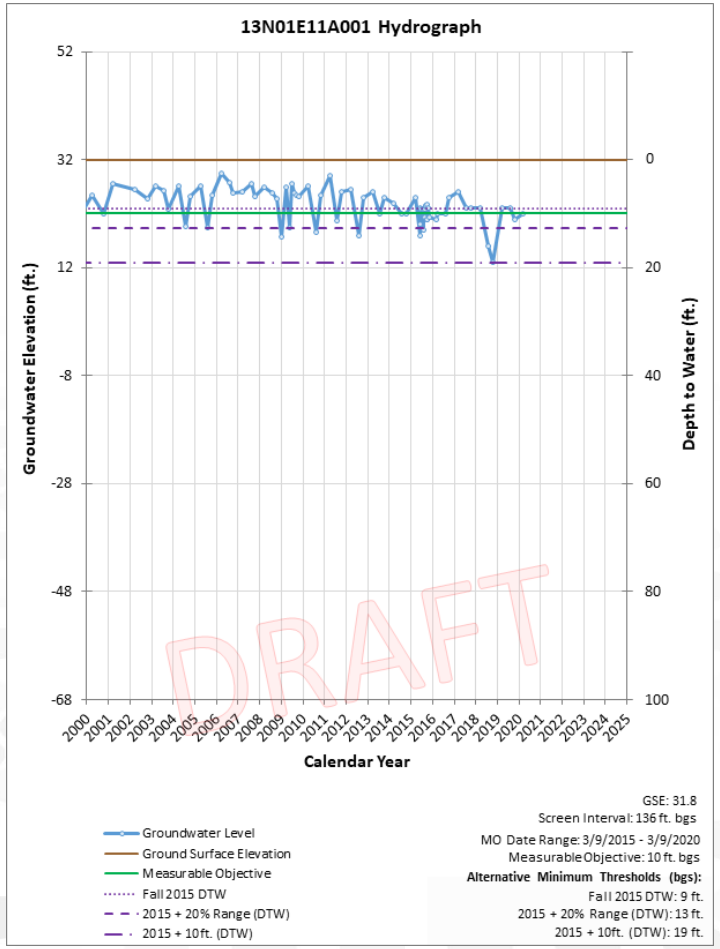

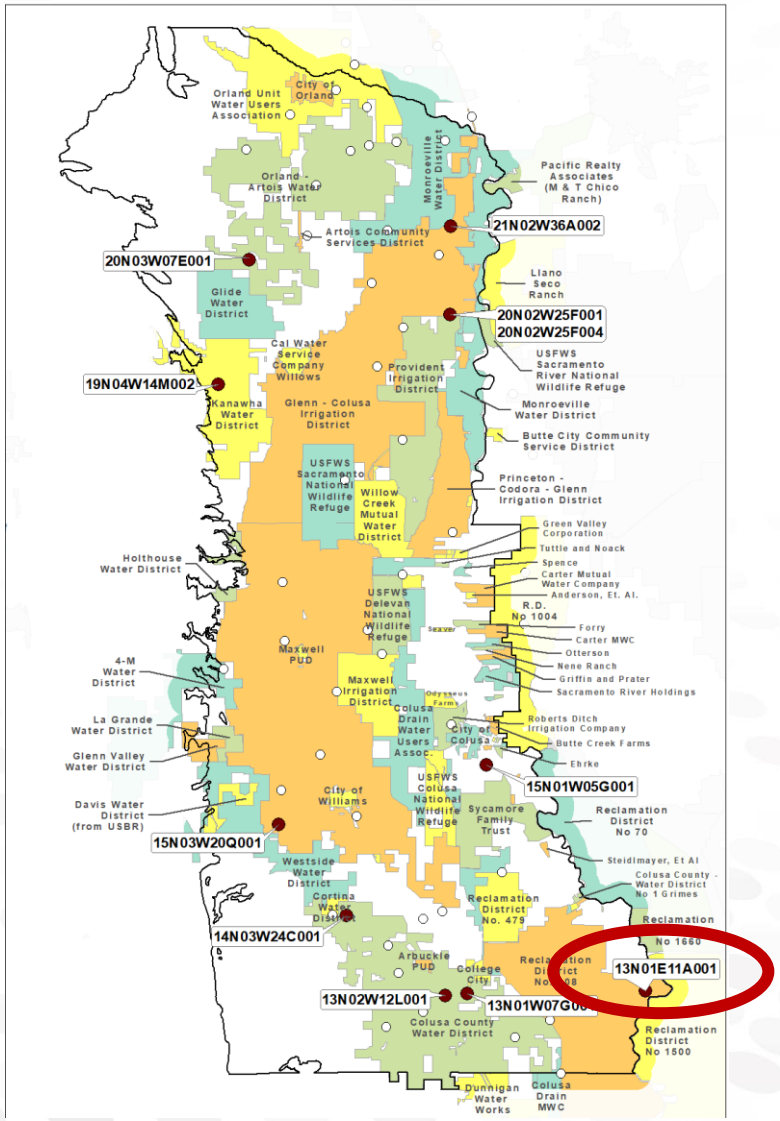

Technical Team Draft Recommendation for Interconnected Surface Water MOs and MTs

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Draft Proposed Action

The Joint TAC recommends that the GSA Boards adopt measurable objectives and minimum thresholds as described on Slide 12 for Sustainability Indicator #6: Depletions of Interconnected Surface Water.

Note: A written "Decision Record" will be prepared following the meeting to document the TACs' decisions.

4.b. Projects and Management Actions (PMAs)

PMA Updates and Discussion Items

- PMA submittal schedule and process
- Modeling of recharge projects
  - Westside in-lieu recharge projects (OAWD and CCWD)
  - Multi-benefit recharge project along Sacramento River corridor
- Demand reduction economic analysis
- Westside watersheds (time permitting)

