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CHAPTER 6

Projects and Management Actions

This chapter describes the projects and management actions (PMAs) that are ongoing or planned for implementation by agencies in the Colusa Subbasin, and potential PMAs in various stages of development. In accordance with 23 CCR §354.44, PMAs were developed to achieve the Colusa Subbasin sustainability goal by 2042 and avoid undesirable results over the GSP planning and implementation horizon. Projects generally refer to structural features whereas management actions are typically non-structural programs or policies designed to support sustainable groundwater management.

6.1 PROJECTS AND MANAGEMENT ACTIONS DEVELOPMENT APPROACH

PMAs developed for the Colusa Subbasin are described in this chapter in accordance with 23 CCR §354.44. The set of PMAs were formulated primarily to address possible future changes in Colusa Subbasin conditions that could cause undesirable results over the long term, and in the near term, to address effects of recent historical (2014-2015) and current (2020-2021) drought conditions that pose challenges to groundwater management in the northwest and southwest portions of the Colusa Subbasin respectively. The possible future changes in Colusa Subbasin conditions without PMAs were assessed through comparison of the projected future water budget conditions without climate change and projected future water budget conditions adjusted by 2070 central tendency (CT) climate change factors (see Chapter 3 for additional water budget information).

Table 6-1 provides a comparison of key water budget parameters considered in formulation of PMAs. All water budget quantities are expressed in average annual volumes of thousand acre-feet per year (taf/yr) over the 50-year model simulation periods. An effect of climate change on Colusa Subbasin hydrology is a nearly 7 percent increase in agricultural evapotranspiration (ET), from 1,494 taf/yr to 1,596 taf/yr. A portion of this increased agricultural ET will be met by an approximate 6 percent increase in precipitation expected to result from 2070 CT climate change. The remaining increase in agricultural ET is expected to be met by increased groundwater pumping since projected future surface water diversions into the Colusa Subbasin from the Sacramento River and Stony Creek are not expected to be affected by climate change¹. Pumping is projected to increase by 58 taf/yr, a nearly 13 percent increase from the projected future conditions without climate change.

¹ Average streamflow volumes in the Sacramento River and its tributaries are generally expected to increase slightly under 2070 Central Tendency climate change due to slightly increased precipitation. However, because Sacramento River and Stony Creek diversions are generally regulated in storage reservoirs, and because Central Valley Project water supplies from the Sacramento River are limited by contracts, it was assumed that future surface water supplies would be the same with and without climate change.

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Table 6-1. Summary of Key Colusa Subbasin Water Budget Parameters Influencing Formulation of Projects and Management Actions

Water Budget Parameter	Projected Future Conditions without Climate Change	Projected Future Conditions with 2070 Central Tendency Climate Change	Difference (Projected future with 2070 Central Tendency climate change minus without climate change)	Percent Difference ^(a)
Avg. Agricultural Evapotranspiration	1,494	1,596	102.0	6.8%
Precipitation	1,183	1,258	75.0	6.3%
Agricultural Pumping	458	516	58.0	12.7%
Avg. Rate of Change in Groundwater Storage, af/yr	0.6	-7.3	-7.9	-0.8%
Sacramento River and Stony Creek Diversions to Colusa Subbasin	1,287.0	1,287.0	0.0	
Net Stream Accretion	125	77	-48.0	-38.3%

(a) Calculated as the difference in the fourth column divided by the Projected Future Condition without Climate Change quantity in the second column, except for Avg. Rate of Change in Groundwater Storage, for which the percent difference is based on the approximately 1 million acre-feet that flow into and out of the Colusa Subbasin on an average annual basis.

Under projected future conditions without climate change, groundwater storage is forecast to increase modestly, at an average rate of 0.6 taf/yr. With 2070 CT climate change and the associated increase in groundwater pumping to meet increased irrigation demands, groundwater storage is projected to decrease at a rate of 7.3 taf/yr. This net change of -7.9 taf/yr is 0.8 percent of the approximately one million acre-feet that flow into and out of the Colusa Subbasin groundwater system annually.

Under projected future conditions without climate change, net stream accretion (stream accretion minus stream depletion) is projected to be 125 taf/yr on average. This aggregate net stream accretion is for the Sacramento River, Stony Creek, and the Colusa Drain combined². With 2070 CT climate change, net stream accretion is projected to remain positive but to decrease by about 48 taf/yr, or by 38 percent, with respect to the without climate change condition. However, viewed in the relation to the average Sacramento River flow above the Feather River confluence of approximately 11.7 million acre-feet per year (af/yr) the projected change is roughly one half of one percent.

The aggregate changes in groundwater storage, 0.8 percent, and net stream accretion, 0.5 percent, are considered to be within standard modeling error for this type of analysis. Chapter 4, Monitoring Networks, and Chapter 3, Basin Setting, identify data gaps that will be addressed as part of GSP implementation (Chapter 7), which will improve the modeled outputs, water budget parameters, and understanding of the

² A more detailed assessment of projected streamflow accretion-depletion is presented in Appendix 3G. The analysis considers the Sacramento River, Stony Creek, and the Colusa Drain individually and collectively, and evaluates temporal accretion-depletion patterns over the 50-year simulation period. Note to reviewer: Appendix 3G was prepared following public review of Chapters 1-4 and will be released with the complete draft Groundwater Sustainability Plan scheduled for August 31, 2021.

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Recognizing the GSP data gaps and uncertainties in the basin setting (per 23 CCR §354.44(d)), and recognizing known areas with declining groundwater levels, PMA development and implementation in the Colusa Subbasin applies an adaptive approach informed by continued monitoring of groundwater conditions. The adaptive approach includes:

- PMAs that will be implemented to primarily address current, localized declining groundwater levels in the Orland and Arbuckle areas. This includes five groundwater recharge projects that are currently moving toward implementation, including three substantial in-lieu recharge projects, one multi-benefit managed aquifer recharge project, and another direct recharge pilot project.
- A portfolio of PMAs to achieve and maintain long-term sustainable groundwater management across the Colusa Subbasin, which will be implemented if established measurable objectives (MOs) cannot be maintained and minimum thresholds (MTs) are being approached. Management actions include two potential demand management programs that could be implemented relatively quickly, primarily because they do not require construction of new infrastructure. These demand management actions are viewed as a backstop to other PMAs to ensure the Colusa Subbasin maintains sustainable groundwater management.

Per 23 CCR § 354.44(b)(9), PMAs described in this GSP are expected to manage the balance of groundwater extractions and recharge to ensure that lowering of groundwater levels or depletion of supply during periods of drought is offset by increases in groundwater levels or storage in other years. In particular, PMAs that provide in-lieu and direct recharge benefits in the Orland and Arbuckle areas are planned to increase the use and recharge of available surface water supplies during wetter years, offsetting any potential increases in groundwater pumping during drought when curtailments of surface water supplies may occur. The expected recharge benefits of these PMAs are described in Section 6.3. The GSAs' extensive portfolio of additional PMAs will be informed by continued monitoring of groundwater conditions and implemented, as needed, to achieve and maintain long-term sustainable groundwater management.

PMAs are categorized and presented in this chapter according to the current status of implementation and development. This is consistent with the adaptive approach to PMA implementation and with development of PMAs based on the best available data and science (per 23 CCR §354.44(c)). This chapter also acknowledges ongoing investments made by agencies in the Colusa Subbasin (including prior to the passage of SGMA), such as projects that were identified and moved forward under regional water management planning efforts, including the Glenn and Colusa County Groundwater Management Plans and the Westside and Northern Sacramento Valley Integrated Regional Water Management Plans.

The PMA categories described in this chapter include:

- **Planned Projects and Management Actions** are PMAs that the GSA or other project proponents are working to implement that will support sustainable groundwater management in the Colusa Subbasin, and mitigate historical and current drought effects. Detailed descriptions of these PMAs are presented in the GSP, reflecting available information including preliminary design and associated cost estimates. In accordance with 23 CCR §354.44(a) these are PMAs that would allow GSAs to achieve the sustainability goal for the Colusa Subbasin and avoid reaching the minimum thresholds defined in this GSP under future, changing conditions.

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- **Ongoing Projects and Management Actions** are PMAs that are ongoing and will support sustainable groundwater management in the Colusa Subbasin. In accordance with 23 CCR §354.44(a) these are PMAs that would allow GSAs to achieve the sustainability goal for the Colusa Subbasin and avoid reaching the minimum thresholds defined in this GSP under future, changing conditions.
- **Potential Projects and Management Actions** are PMAs that may be implemented if necessitated by groundwater conditions in the Colusa Subbasin. These may have been studied by the project proponent, or in earlier regional water planning documents, but most project design, costs, and planning work has yet to be completed, and would only be initiated if the project is eventually triggered for implementation as a result of continued monitoring of groundwater conditions.

This rest of this chapter is structured as follows. Section 6.2 provides a summary of all (ongoing, planned, and potential) PMAs. The three subsequent sections – Sections 6.3 through 6.5 – describe the PMAs in each of the three categories. Within each category, PMAs are further classified by type (project or management action), which are described in corresponding subsections. Appendix 6A provides additional analysis of water available for recharge and other projects, as well as an assessment of incentives to encourage utilization of surface water supplies. Appendix 6B describes potential demand management action costs and Colusa Subbasin agricultural economic conditions. Appendix 6C provides a matrix summary of all planned, ongoing, and potential PMAs. Lastly, Appendix 6D describes modeling of selected PMAs to estimate the effects of those PMAs on groundwater conditions in the Colusa Subbasin.

6.2 PROJECT AND MANAGEMENT ACTIONS SUMMARY

Table 6-2 summarizes all PMAs identified in the Colusa Subbasin. Summary information includes the PMA name, type, proponent, and a brief description. PMAs are grouped into subsections in the table according to their status (planned, ongoing, or potential). As described under Section 6.1 above, ongoing projects are currently being implemented in the Colusa Subbasin. Planned PMAs are currently being developed to achieve sustainable management conditions in the Colusa Subbasin. Potential PMAs will be implemented in the future, if/as required by changing conditions in the Colusa Subbasin.

All PMAs are described according to the requirements of 23 CCR §354.44(b). Planned projects are described in detail. Ongoing and potential PMAs are described concisely, reflecting the current operational status and “as-needed” basis of these projects. It is anticipated that additional information will be prepared in annual reports and 5-year GSP updates, as needed.

GSAs will notify the public and other agencies of the planned or ongoing implementation of PMAs through the communication channels identified in Sections 6.3 through 6.5 (23 CCR §354.44(b)(1)(B)). Noticing will occur as potential projects are being considered for implementation, and as ongoing and planned projects are implemented. Noticing will inform the public and other agencies that the GSA is considering or will be implementing the PMA, and will provide a description of the actions that will be taken.

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Table 6-2. Summary of All Projects and Management Actions

Project/ Management Action Name	Project/ Management Action Type	Proponent	Brief Description
Planned			
<i>Projects</i>			
Colusa Subbasin Multi-Benefit Groundwater Recharge (TNC)	Direct Groundwater Recharge	CGA, GGA and TNC	The Nature Conservancy 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 2020, with plans to expand and continue into the future.
Orland-Artois Water District 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. An expansion of the project is planned for recharge and revegetation in the neighboring Sycamore and Dry Sloughs.
Colusa County Water District 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 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 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.

