



COLUSA AND GLENN GROUNDWATER AUTHORITIES

**Colusa Subbasin**  
Joint Technical Advisory Committee  
GSP Development

April 23, 2021

# Discussion Topics

- 4.a.—TAC Recommendation Timeline
- 4.b.—Sustainable Management Criteria
- 4.c.—Projects and Management Actions
- 5.—Topics for May 14 Joint TAC Meeting

# 4.a. TAC Recommendations Timeline

- Preparation of GSP Chapters 5 and 6 depend on TAC decisions
  - Chapter 5—Sustainable Management Criteria
  - Chapter 6—Projects and Management Actions
- Both chapters scheduled for draft review by July 16
- Joint TAC Meetings
  - April 23 (today)—TAC recommendations for Groundwater Storage and Groundwater Dependent Ecosystems
  - May 14—TAC recommendations for Groundwater Levels, Groundwater storage, and Streamflow Depletion
  - June 11—TAC recommendations for Projects and Management Actions to be included in the GSP
- Possible Need for Extra Meetings

# 4.b. Sustainable Management Criteria

# 4.b.i. Reduction of Groundwater Storage

# Reduction of Groundwater Storage

- Groundwater levels are an appropriate proxy for groundwater storage because the limiting factor in accessing storage in the Colusa Subbasin is well infrastructure, not water available in storage.
- Technical Team Recommendation:
  - Monitor and manage reduction of groundwater storage using groundwater level MTs and MOs as a proxy.