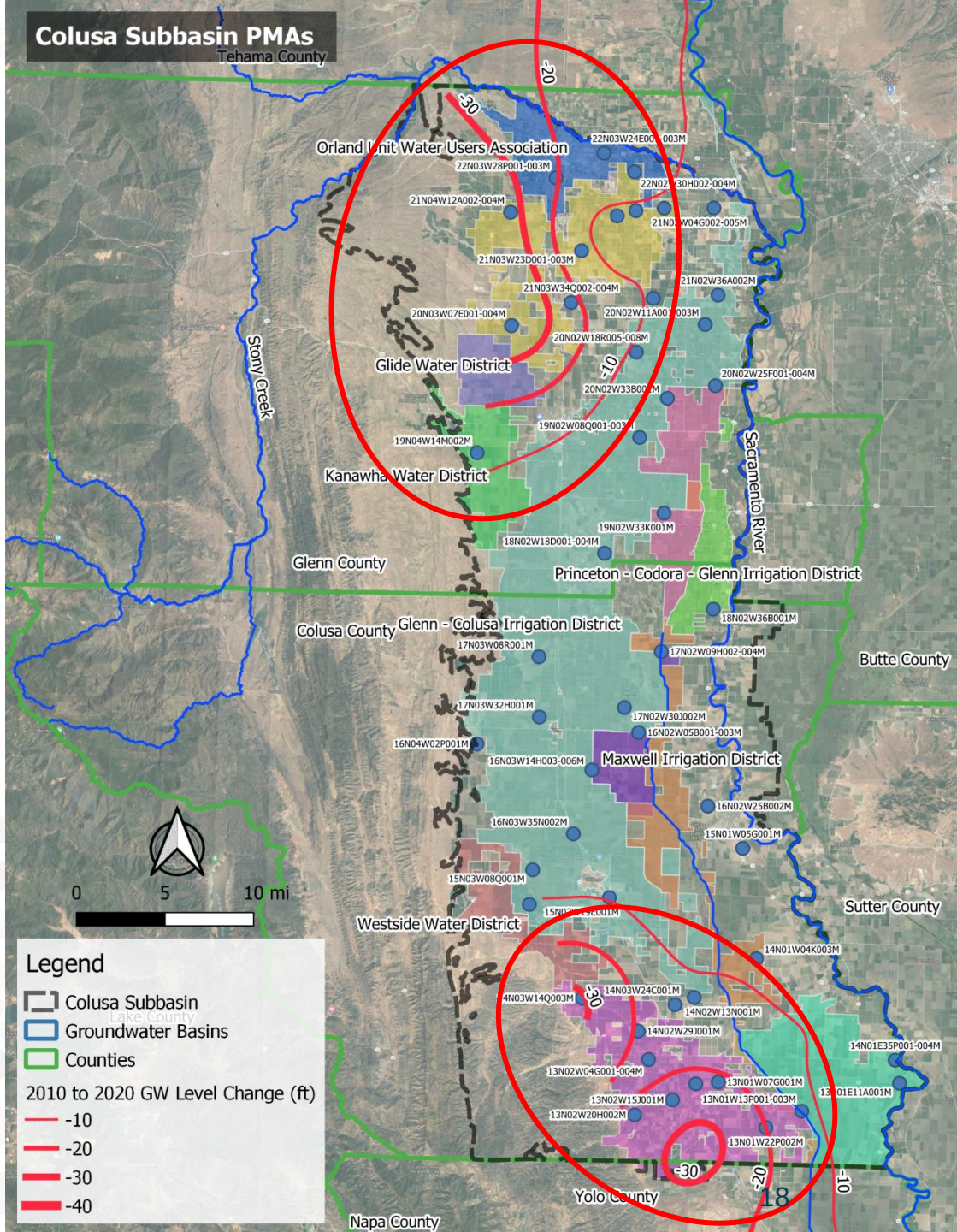
PMA Submittal Schedule and Process

- 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 during GSP implementation 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 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 Annexation and In-lieu Recharge
  - Additional 25 TAF/yr SW in all but critical years (average 20 TAF/yr)
- CCWD In-lieu Recharge
  - Additional 30 TAF/yr SW in all but critical years (average 24 TAF/yr)
- Basis for comparison: 50-year projected future conditions (2016-2065 based on 1965-2015 hydrology):
  - Future without climate change baseline
  - Future with 2070 climate change baseline
  - Future with 2070 climate change with projects
  - Land use the same for all three future conditions

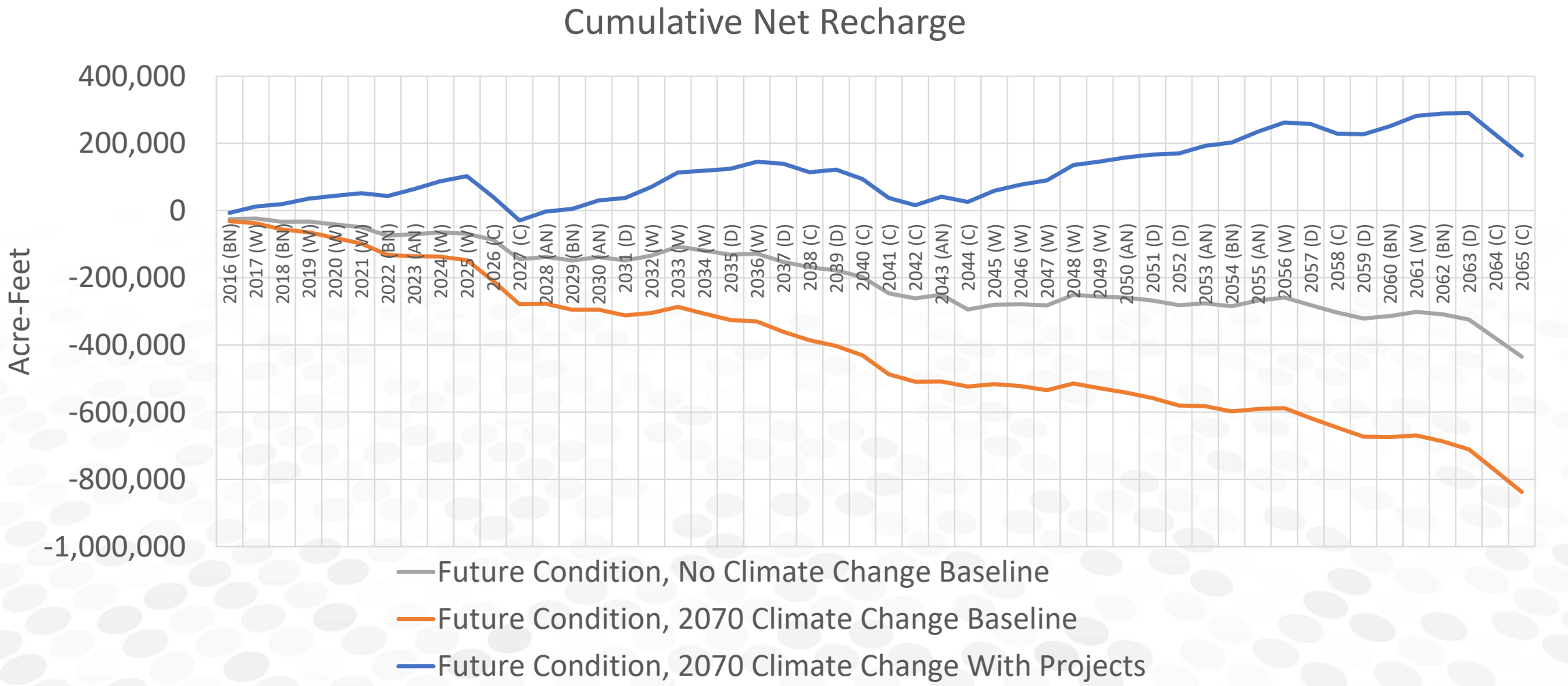
OAWD Subarea Surface Water System Budget: Average Annual Volumes in Acre-Feet

Condition/Change	Surface Water Diversions	Groundwater Pumping	Percolation	Net Recharge
Future Condition: No Climate Change Baseline	48,026	54,174	45,478	-8,696
Future Condition: 2070 Climate Change Baseline	48,026	62,067	45,324	-16,742
Future Condition: 2070 Climate Change With Projects	68,025	42,047	45,314	3,267
Difference: 2070 Climate Change minus No Climate Change	0	7,893	-154	-8,047
Difference: 2070 Climate Change With Project minus 2070 Climate Change Baseline	19,999	-20,020	-10	20,010

PRELIMINARY

OAWD Subarea Cumulative Net Recharge (2016-2065)

PRELIMINARY



OAWD Subarea Groundwater System Budget: Average Annual Volumes in Acre-Feet

Condition/Change	Percolation	Subsurface Inflow (net)	Groundwater Pumping	Change in Storage
Future Condition: No Climate Change Baseline	45,484	8,667	54,174	-22
Future Condition: 2070 Climate Change Baseline	45,331	15,671	62,067	-1,064
Future Condition: 2070 Climate Change With Projects	45,321	-3,479	42,047	-205
Difference: 2070 Climate Change minus No Climate Change	-153	7,004	7,893	-1,042
Difference: 2070 Climate Change With Project minus 2070 Climate Change Baseline	-10	-19,150	-20,020	860

