COLUSA AND GLENN GROUNDWATER AUTHORITIES

Colusa Subbasin

Joint Technical Advisory Committee

Activity Updates and Coordination

July 8, 2022

Meeting Topics

- Item 5. Subsidence Benchmark Update
- Item 6. Hydrogeologic Investigation Update
- Item 7. Well Monitoring Pilot Program Update
- Item 9. 2022/2023 Grant Application

COLUSA SUBBASIN

Item 5. Subsidence Benchmark Update

Project Report
Colusa Subbasin
Supplemental Benchmarks

Project Purpose

The purpose of this project was to install 12 new bench marks in the Colusa Subbasin, and to establish NAD83 ellipsoid heights for each in support of ongoing land subsidence monitoring. The general locations for the new bench marks were identified by the Colusa Subbasin Groundwater Sustainability Plan Technical Advisory Committee (TAC) in May of 2022. Five of the Areas of Interest (AOIs) are in Glenn County, and seven are in Colusa County. (See Appendix A, Areas of Interest.)

Static GPS receiver at H62U

RTK base receiver at 5B35

Appendix B – New Bench Mark Descriptions

WIRD (AOI 11) 38°58'36.0"N 122° 03'4.2"W

The station is located about 3 miles south of Arbuckle in Colusa County. To reach the station from the intersection of Interstate 5 and the underpass road at Exit 567 in Arbuckle, go west on the underpass road for 300 ft. to Wildwood Road. Turn left and go south on Wildwood Road for 1.0 mi. to a 90-degree turn to the right. Follow the road and continue west on Wildwood Road for 0.2 mi. to Wagner Avenue. Turn left and continue south on Wildwood Road for 1.5 mi. to Nonpareil Avenue. Turn left and go east on Nonpareil Avenue for 0.5 mi. to the Tehama-Colusa Canal and the station on the right.

The station is a 1" copper disk stamped WIRD set in the southwest corner of a bridge over the Tehama-Colusa Canal. It is 1.0 ft. north of and 0.8 ft. east of the southwest corner of the bridge deck.