# Proposed Action

*The Joint TAC recommends that the GSA Boards adopt a GSP policy to monitor and manage reduction of groundwater storage using groundwater level MTs and MOs as a proxy.*

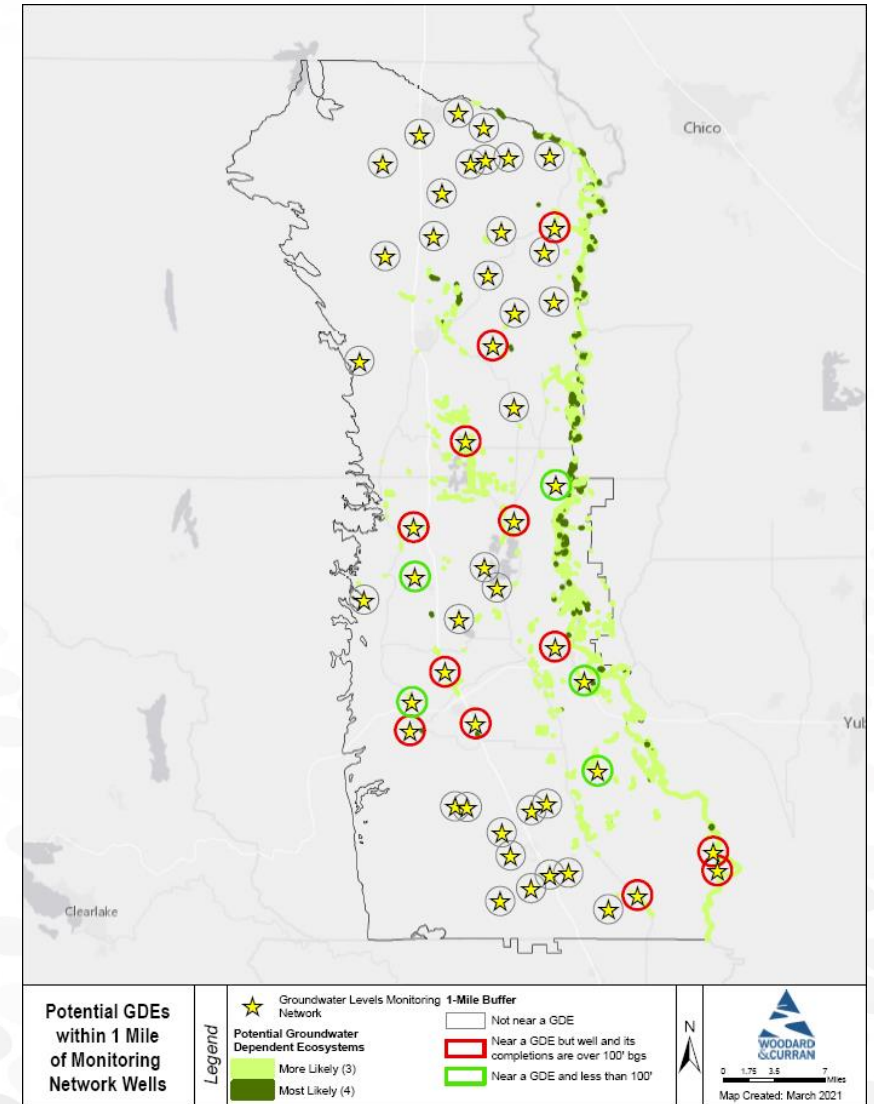
## **4.b.ii. Groundwater Dependent Ecosystems (GDEs)**



# Groundwater Dependent Ecosystems (GDEs)

- Select Representative Network:
  - Shallow monitoring wells (shallower than 100 feet bgs) within one mile of “More Likely (3)” and “Most Likely (4)” GDE locations
- Only 5 of the 50 representative sites are both shallower than 100 feet bgs, and within one mile of a GDE
- Minimum threshold consideration - 30 feet bgs (TNC 2018 pp 46, 72, and 75)<sup>1</sup>

1. Nature Conservancy. 2018. *Groundwater Dependent Ecosystems under the Sustainable Groundwater Management Act*. January.



# Groundwater Dependent Ecosystems (GDEs)

- Technical Team Recommendation:
  - Improve GDE classification reliability, expand shallow monitoring network near GDE locations, and establish minimum thresholds in 2027 GSP update

# Proposed Action

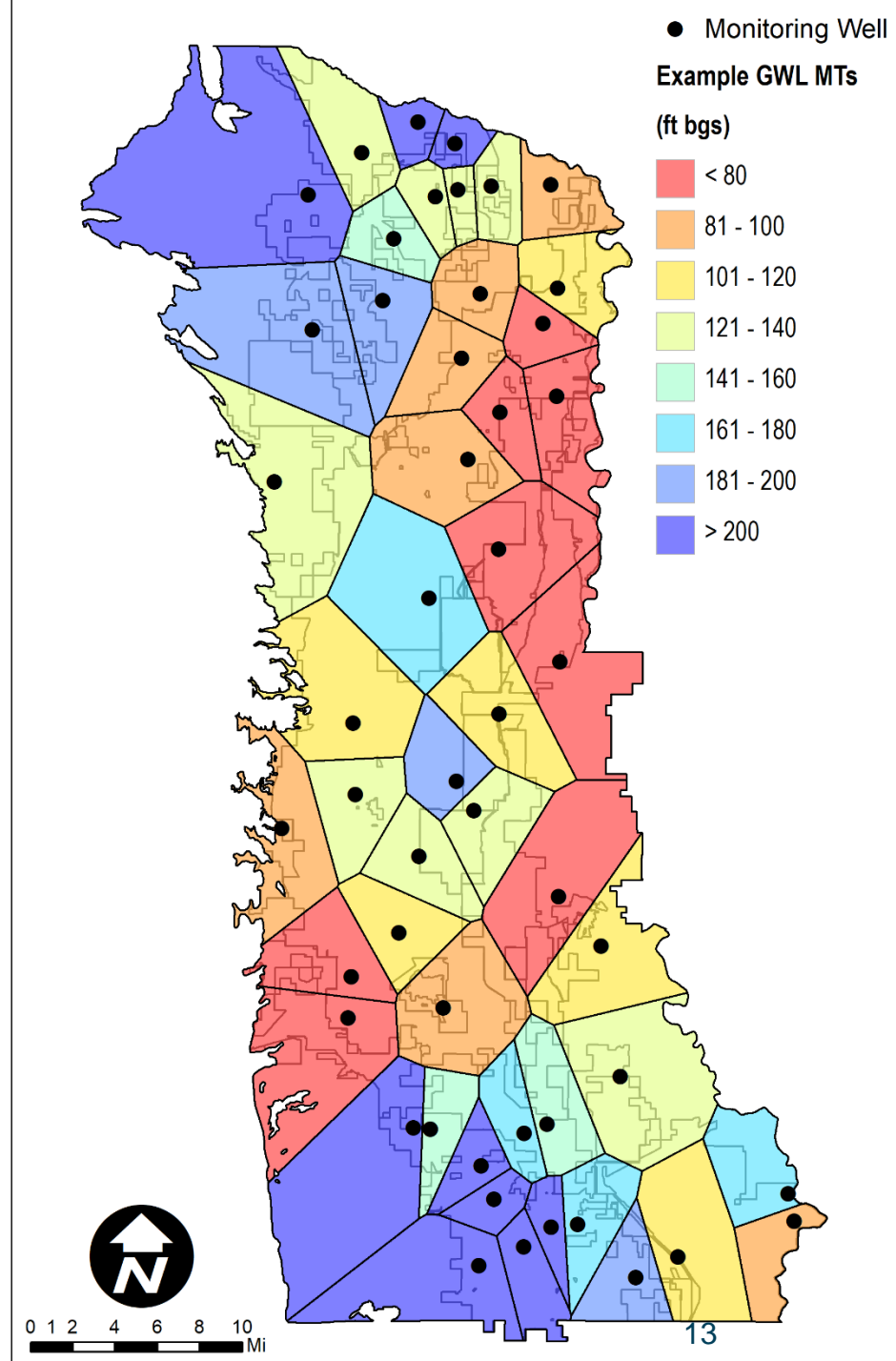
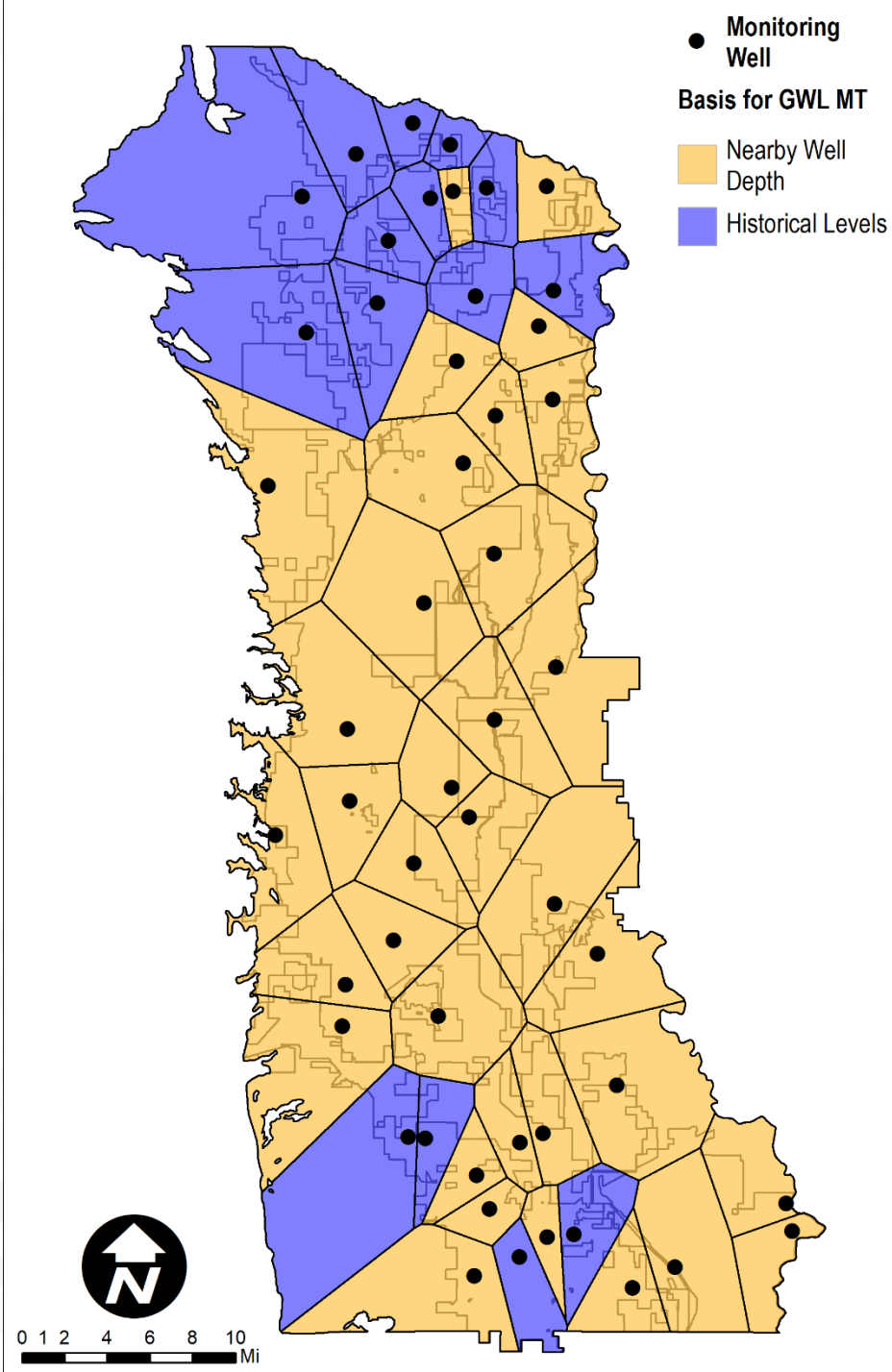
*The Joint TAC recommends that the GSA Boards adopt a GSP policy to improve GDE classification reliability, expand shallow monitoring network near GDE locations, and establish minimum thresholds in 2027 GSP update.*