PRELIMINARY

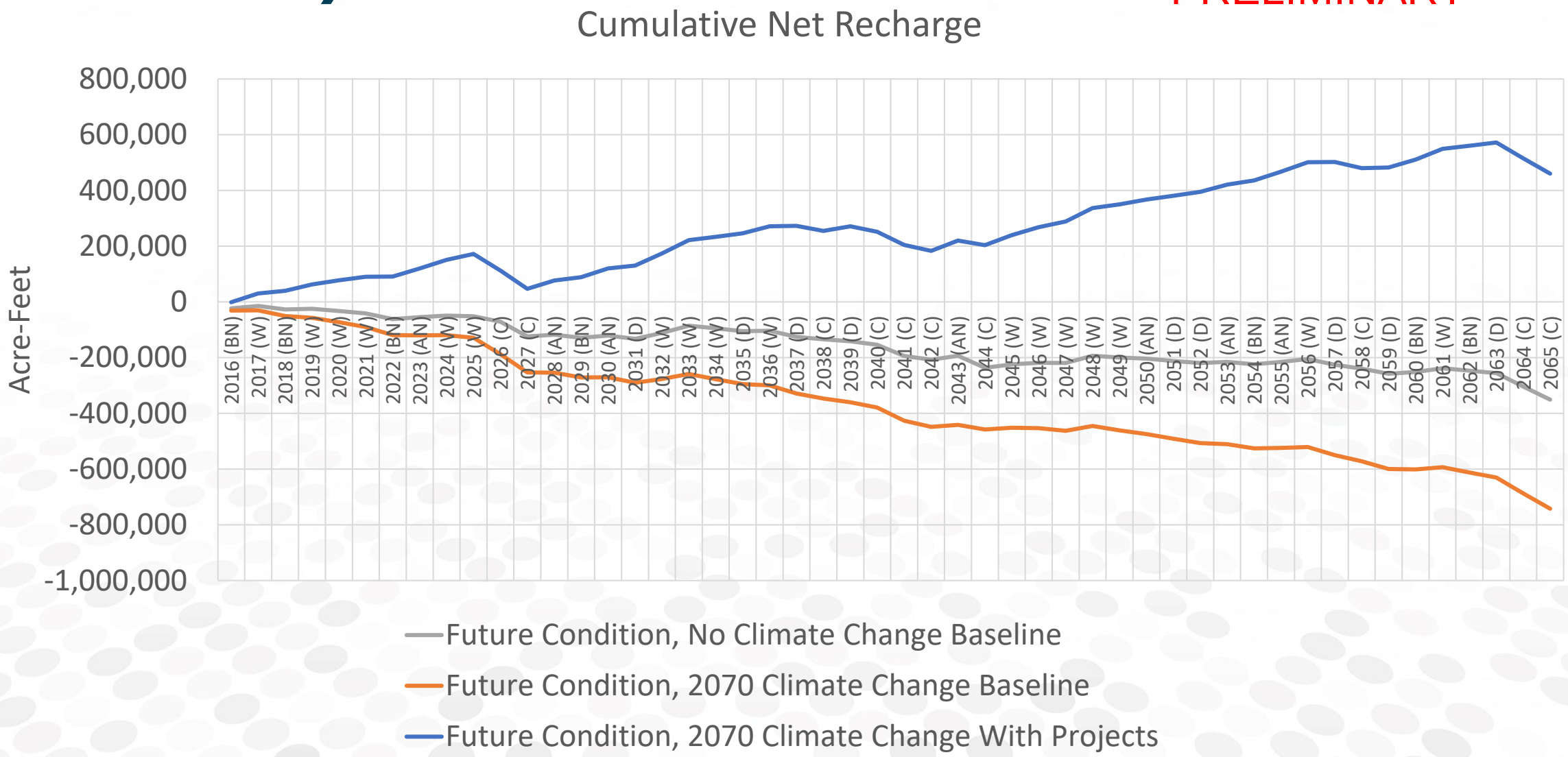
CCWD Subarea Surface Water System Budget: Average Annual Volumes in Acre-Feet

Condition/Change	Surface Water Diversions	Groundwater Pumping	Percolation	Net Recharge
Future Condition: No Climate Change Baseline	65,858	55,505	48,488	-7,017
Future Condition: 2070 Climate Change Baseline	65,859	63,314	48,460	-14,854
Future Condition: 2070 Climate Change With Projects	89,859	39,220	48,417	9,198
Difference: 2070 Climate Change minus No Climate Change	1	7,809	-28	-7,837
Difference: 2070 Climate Change With Project minus 2070 Climate Change Baseline	24,000	-24,095	-43	24,052

PRELIMINARY

CCWD Subarea Cumulative Net Recharge (2016-2065)

PRELIMINARY



CCWD Subarea Groundwater System Budget: Average Annual Volumes in Acre-Feet

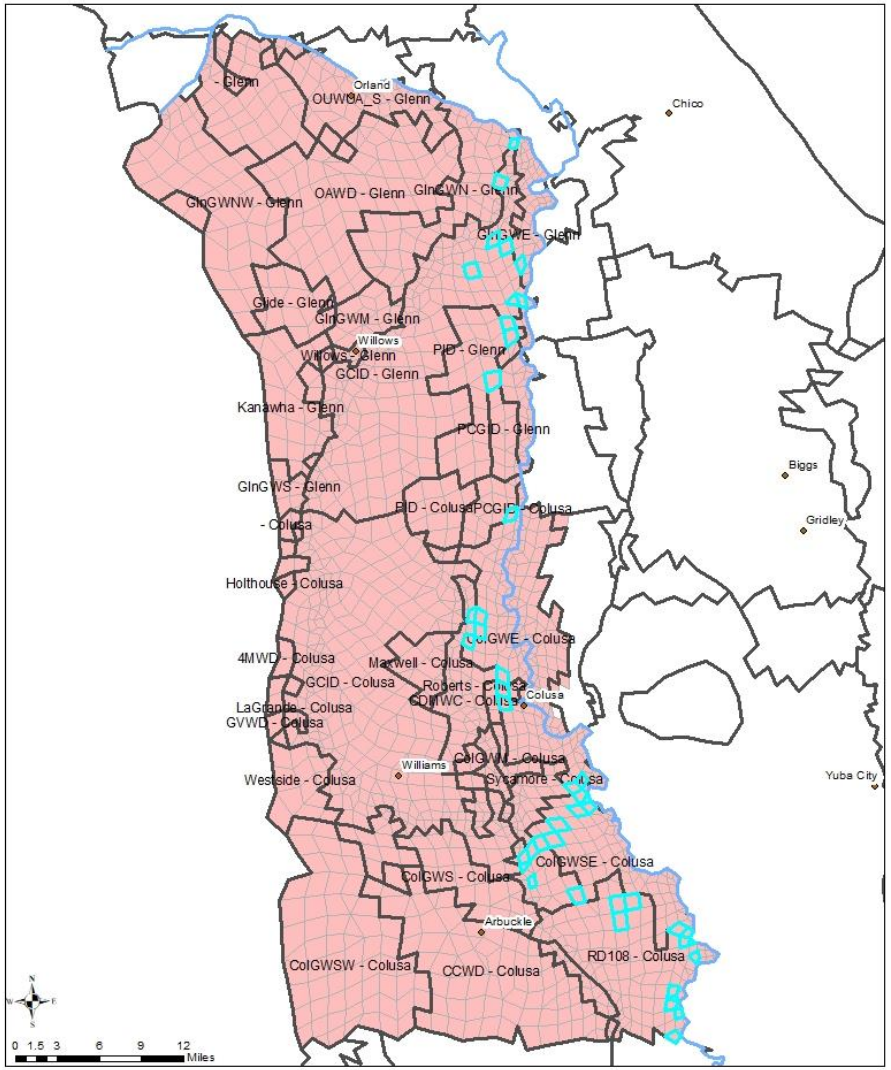
Condition/Change	Percolation	Subsurface Inflow (net)	Groundwater Pumping	Change in Storage
Future Condition: No Climate Change Baseline	48,573	6,541	55,505	-392
Future Condition: 2070 Climate Change Baseline	48,541	13,297	63,314	-1,476
Future Condition: 2070 Climate Change With Projects	48,498	-9,507	39,220	-228
Difference: 2070 Climate Change minus No Climate Change	-31	6,756	7,809	-1,084
Difference: 2070 Climate Change With Project minus 2070 Climate Change Baseline	-43	-22,804	-24,095	1,248