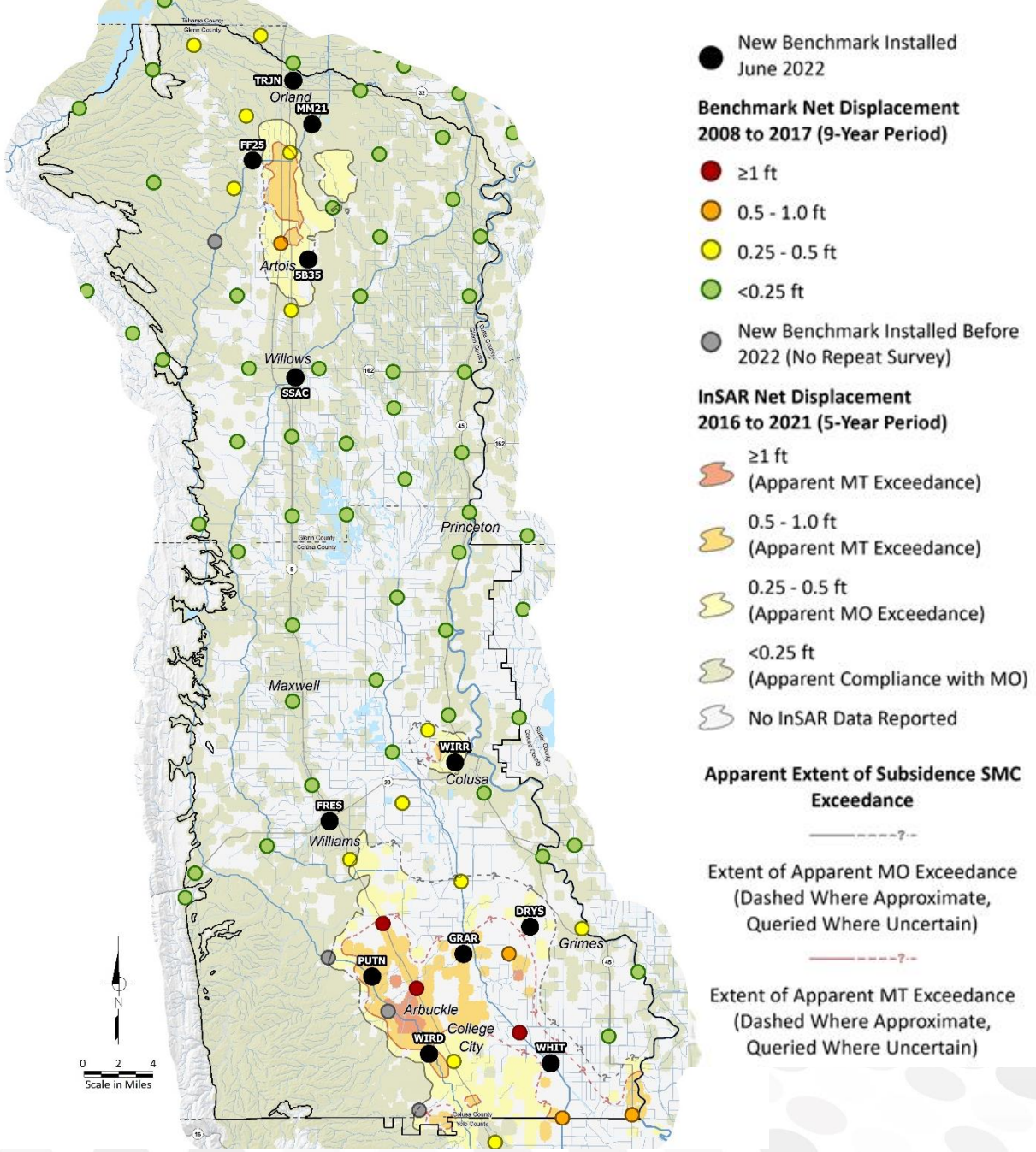
COLUSA SUBBASIN

Measured Subsidence

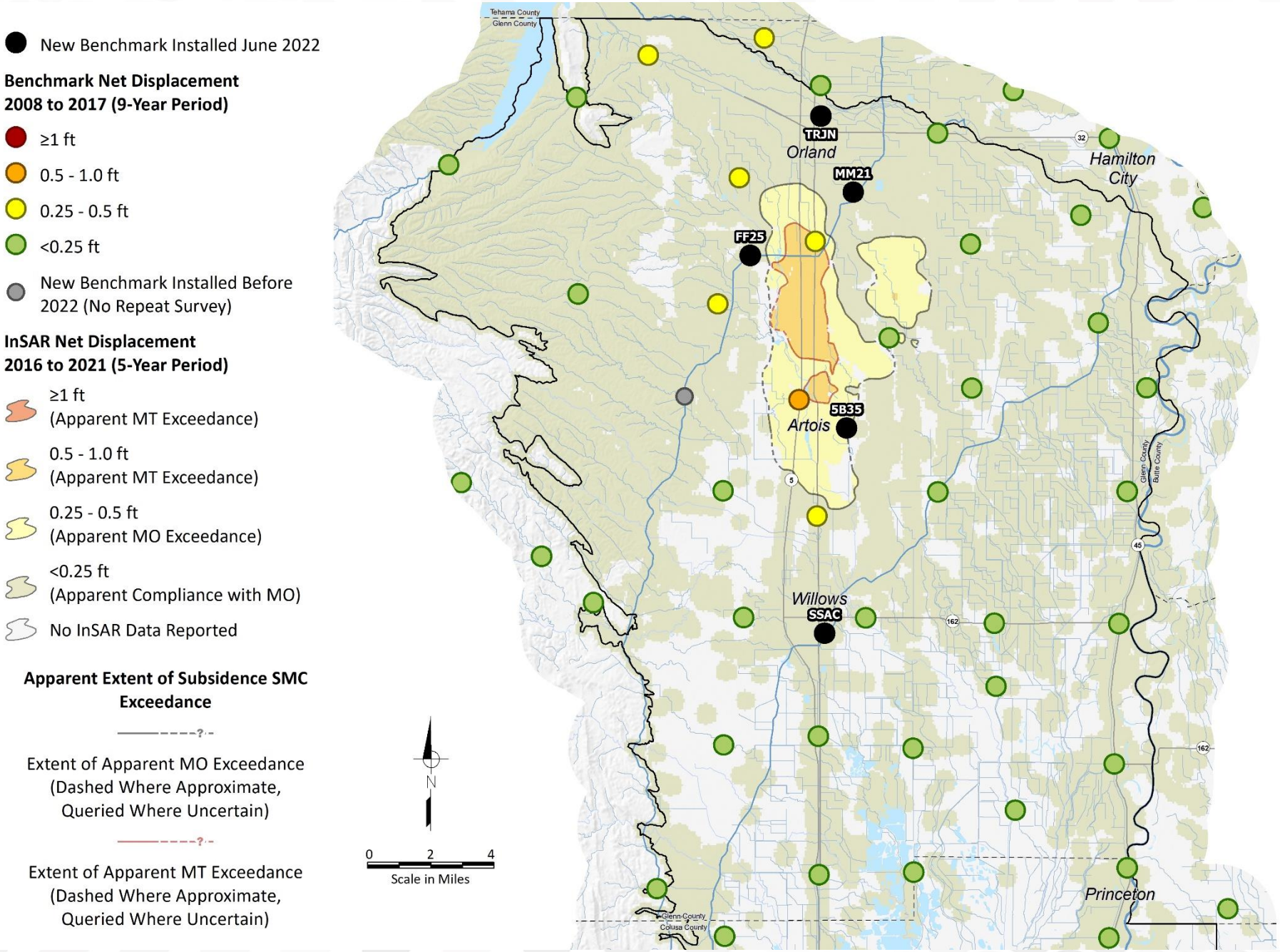
Map to the right shows:

- New benchmarks installed June 2022
- Existing benchmarks color coded with change in land surface elevation between 2008 and 2017 surveys (9 years)
- Interferometric Synthetic Aperture Radar (InSAR) satellite results color coded with change in land surface elevation between 2016 and 2021 surveys (5 years)
- Delineation of areas where measurable objectives (MO) and minimum thresholds (MT) may be exceeded based on InSAR results

Repeat survey of the benchmark network is needed to assess the sustainable management criteria (SMC) for land subsidence.