**4.b.iii. Measurable Objectives and  
Alternative Minimum Thresholds for  
Groundwater Levels and Depletions of  
Interconnected Surface Water**

# Proposed Approach

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

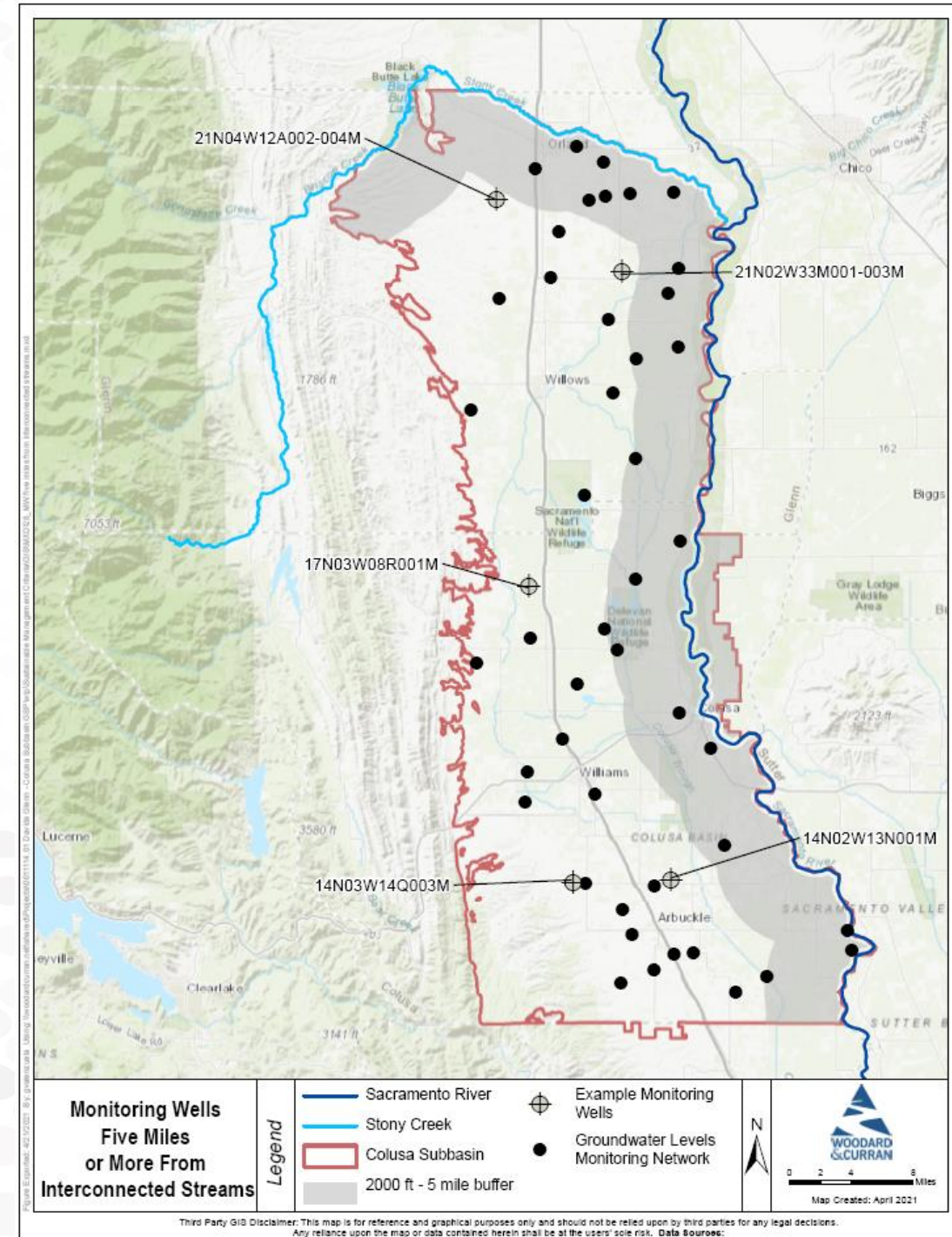
4/23/2021





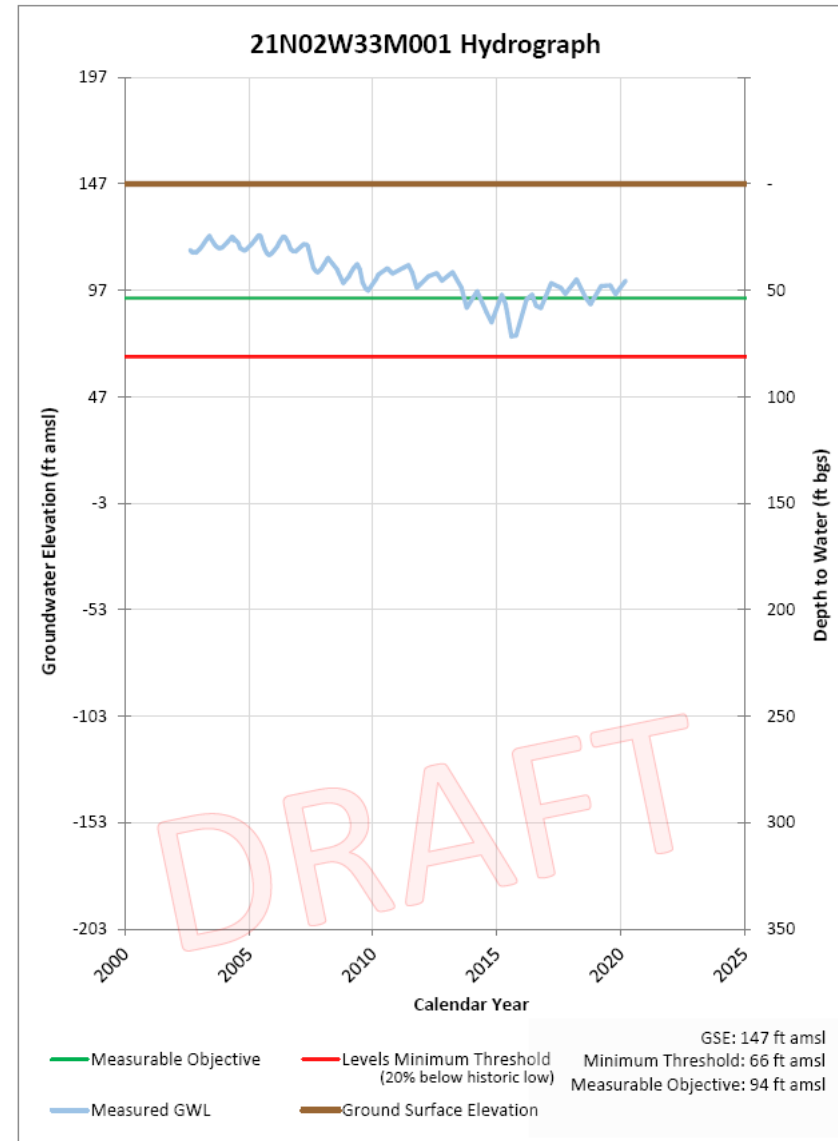
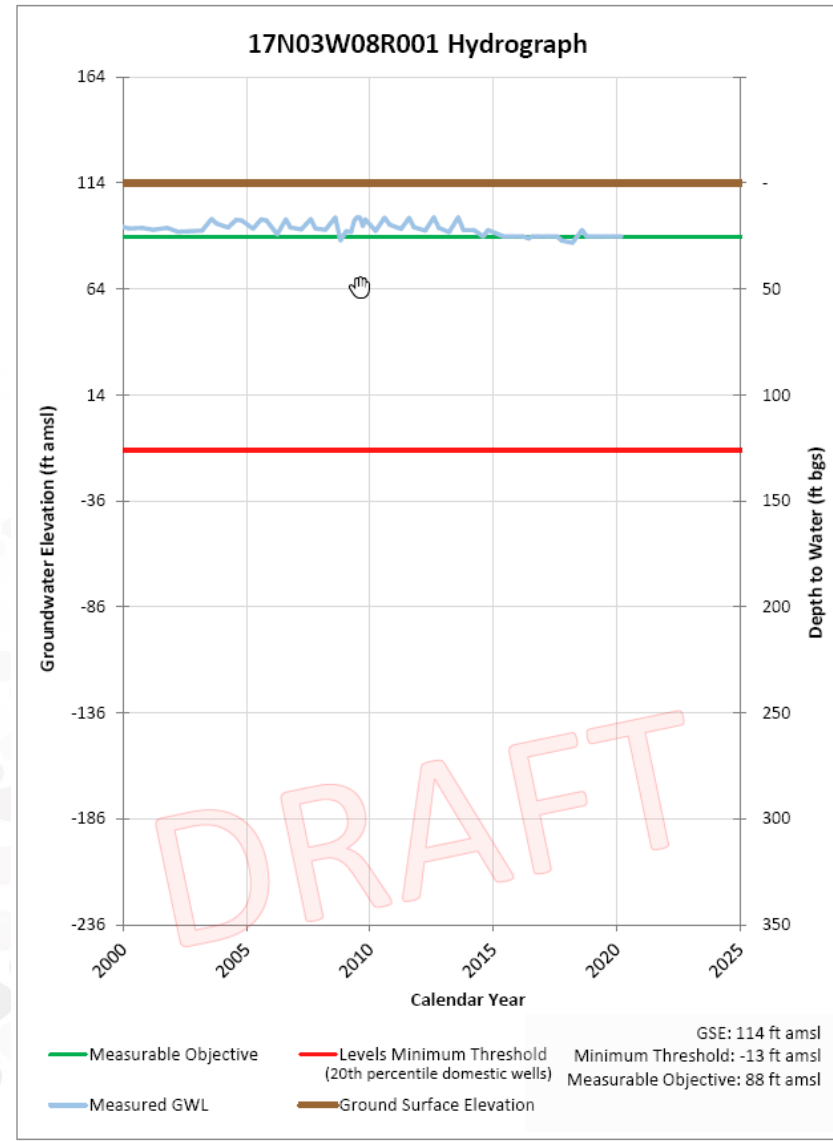
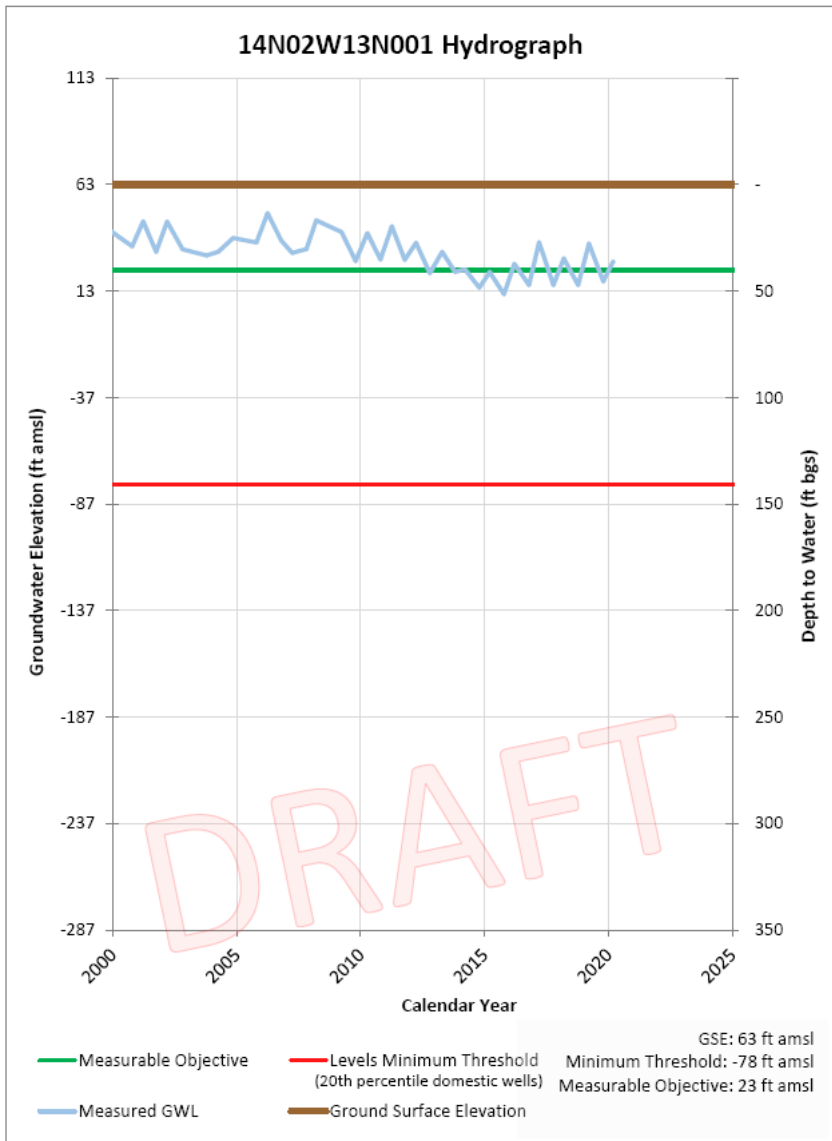
# Chronic Lowering of Groundwater Levels

- MT = Lower of:
  - 20% of range below historical low, and
  - The 20th percentile of shallowest domestic wells in the monitoring well's Thiessen polygon
- MO = Mean of last 5 years available measurements
- IMs = TBD based on PMAs