PRELIMINARY

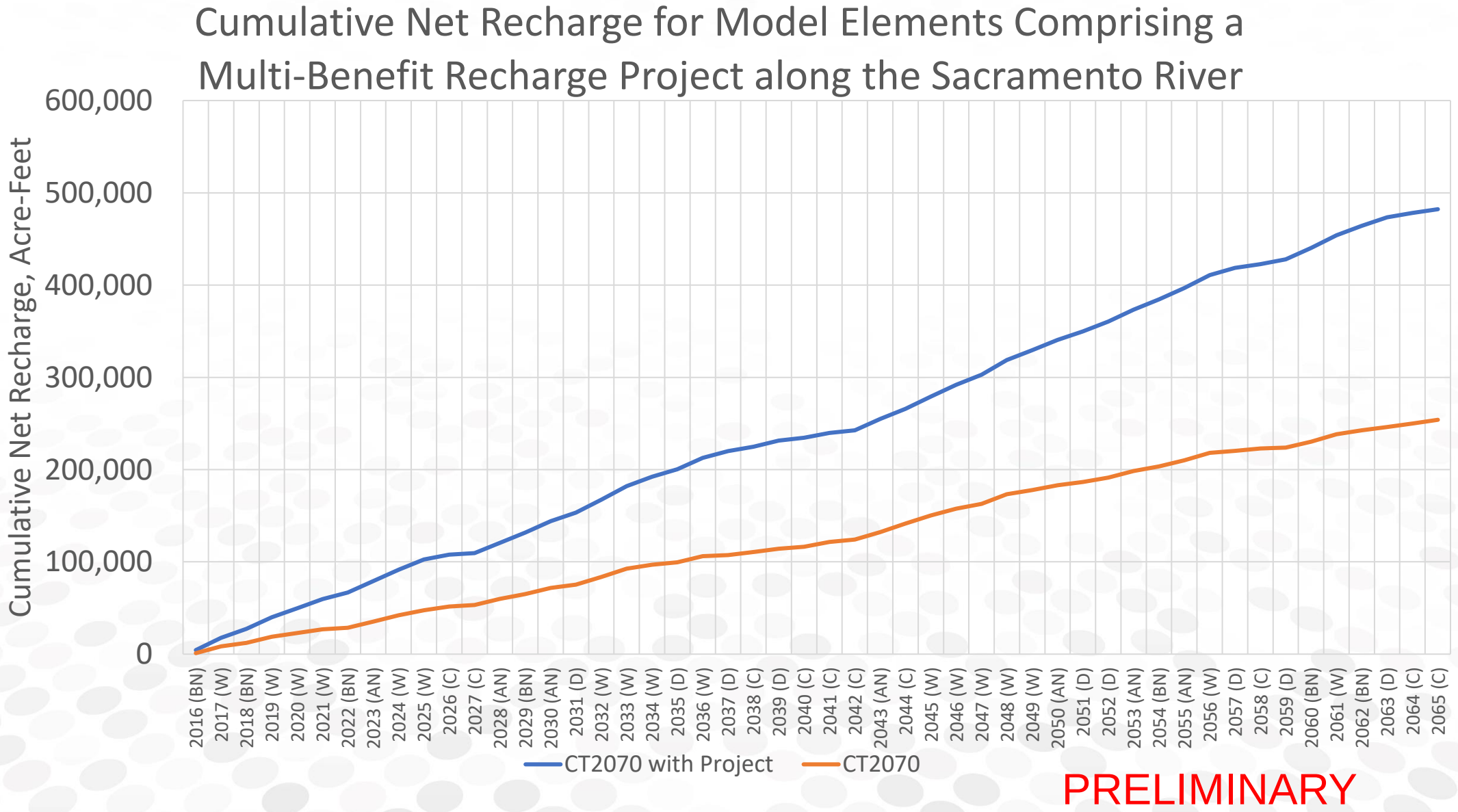
Multi-Benefit Managed Aquifer Recharge (MAR) Project

- Criteria for Selection of Model Elements with Suitable Conditions for MAR
  - Access to surface water
  - "Moderately good" or better SAGBI index
  - Annual crops harvested by August for post-harvest flooding
  - Within 6 miles of Sac River
  - Minimum 25-acre field size
  - Approx. 4,100 qualifying acres

Eligible Area nearer to the Sacramento River (~4,100 ac)



Multi-Benefit Managed Aquifer Recharge (MAR) Project



PRELIMINARY

Observations Regarding Recharge Projects

- OAWD and CCWD in-lieu recharge projects and MAR project provide substantial potential benefits to groundwater conditions (increased net recharge)
- Benefits accrue within and adjoining the recharge areas, particularly for the in-lieu recharge projects
- Further project evaluation
  - Subbasin-wide effects
    - Changes in groundwater levels, groundwater storage, and streamflow accretion/depletion
  - Economics (project costs and benefits)