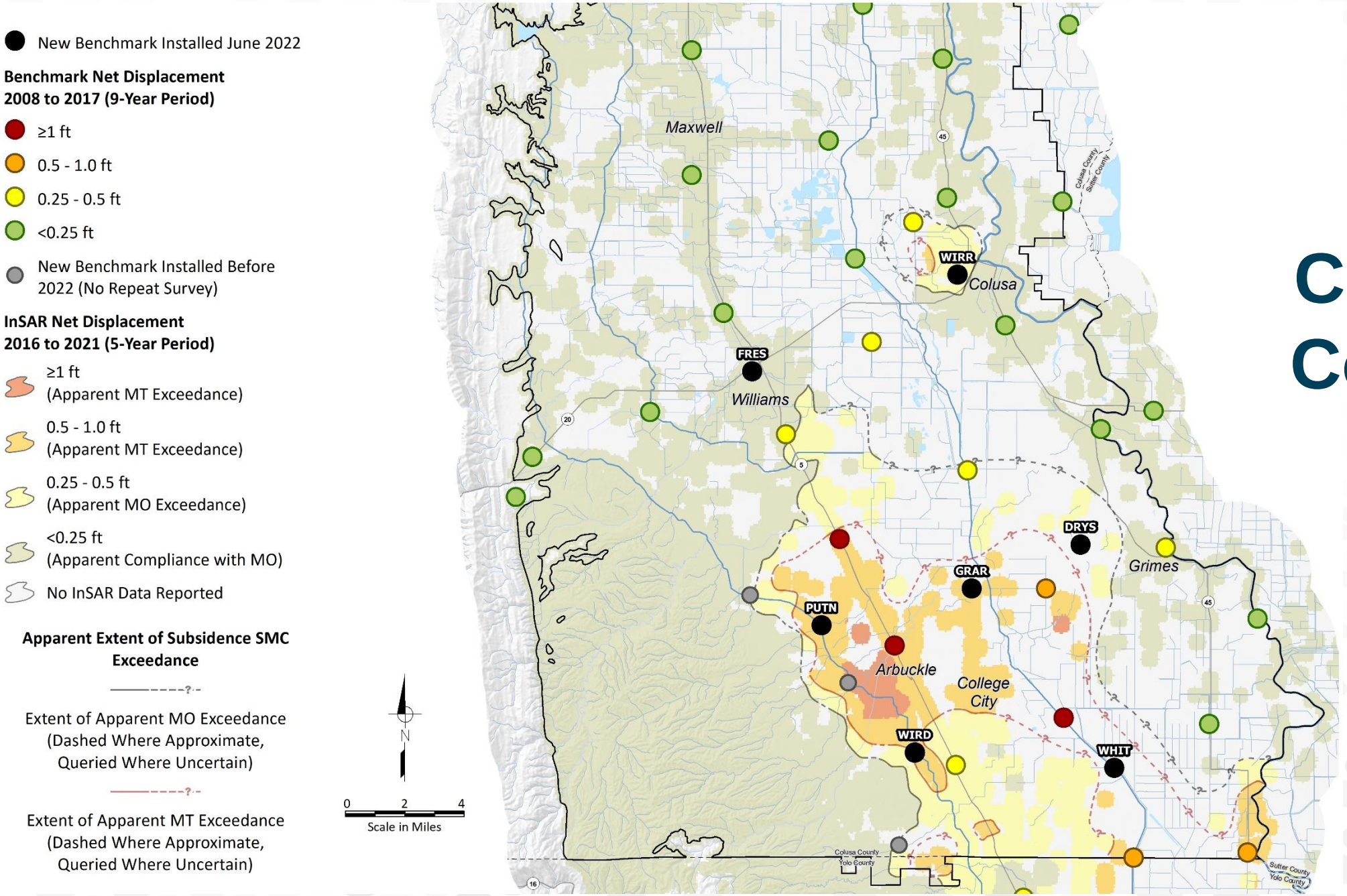


Glenn County



COLUSA SUBBASIN

Colusa County

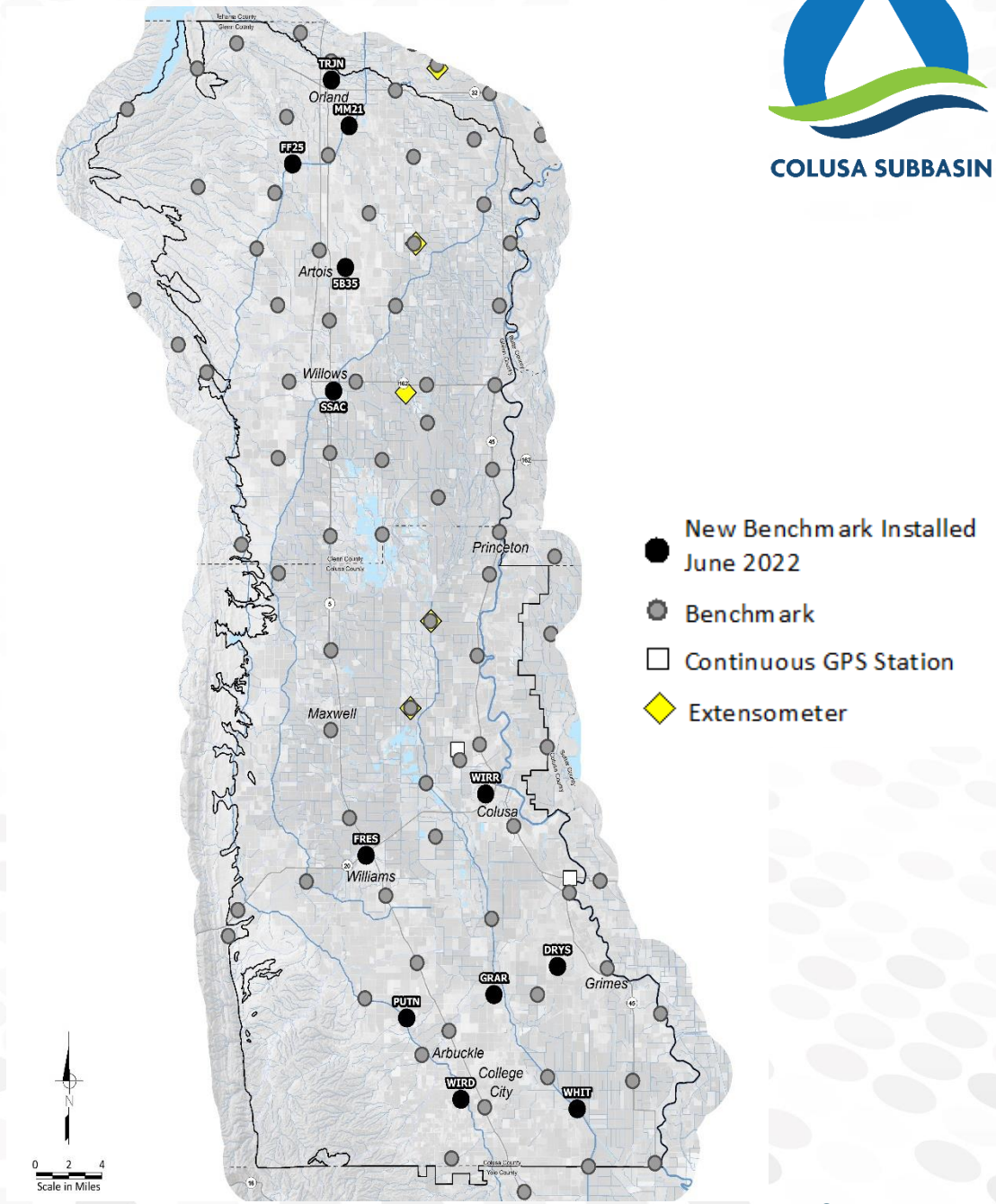


COLUSA SUBBASIN

Complete Land Subsidence Monitoring Network

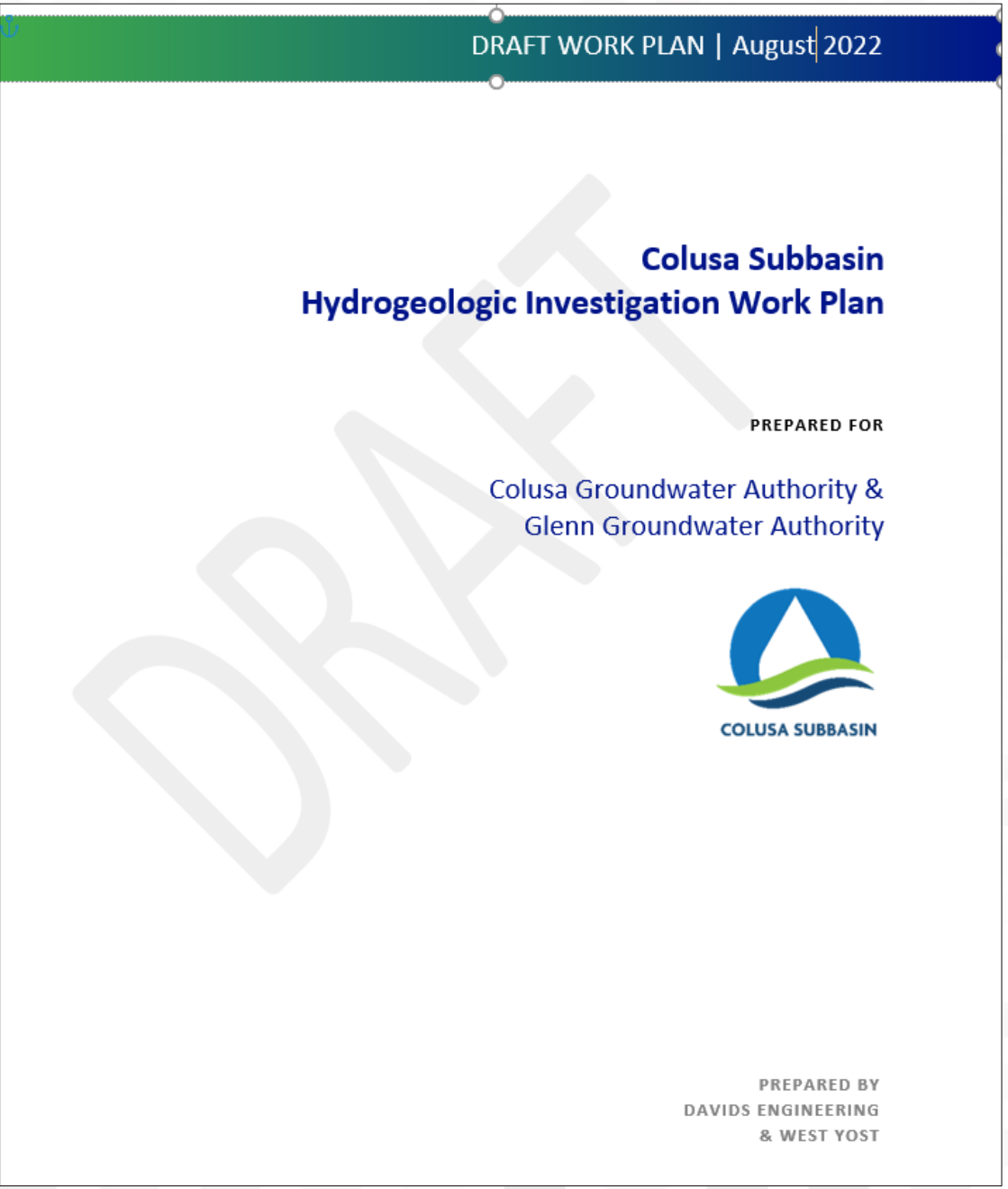
Map to the right shows:

- Benchmarks Installed June 2022
- Benchmarks Installed Before 2022
- Continuous GPS Stations
- Extensometers



COLUSA SUBBASIN

Item 6. Hydrogeologic Investigation Update



Work Plan Highlights:

COLUSA SUBBASIN

- Supports planning and implementation of hydrogeologic investigations and data analyses to fill data gaps and address projects and management actions identified in the Colusa Subbasin GSP
- Structured for use in preparing grant applications
- Addresses:
  - Shallow Groundwater Monitoring Network Expansion
  - Groundwater Quality Monitoring Network Expansion
  - Surface Water Monitoring Network Expansion
  - Land Subsidence Monitoring Network Expansion
  - Colusa Subbasin Western Boundary Investigation
- In preparation - will be available for discussion at the August 2022 Joint TAC meeting

COLUSA SUBBASIN

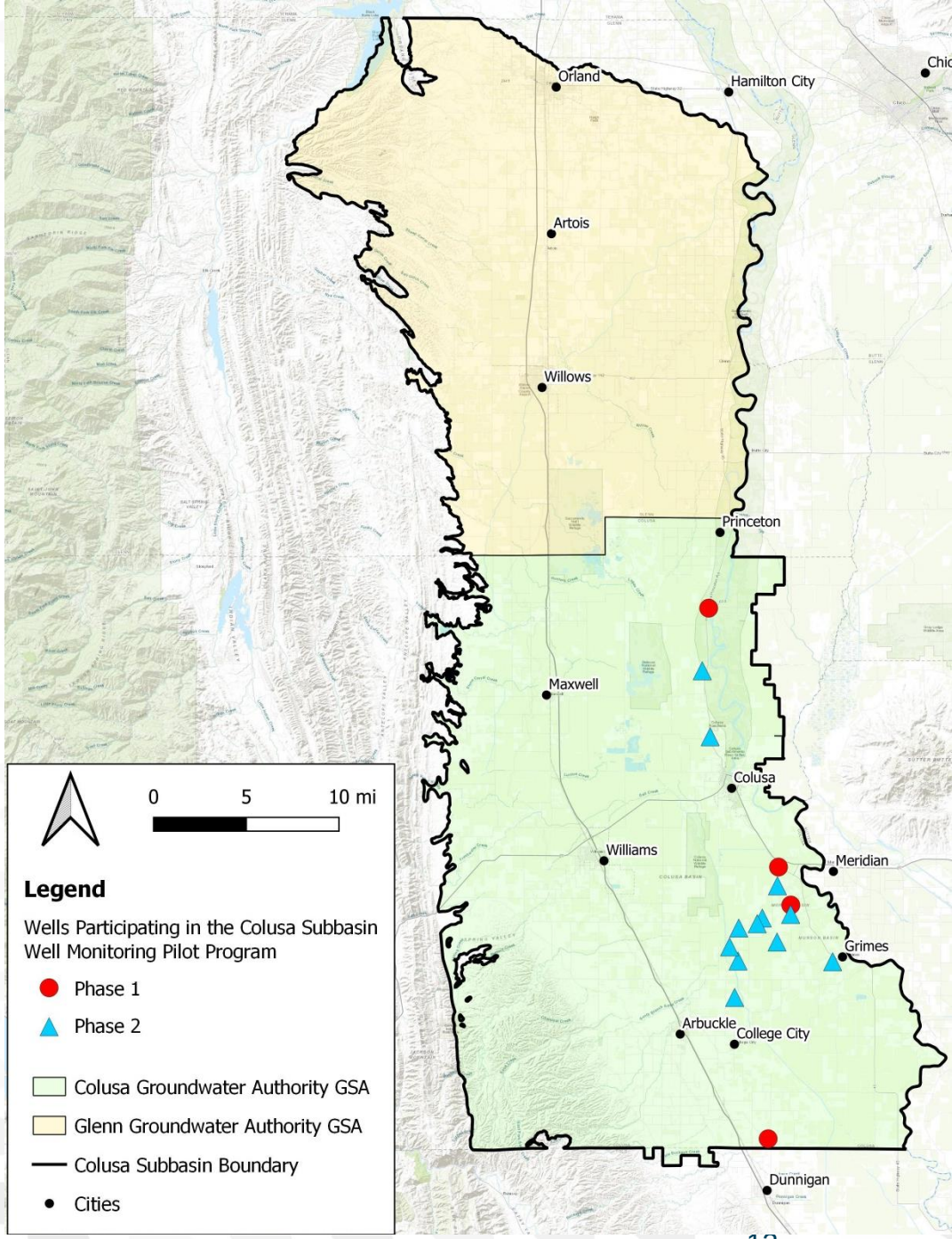
Item 7. Well Monitoring Pilot Program (WMPP)

History and Objectives of the WMPP

- Installed monitoring/telemetry equipment to continuously monitor groundwater levels and groundwater extraction at participating wells.
  - Voluntary, non-regulatory program
  - Incentive-based
- Objectives:
  - Encourage **stakeholder engagement** in GSP implementation.
  - Test **functionality/practicality of WMPP equipment** for monitoring GW conditions.
  - Evaluate opportunities and benefits of new technologies to **improve on-farm water management**.
  - Expand **data collection** and **fill data gaps** related to GW levels and GW extraction.
  - Evaluate the **utility/feasibility of Subbasin-wide implementation** of the WMPP.