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Table 6-2. Summary of All Projects and Management Actions

Project/ Management Action Name	Project/ Management Action Type	Proponent	Brief Description
<i>Ongoing</i>			
<i>Projects</i>			
Reclamation District 108 and Colusa County Water District Agreement for Five-Year In-Lieu Groundwater Recharge Project	In-lieu Groundwater Recharge	RD108 and CCWD	CCWD (and 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 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.
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.
Orland Unit Water Users Association 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.
<i>Management Actions</i>			
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.

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Table 6-2. Summary of All Projects and Management Actions

Project/ Management Action Name	Project/ Management Action Type	Proponent	Brief Description
Potential			
<i>Projects</i>			
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. Depending on project operation and yield, there is potential for groundwater benefits to accrue to the Colusa Subbasin from Sites Reservoir.
Delevan Pipeline Colusa Basin Drain Intertie	Direct and In-lieu Groundwater Recharge	Interested Stakeholder	Intertie between proposed Delevan Pipeline component of the Sites Reservoir Project and the Colusa Basin Drain, providing a connection to downstream water users, and providing protection for the ecosystems, and earthquake resilience.
Orland Unit Water Users Association 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 Direct Groundwater Recharge	Direct Groundwater Recharge	OAWD	OAWD would directly recharge groundwater. A pilot project was conducted in 2017.
Sycamore Slough Colusa Basin Drain Multi-Benefit Recharge Project	Direct Groundwater Recharge	Landowner	Restoration of portions of Sycamore Slough would support diversion of winter flows from the Colusa Basin 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 Colusa 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.

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Table 6-2. Summary of All Projects and Management Actions

Project/ Management Action Name	Project/ Management Action Type	Proponent	Brief Description
Colusa 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 Colusa Subbasin, when available, for spreading across agricultural lands for direct groundwater recharge.
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 fresh drinking water to public water supply systems in Colusa and possibly Sutter and Yolo Counties.
Glenn Colusa Irrigation District Water Transfers to 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.
Colusa 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 Offstream Reservoir and In-Lieu Groundwater Recharge	In-lieu Groundwater Recharge	TCCA Contractors	Construct offstream surface reservoirs along the western edge of the Colusa 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.
<i>Management Actions</i>			
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 Colusa 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.

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Project/ Management Action Name	Project/ Management Action Type	Proponent	Brief Description
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 Colusa Subbasin and conveying the saved surface water to the drought-affected areas.
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.
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.
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.

Table 6-3 summarizes how each type of PMA would benefit measurable objectives in the Colusa Subbasin. All proposed PMAs are expected to benefit groundwater levels and groundwater storage, whether through direct or in-lieu groundwater recharge, management of water supplies, or demand reduction. Projects that incentivize additional use of available surface water in lieu of groundwater are also expected to reduce depletions of interconnected surface water.

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Projects and Management Actions

Table 6-3. Measurable Objectives Expected to Benefit from Projects and Management Action Types Proposed in the Colusa Subbasin

Project/ Management Action Type	Project/ Management Action Names	Measurable Objectives Expected to Directly Benefit				
		GW Levels	GW Storage	SW Depletion	Land Subsidence	Water Quality
Planned						
Direct Groundwater Recharge	Colusa Subbasin Multi-Benefit Groundwater Recharge (TNC); Sycamore Slough Groundwater Recharge Pilot Project	X	X	X	X	
In-lieu Groundwater Recharge	CCWD In-Lieu Groundwater Recharge; Colusa Drain MWC In-Lieu Groundwater Recharge; GCID In-lieu Groundwater Recharge	X	X	X	X	
Direct and In-lieu Groundwater Recharge	OAWD Land Annexation and Groundwater Recharge	X	X	X	X	
Ongoing						
Direct Groundwater Recharge	Sycamore Marsh Farm Direct Recharge Project	X	X	X	X	X
In-lieu Groundwater Recharge	RD 108 and CCWD Agreement for Five-Year In-Lieu Groundwater Recharge Project; GCID Expansion of In-Basin Program for In-lieu Groundwater Recharge; OUWUA Irrigation Modernization for Increased Surface Water Delivery and Reduced Groundwater Pumping	X	X	X	X	
Direct and In-lieu Groundwater Recharge	GCID Strategic Winter Water Use for Groundwater Recharge and Multiple Benefits	X	X	X		
Management Action	Urban Water Conservation in Willows	X	X	X		

Chapter 6 Projects and Management Actions

Table 6-3. Measurable Objectives Expected to Benefit from Projects and Management Action Types Proposed in the Colusa Subbasin

Project/ Management Action Type	Project/ Management Action Names	Measurable Objectives Expected to Directly Benefit				
		GW Levels	GW Storage	SW Depletion	Land Subsidence	Water Quality
Potential						
Direct Groundwater Recharge	Ouwua Flood Water Conveyance; OAWD Direct Groundwater Recharge; Sycamore Slough Colusa Basin Drain Multi-Benefit Recharge Project; TCC Trickle Flow to Ephemeral Streams; Enhanced Infiltration of Precipitation on Agricultural Lands; Colusa Subbasin Flood-MAR	X	X	X		
In-lieu Groundwater Recharge	Colusa Subbasin In-lieu Recharge & Banking Program; Sycamore Marsh Farm In-lieu Recharge Project	X	X	X	X	X
In-lieu Groundwater Recharge	Colusa County Public Water System Water Treatment Plant; Colusa Drain MWC In-Lieu Groundwater Recharge; GCID Water Transfers to TCCA CVP Contractors; Westside Offstream Reservoir and In-Lieu Groundwater Recharge	X	X	X		
Direct and In-lieu Groundwater Recharge	Westside Streams Diversion for Direct or In-lieu Groundwater Recharge; Sites Reservoir; Delevan Pipeline Colusa Basin Drain Intertie	X	X	X		
Management Action	Domestic Well Mitigation Program	X				
Management Action	Drought Contingency Planning for Urban Areas; Strategic Short-Term Demand Management; Preservation of Lands Favorable for Recharge	X	X	X		
Reduce Groundwater Demand	Reduce Non-beneficial Evapotranspiration/Invasive Species Eradication (Arundo, Eucalyptus, Tamarisk, etc.)	X	X	X		

The following subsections describe the planned, ongoing, and potential PMAs in accordance with the requirements in 23 CCR §354.44(b). The information presented in this chapter is based on the best available data and science. The estimated groundwater recharge benefit and capital, operating, and maintenance costs of developing and operating each project are shown. To the extent possible, project costs are adjusted and reported on a consistent basis. All costs are indexed using an appropriate index³ and reported in current (2021) dollars. GSAs and districts in the Colusa Subbasin will further develop

³ Either the Implicit Price Deflator or the Engineering News Report Construction Cost Index

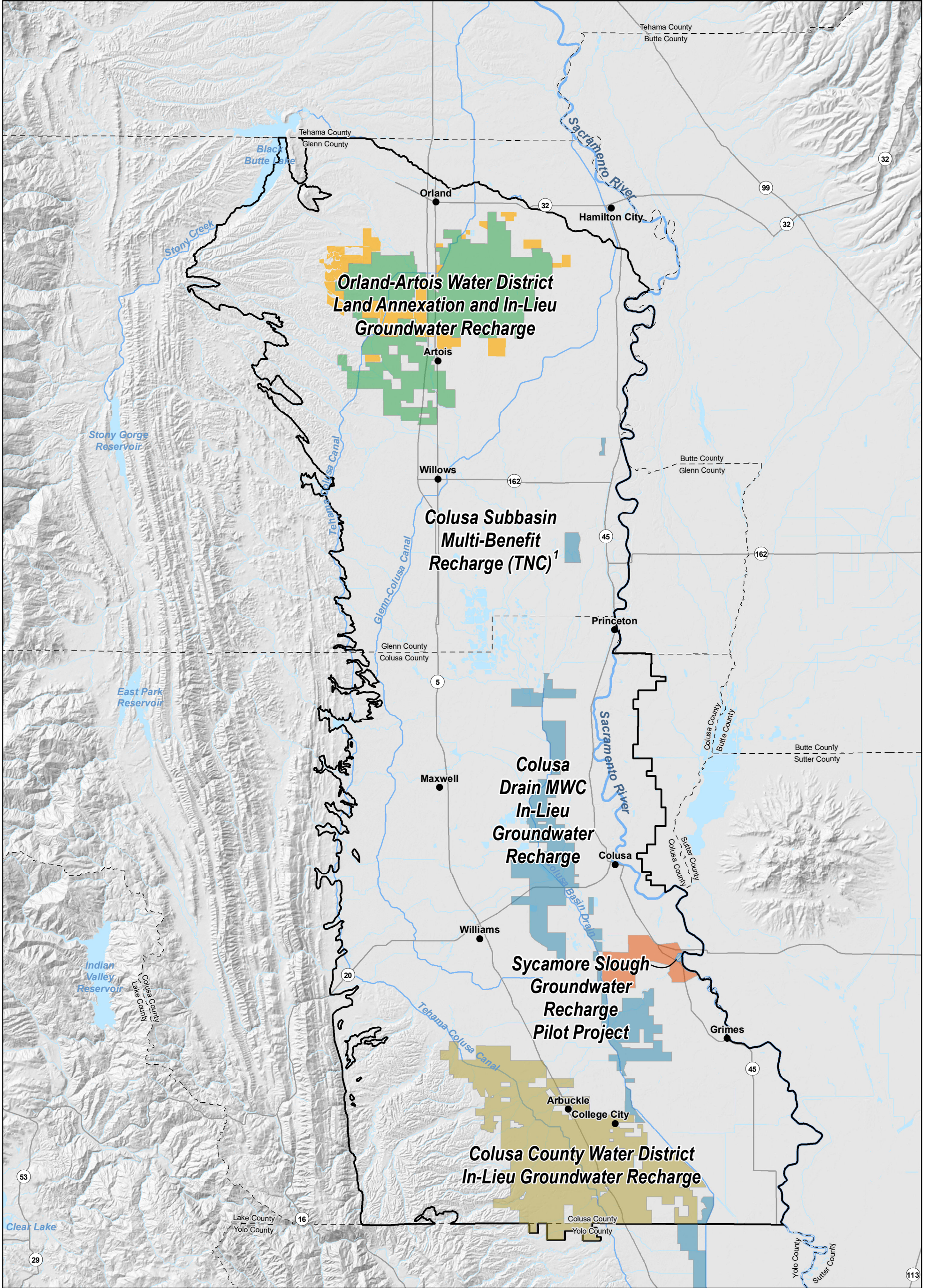
projects during the GSP implementation period and refine estimated costs in annual reports and 5-year updates. Additional information about all PMAs is provided in a matrix format in Appendix 6C.

6.3 PLANNED PROJECTS AND MANAGEMENT ACTIONS

The Glenn Groundwater Authority (GGA) GSA and Colusa Groundwater Authority (CGA) GSA have included five groundwater recharge projects that are planned for implementation. All five projects involve the use of surface water for direct or in-lieu recharge. Three of the five projects are substantial in-lieu recharge projects, meaning that they will require regulated surface water sources available on an irrigation demand schedule. These three projects are planning to acquire all or most of the required surface water through transfers of Central Valley Project (CVP) water supplies that are available from other CVP water supply or Settlement Contractors.