Demand Management Economic Analysis

Demand Management Economic Analysis

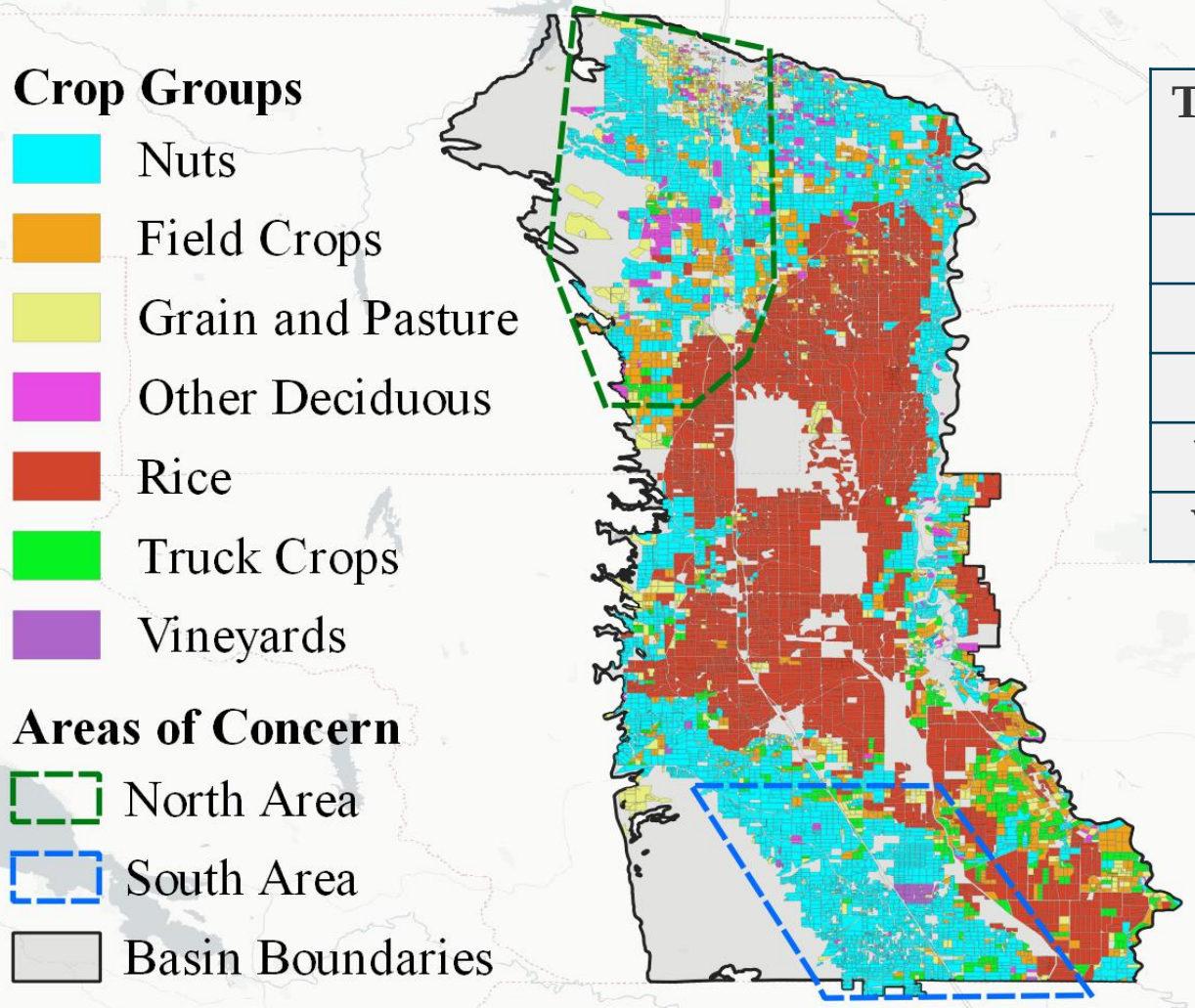
- Allocation (pumping limits)
- Allocation + water market
- Land repurposing programs
- Fees/financial incentive programs

- 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

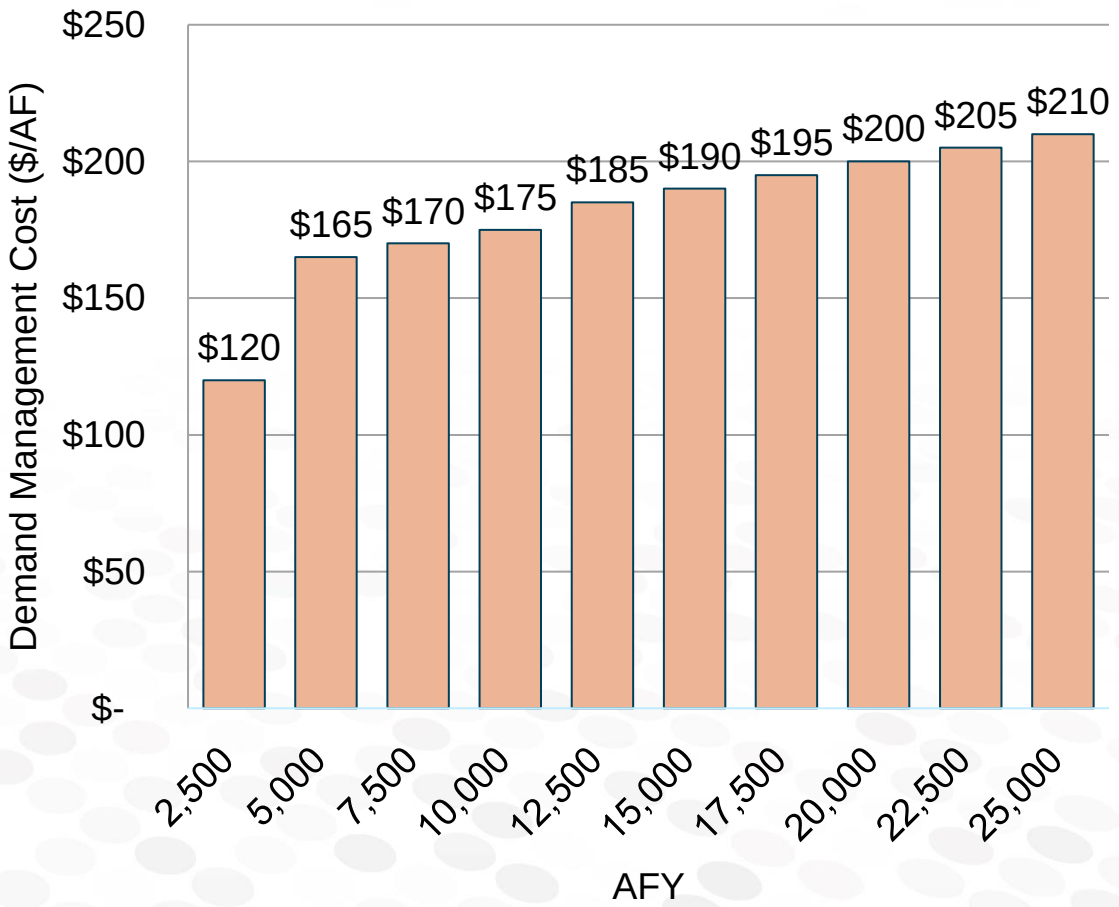
Colusa Subbasin Demand Management Analysis