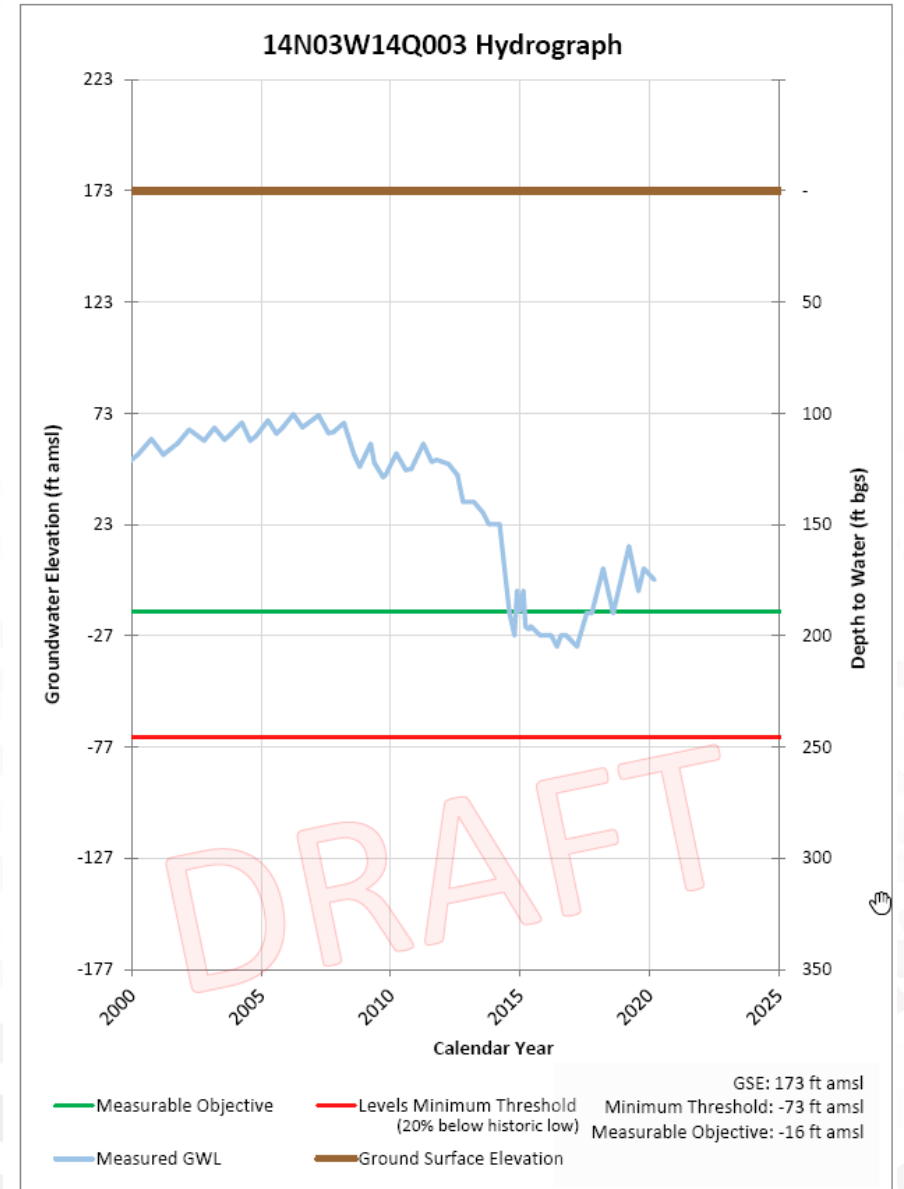
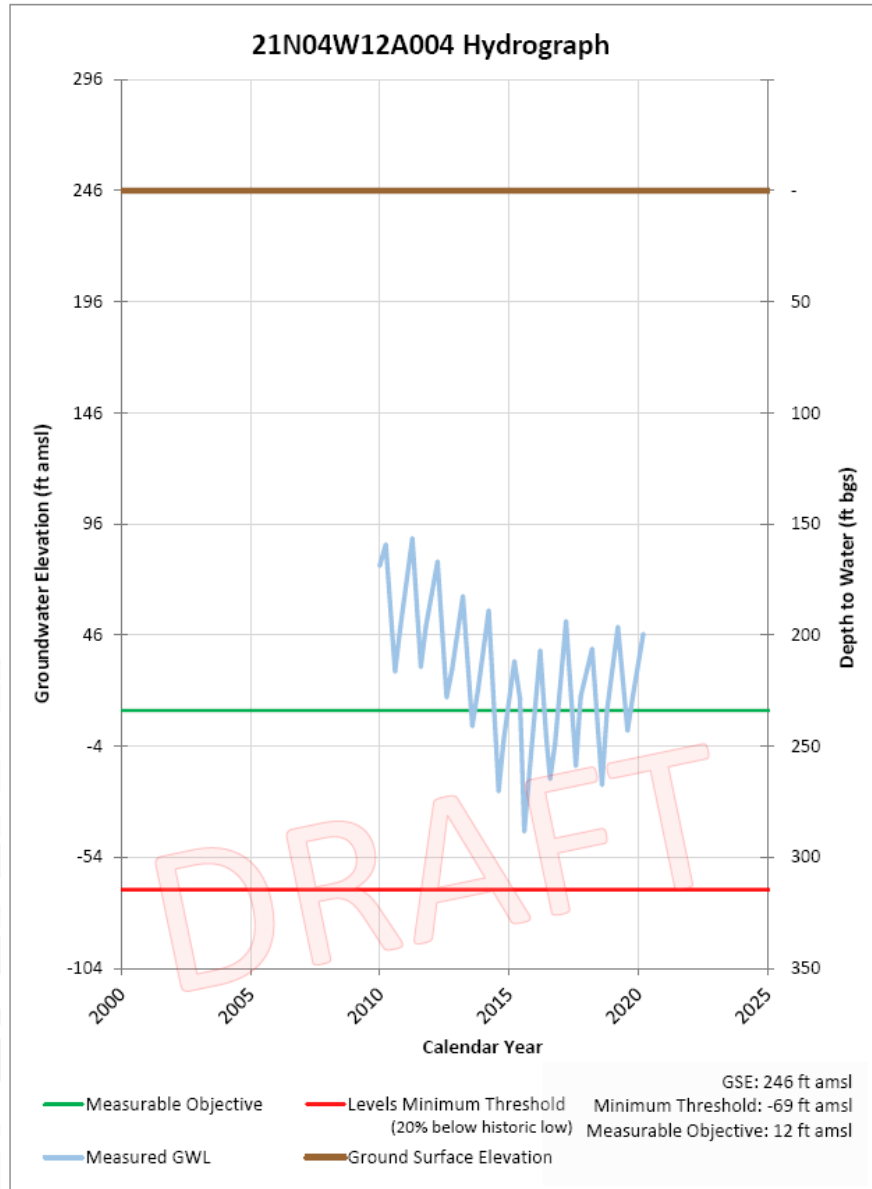




# Hydrographs for Five Monitoring Locations Outside of 5-Mile Interconnected Stream Buffer

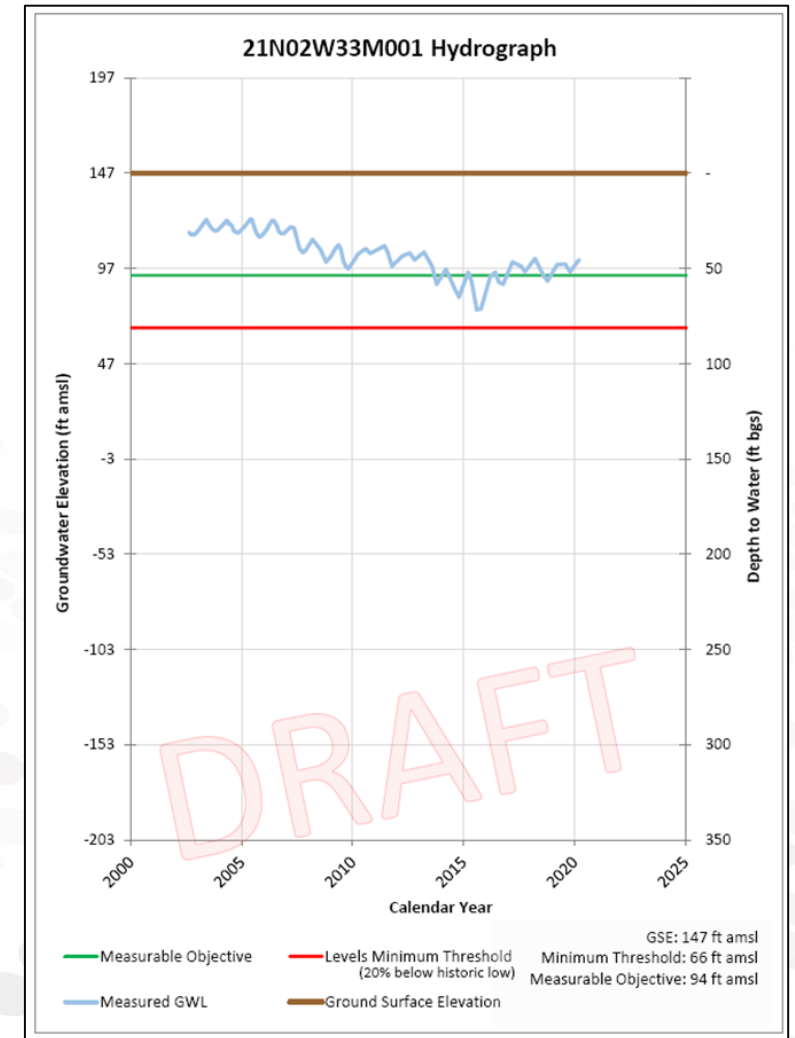


# Hydrographs for Five Monitoring Locations Outside of 5-Mile Interconnected Stream Buffer



# Technical Team Recommendation for Groundwater Levels MTs and MOs

- MT = Lower of:
  - 20% of range below historical low, and
  - The 20th percentile of shallowest domestic wells in the monitoring well's Theissen polygon
- MO = Mean of last 5 years available measurements
- Undesirable Result is detected when:
  - 25% (13 of 50 representative monitoring wells) fall below the minimum threshold for 24 consecutive months



# Draft Proposed Action (for action at May 14 Meeting)

*The Joint TAC recommends that the GSA Boards adopt minimum thresholds and measurable objectives as described on Slide 17 for the chronic lowering of groundwater levels sustainability indicator.*

# Depletions of Interconnected Surface Water

- Depletion of Interconnected Surface Water Undesirable Result Statement (from 11/13/20 Joint TAC Meeting)
  - The undesirable result for depletions of interconnected surface water is a result that causes significant and unreasonable adverse effects on Beneficial Uses and Users of interconnected surface water **within the Colusa Subbasin** over the planning and implementation horizon of this GSP. (Emphasis added)