Figure 6-2 illustrates the location and name of the five planned PMAs in the Colusa Subbasin. Planned projects are targeted to areas where groundwater levels have been declining in the Colusa Subbasin due to historical and current drought conditions. In addition, recharge opportunities are targeted near the Sacramento River to provide multiple benefits including potential habitat and streamflow benefits.

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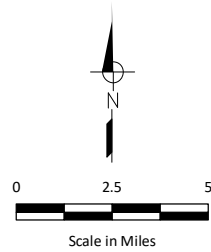


- Sycamore Slough Pilot Project Recharge Area
- Davis Ranches Boundary
- Colusa County WD Boundary
- Colusa Drain MWC Boundary
- Orland-Artois WD Boundary
- Orland-Artois WD Planned Annexations
- Colusa Subbasin Boundary

Horizontal Datum: North American Datum of 1983 (NAD 83), California State Plane Zone II, feet.

Note:

1. Multi-benefit recharge locations will depend on grower enrollment and could be anywhere within the Colusa Subbasin where surface water supplies are available and recharge conditions are favorable.



DRAFT Figure 6-2

Planned Projects Overview

**Colusa Groundwater Authority
and Glenn Groundwater Authority**
Colusa Subbasin
Groundwater Sustainability Plan

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Projects and Management Actions

Table 6-4 lists the planned PMAs, project type, proponent, expected first year of implementation, estimated capital cost, and estimated gross annual benefit (taf/yr).

Project	Project Type	Proponent	Year Implemented	Estimated Capital / Establishment Cost, \$M ^(a)	Gross Average Annual Benefit, taf/yr
Colusa County Water District In-Lieu Groundwater Recharge	In-Lieu GW Recharge	CCWD	2021	\$0.1	27
Colusa Drain MWC In-Lieu Groundwater Recharge	In-Lieu GW Recharge	CDMWC	2021	\$0.1	28
Colusa Subbasin Multi-Benefit Recharge	Direct GW Recharge	CGA, GGA, and TNC	2020	\$0.004 per site	5.2
Orland-Artois Water District Land Annexation and In-Lieu Groundwater Recharge	Direct and In-Lieu GW Recharge	OAWD	2020	Under development	23
Sycamore Slough Groundwater Recharge Pilot Project	Direct GW Recharge	Landowner	2021	\$0.028	0.5

(a) Annual costs are summarized in the "Project Costs" sections of the project descriptions, below.

6.3.1 Colusa County Water District In-Lieu Groundwater Recharge

6.3.1.1 Project Overview

Colusa County Water District (CCWD) includes over 45,000 acres within its service area, of which roughly 35,000 acres are irrigated. In this project, CCWD will utilize up to an additional 30 taf of surface water for irrigation in all years but Shasta Critical years, resulting in a long-term average annual additional surface water supply of 27 taf/yr. Shasta Critical conditions are declared when the forecast inflow to Lake Shasta for a particular water year is equal to or less than 3.2 million acre-feet. The additional surface water will be made available through full use of the district's existing CVP contract and annual and multi-year water purchase and transfer agreements. The additional water will be conveyed through the existing Tehama-Colusa (TC) Canal and CCWD facilities and will be used primarily on existing district lands, resulting in in-lieu groundwater recharge through reduction of groundwater pumping. As an optional component of this project, CCWD is considering relatively small annexations of lands adjoining the district and supplying surface water to these lands in-lieu of groundwater pumping. If these annexations proceed, the additional water may also be used on the newly annexed lands that are currently dependent on groundwater and require construction of additional infrastructure for surface water delivery. Figure 6-3 illustrates the general location in CCWD where in-lieu recharge could occur, along with the groundwater elevation change between spring 2010 and spring 2020.

Use of additional surface water within CCWD will require a combination of incentivizing additional use of CCWD existing CVP supplies and transfer arrangements with other districts. Transfers already occur in many years and would continue to be negotiated between parties as part of GSP implementation.

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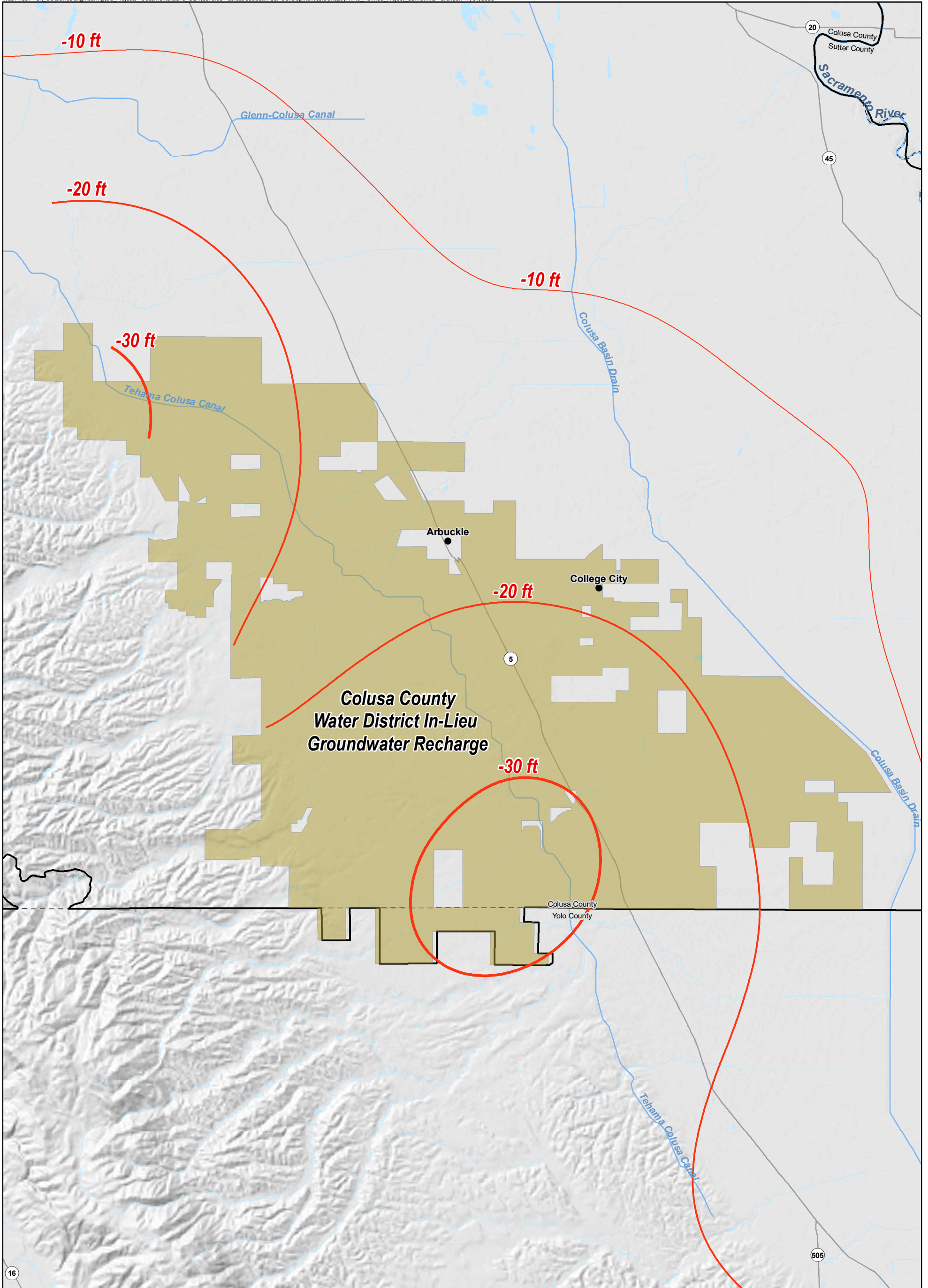
Projects and Management Actions

Incentivizing use of existing CVP supplies would require making the cost comparable to the cost of pumping groundwater. Historically, according to federal law under the CVP improvement Act of 1992, CVP irrigation water supply contracts required payments of tiered water rates for contractual water entitlements. The lowest, Tier 1, rate applied to 80 percent of the contractual water entitlement. The highest, Tier 3, rate reflected the full cost rate and applied to the last 10 percent of the contractual water entitlement. The Tier 2 rate, applied to the middle 10 percent, is an average of the Tier 1 and 3 rates.

Even when blended with Tier 1 water, using Tier 2 and Tier 3 water resulted in excessive water cost, and so some or all of the Tier 2 and Tier 3 water went unused. CCWD, along with other CVP contractors in the Colusa Subbasin, has recently converted its water service contract to a repayment contract, thus paying off and removing the capital component from CVP rates. However, repayment of CVP capital required borrowing money that the district will pay off over the next 15 years or more, which is reflected in water rates to growers.



Depending on the relative costs of district supply versus groundwater, under the repayment contracts, CCWD rates may be low enough already to encourage full use of CVP supply. However, if groundwater pumping remains a lower cost alternative to CVP water for some growers, incentivizing their use of CVP water in lieu of pumping would require an incentive that is at least equal to the difference between district surface supply and the variable cost of pumping groundwater.

Appendix 6A provides a summary of CVP rates, repayment contracts, and incentives to encourage additional use of district supplies.



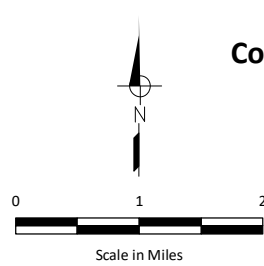
Spring 2010 to Spring 2020 Groundwater Elevation Change

— -30 ft — -20 ft — -10 ft

 Colusa County WD Boundary
 Colusa Subbasin Boundary

Horizontal Datum: North American Datum of 1983 (NAD 83), California State Plane Zone II, feet.

- Notes:
1. Planning for this project is currently ongoing and map depictions are subject to change.
 2. In-lieu recharge will occur within the Colusa County WD boundary.



DRAFT Figure 6-3

Colusa County Water District In-Lieu Groundwater Recharge Overview

**Colusa Groundwater Authority
 and Glenn Groundwater Authority**
 Colusa Subbasin
 Groundwater Sustainability Plan

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Projects and Management Actions

6.3.1.2 Implementation

Planning is currently underway for utilization of this additional surface water through CCWD’s existing CVP contract and annual and multi-year water purchase and transfer agreements, as shown in Table 6-5 below. Utilization of additional surface water is anticipated to begin in 2022 (subject to the availability of water).

Phase	Description	Start	End
Program Structure and Planning	Specify program goals, structure, and targets for implementation	2020	2022
Evaluate Incentives, Partners, and Develop Strategy	Evaluate grower incentives and on-farm costs for surface and groundwater irrigation, quantify willingness to pay for each system, and define program incentives. Work with partner districts to identify transfers	2020	2022
Initial/Pilot Program Implementation	Develop and implement a pilot program to evaluate participation, incentives, and assess landowner feedback	2022	2023
Program Implementation	Implement full program and scale up over time to achieve specified program goals for in-lieu recharge	2023	Ongoing
Monitoring	Monitor and report on the status of program development for GSP implementation (annual reports and 5-year updates)	2021	Ongoing

6.3.1.3 Notice to public and other agencies

Public noticing for this project will be done in accordance with noticing requirements in NEPA and CEQA (as needed), as well as noticing for public meetings held by the CGA, GGA, CCWD, TCCA, and Colusa County LAFCO.