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

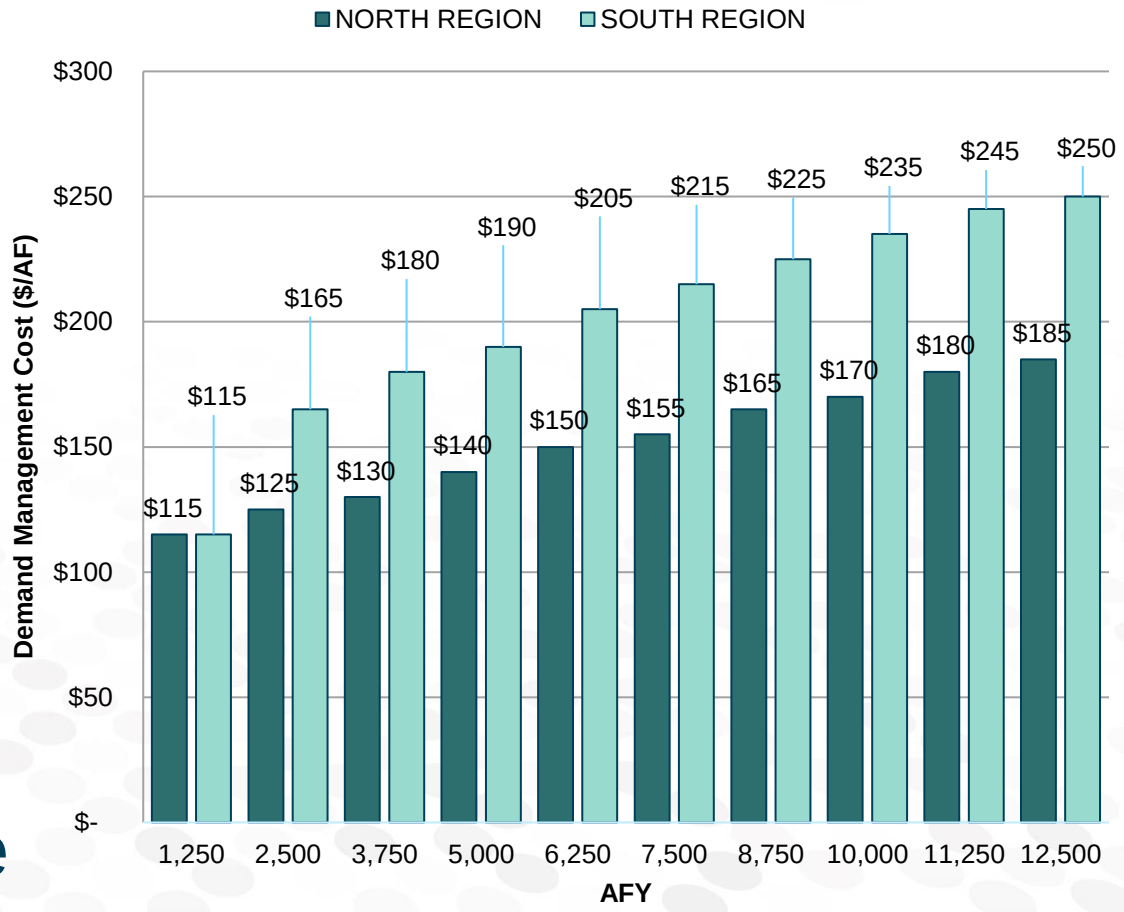
Subbasin-wide Demand Management

- 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
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Creek Name	Watershed Area (ac)
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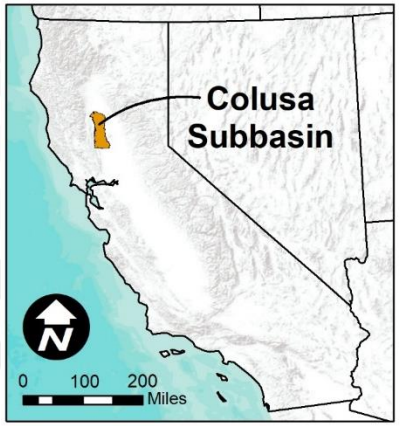

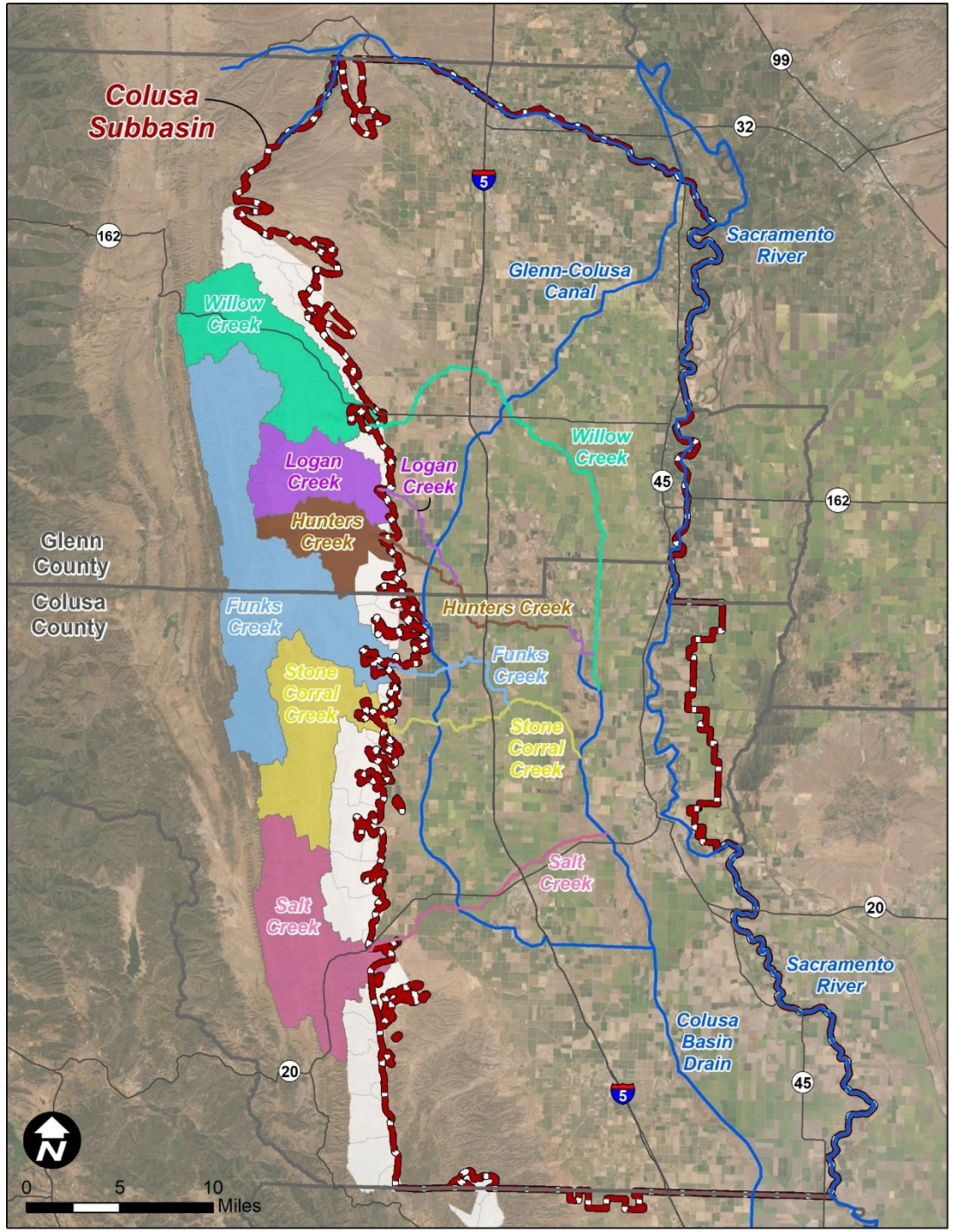

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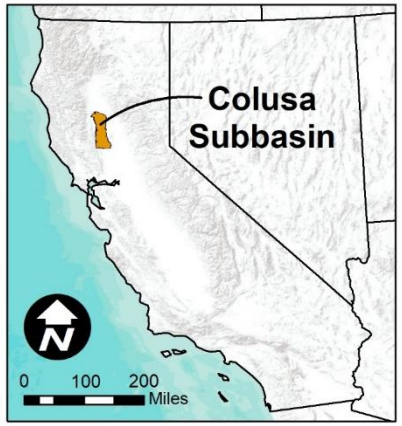