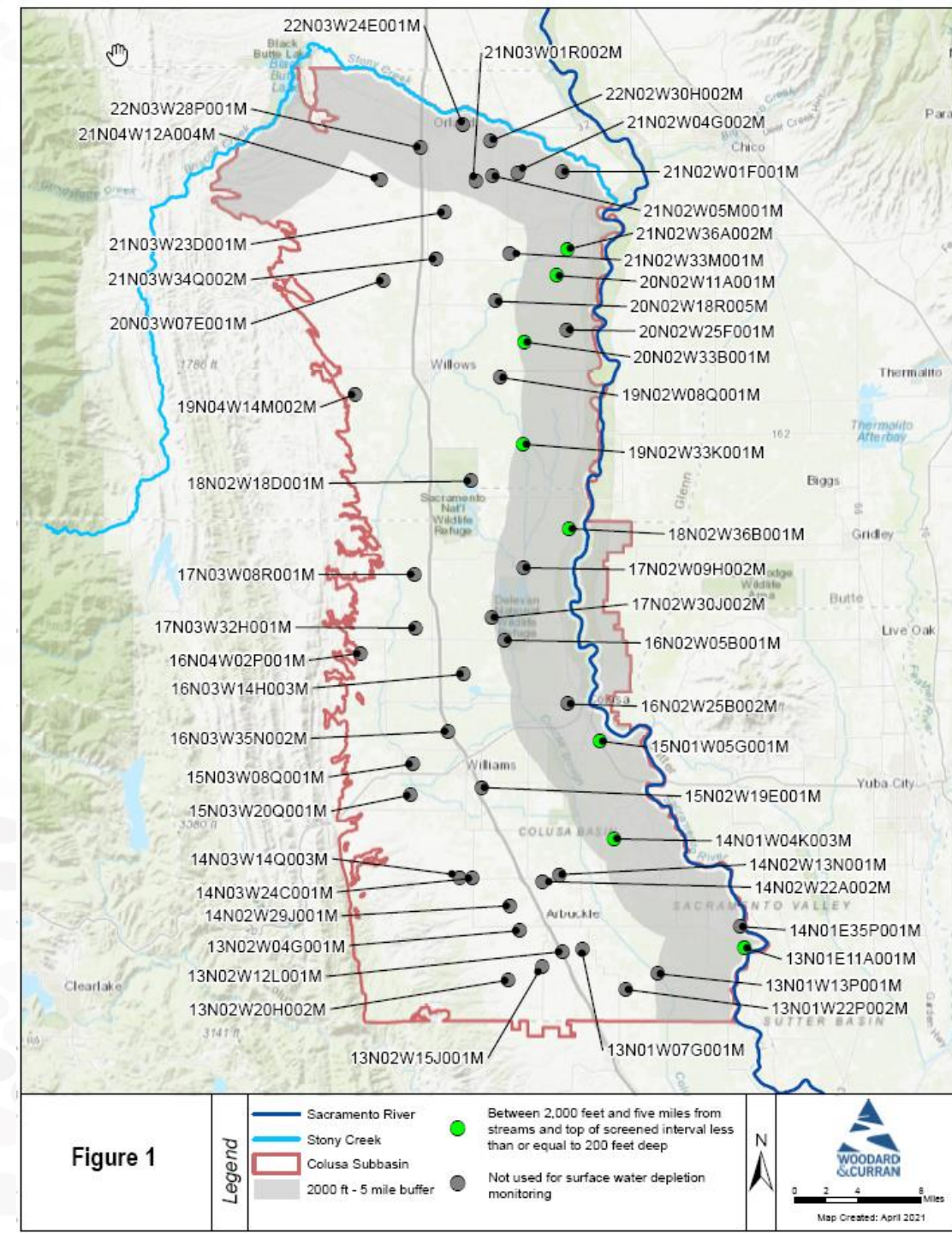
# Depletions of Interconnected Surface Water: Possible Approach for Near-Stream Wells

- Approach Depletions of Interconnected Surface Water using groundwater levels as a proxy
  - Stream gages are not prevalent enough to use for monitoring at this time
- Evaluate MTs based on historical low GW levels to avoid changes to SW gain/loss relative to recent historical (2015) conditions
- Focus on key interconnected streams:
  - Sacramento River
  - Stony Creek
  - Colusa Basin Drain



# Surface Water Depletion Monitoring Well Network

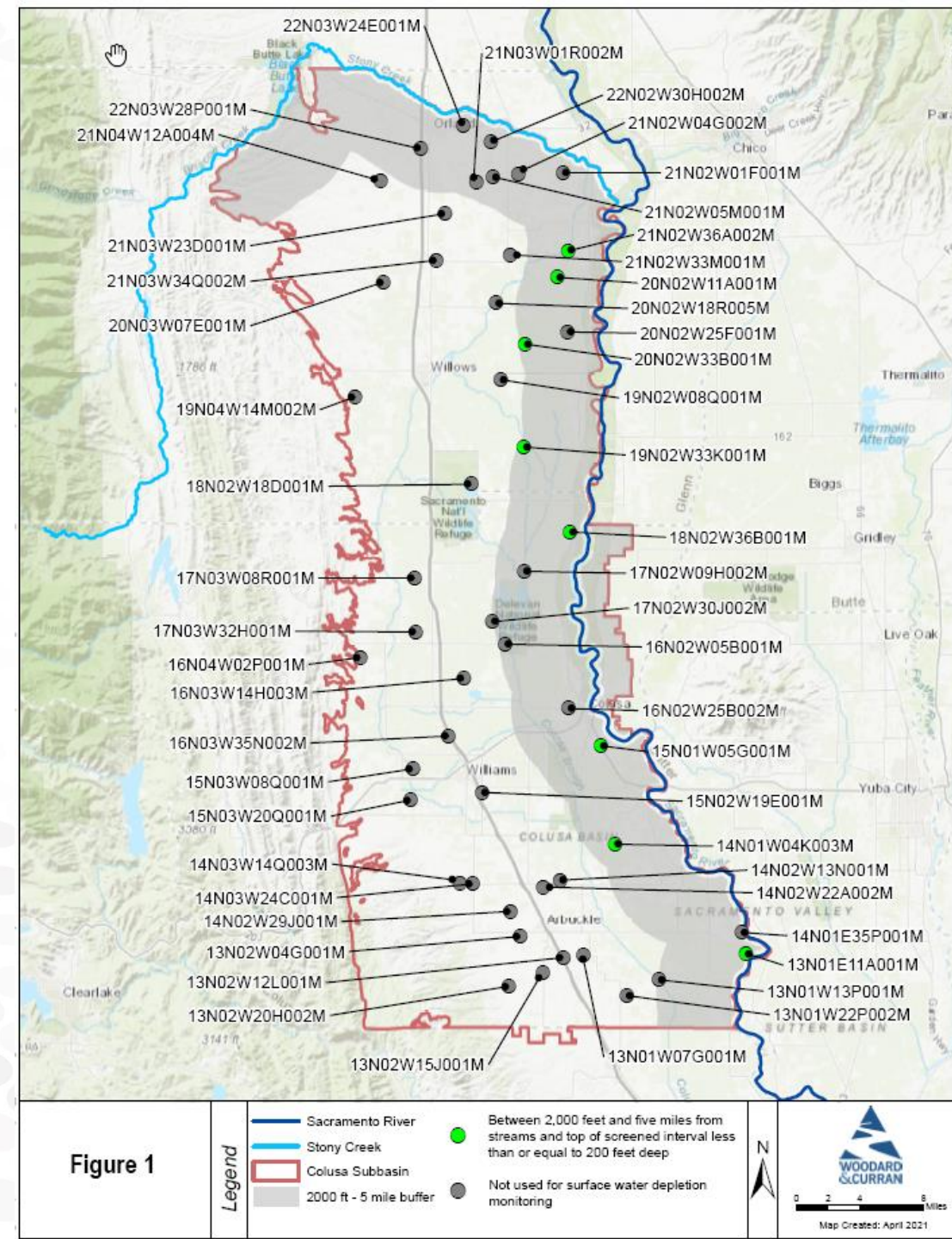
- Select representative monitoring wells that are located 2000 feet to 5 miles away from interconnected streams and are less than 200 feet to top of screened interval
- 8 wells meeting criteria shown as green dots