6.3.1.4 Construction activities and requirements

The project plans to utilize existing water conveyance facilities, including the TC Canal and the district’s piped distribution system. Under this project configuration, no additional construction activities would be required.

As an optional component of this project, CCWD is considering relatively small annexations of lands adjoining the district and supplying surface water to these lands in-lieu of groundwater pumping. However, the operation, benefits, and expected costs of the project does not depend on these annexations. Annexing lands would require construction of new water conveyance facilities for delivery and measurement of surface water to these newly annexed lands. These costs would be assessed as part of program development, if CCWD decides to annex lands.

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6.3.1.5 Water source

The surface water source for the project will come from CCWD's existing CVP contract and from multiple Sacramento Valley entities with surface water entitlements that are regularly available in below-normal to wet year types. These entities include CVP water supply and Settlement Contractors and, potentially, Sacramento River water rights holders.

The intent is to first utilize existing CCWD CVP supplies by making the cost of that supply comparable, or less, than the cost to pump groundwater. Additional water supply would be acquired through annual and multi-year, renewable water purchase or transfer agreements, building on similar existing agreements that CCWD has with certain Sacramento Valley entities. New surface supplies would be diverted from the Sacramento River at the Red Bluff Pumping Plant and Fish Screen facility and conveyed through the Tehama-Colusa Canal, which is operated and maintained by the Tehama-Colusa Canal Authority.

Appendix 6A summarizes an assessment of the volumes of water potentially available for in-lieu recharge. The CCWD project would acquire surface water primarily via water transfers from other entities with available CVP contract supplies and CVP Settlement Contract project water under the provisions of CVPIA Section 3405(a). Transfer of project supplies under Settlement Contracts alone would meet most of the needs of in-lieu recharge, with full use of existing contract supplies in CCWD and potential transfers of additional available CVP contract supplies adding to that amount.

6.3.1.6 Circumstances and criteria for implementation

This project is planned for immediate implementation. As described above, CCWD has already converted its water service contract to a repayment contract and is evaluating potential transfer opportunities with partner districts in the region. This process in 2021 was hampered by historically dry conditions across the state and the resulting lack of surface water. Beginning later in 2021, and into 2022 as water conditions hopefully improve, CCWD will begin evaluating incentives to encourage additional use of CVP supplies. It is anticipated that the utilization of additional surface water will begin in 2022.

Implementation of the in-lieu recharge program in CCWD does not depend on the implementation or performance of other PMAs or district activities. While operation of this project is not expected to terminate, any future changes will be made to align with CCWD goals and the overall Colusa Subbasin sustainability goal.

6.3.1.7 Legal authority, permitting processes, and regulatory control

CCWD has the legal authority as a water district to provide for the acquisition and conveyance of supplemental surface water to its lands and pursue expansion of its service area. The planning and implementation of this project will be done in accordance with the required permitting processes and regulatory control. Required permitting and regulatory review is being initiated through consultation with applicable governing agencies.

Because the additional surface water supplies will be conveyed through the existing TC Canal and CCWD facilities and used primarily on existing district lands, there are no anticipated permitting requirements for this project. However, if additional land is annexed and new facilities are required to serve those lands, then permits will be required. In that case, governing agencies with which consultation may need to be initiated include, but are not limited to: DWR, the California State Water Resources Control Board (SWRCB), the California Department of Fish and Wildlife (CDFW), the Central Valley Flood Protection Board (Flood Board), Regional Water Boards, the United States Bureau of Reclamation (Reclamation or

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USBR), the United States Army Corps of Engineers (USACE), the United States Fish and Wildlife Service (USFWS), the National Marine Fisheries Service (NMFS), Local Agency Formation Commissions (LAFCo), the Counties of Colusa and/or Glenn, and the California Air Resources Board (CARB). Specific permitting and regulatory processes that may affect the construction of additional infrastructure include, but are not limited to:

- USACE Section 404 Permits (potential exemption under Section 404(f)(1)(C) of Clean Water Act)
- Regional Water Quality Control Board Section 401 Water Quality Certification (not required if exempt from USACE Section 404)
- SWRCB Construction General Permit and Storm Water Pollution Prevention Plan (SWPPP)
- State Historic Preservation Office (SHPO) and National Historic Preservation Act (NHPA) Section 106 Coordination
- California Endangered Species Act (CESA) Consultation
- Endangered Species Act (ESA) Compliance
- National Environmental Policy Act (NEPA) Compliance
- California Environmental Quality Act (CEQA) Compliance

6.3.1.8 Project Operations and Monitoring

CCWD will operate and maintain its existing district facilities and conduct project monitoring. If CCWD annexes additional lands into the district, the district would operate and maintain facilities developed for these lands, and conduct project monitoring.

Project monitoring will include a range of activities to evaluate the benefits described in the next section. This will include local monitoring to track the additional volumes of water made available through transfers and estimates of the reduction in pumping relative to pre-project baselines. Additionally, the district may monitor grower adoption through delivery records and periodic grower surveys during project design and implementation. Information gathered from these surveys would be used to refine the initial program design and encourage additional adoption.

The benefit of in-lieu recharge on measurable objectives in the Colusa Subbasin (groundwater levels and groundwater storage) will be monitored using the monitoring network sites and monitoring practices described in the GSP (Chapter 3).

6.3.1.9 Project Benefits

The primary benefit of the project is reduction of groundwater pumping resulting from in-lieu groundwater recharge with benefits to the sustainability indicators previously shown in Table 6-3. It is estimated that approximately 30 taf of surface water would be delivered to annexed lands in all years but Shasta Critical years, resulting in an average annual reduction of groundwater pumping of approximately 27 taf/yr over the long term. Transfer volumes would vary in Shasta Non-Critical years based on the terms of the transfer agreements, and broader water market conditions, but the average annual quantity in all Shasta Non-Critical years is estimated to be 27 taf/yr. These benefits are expected to begin to be realized in 2022. Table 6-6 summarizes the expected annual volume. These project benefits have been assessed, and may continue to be assessed, using the C2VSimFG-Colusa model developed for GSP development by simulating groundwater conditions with and without the project. Additional information on the project modeling is described in Appendix 6D.

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Table 6-6. CCWD In-Lieu Groundwater Recharge Estimated Average Recharge Volume by Year Type, in af/yr (2016-2065)

Year Type	Total Annual Volume	% of Years	Weighted Avg.
Shasta Non-Critical	Up to 30,000	90%	27,000
Shasta Critical	0	10%	0
Avg. Annual			27,000

6.3.1.10 Project Costs

Project costs include the cost of purchased water, applicable CVP costs associated with the use of the TC Canal, and CCWD operation and maintenance costs. If some additional lands are annexed into the district, costs will also include capital costs associated with construction of new facilities, but none are included in preliminary planning costs. Other fixed costs include \$100,000 for CCWD effort to develop a preliminary project plan, and establish potential incentives based on an assessment of grower willingness to pay.

An initial estimate of \$75 per af corresponding to estimated CCWD fully-loaded water rates (see Appendix 6A) is applied for the initial planning-level annual operating cost assessment. As described in Appendix 6A, this is CCWD staff's rough estimate of CCWD's 2021 water rate if it had received full CVP supply. It includes its repayment rate for CVP water, other CVP charges, Tehama Colusa Canal Authority charges, and District charges. Using this rate, the total water supply cost would be approximately \$2.0 million per year. Efforts are currently underway by CCWD to estimate and refine these project costs, and to identify funding sources and establish repayment terms. Table 6-7 summarizes project costs.

Table 6-7. CCWD In-Lieu Groundwater Recharge Estimated Project Costs

Item	Total Cost	Year Incurred	Notes
Capital Costs			
Project planning and development	\$100,000	2021-2022	Project studies and planning; does not include any capital costs
O&M Costs			
Fully-loaded water supply cost	\$2.0 million	All	Assumed water supply cost equal to CCWD fully-loaded rate in full water supply years

23 CCR §354.44(b)(8) requires a summary of how the district plans to pay these costs. It is anticipated that the cost of incentivizing additional use of CVP supplies, and transfer purchases would primarily be recovered through district assessments. This may include more land-based assessments to reduce the variable cost of water rates, thereby making district water comparatively less expensive than groundwater. Other potential funding sources include grants, loans, and bonds for capital financing. Debt service and operations would be funded through assessments and charges. Potentially, a type of cost-share program where other groundwater-dependent water users in the Colusa Subbasin share a portion

of the costs since they will also realize regional benefits through this in-lieu recharge project. Appendix 7X⁴ in Chapter 7 describes different funding mechanisms, and the conceptual approach for allocating project costs across multiple potential project beneficiaries.

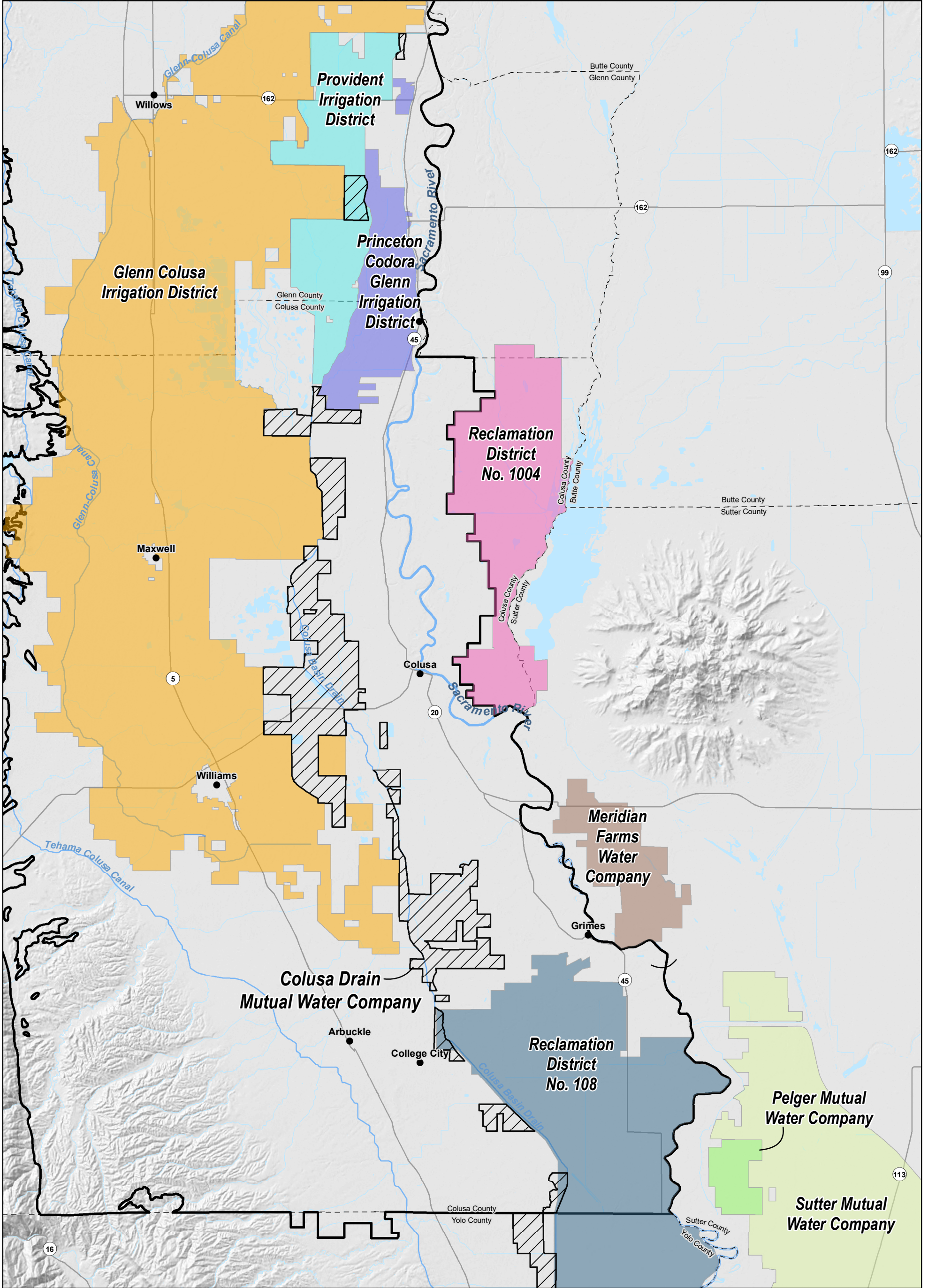
6.3.2 Colusa Drain MWC In-Lieu Groundwater Recharge