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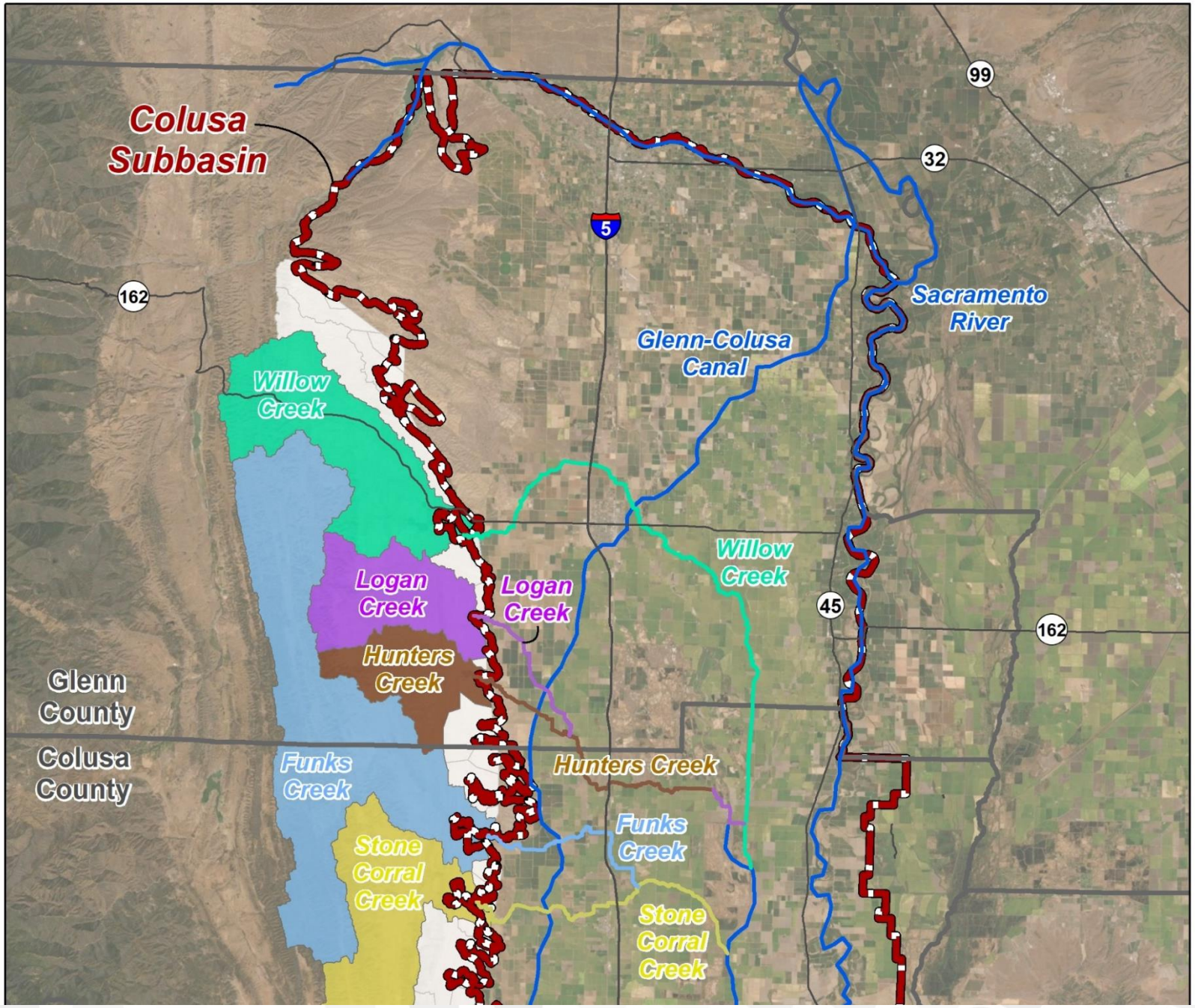

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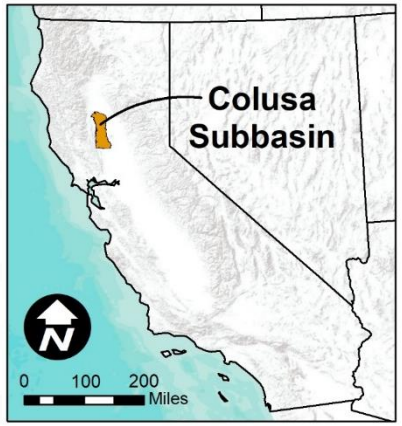

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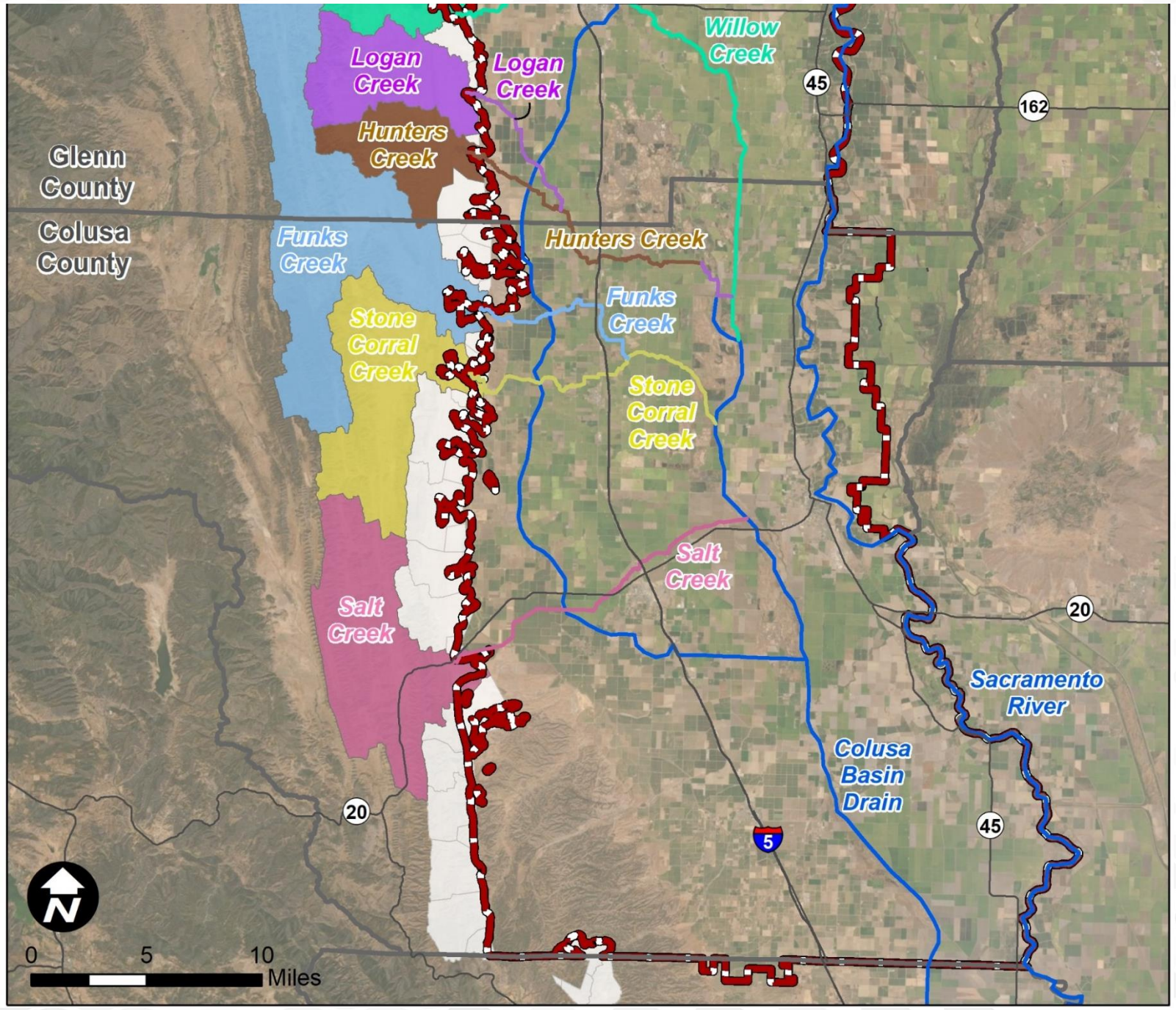
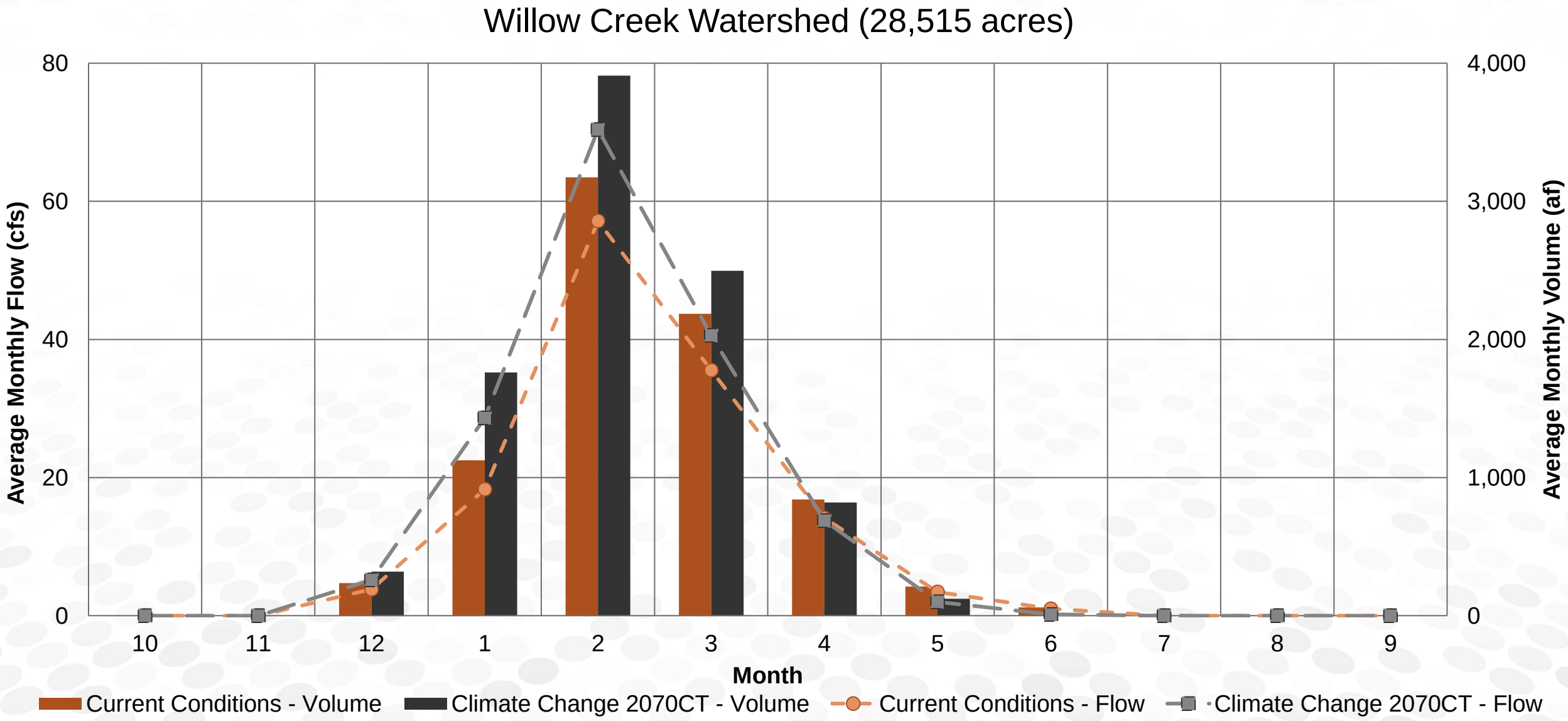