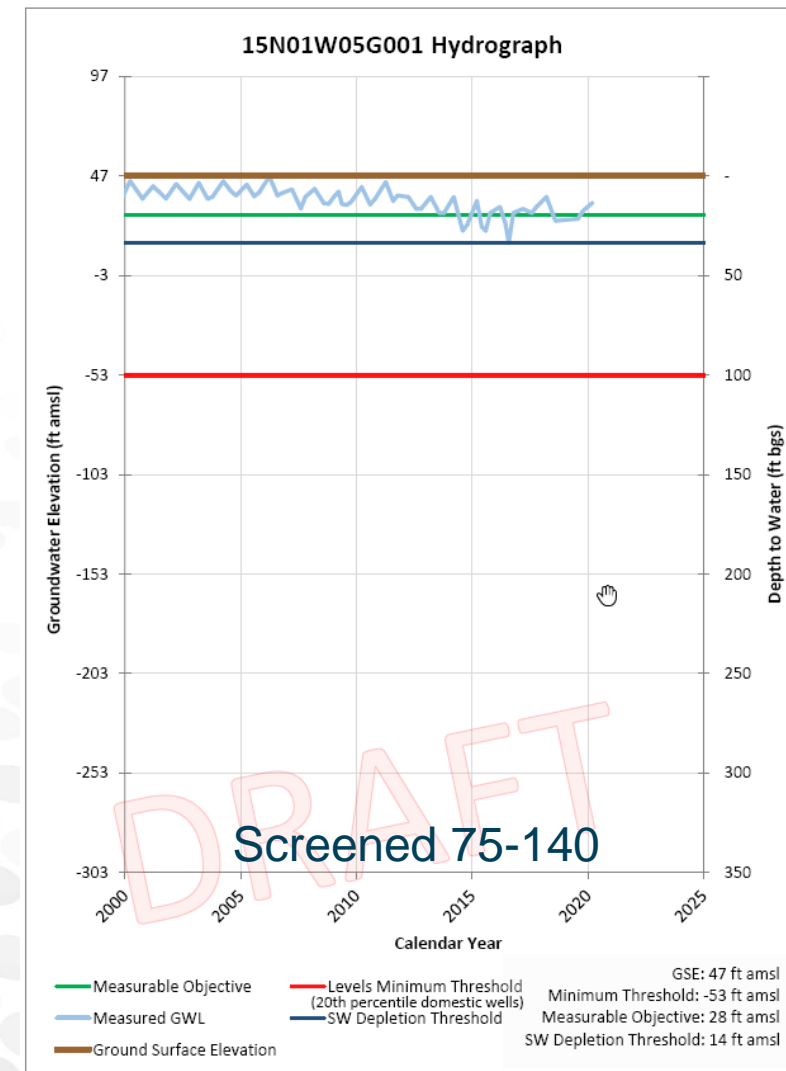
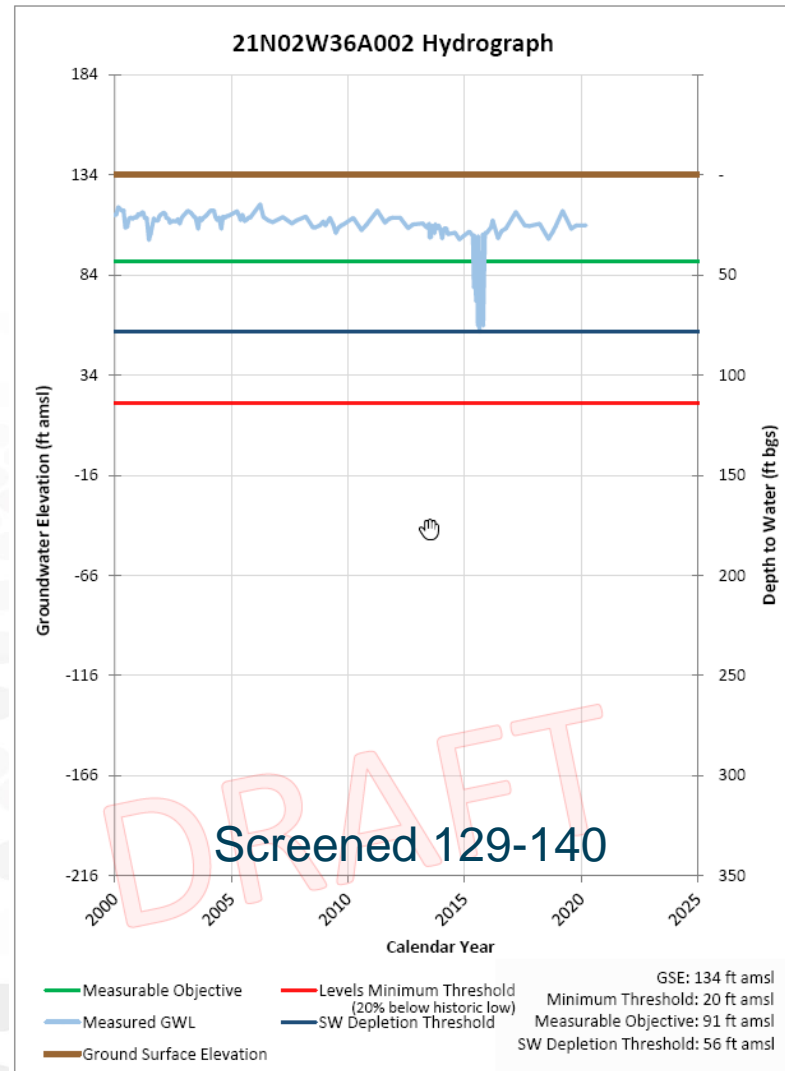
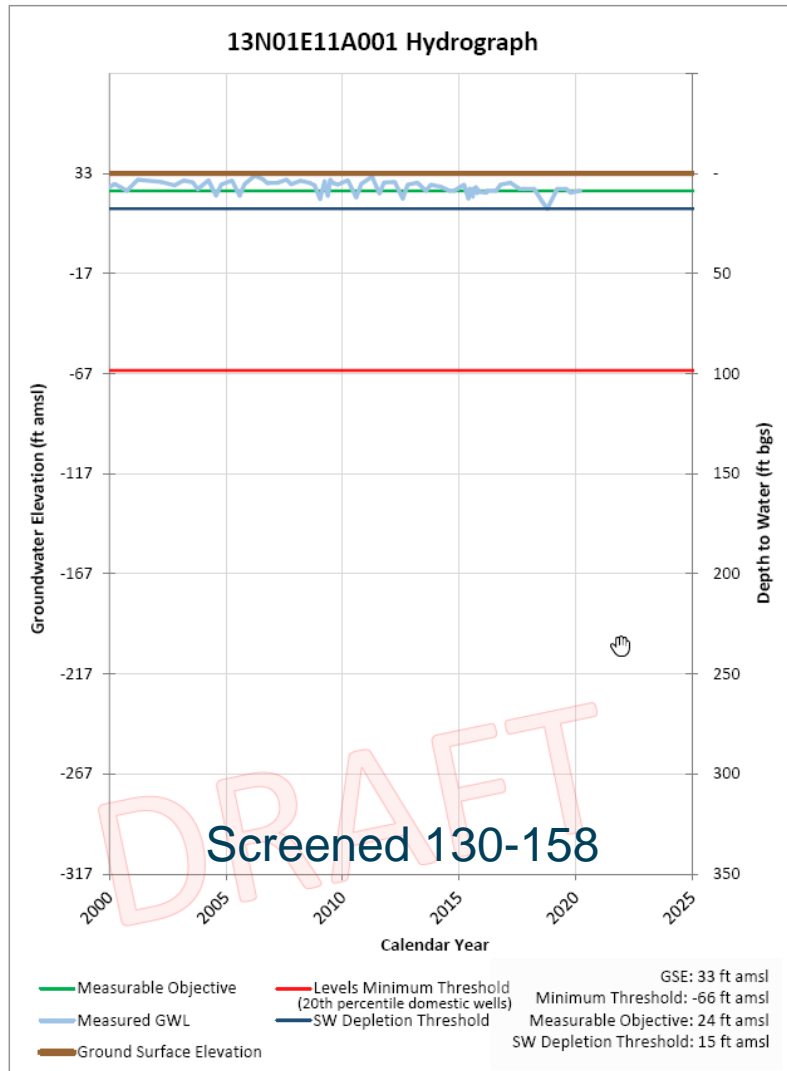


# Surface Water Depletion Monitoring Well Network

- Monitoring Wells between 2,000 feet and Five (5) Miles from Interconnected Streams and Less than 200 Feet Deep to Top of Screened Interval
- Of 8 qualifying wells, 4 wells not suitable because of well construction or use considerations
- 4 potential monitoring wells for setting streamflow depletion MTs
- 3 example hydrographs



# Example Hydrographs for Monitoring Wells between 2,000 feet and Five (5) Miles from Interconnected Streams and Less than 200 Feet Deep to Top of Screened Interval





# Surface Water Depletion Recommendation

- Conclusion:
  - Spatial distribution of suitable monitoring wells is inadequate for setting stream depletion MTs at the time
- Recommendation:
  - Improve stream depletion monitoring network and set stream depletion thresholds in 2027

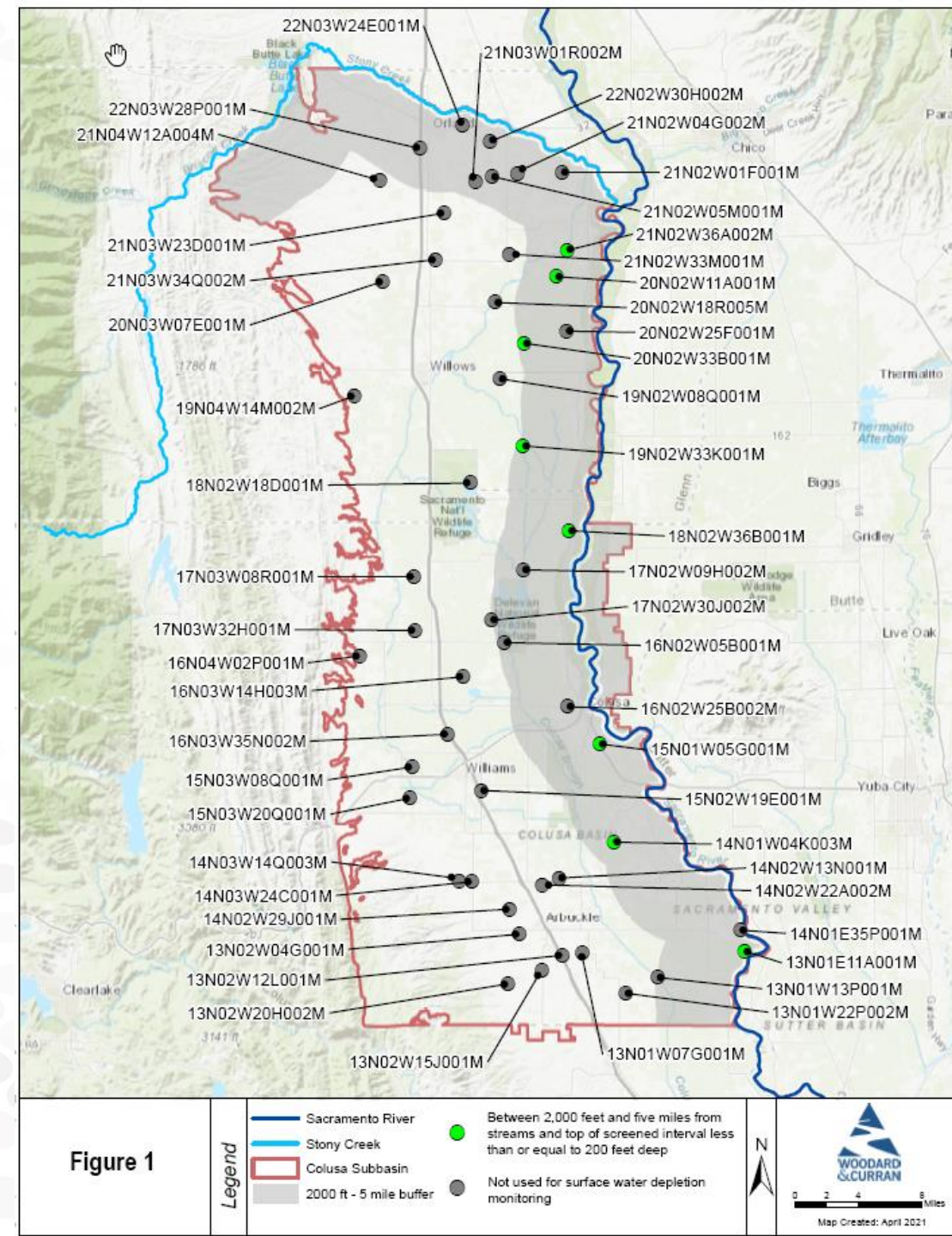


Figure 1

Legend	Sacramento River	Between 2,000 feet and five miles from streams and top of screened interval less than or equal to 200 feet deep
	Colusa Subbasin	Not used for surface water depletion monitoring
	2000 ft - 5 mile buffer	