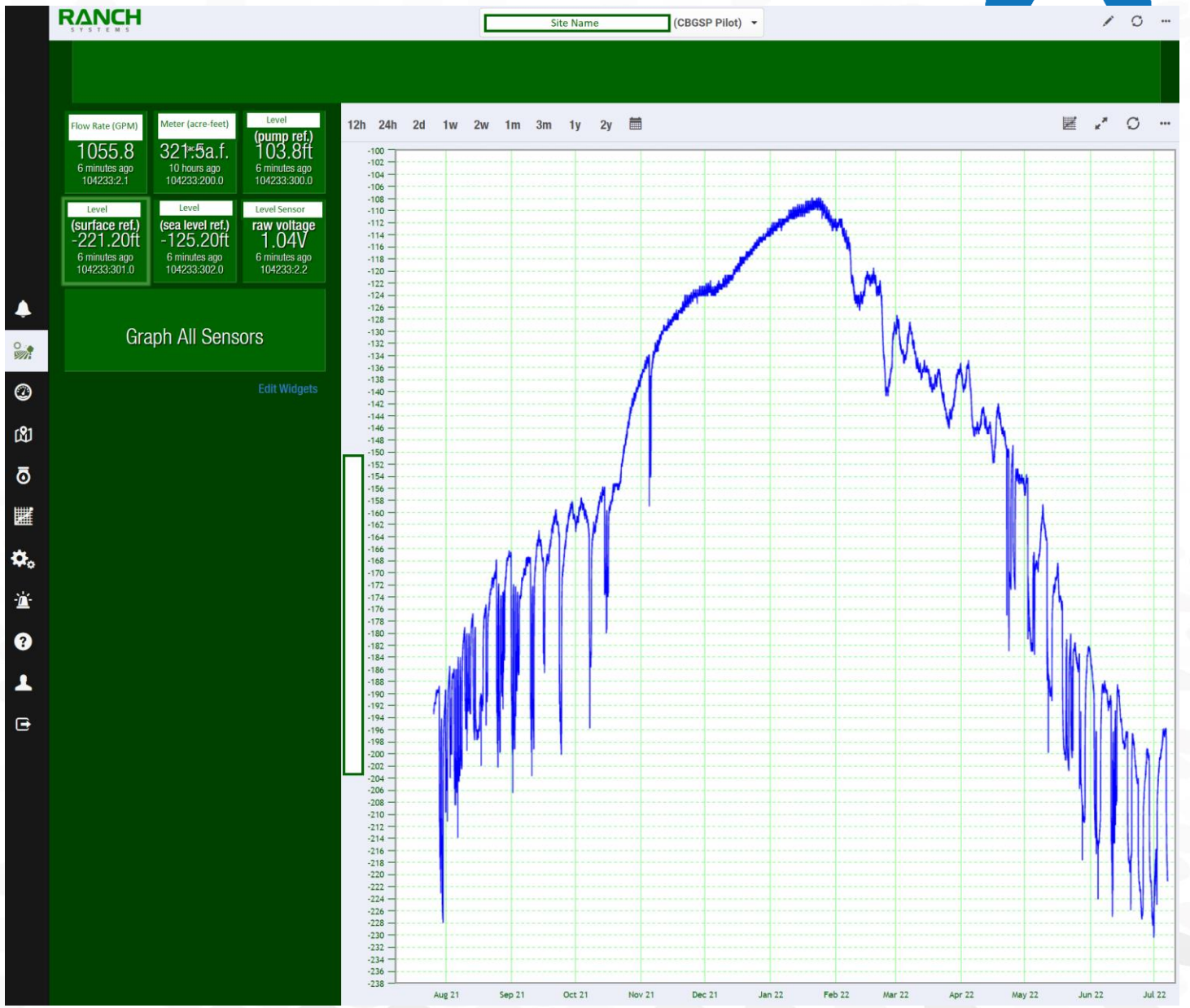
Status of the WMPP

- **<u>Currently 16 participating sites</u>**
- Phase 1: initial program development
  - Four participating sites
  - Monitoring equipment installed in 2021
  - Data collected since July 2021
- Phase 2: program expansion
  - 12 participating sites
  - Monitoring equipment installed in 2022
  - Data collected since June 2022



Ongoing Monitoring

- Monitoring continues through December 2024
- Data is continuously collected and accessible to well owners and GSA staff through a web-based portal
  - Well owners can access their own data
  - GSA staff can access all data
- Available data:
  - Flow rate (GPM)
  - Volume pumped (acre-feet)
  - GW level (feet; relative to sea level, ground surface, and pump)



COLUSA SUBBASIN

Item 9. 2022/2023 Grant Application

Purpose of Today's Discussion

COLUSA SUBBASIN

- Frame grant timeline and "ground rules"
- Discuss potential uses of grant funding
- Gather TAC input regarding importance and prioritization of Colusa Subbasin projects
  - Serves to guide detailed prioritization by staff and Consultant Team
- Review draft prioritization at August Joint TAC meeting
- Finalize prioritization in time for grant application preparation
  - TAC recommendations to GSA Boards in August/September timeframe

Grant Timeline and "Ground Rules"

- Expected Timeline
  - DWR solicitation late 2022/early 2023 (latest DWR estimate)
  - Application deadline expected in early 2023
  - Anticipate awards will be announced July 2023, contracts executed Sept-Nov 2023
- $200+ million total DWR funding
- Available to critically overdrafted and high- and medium-priority subbasins
- One application per subbasin (CGA and GGA coordination)
- $20 million cap per subbasin
- Competitive among subbasins and other grantees (Tribes, non-profits, public agencies)