6.3.2.1 Project Overview

The Colusa Drain Mutual Water Company (CDMWC) encompasses approximately 46,000 acres of agricultural land and environmental habitat adjacent to the Colusa Basin Drain. Shareholders in CDMWC divert water for summer irrigation from the drain under a combination of appropriative water rights held individually by the shareholders, a long-term service supply agreement with the United States Bureau of Reclamation (Reclamation or USBR), and annual and multi-year transfer agreements with neighboring Settlement Contractors. Figure 6-4 illustrates the general locations of CDMWC, neighboring Settlement Contractors, and other entities in the surrounding area. Historically, many CDMWC diverters use both groundwater and surface water for summer irrigation because physical supplies of surface water in the Colusa Drain are often unreliable and insufficient to satisfy all irrigation requirements.

The purpose of this project is to provide a reliable and sufficient supply of surface water in the Drain allowing CDMWC diverters to increase their diversions of surface water and decrease groundwater pumping by an equal amount. It is estimated that an average annual yield of up to 28 taf of in-lieu groundwater recharge could be realized through this project.

⁴ Note to reviewer: Appendix 7X will be released with the complete draft Groundwater Sustainability Plan scheduled for August 31, 2021.



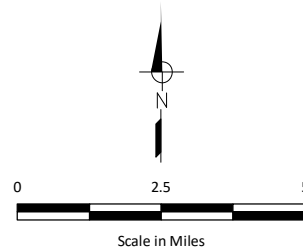
- Meridian Farms Water Company
- Pelger Mutual Water Company
- Princeton-Codora-Glenn Irrigation District
- Provident Irrigation District
- Reclamation District No. 1004
- Reclamation District No. 108
- Sutter Mutual Water Company
- Glenn Colusa Irrigation District

- Colusa Drain MWC Boundary
- Colusa Subbasin Boundary

Horizontal Datum: North American Datum of 1983 (NAD 83), California State Plane Zone II, feet.

Note:

1. Sacramento River Settlement Contractors (SRSC) in the vicinity of the Colusa Drain MWC within the Colusa Subbasin are included in this map, although there are other SRSCs that exist and could potentially provide a water source for this project.



DRAFT Figure 6-4

Colusa Drain MWC In-Lieu Groundwater Recharge

**Colusa Groundwater Authority and Glenn Groundwater Authority
Colusa Subbasin
Groundwater Sustainability Plan**

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Projects and Management Actions

6.3.2.2 Implementation

The project is currently being planned for implementation. The planned implementation timeline is shown in Table 6-8. CDMWC has existing transfer agreements with Settlement Contractors upon which the transfer terms under this project would be based. In addition, CDMWC has existing water rights, permitting, and infrastructure in place to operate the program. Initial program implementation will require a planning study of water transfer, prices, full-cost of transferred water delivered to CDMWC diverters, and a comparison to the cost to continue utilizing groundwater. This would establish program feasibility and potential program scale. Preliminary program design is already under way and will continue through 2022.

Benefits could begin to accrue as early as during the 2022 irrigation season, depending on availability of transfers. 2021 is a Shasta Critical year, with dry conditions across the state. Several criteria necessary for implementation are already in place:

- Most CDMWC shareholders have necessary infrastructure required to divert water from the drain and deliver it to their agricultural lands, and several Settlement Contractors have the infrastructure in place to introduce surface water supplies into the Colusa Basin Drain for CDMWC diversion and use (pursuant to transfer agreements).
- CDMWC shareholders have the necessary licenses and permits in place with DWR and SWRCB to allow diversions from the drain.
- CDMWC has a long-term supply agreement with Reclamation to supply water into the Sacramento River to offset shareholders diversions from the drain that would otherwise infringe the rights of senior water right holders in the Sacramento River.
- CDMWC and Glenn-Colusa Irrigation District (GCID, a Settlement Contractor) currently have a transfer agreement in place that includes the necessary environmental permitting with Reclamation and DWR.

Following the model of the transfer agreement with GCID, CDMWC would establish transfer agreements with other Settlement Contractors or other entities to provide surface water to the Colusa Basin Drain for CDMWC diversion and use.

These transfer agreements would need to be designed to provide settlement contractors with sufficient economic incentive to deliver water to the Colusa Basin Drain and, at the same time, provide CDMWC diverters with a sufficient incentive to access and utilize this surface water supply in-lieu of using groundwater. Coordination and planning for these transfer agreements is currently underway.

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Table 6-8. CDMWC In-Lieu Groundwater Recharge Implementation Timeline

Phase	Description	Start	End
Project Planning and Concept Development	Evaluate lands, existing infrastructure, permitting, and potential partners	2020	2021
Program Development and Incentives Analysis	Develop program costs and financial parameters; assess groundwater costs to CDMWC irrigators and willingness to accept payment for transfer from partners; establish program costs and structure	2021	2022
Transfer Agreements	Model and pursue transfer agreements based on the existing agreement with GCID	2019	Ongoing
Program Operation	Program implementation, monitoring, updates, and ongoing agreements	2022	Ongoing

6.3.2.3 Notice to public and other agencies

Public noticing for this project will be done in accordance with noticing requirements and in public meetings held by CDMWC and others. This would include CGA public meetings.

6.3.2.4 Construction activities and requirements

There are no infrastructure construction activities and requirements, as the project will use existing infrastructure and facilities.

6.3.2.5 Water source

The surface water source for the project will come from multiple Sacramento Valley entities with surface water entitlements that result in water available for transfer in some normal to wet year types. These entities include Settlement Contractors, Sacramento River water rights holders, and potentially others. The intent is to acquire the water through annual and multi-year, renewable water transfer agreements. A framework for this has already been established based on the existing agreement between CDMWC and GCID. New surface supplies would be provided to the Colusa Basin Drain for diversion and use by CDMWC shareholders.

Appendix 6A summarizes an assessment of the volumes of water available for transfer in the Colusa Subbasin. The water availability assessment finds there is sufficient water available for transfer for the CDMWC project, in addition to the other four planned GSP recharge projects.

6.3.2.6 Circumstances and criteria for implementation

This project is planned for immediate implementation. Coordination and planning are currently underway, and depending on outcomes, implementation and project benefits could potentially begin in 2022.

Implementation of the CDMWC program does not depend on the implementation or performance of other PMAs or district activities. While operation of this project is not expected to terminate, any future changes will be made to align with CDMWC goals and the overall Colusa Subbasin sustainability goal.

6.3.2.7 Legal authority, permitting processes, and regulatory control

As a mutual water company, CDMWC has the legal authority to plan for and pursue the acquisition and conveyance of supplemental surface water to its lands. The planning and implementation of this project will be done in accordance with the required permitting processes and regulatory control. CDMWC already has water rights, permitting, and infrastructure in place to operate the program. CDMWC shareholders have the necessary licenses and permits in place with DWR and SWRCB to allow diversions from the drain, and CDMWC and GCID currently have a transfer agreement in place that includes the necessary environmental permitting with Reclamation and DWR. No additional permitting requirements are anticipated, though CDMWC will consult with governing agencies, as needed.

6.3.2.8 Project Operations and Monitoring

CDMWC will operate, maintain, and monitor its existing facilities that would be utilized for the project during implementation and operation. No new additional facilities are planned for development.

Ongoing project monitoring will include a range of activities to evaluate the benefits described in the next section. This will include local monitoring to track the use of additional volumes of surface water made available through the project and estimates of the reduction in groundwater use relative to pre-project baselines. Assessments of economic incentives will also be conducted to evaluate their utility in encouraging surface water usage. Monitoring may include additional outreach to shareholders, which would be used to refine the program design and encourage additional adoption. It is further anticipated that annual and multi-year transfer agreements would be continually reviewed, negotiated, and executed to ensure sufficient supplies to achieve the desired program scale.

The benefit of utilizing additional surface water for in-lieu recharge on measurable objectives in the Colusa Subbasin (groundwater levels and groundwater storage) will be monitored using the monitoring network sites and monitoring practices described in the GSP (Chapter 3).

6.3.2.9 Project Benefits

CDMWC anticipates that the project would scale up over time, based on water transfer availability and the economics of utilizing those available supplies. A detailed assessment of project benefits will be completed during GSP implementation, as additional information is available from potential water transfer partners. A preliminary project benefits assessment was developed for the GSP.

The primary benefit of the project is reduction of groundwater pumping resulting from in-lieu groundwater recharge with benefits to the sustainability indicators previously shown in Table 6-3. A preliminary analysis estimates this project has the potential to provide 28 taf/yr of additional surface water for in-lieu recharge to CDMWC. The quantities transferred in each year would depend on water supply conditions in the Sacramento and San Joaquin Valleys. In Shasta Critical years, such as 2021, it is estimated that no water would be available for transfer for the project. Under recent historical conditions, this occurs approximately 1 in 10 years. In other, Shasta Non-Critical years it is estimated that an average of approximately 31 taf/yr would be transferred under agreements entered for this project.

Transfer volumes would vary in Shasta Non-Critical years based on the terms of the transfer agreements, and broader water market conditions. Prices for water transfers to the San Joaquin Valley have increased in recent years, affecting volumes available for transfer, particularly in drier years. Delta capacity constraints limit transfer potential south of the Delta in wet years. It is anticipated that CDMWC transfer volumes would vary with availability of CVP supplies in Shasta Non-Critical years. Table 6-9 summarizes

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the historical CVP final allocation for North of Delta agricultural water service contracts. Average CVP contract deliveries were 75 percent between 1990 and 2021, over the more recent 15 years, average deliveries were 67 percent of contracts.