Map Created: April 2021

# Discussion

# **4.c. Projects and Management Actions (PMAs)**



# Projects and Management Actions (PMAs)

- Last addressed at 11/13/20 Joint TAC meeting
  - Reviewed approach to identify, describe, and select PMAs for inclusion in the GSP
- Draft Chapter 6 due for review by July 16
- Targeting completion of technical work by mid-June
- Joint TAC Meetings
  - April 23 (today): Review PMA list and prelim ranking
  - May 14: Additional project details
  - June 11: Adopt recommendation on selected PMAs

# PMAAs - GSP Regulatory Requirements

- GSP must include projects and management actions (PMAAs) “.. to meet the *sustainability goal* for the basin in a manner that can be maintained over the planning and implementation horizon.” (§ 354.42)
- Sustainability goal must “... ensure that the basin will be operated within its sustainable yield...” (§ 354.24)
- Information Required (§ 354.44) :
  - List of proposed PMAAs
  - Measurable objective(s) that will benefit from the proposed PMAAs
  - Description of conditions triggering implementation and decision process
  - Other details

# General Project Types

- Groundwater Recharge
  - In-lieu groundwater recharge
    - Within existing service areas, with existing infrastructure
    - Within annexed areas, with new or extended infrastructure
    - In GW-only areas with new infrastructure
  - Direct groundwater recharge
    - In natural or modified/engineered streambeds
    - Off-season pre-irrigation or flooding of ag lands (AgMAR, FloodMAR multi-benefit projects)
    - Dedicated recharge basins in high recharge areas
- Reductions in non-beneficial consumption of groundwater
  - Invasive species eradication (Arundo)
- Initial focus on areas with sustainability concerns, but not to the exclusion of cost-effective projects in other areas

# Surface Water Supply Sources for Groundwater Recharge

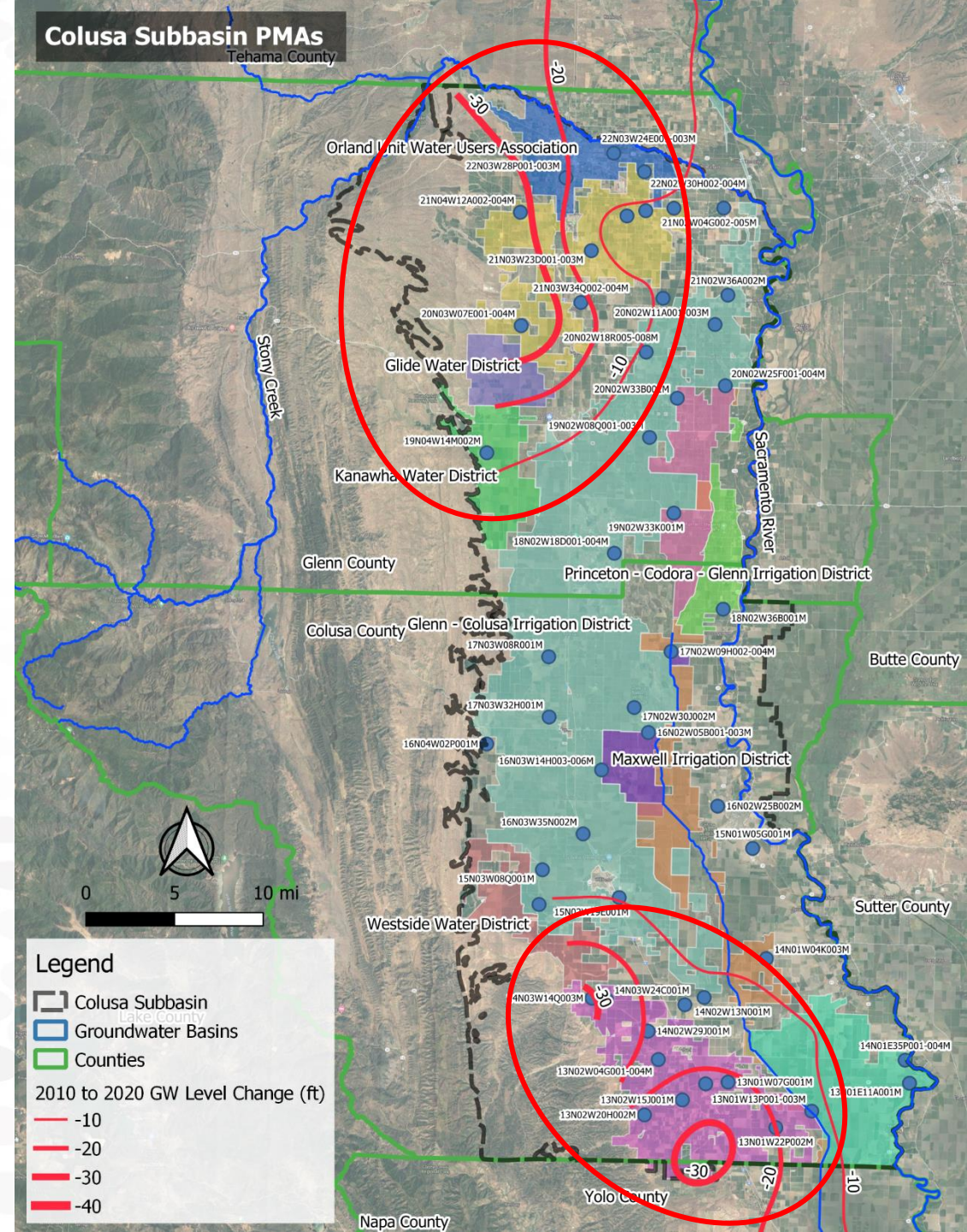
- Sacramento River
  - Maximize use under existing CVP contracts
  - CVP water transfers under CVPIA
  - Section 215 water (unmanaged flood flows as declared by USBR)
- Stony Creek
  - High water
  - Storage releases
  - Institutional hurdles
- Larger Westside watersheds
  - Ephemeral streams
  - Large seasonal and inter-annual flow variability
- Each source has its own, unique pattern of availability and cost



# Areas with Sustainability Concerns

- Orland-Willows Westside
- Williams-Arbuckle Westside

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





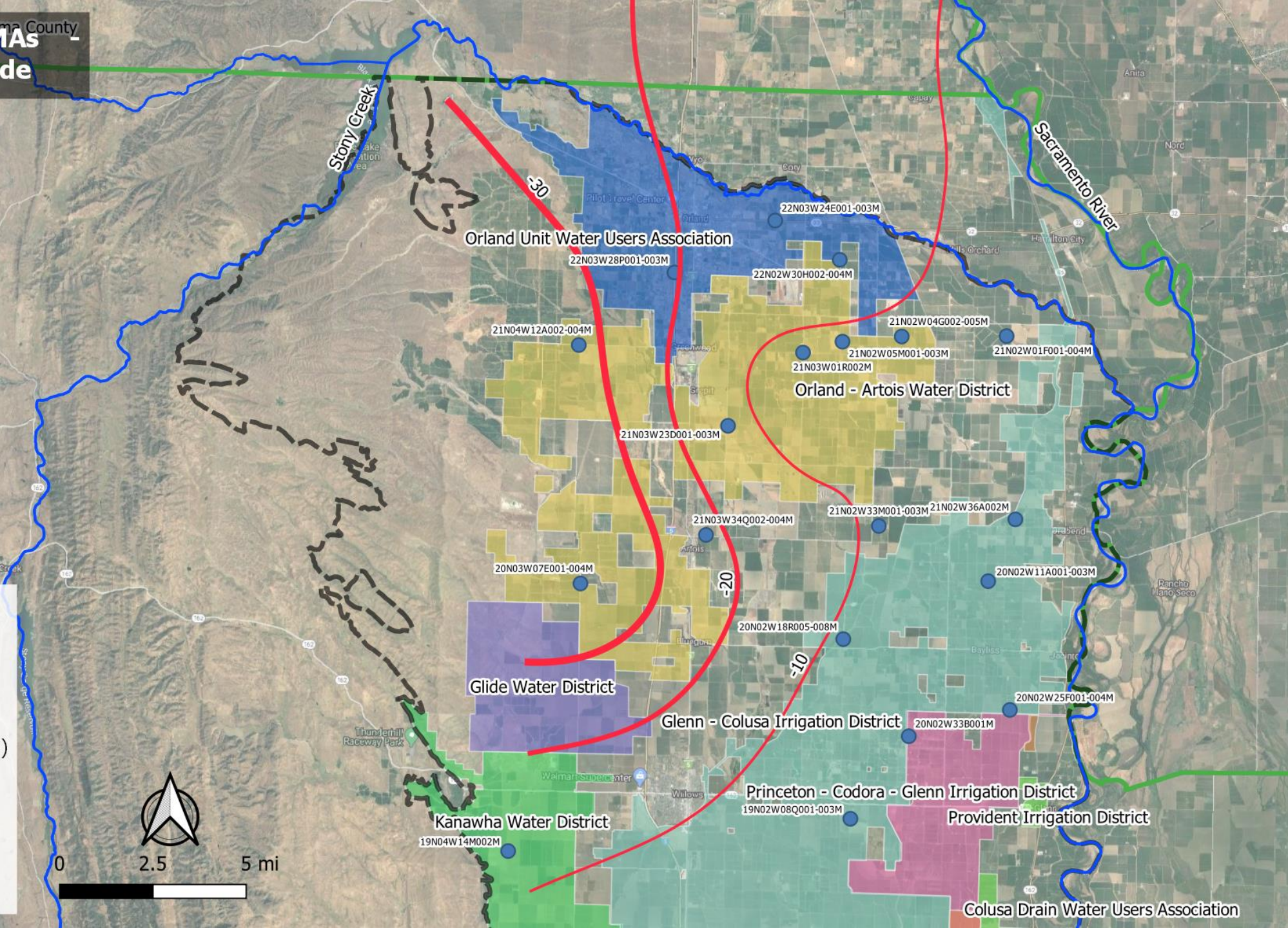
**Colusa Subbasin PMA's**  
**Orland-Willows Westside**