Potential Uses of Grant Funds

COLUSA SUBBASIN

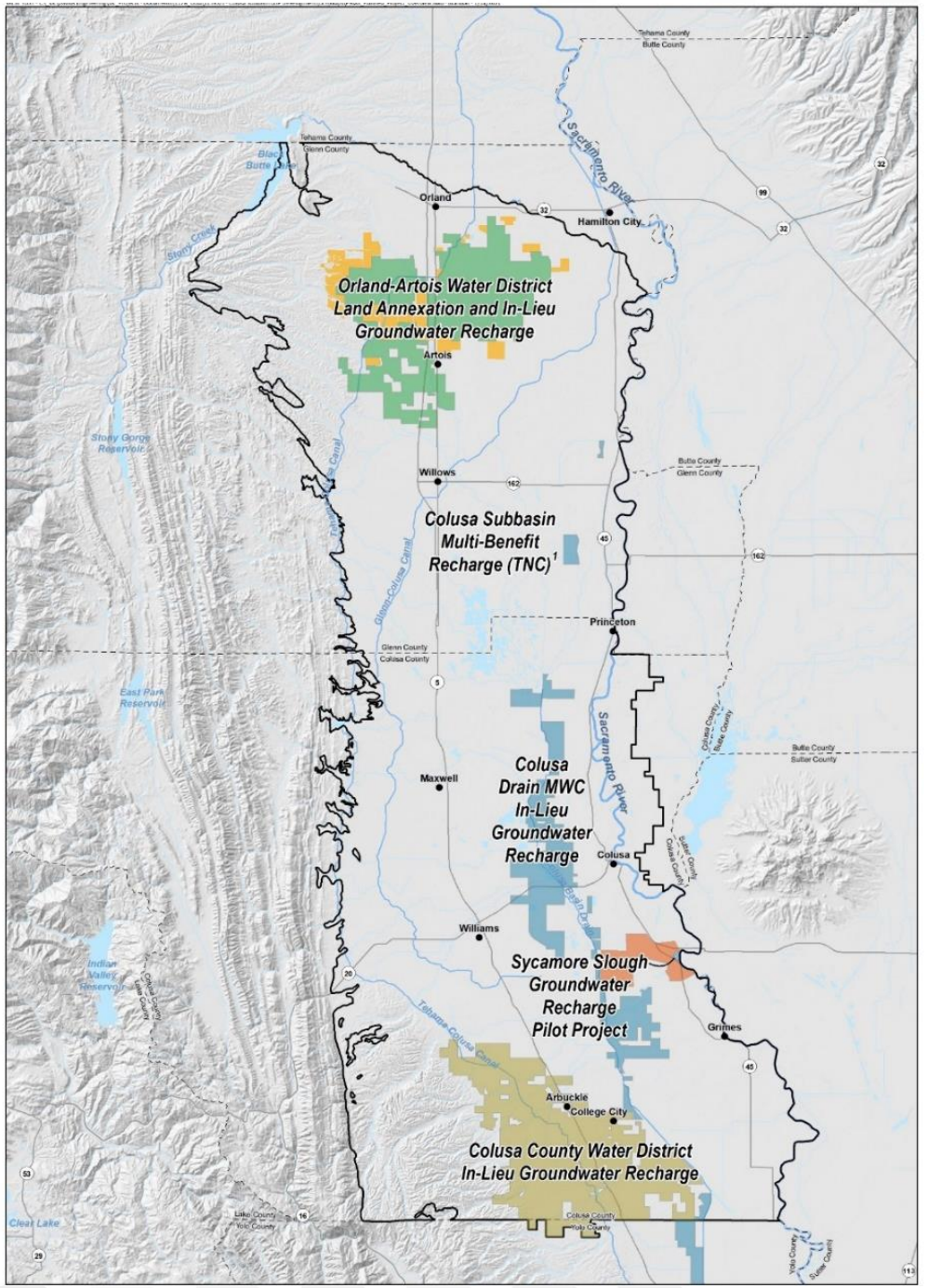
- Support ongoing development/implementation of PMAs
- Support recharge project implementation
- Address critical data gaps identified in the GSP
- Update and improve analytic tools needed to support groundwater management and 5-year GSP updates
- Support interbasin coordination
- Address any GSP deficiencies expected from DWR or alleged by commenters
- Probably some combination of the above

Support Recharge Project Implementation

- Limited to projects that can be implemented within the 3-year grant performance period
- Policy Question: Is grant funding available to any recharge project proponent or only the GSAs?
- Three large in-lieu recharge projects identified in GSP likely to provide the largest and most immediate benefits to the subbasin
- All recharge projects depend on availability of surface water supplies
- What if dry conditions persist?

Planned PMAs (5)

1. Colusa Subbasin Multi-Benefit Groundwater Recharge
2. Sycamore Slough Groundwater Recharge Pilot Project
3. Orland-Artois Water District Land Annexation and Groundwater Recharge
4. Colusa County Water District In-Lieu Groundwater Recharge
5. Colusa Drain Mutual Water Company In-Lieu Groundwater Recharge



Address Critical Data Gaps

- Shallow groundwater monitoring
- Identification/mapping of Groundwater Dependent Ecosystems
- Characterization of streamflow depletion (surface water-groundwater interaction)
- Water quality
- Coordinated with the Hydrogeologic Investigation

Update and Improve Analytic Tools

COLUSA SUBBASIN

- C2VSimFG-Colusa model
  - Model currently covers 1990-2015
  - Current drought years (2020, 2021, and 2022) not represented
  - Model will be 10+ years out of date by 2027 5-year update
  - Improved calibration needed in certain areas
- Data Management System (DMS)
  - Required under SGMA
  - DMS implementation Tech Memo recently completed

Support Inter-basin Coordination

COLUSA SUBBASIN

- Coordination of Measurable Objectives and Minimum Thresholds along subbasin boundaries
- Address cumulative effects among subbasins on streamflow depletion
- Other?

Potential GSP Concerns Identified by DWR and Stakeholders

- Need to review and evaluate DWR comments on critically overdrafted subbasin GSPs
- Need to review and evaluate comment letters and summarize any potential concerns or deficiencies

Criteria for Prioritizing PMAs and Studies

- Not enough funding to cover all needs
- What criteria should be used to prioritize PMAs and studies?
- Potential criteria:
  - Achieves basin-wide benefits
  - Has high benefit to cost ratio
  - Achieves benefits in areas of concern (with emphasis on water levels and subsidence)
  - Is eligible for grant funding
  - Has potential for cost-sharing among beneficiaries

Concluding Discussion

- Key takeaways
- Summary guidance to staff and consultants

COLUSA SUBBASIN

Additional Slides

Summary of All Projects and Management Actions in the Colusa GSP

- Planned:

Project/ Management Action Name	Project/ Management Action Type	Proponent	Brief Description
Colusa County Water District (CCWD) In-Lieu Groundwater Recharge	In-lieu Groundwater Recharge	CCWD	CCWD will utilize 30 taf of additional surface water for irrigation in all years but Shasta Critical years for in-lieu recharge. The additional surface water will be made available through full use of the district's existing Central Valley Project (CVP) contract and annual and multi-year water purchase and transfer agreements. Additional surface water deliveries are estimated to be 27 taf/yr, enabling reduction of groundwater pumping by a like amount.
Colusa Drain MWC (CDMWC) In-Lieu Groundwater Recharge	In-lieu Groundwater Recharge	CDMWC	CDMWC diverters use both ground and surface water because Colusa Drain supplies are insufficient to satisfy all irrigation requirements. This project would provide additional surface supplies averaging approximately 28 taf/yr in the Drain allowing CDMWC diverters to increase their diversions of surface water to provide in-lieu groundwater recharge of a like amount.
Subbasin Multi-Benefit Groundwater Recharge	Direct Groundwater Recharge	CGA, GGA and TNC	The Nature Conservancy (TNC) is partnering with entities for an on-farm, multi-benefit groundwater recharge incentive program. The pilot program was initiated in Colusa County in 2018 and concluded in the spring of 2021, with plans to expand and continue into the future. DWR is a partner in the Subbasin Multi-Benefit Groundwater Recharge project as it moves into the expanded program.

Summary of All Projects and Management Actions in the Colusa GSP

COLUSA SUBBASIN

- Planned:
  (continued)

Orland-Artois Water District (OAWD) Land Annexation and Groundwater Recharge	Direct and In-lieu Groundwater Recharge	OAWD	OAWD is planning to annex approximately 12,000 acres of groundwater-dependent agricultural lands. Additional direct recharge may be considered on suitable annexed lands. The project is an area where groundwater levels have been in decline in recent years. It is estimated that a long-term average of approximately 23 taf/yr of surface water would be available, reducing groundwater pumping by approximately 23 taf/yr.
Sycamore Slough Groundwater Recharge Pilot Project	Direct Groundwater Recharge	Landowner	Proctor and Gamble (P&G) and Davis Ranches have entered into an agreement to implement a 10-year groundwater recharge pilot project. A 66-acre field on Davis Ranches will receive surface water for groundwater recharge and provide habitat for migrating shorebirds. Water would be diverted from the Sacramento River during fall/winter months using existing riparian rights or would be available from settlement contract supplies (should the project begin before November 1). An expansion of the project is planned for recharge and revegetation in the neighboring Sycamore and Dry Sloughs.