CVP Water Service Contract Allocation (%)	Historical Period	
	1990 – 2021	2007 - 2021
>90%	63%	53%
50%-90%	13%	13%
25% - 50%	16%	13%
<25%	9%	20%
Average	75%	67%

Table 6-10 summarizes estimated project benefits. Project benefits would also be assessed using the C2VSimFG-Colusa model developed for GSP development by simulating groundwater conditions with and without the project. Benefits assume 31 taf/yr of transfers in Shasta Non-Critical years. As described above, the specific volume in each year type would be specified in transfer agreements. It is estimated that groundwater pumping within the CDMWC area is approximately 40 taf/yr. This project has the potential to provide an average of 28 taf/yr of additional surface water for in-lieu recharge. Therefore, assuming there is no development of groundwater on previously unirrigated lands, the project potential benefit would be 28 taf of in-lieu recharge, reducing the 40 taf annual pumping in CDMWC by 70 percent.

Year Type	Total Annual Volume	% of Years	Weighted Avg.
Shasta Non-Critical	Up to 31,000	90%	28,000
Shasta Critical	0	10%	0
Avg. Annual			28,000

6.3.2.10 Project Costs

The primary project cost is the cost of purchased and transferred water. Water transfer prices will be defined in the water transfer agreements. A detailed assessment of the water transfer market in the Colusa Subbasin and greater Sacramento Valley is beyond the scope of this initial project investigation for the GSP. Water transfer prices have increased substantially over the last decade. This is due to a combination of more limited supply due to drought, GSP implementation in the San Joaquin Valley, and the biological opinion regarding operation of the CVP system, as well as demand driven by plantings of permanent crops and strong nut prices. Historical (1993 – 2020) data for water transfers (price and volume) for agricultural water within the Sacramento Valley were reviewed.

Table 6-11 summarizes that average and range of within-Sacramento Valley transfer prices. The range highlights the variability in observed prices. Water conditions are classified according to the Sacramento

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River Index (Sacramento 40-30-30 index), which is formally defined in the State Water Board's Decision 1641. Year types are classified as follows: Wet (Wet), Average (Above Normal, Below Normal, Dry), and Dry (Critical). Prices are typically lower in longer-term agreements, which would be included under this project. As such, the lower end of the range is applied for planning cost estimates in this GSP.

Sacramento Valley WY Index	Average, \$/AF	Range, \$/af	
		Low	High
Wet	\$140	\$50	\$225
Average	\$210	\$75	\$415
Dry	\$265	\$95	\$430
Weighted-Average	\$192	\$83	\$347

Table 6-12 summarizes the estimated project costs. An initial estimate of the anticipated cost of the project is approximately \$1.7 million per year. This assumes a water transfer cost of \$62 per af for an average annual transfer volume of 28,000 af. This is within the range of prices observed in wetter conditions. It is anticipated that water transfer prices will depend on the length of the transfer, terms, and hydrologic conditions. The price of \$62 per af is used for initial planning purposes and does not include and additional conveyance or delivery costs.

Item	Total Cost	Year Incurred	Notes
Capital Costs			
Project planning and development	\$100,000	Start of project	Initial project design, planning, and implementation
O&M Costs			
Water supply cost	\$1.7 million	Annual average	Average annual water purchase cost that does not include any additional O&M or overhead costs.

23 CCR §354.44(b)(8) requires a summary of how CDMWC plans to pay the costs of the project. It is anticipated that the cost of transfer purchases would primarily be recovered through CDMWC assessments. Other potential funding sources include grants, loans, and potentially, a type of cost-share program where other groundwater-dependent water users in the Colusa Subbasin share a portion of the costs since they will also realize regional benefits through this project. Appendix 7X⁵ in Chapter 7 describes different funding mechanisms, and the conceptual approach for allocating project costs across multiple potential project beneficiaries.

⁵ Note to reviewer: Appendix 7X will be released with the complete draft Groundwater Sustainability Plan scheduled for August 31, 2021.

6.3.3 Colusa Subbasin Multi-Benefit Groundwater Recharge

6.3.3.1 Project Overview

The Nature Conservancy is partnering with private landowners and the Colusa and Glenn Groundwater Authorities for an on-farm, multi-benefit groundwater recharge incentive program. Program objectives are to benefit:

- disadvantaged communities by replenishing critical domestic and agricultural water supplies,
- private landowners economically through incentive payments, and
- migratory shorebirds through the creation of critical winter habitat on farms.

Surface water from the Sacramento River, subject to availability, is conveyed and applied to participating fields using existing diversion, conveyance, and on-farm infrastructure, flooding and maintaining ponded conditions during the program's annual implementation period.

The pilot program was initiated on Davis Ranches in Colusa County in 2018 and concluded in the spring of 2020. The pilot program evaluated different durations and locations of flooding that would provide multiple habitat benefits for migratory shorebirds.

The program is planned to expand into the future. Program expansion would include:

- Identifying willing landowner participants to participate in the program. Preliminary mapping based on migratory bird habitat and recharge suitability using the Soil Agricultural Groundwater Banking Index (SAGBI⁶) has been developed to identify potential areas of interest.
- Review and analyze pilot program data to quantify potential multi-benefits and evaluate economic incentives that would be required to support additional program enrollment.
- Evaluate options for funding sources to support program implementation. This may include State funding earmarked for the Department of Conservation to support multi-benefit agricultural land repurposing, or additional funding that may be allocated under potential bill AB-252 or similar initiatives.
- Develop program incentives and funding opportunities to encourage enrollment. Monitor and revise the program annually in response to landowner participant feedback and changing incentive conditions in the Colusa Subbasin (e.g., changes in the returns to farming that would affect willingness to accept payment to participate in the program). Continue to refine program to achieve desired multi-benefit outcomes.

⁶ SAGBI is a suitability index indicating the potential for groundwater recharge on agricultural land, determined according to five main factors: deep percolation, root zone residence time, topography, chemical limitations, and soil surface condition. SAGBI ratings for lands in California are developed by the California Soil Resource Lab at UC Davis and UC-ANR, and are available online at: <https://casoilresource.lawr.ucdavis.edu/sagbi/>.

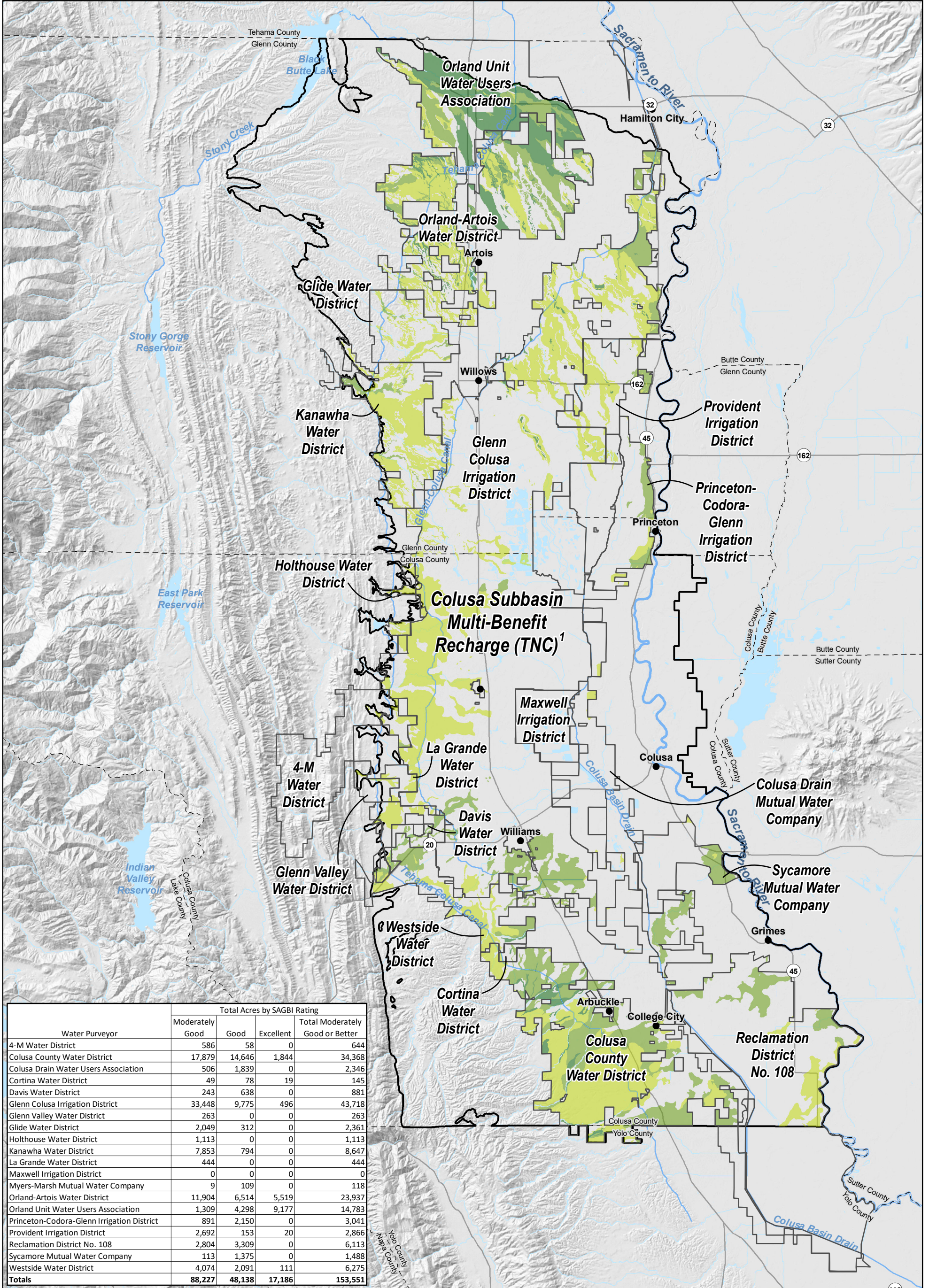
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With an incentive structure developed, the project would provide financial compensation for recharging groundwater through normal farming operations while also providing critical wetland habitat for waterbirds migrating along the Pacific Flyway, and potential ancillary benefits for water levels near disadvantaged communities in the Colusa Subbasin.

Figure 6-5 below illustrates the location of lands that are potentially suitable for participation in the program near the Sacramento River, identified according to elements in the C2VSimFG-Colusa model domain. The areas indicated in Figure 6-5 were selected for modeling the potential project effects near the Sacramento River⁷, though in general fields can be selected throughout the Colusa Subbasin by evaluating the SAGBI index to identify areas suitable for recharge and by evaluating land characteristics that benefit migratory shorebird habitat. In practice, the location and scale of the project will depend on the effectiveness of incentives to attract willing landowners, which might or might not be located near the river. Locations will depend on grower enrollment and could be anywhere within the Colusa Subbasin where surface water supplies are available and recharge conditions are favorable. Landowner participation would be voluntary, and subject to incentives that would be developed as part of ongoing program implementation.

⁷ Project modeling is described in Appendix 6-D. For modeling, proximity of lands to the Sacramento River was considered when selecting potential recharge areas because these lands are expected to have the greatest positive impact on streamflows.