**Legend**

- Colusa Subbasin
- Groundwater Basins
- Counties

2010 to 2020 GW Level Change (ft)

- 0
- 10
- 20
- 30
- 40





# Orland-Willows Westside Recharge Project: Potential Components

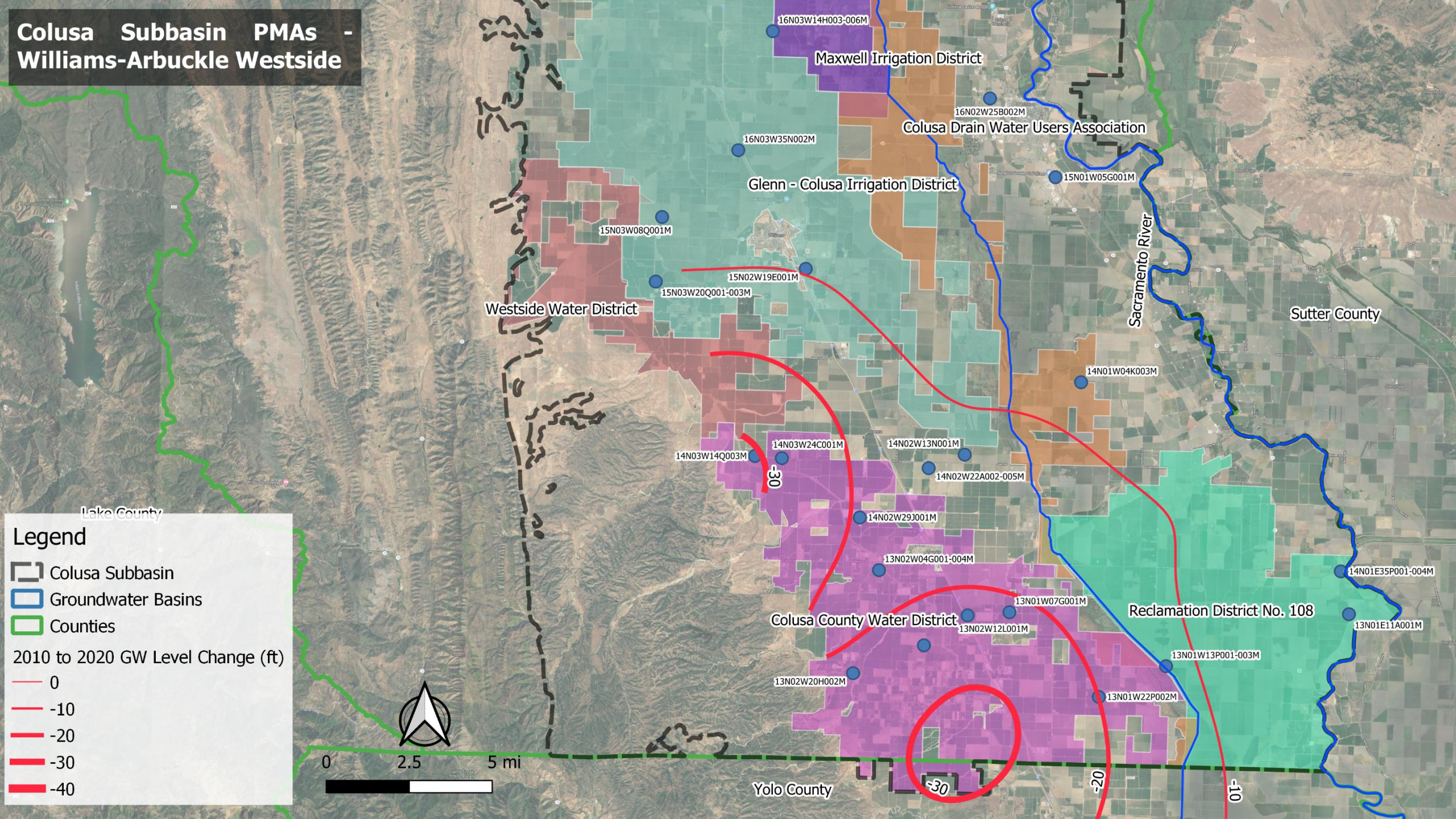
- In-lieu groundwater recharge
  - Maximize SW use within existing service areas
    - Incentivize use of existing contract supplies (OAWD and GWD)
    - Incentivize use of 215 water (OAWD, GWD and KWD)
      - Mostly pre-irrigation (probably not much flooding)
    - Existing infrastructure
  - OAWD Annexation Project
    - Up to 13,000 acres (up to 20-25 TAF SW delivery in non-critical years)
    - Combination of mostly new and some extended infrastructure
    - Combination of water sources, mainly CVP water transfers, possible Orland Unit SW water in future
  - Possible OUWUA future annexations
    - Along southern boundary (TBD)

# Orland-Willows Westside Recharge Project: Potential Components, continued

- Direct groundwater recharge
  - Streambed recharge in various local streams: Wilson, Walker, Prince, French, and Walker Creeks
    - Natural or modified/engineered streambeds
    - Local runoff, 215 water, unused CVP contract supplies
  - Dedicated recharge basins in gravelly areas within OAWD existing service area and potential annexed lands



# Colusa Subbasin PMAs - Williams-Arbuckle Westside

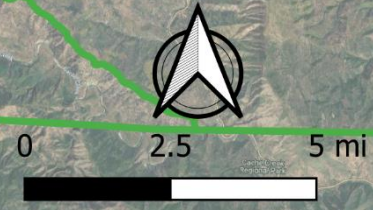


**Legend**

- Colusa Subbasin
- Groundwater Basins
- Counties

**2010 to 2020 GW Level Change (ft)**

- 0
- 10
- 20
- 30
- 40



**Maxwell Irrigation District**

**Colusa Drain Water Users Association**

**Glenn - Colusa Irrigation District**

**Westside Water District**

**Colusa County Water District**

**Reclamation District No. 108**

**Sacramento River**

**Sutter County**

**Yolo County**

**Lake County**

16N03W14H003-006M

16N02W25B002M

16N03W35N002M

15N01W05G001M

15N03W08Q001M

15N02W19E001M

15N03W20Q001-003M

14N01W04K003M

14N03W14Q003M

14N03W24C001M

14N02W13N001M

14N02W22A002-005M

14N02W29J001M

14N01E35P001-004M

13N02W04G001-004M

13N01W07G001M

13N02W12L001M

13N01W13P001-003M

13N01W22P002M

13N02W20H002M

13N01W22P002M

-30

-30

-20

-10



# Williams-Arbuckle Westside Recharge Project: Potential Components

- In-lieu groundwater recharge
  - Maximize SW use within existing service areas
    - Incentivize use of existing contract and CVP transfer supplies (primarily CCWD, up to 30 TAF/year)
      - SW cost needs to be on par with GW cost
      - SW costs needs to include additional cost, management hassle for screening/filtering SW
    - Incentivize use of 215 water (WWD and CCWD)
      - Mostly pre-irrigation (probably not much flooding)
      - Metering and water accounting challenges in CCWD

# Williams-Arbuckle Westside Recharge Project:

## Potential Components, continued

- In-lieu groundwater recharge
  - WWD annexation of up to about 3,000 acres
    - Increased SW deliveries, reduced GW pumping
    - Existing contract water
  - OAWD annexation of potentially 600 acres
    - Increased SW deliveries, reduced GW pumping
    - Existing contract water and CVP water transfers
- Direct groundwater recharge
  - Local streams, TBD
  - Dedicated recharge basins in suitable areas, TBD

# AgMAR and FloodMAR Multi-Benefit Projects

- AgMAR—CGA/TNC/DWR 2020 Pilot Project
- FloodMAR—TNC/DWR concept stage
- Voluntary, incentive driven landowner participation



# Other Identified Projects—Preliminary Draft

- 1) GCID Main Canal regulating reservoir
  - 30,000 to 40,000 AF regulating reservoir on Colusa Basin Drain
  - Conserve and deliver SW to reduce GW pumping ??
- 2) Invasive plant species (Arundo) eradication
  - Reduce shallow GW consumption
- 3) Sacramento River water treatment facility
  - Treat and deliver high quality drinking water to small communities currently using poor quality groundwater
- 4) Colusa Subbasin Groundwater Recharge and Banking Program
  - Recently submitted through on-line form by South Valley Water Resources Authority
  - “Project cost-share for water-share”

# Management Actions—Preliminary Draft

- Enhanced monitoring (Primarily for SMC Refinement)
  - Water quality (TDS)
  - Improved GDE classification
  - Shallow groundwater levels near GDEs and rivers/streams
  - Stream flow and stage
- Well replacement program
  - Financial support for replacement of wells not protected by MTs
- Well database improvement and maintenance
  - Potentially needed to support GSP implementation funding through well head or pumping fees

# Management Actions, cont.—Preliminary Draft

- Demand management (reduction in groundwater pumping)
  - Allocation (pumping limits)
  - Allocation + water market
  - Land repurposing programs
  - Fees/financial incentive programs
- Feasible and cost-effective projects would be pursued before demand management

# PMAAs - Next Steps

- Characterize recharge water sources, quantities and timing (high-level analysis)
- Prepare conceptual recharge project descriptions with focus on recharge quantities, frequency and locations
- Use model and water budget analyses to estimate sustainability benefits
- Evaluate demand reduction if recharge projects insufficient to achieve and maintain sustainability
- Develop project descriptions for GSP



# **5. Topics and TAC Decisions for Next Meeting**

# May 14, 2021 Joint TAC Meeting Topics

- Sustainable Management Criteria
  - Adopt TAC recommendations to GSA Boards for GW levels and streamflow depletion
- Projects and Management Actions
  - Conceptual project configurations
  - Preliminary model results (sustainability benefits)
  - Initial identification at most promising projects

# Discussion