Summary of All Projects and Management Actions in the Colusa GSP

COLUSA SUBBASIN

- Ongoing:

Reclamation District 108 (RD108) and Colusa County Water District (CCWD) Agreement for Five-Year In-Lieu Groundwater Recharge Project	In-lieu Groundwater Recharge	RD108 and CCWD	CCWD (and Dunnigan Water District [DWD]) purchases surface water from RD108 for distribution within its service area. The agreement expires in 2022. This project supplies additional surface water to CCWD (and DWD) that provides in-lieu recharge.
Glenn-Colusa Irrigation District (GCID) Strategic Winter Water Use for Groundwater Recharge and Multiple Benefits	Direct and In-lieu Groundwater Recharge	GCID	GCID holds a water right for winter water. This project will increase the groundwater recharge and habitat enhancement benefits of winter water use by increasing use for rice straw decomposition, irrigation, and frost control provided that certain constraints can be alleviated.
Sycamore Marsh Farm Direct Recharge Project	Direct Groundwater Recharge	Landowner	Sycamore Marsh Farm is developing a groundwater recharge plan to store groundwater. The plan provides for 205 acres of year-round recharge basins and 163 additional acres of winter recharge areas.

Summary of All Projects and Management Actions in the Colusa GSP

COLUSA SUBBASIN

- Ongoing: *(continued)*

Glenn-Colusa Irrigation District Expansion of In-Basin Program for In-lieu Groundwater Recharge	In-lieu Groundwater Recharge	GCID	GCID has developed arrangements to supply district surface water to neighboring non-district agricultural lands that primarily use groundwater. These temporary arrangements expired in 2020. There is interest in continuing and expanding this in-basin surface water use for in-lieu groundwater recharge. Supplies would potentially be available only in Shasta Non-Critical years.
Orland Unit Water Users Association (OUWUA) Irrigation Modernization for Increased Surface Water Delivery and Reduced Groundwater Pumping	In-lieu Groundwater Recharge	OUWUA	Modernization of OUWUA southside system for more reliable and flexible farm deliveries that will provide incentive for growers to use more surface water and less groundwater.
Management Actions			
Urban Water Conservation in Willows	Management Action	California Water Service – Willows District	This project includes urban water conservation measures through water waste prevention ordinances, metering, conservation pricing, public education, and outreach programs to assess and manage distribution system real loss, water conservation program coordination and staffing support, and other demand management measures.

Summary of All Projects and Management Actions in the Colusa GSP

- Potential:

Glenn-Colusa Irrigation District In-lieu Groundwater Recharge	In-lieu Groundwater Recharge	GCID	GCID will investigate, develop, and implement measures to incentivize additional use of surface water supplied by GCID, which will provide in-lieu recharge through reduced groundwater pumping.
Westside Streams Diversion for Direct or In-lieu Groundwater Recharge	Direct and In-lieu Groundwater Recharge	CGA and GGA	A portion of western ephemeral stream flows could be diverted for in-lieu or direct groundwater recharge.
Sites Reservoir	Direct and In-lieu Groundwater Recharge	Sites Project Authority	The Sites Project is a new off-stream storage facility that is currently in development. Depending on project operation and yield, there is potential for groundwater benefits to accrue to the Subbasin from Sites Reservoir.
Delevan Pipeline Colusa Basin Drainage Canal System (Colusa Drain) Intertie	Direct and In-lieu Groundwater Recharge	Interested Stakeholder	Intertie between proposed Delevan Pipeline component of the Sites Reservoir Project and the Colusa Drain, providing a connection to downstream water users, and providing protection for the ecosystems, and earthquake resilience.
Orland Unit Water Users Association (OUWUA) Flood Water Conveyance	Direct Groundwater Recharge	OUWUA	Divert Stony Creek water at OUWUA's south diversion and convey it to various locations for direct recharge within the OUWUA service area.
Orland-Artois Water District (OAWD) Direct Groundwater Recharge	Direct Groundwater Recharge	OAWD	OAWD would directly recharge groundwater. A pilot project was conducted in 2017.

Summary of All Projects and Management Actions in the Colusa GSP

- Potential: *(continued)*

Sycamore Slough Colusa Drain Multi-Benefit Recharge Project	Direct Groundwater Recharge	Landowner	Restoration of portions of Sycamore Slough would support diversion of winter flows from the Colusa Drain for recharge and restoration.
Tehama-Colusa Canal Trickle Flow to Ephemeral Streams	Direct Groundwater Recharge	RD108	Operate Tehama-Colusa Canal (TCC) existing gates for discharge into ephemeral streams at a rate where they do not flow out of the Subbasin but recharge the groundwater system.
Enhanced Infiltration of Precipitation on Agricultural Lands	Direct Groundwater Recharge	CGA and GGA	Develop and adoption of on-farm cultural practices to reduce precipitation runoff and increase infiltration, which would result in increased storage of precipitation in the crop root zone, thereby reducing irrigation water requirements and achieving some direct groundwater recharge.
Subbasin Flood-MAR	Direct Groundwater Recharge	CGA and GGA	The CGA and GGA would investigate, develop, and implement a program to divert flood waters within the Subbasin, when available, for spreading across agricultural lands for direct groundwater recharge.
Reclamation District 108 "Boards In" Program	Direct Groundwater Recharge	RD108	RD108 would institute a voluntary or financially incentivized program in which landowners leave spill boards in place during the winter to capture rainfall and hold it on the fields for recharge.

Summary of All Projects and Management Actions in the Colusa GSP

- Potential: *(continued)*

Colusa County Public Water System Water Treatment Plant	In-lieu Groundwater Recharge	Interested Stakeholder	Construct a water treatment plant on the Sacramento River between Colusa and Grimes to provide treated surface water to public water supply systems in Colusa and possibly Sutter and Yolo Counties.
Glenn-Colusa Irrigation District Water Transfers to Tehama-Colusa Canal Authority (TCCA) CVP Contractors	In-lieu Groundwater Recharge	GCID	Evaluate potential for transferring water to CVP contractors served by the TCC for in-lieu groundwater recharge.
Subbasin In-lieu Recharge & Banking Program	In-lieu Groundwater Recharge	South Valley Water Resources Authority	Incentivize taking available contract surface water in-lieu of pumping groundwater, providing dedicated contribution to local groundwater sustainability, with a portion available to San Joaquin Valley partners.
Sycamore Marsh Farm In-lieu Recharge Project	In-lieu Groundwater Recharge	Landowner	Sycamore Marsh Farm is developing an in-lieu groundwater recharge plan, and could partner with additional lands in the CDMWC, allowing for diversion of surface water from CDMWC.
Westside Off-stream Reservoir and In-Lieu Groundwater Recharge	In-lieu Groundwater Recharge	TCCA Contractors	Construct off-stream surface reservoirs along the western edge of the Subbasin and up-slope from the TCC to divert surplus Sacramento River flows (e.g., Section 215 water) into these storage reservoirs. Release stored water on demand to serve lands otherwise served by groundwater.