Water Purveyor	Total Acres by SAGBI Rating			
	Moderately Good	Good	Excellent	Total Moderately Good or Better
4-M Water District	586	58	0	644
Colusa County Water District	17,879	14,646	1,844	34,368
Colusa Drain Water Users Association	506	1,839	0	2,346
Cortina Water District	49	78	19	145
Davis Water District	243	638	0	881
Glenn Colusa Irrigation District	33,448	9,775	496	43,718
Glenn Valley Water District	263	0	0	263
Glide Water District	2,049	312	0	2,361
Holthouse Water District	1,113	0	0	1,113
Kanawha Water District	7,853	794	0	8,647
La Grande Water District	444	0	0	444
Maxwell Irrigation District	0	0	0	0
Myers-Marsh Mutual Water Company	9	109	0	118
Orland-Artois Water District	11,904	6,514	5,519	23,937
Orland Unit Water Users Association	1,309	4,298	9,177	14,783
Princeton-Codora-Glenn Irrigation District	891	2,150	0	3,041
Provident Irrigation District	2,692	153	20	2,866
Reclamation District No. 108	2,804	3,309	0	6,113
Sycamore Mutual Water Company	113	1,375	0	1,488
Westside Water District	4,074	2,091	111	6,275
Totals	88,227	48,138	17,186	153,551

SAGBI Rating Group

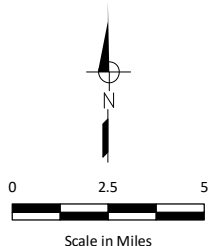
- Excellent
- Good
- Moderately Good

Surface Water Purveyors

Colusa Subbasin Boundary

Horizontal Datum: North American Datum of 1983 (NAD 83), California State Plane Zone II, feet.

- Notes:
- SAGBI is an acronym for the Soil Agricultural Groundwater Banking Index, which is a standard suitability index for groundwater recharge on agricultural land.
 - SAGBI results are shown within the service area boundaries of surface water purveyors within the Colusa Subbasin; locations where water conveyance infrastructure already exists.
 - Multi-benefit recharge locations will depend on grower enrollment and could be anywhere within the Colusa Subbasin where surface water supplies are available and recharge conditions are favorable.



DRAFT Figure 6-5
Multi-Benefit Recharge Project
 Colusa Groundwater Authority and Glenn Groundwater Authority
 Colusa Subbasin Groundwater Sustainability Plan

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6.3.3.2 Implementation

Following successful completion of a pilot program from 2018 to 2020, continuation and expansion of the project is currently being planned within the Colusa Subbasin. Table 6-13 summarizes the expected implementation timeline for the expanded program.

Phase	Description	Start	End
Pilot Program	Completion of a pilot project for multi-benefit recharge on Davis Ranches	2018	2020
Planning for Expansion of Multi-Benefit Groundwater Recharge	Planning and coordination for expansion and continuation of multi-benefit recharge projects within the Colusa Subbasin	2018	2022
Implementation of Multi-Benefit Recharge	Implementation of multi-benefit recharge projects within the Colusa Subbasin	2022	Ongoing

6.3.3.3 Notice to public and other agencies

Public noticing for this project will be done in accordance with noticing requirements in coordination with the CGA and GGA.

6.3.3.4 Construction activities and requirements

There are no infrastructure construction activities and requirements, as the project will use existing infrastructure and facilities.

The program would involve some on-farm activities for participating landowners to develop “pop up” recharge on existing fields. The program is designed to work within existing field infrastructure and irrigation systems. Any on-farm water management modifications are expected to be modest to increase standing water on fields in winter months to support both habitat and recharge.

6.3.3.5 Water source

The surface water source for the project will be Sacramento River water available under existing rights, subject to availability and agreements established between TNC, CGA, GGA, and private landowners that choose to participate in this voluntary program. The water supply would need to be available during prime flooding windows that support migratory bird habitat and recharge, which are generally in the late summer and fall. It is anticipated that water will generally be available for this project in all years except Shasta Critical years.

6.3.3.6 Circumstances and criteria for implementation

This pilot program was completed in 2020. The expanded project is currently planned for implementation, and TNC is working with potential partners. Depending on the outcome of current implementation, and landowner interest, implementation and project benefits could potentially begin in 2022.

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Implementation will proceed in several phases. The first phase will be selection of sites suitable for multi-benefit recharge (see Figure 6-5, above). This would concurrently include initiation of any required environmental documentation. Site selection will be based on:

- Lands that would provide multiple benefits for bird habitat and local communities.
- Soil characteristics that are suitable for recharge, using the SAGBI index in addition to local data developed for the GSP or in coordination with landowner partners.
- Identification of crop types that are suitable for recharge and could accept flooding in late summer and early fall, with minimal impacts (costs) to crops and farming operations.
- Availability of water rights and infrastructure to support implementation of the program. Availability of existing measurement and monitoring infrastructure.
- The second phase of implementation will include developing incentives to encourage landowner participation. This would concurrently include identification of potential funding sources to support the program. Incentives would consider:
 - Landowner costs to participate in the program (e.g., on-farm costs, potential crop damage, other direct costs to implement recharge).
 - Benefits that would accrue to the local region, the Colusa Subbasin, and general public from implementation of the program. These may include improved groundwater levels, other groundwater sustainability indicators, and regional benefits of improved habitat for migratory birds.
 - Funding sources would be identified to develop financial incentives. In addition, some program costs could be covered with GGA and CGA participation, where costs would be allocated in proportion to benefits received.

The final phase of program implementation would include ongoing monitoring to measure groundwater (and habitat) benefits for the Colusa Subbasin. It is expected that this would result in adjustment to program parameters to support continued expansion and adoption of the program.

Implementation of the multi-benefit program does not depend on the implementation or performance of other PMAs or district activities. While operation of this project is not expected to terminate, any future changes will be made to align with landowner participant goals and the overall Colusa Subbasin sustainability goal.

6.3.3.7 Legal authority, permitting processes, and regulatory control

The multi-benefit recharge project will be implemented as a collaborative effort between private landowners that have the legal authority to implement this project and facilitate multi-benefit recharge on their lands. Implementation will be done in accordance with the required permitting processes and regulatory control.

The following agencies have potential permitting roles for the multi-benefit groundwater recharge project: the Counties of Colusa and/or Glenn, SWRCB, and Reclamation. The project may also require applications for permits required from the SWRCB for diversion of surface water to the extent that diversion is not already permitted under existing water rights and contracts. Recharge projects may also require an environmental 1199 process under CEQA. If required, this project would need either an Environmental Impact Report and Negative Declaration or Mitigated Negative Declaration.

6.3.3.8 Project Operations and Monitoring

Operations and monitoring will be completed by the various project proponents to evaluate the benefits described in the next section. It is anticipated that the total amount of surface water applied to the field will be measured, other flow paths will be measured or estimated, and the amount of recharge achieved will be determined using a mass balance approach. This is consistent with the approach used in the pilot program.

During the implementation period, participants will spread water on their fields and maintain a shallow depth (4 inches maximum) for four to six weeks. Landowner participants will record any changes in water flow in an irrigation log, or other field measurement as appropriate. TNC would coordinate monitoring of field depth, bird presence, water delivery, and changes in groundwater depth.

Project performance would be summarized as part of GSP annual reports and 5-year updates.

6.3.3.9 Project Benefits

The primary benefits of the project are direct groundwater recharge and temporary habitat creation for migrating shorebirds, with benefits to the sustainability indicators previously shown in Table 6-3. The potential project groundwater recharge benefits were evaluated in the C2VSimFG-Colusa model, assuming that approximately 4,100 acres participate in the program each year that water is available (anticipated in all but Shasta Critical years). The model was used to simulate field flooding on participating land within the elements identified in Figure 6-5 during the annual project implementation period.⁸ From this analysis, it is estimated that an average of 11.5 taf/yr of surface water could be delivered to those participating lands over all year types for multi-benefit recharge, or approximately 2.8 feet per acre of participating land. Over all years simulated, this results in an average annual net groundwater recharge benefit of approximately 5.2 taf/yr, or approximately 1.3 feet per acre of participating land. Additionally, environmental benefits will occur through habitat for migrating shorebirds. All benefits will ultimately depend on grower participation in the program, as it affects the scale of recharge areas and the location where recharge occurs.

During project implementation, actual benefits each year will be evaluated as described in Section 6.3.3.8. Potential project benefits have been assessed, and may continue to be assessed, using the C2VSimFG-Colusa model developed for GSP development by simulating groundwater conditions with and without the project. Additional information on the project modeling is described in Appendix 6D.

Program participation will vary from year to year, depending on landowner interest, financial incentives, water availability, changes in crop market conditions, and sustainability indicators. The program is anticipated to continue every year, providing both groundwater recharge and migratory bird habitat along the Pacific Flyway.

⁸ Multi-benefit recharge was modeled by applying water during a 30-day flooding window (September) to designated irrigated lands (approximately 4,100 acres total) within the selected model elements. Soil characteristics were set to simulate flooding by setting the target soil moisture equal the total porosity of the soil.

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6.3.3.10 Project Costs

Project costs include costs of incentive payments to landowners, land preparation, water conveyance and application, and operations and monitoring.

Table 6-14 summarizes typical program costs based on the results of the pilot project. Costs are greatest in the initial year of the program due to coordination and site preparation but would be expected to fall over time. Site-specific costs will vary based on field conditions and changes to the program over time. As such, the total costs of the program will vary over time, depending on the number of participating landowners.

Item	Total Cost	Year Incurred	Notes
Capital Costs			
Site preparation	\$4,000	First project year	Per site cost
O&M Costs			
Site management	\$3,000	All years	Per site cost. Includes on-farm equipment, labor, and administration costs.
Other O&M cost	TBD	All years	Additional water costs, conveyance, and other site-specific costs would be assessed as part of entering into an agreement with willing landowners

23 CCR §354.44(b)(8) requires a summary of how the project proponent plans to pay these costs. It is anticipated that the cost of incentivizing multi-benefit on-farm recharge would primarily be recovered through funding sources including grants, loans, and potentially, a type of cost-share program where other groundwater-dependent water users in the Colusa Subbasin share a portion of the costs since they will also realize regional benefits through this multi-benefit recharge project. Appendix 7X⁹ in Chapter 7 describes different funding mechanisms, and the conceptual approach for allocating project costs across multiple potential project beneficiaries.

6.3.4 Orland-Artois Water District Land Annexation and In-Lieu Groundwater Recharge

6.3.4.1 Project Overview

Orland-Artois WD (OAWD), a Central Valley Project (CVP) water contractor, is working with a group of neighboring non-district landowners to annex approximately 12,000 acres into the district. Figure 6-6 illustrates the location of lands that would be annexed into the district. These lands are already developed agricultural lands that currently rely solely on groundwater for irrigation water supplies. Supplemental surface water for the annexed lands would be secured through annual and multi-year purchase or transfer agreements with willing sellers, conveyed through the existing Tehama-Colusa (TC) Canal, and distributed

⁹ Note to reviewer: Appendix 7X will be released with the complete draft Groundwater Sustainability Plan scheduled for August 31, 2021.