Westside Watersheds

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

Westside Watersheds



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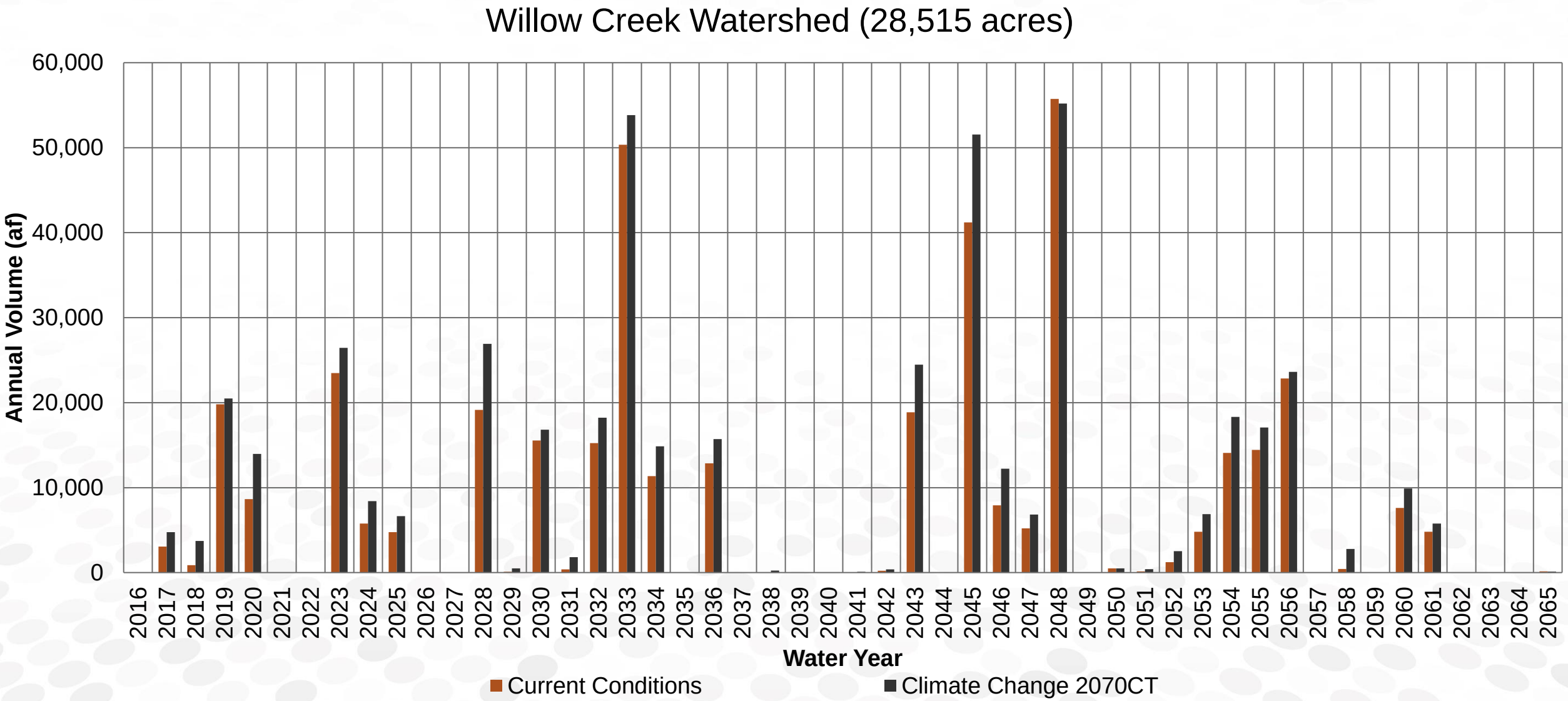

Westside Watersheds

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 (if necessary)
  - Final TAC decision on streamflow depletion MOs, MTs, and UR
- PMA Update
  - Current project list
  - Sample detailed project description
  - Sample simplified project description