Summary of All Projects and Management Actions in the Colusa GSP

COLUSA SUBBASIN

- Potential: *(continued)*

Management Actions			
Domestic Well Mitigation Program	Management Action	CGA and GGA	To mitigate the effects of domestic well stranding due to groundwater level decline, the CGA and GGA will investigate implementing domestic well mitigation programs in their respective portions of the Subbasin.
Drought Contingency Planning for Urban Areas	Management Action	CGA, GGA, and cities (GSA member agencies)	The CGA and GGA will coordinate with M&I water suppliers dependent on groundwater to encourage drought planning consistent with the GSP.
Long-Term Demand Management Action	Management Action	CGA and GGA	Demand management broadly refers to any water management activity that reduces the consumptive use of irrigation water. A demand management action is one that incentivizes, enables, or possibly requires water users to reduce their consumptive use.
Strategic Short-Term Demand Management	Management Action	CGA and GGA	Develop a voluntary, flexible, short-run financial incentive program to alleviate impacts of drought in target areas through idling lands in drought-affected areas or in participating surface water-using portions of the Subbasin and conveying the saved surface water to the drought-affected areas.

Summary of All Projects and Management Actions in the Colusa GSP

- Potential: *(continued)*

Well Abandonment Outreach and Funding Program	Management Action	CGA and GGA	Create a program providing outreach and education to landowners regarding the proper procedures for well decommissioning and abandonment, as well as funding sources. This effort would be accomplished by working with well permitting agencies.
Preservation of Lands Favorable for Recharge	Management Action	CGA and GGA	Working cooperatively with the counties, investigate, design, and implement a program providing incentives to landowners with lands favorable to groundwater recharge to preserve them as agricultural or undeveloped lands on which groundwater recharge.
Review of County Well Permitting Ordinances	Management Action	CGA and GGA	Review and revise the county well permitting processes in the Subbasin to ensure that future well permitting aligns with the Subbasin sustainability goal and that future changes to well permitting are reviewed by the GSAs. The GSAs would work with the counties to review and suggest revisions to ordinances (these are outside of the jurisdiction of the GSAs).

Summary of All Projects and Management Actions in the Colusa GSP

COLUSA SUBBASIN

- Potential:
  (continued)

Reduce Non-beneficial Evapotranspiration/ Invasive Species Eradication	Reduce Groundwater Demand	CGA and GGA	Removal of invasive, non-native plant species from riparian corridors and other areas to reduce evapotranspiration from shallow groundwater and support native ecosystem restoration.
Development of a Dedicated Network of Shallow Monitoring Wells for GDE Monitoring	Management Action, Closing Data Gaps	CGA and GGA	Evaluate and develop a dedicated network of shallow monitoring wells specifically planned and sited for monitoring conditions in areas of the Subbasin where GDEs are most likely to be found. This action is also expected to incorporate biological monitoring to inform the location of new shallow monitoring wells and monitor whether GDEs are being impacted by changing groundwater conditions.

Summary of All GSP Implementation Studies in the Colusa GSP

COLUSA SUBBASIN

Table 7-1. Summary of GSP Implementation Studies	
Study	**Description**
Expand Shallow Groundwater Level Monitoring Network	To expand the shallow groundwater monitoring network, additional monitoring wells must be evaluated. This includes existing monitoring wells and suitable locations for the construction of new monitoring wells.
Expand Water Quality Monitoring Network	This study will evaluate and expand additional groundwater quality monitoring wells.
Colusa Subbasin Western Boundary Investigation	This study will evaluate data to better understand the physical characteristics and groundwater conditions of the principal aquifer along the western margin of the Subbasin.
Westside Streams Monitoring Program	Streams originating from the Coastal Range west of the Subbasin will be evaluated for potential recharge volumes, water quality, and the interconnectedness of the streams and the groundwater system within the Subbasin.
Groundwater Well Monitoring Program	This pilot program will evaluate the costs and benefits of continuous groundwater monitoring data collection via six irrigation production wells. Program expansion throughout the Subbasin will be considered based on the data utility and costs of the pilot program.
Groundwater Financial Incentives Investigation	This analysis will quantify the total costs of groundwater use and switching to surface water. The analysis will also identify grower financial incentives for in-lieu recharge and options for structuring those incentives.

Summary of All GSP Implementation Studies in the Colusa GSP *(continued)*

COLUSA SUBBASIN

CV2SimFG-Colusa Model Updates and Enhancement	This program will implement the periodic model data updates necessary to adequately represent near-term and future conditions within the Subbasin, and to support annual and five-year periodic GSP reporting to the DWR.
Well Inventory Program	This program will inventory the estimated 20% of groundwater wells unaccounted for within the Subbasin, and would seek to identify wells that are no longer active.
Well Registration Program	This study will evaluate the potential of a program for landowners to inventory their well data. This will complement the well inventory program.
Increasing GSA Involvement in County Well Permitting and Land Use Planning	CGA and GGA will explore options for allowing GSA input to the counties' well permitting processes and land use planning. The objective of GSA input would be to ensure that wells are permitted and land uses are planned in a manner consistent with sustainable groundwater management according to the GSP.
GSA Coordination with Water Quality Coalitions and Regulatory Agencies	GSAs will coordinate with the various water quality coalitions, water stakeholders, and regulatory agencies regarding GSP and other regulatory program implementation. This will include helping to identify and address water quality problems across the Subbasin, including those affecting disadvantaged communities (DACs) and severely disadvantaged communities (SDACs), and consideration of opportunities to expand public water systems and consolidate small public systems to improve drinking water quality delivered to DACs and SDACs.
Sutter Buttes Rampart Water Quality Interbasin Working Group	The CGA, GGA and the GSAs in the Butte, Sutter, Yolo, North Yuba and South Yuba Subbasins should participate in an interbasin working group focused on collaborative discussions, consensus-building and planning to address groundwater quality matters associated with the unique geology of the Sutter Buttes area.

Summary of All GSP Implementation Studies in the Colusa GSP *(continued)*

COLUSA SUBBASIN

Participation in Interagency Drought Task Forces	The CGA and GGA should coordinate their responses to droughts with their respective county and state agency partners through existing Interagency Drought Task Forces established in each county by the Colusa and Glenn County Boards of Supervisors.
Sacramento Valley Subsidence Interbasin Working Group	The CGA and GGA should consider participating in a Sacramento Valley Subsidence Interbasin Working Group with DWR, the other GSAs in the Sacramento Valley and federal partners. The working group would provide a forum for collaborative discussions, consensus-building, and planning to address inelastic land subsidence in the Sacramento Valley.
Evaluate Infrastructure Sensitivity to Subsidence	This study will evaluate the sensitivity of infrastructure in the Subbasin to potential subsidence rates.