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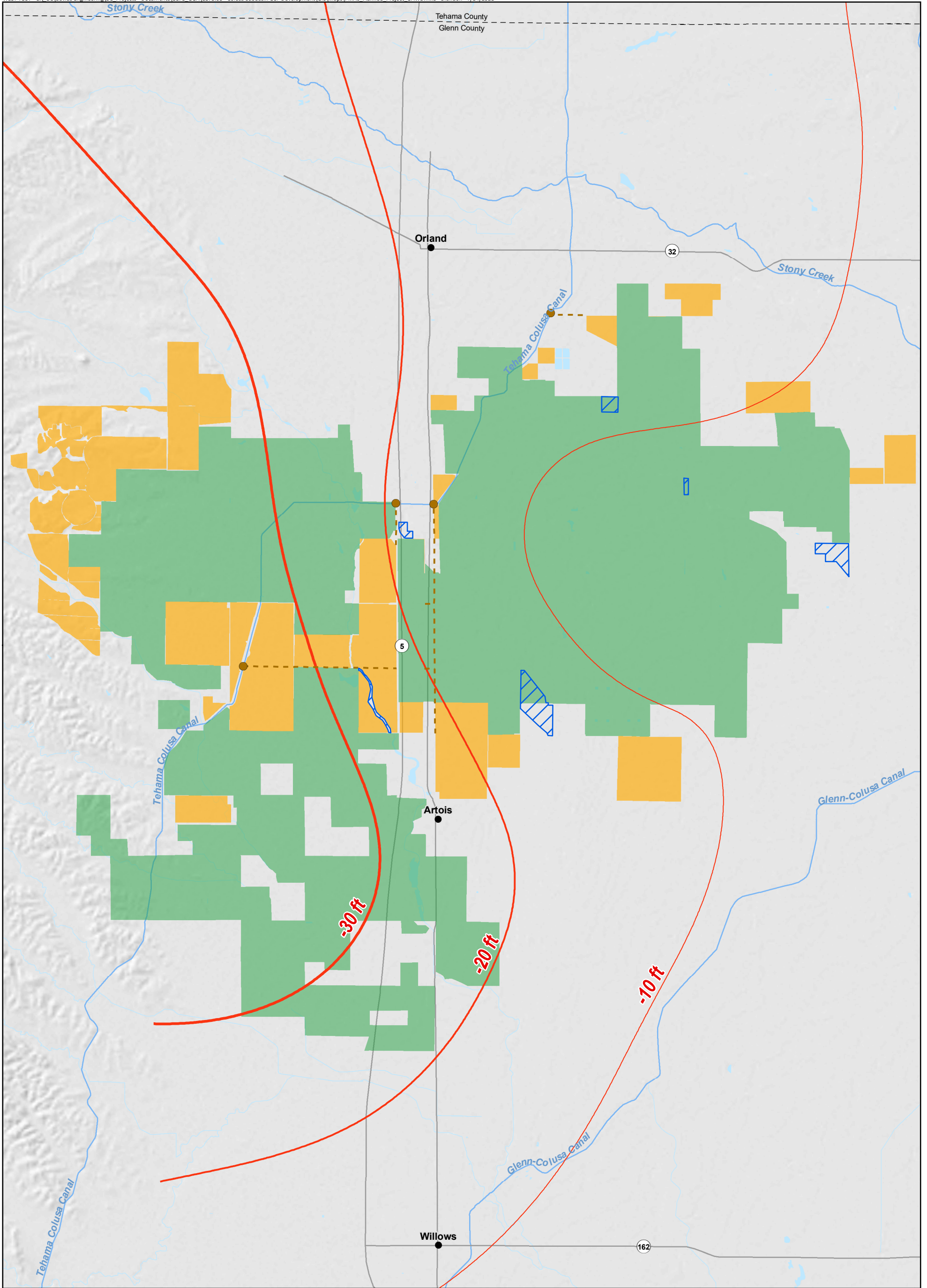
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to the annexed lands through new distribution facilities. New facilities include turnouts off the TC Canal, pipelines, pumping plants, and metered farm deliveries.

It is estimated that approximately 25 taf of surface water would be delivered to annexed lands in all years but Shasta Critical years, resulting in a reduction of groundwater pumping of 23 taf/yr on average across all years. Additionally, certain annexed lands with high infiltration characteristics would be configured for direct recharge by surface spreading. Direct recharge would be done primarily with Section 215 water. The direct recharge capacity has not yet been estimated.

This project would address an area within the Colusa Subbasin where groundwater levels have been in decline in recent years due to increasing irrigation demands being met through groundwater pumping, compounded in recent years by drought and related curtailments of surface water supplies to OAWD and other neighboring CVP contractors. The measurable objectives expected to benefit from the project are changes in groundwater levels, groundwater storage, and depletion of interconnected surface water.

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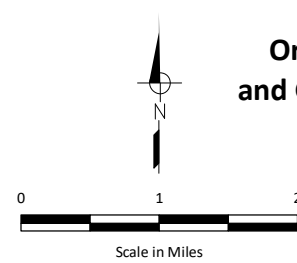
Spring 2010 to Spring 2020 Groundwater Elevation Change

-30 ft -20 ft -10 ft

- Proposed New TCC Turnout
- - - Proposed New Pipeline
- ▨ Proposed Recharge Areas
- Orland-Artois WD Boundary
- Orland-Artois WD Planned Annexations

Horizontal Datum: North American Datum of 1983 (NAD 83), California State Plane Zone II, feet.

Note:
1. Planning for this project is currently ongoing and map depictions are subject to change.



DRAFT Figure 6-6

Orland-Artois WD Land Annexation and Groundwater Recharge Overview

Colusa Groundwater Authority and Glenn Groundwater Authority
Colusa Subbasin
Groundwater Sustainability Plan

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6.3.4.2 Implementation

Planning is currently underway for annexation of these lands into OAWD and extension and expansion of the OAWD distribution system. Table 6-15 summarizes the current and planned implementation of the project. It is anticipated that annexed lands would receive surface water deliveries starting in 2025.

Phase	Description	Start	End
Annexation of Additional Lands	Determination of terms and conditions of annexation; development of agreements between OAWD and landowners; requires approval by OAWD, Reclamation, and Glenn County LAFCO	2020	2022
Negotiation of Annual and Multi-year Water Purchase or Transfer Contracts	Including engineering and environmental review; requires approval by TCCA, Reclamation and OAWD	2021	2022
Design of New Facilities	Including engineering and environmental review; requires approval by TCCA, Reclamation, and OAWD	2021	2022
Construction of New Facilities	Construction of new turnouts off Tehama-Colusa Canal, pumping plants, pipelines, and metered farm deliveries	2023	2025
Delivery of Surface Water to Annexed Lands	Delivery of purchased or transferred surface water under multi-year agreements	2025	Annually, in perpetuity, except for critical years

6.3.4.3 Notice to public and other agencies

Public noticing for this project will be done in accordance with noticing requirements in NEPA and CEQA, as well as noticing for public meetings held by OAWD, TCCA, and Glenn County LAFCO.

6.3.4.4 Construction activities and requirements

Construction of new water conveyance facilities will be required for distribution of surface water from the existing TC Canal to the newly annexed lands. The new facilities include the following:

- Approximately four new turnouts on the TC Canal to regulate releases from the canal into newly constructed distribution facilities
- Pumping plants on the TC Canal to lift water to annexed lands that are up-gradient from the TC canal
- Distribution pipelines ranging in size from approximately 12 to 36 inches in diameter
- Farm deliveries with instantaneous and totalizing flow measurement devices
- Recharge basins for surface spreading in certain locations with high infiltration rate (gravelly) soils

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6.3.4.5 Water source

The surface water source for the project will come from multiple Sacramento Valley entities with surface water entitlements that are regularly surplus to their own needs in normal to wet year types. These entities include CVP water supply and settlement contractors and, potentially, Sacramento River water rights holders. The intent is to acquire the water through annual and multi-year, renewable water purchase or transfer agreements, building on similar existing agreements that OAWD has with certain Sacramento Valley entities. New surface supplies would be diverted from the Sacramento River at the Red Bluff Pumping Plant and Fish Screen facility and conveyed through the Tehama-Colusa Canal, which is operated and maintained by the Tehama-Colusa Canal Authority.

Appendix 6A summarizes an assessment of the volumes of water available for transfer in the Colusa Subbasin. The water availability assessment finds there is sufficient water available for transfer for the OAWD project, in addition to the other four planned GSP recharge projects.

6.3.4.6 Circumstances and criteria for implementation

This project is planned for implementation as soon as possible, with planning for annexation and new facilities design already underway. In the latter half of 2020 and in 2021, the planning effort has included multiple discussions with OAWD, TCCA and Glenn County LAFCO. A formal letter has also been submitted by OAWD to the USBR notifying them of the proposed project. The initial feedback from all agencies has been positive to date.

6.3.4.7 Legal authority, permitting processes, and regulatory control

As a Water District, OAWD has the legal authority to pursue expansion of their service area and provide for the acquisition and conveyance of supplemental surface water to these additional lands. The planning and implementation of this project will be done in accordance with the required permitting processes and regulatory control.

Governing agencies with which consultation may need to be initiated include, but are not limited to: DWR, SWRCB, CDFW, the Flood Board, Regional Water Boards, Reclamation, USACE, USFWS, NMFS, LAFCO, the County of Colusa and/or Glenn, and CARB.

Specific permitting and regulatory processes that may affect the construction of new infrastructure include, but are not limited to:

- USACE Section 404 Permits (potential exemption under Section 404(f)(1)(C) of Clean Water Act)
- Regional Water Quality Control Board Section 401 Water Quality Certification (not required if exempt from USACE Section 404)
- SWRCB Construction General Permit and SWPPP
- SHPO and NHPA Section 106 Coordination
- California Endangered Species Act (CESA) Consultation
- ESA Compliance
- NEPA Compliance
- CEQA Compliance

6.3.4.8 Project Operations and Monitoring

OAWD plans to operate and maintain its existing district facilities, new facilities for annexed lands, and conduct project monitoring.

Project monitoring will include a range of activities to evaluate the benefits described in the next section. This will include local monitoring to track the additional volumes of water made available through transfers and estimates of the reduction in pumping relative to pre-project baselines. The district plans to monitor deliveries of surface water to newly annexed lands in-lieu of groundwater pumping. The benefit of in-lieu recharge on measurable objectives in the Colusa Subbasin (groundwater levels and groundwater storage) will be monitored using the monitoring network sites and monitoring practices described in the GSP (Chapter 3).

6.3.4.9 Project Benefits

The primary benefit of the project is reduction of groundwater pumping resulting from in-lieu groundwater recharge with benefits to the sustainability indicators previously shown in Table 6-3. It is estimated that approximately 25 taf of surface water would be delivered to annexed lands in all years but Shasta Critical years, resulting in an average reduction of groundwater pumping of 23 taf/yr across all years.

Certain annexed lands with high infiltration characteristics would be configured for direct recharge by surface spreading. Direct recharge would be done primarily with Section 215 water. The direct recharge capacity has not yet been estimated. These benefits would be realized after construction of the water delivery infrastructure is complete and delivery of surface water to these newly annexed lands begins.

Table 6-16 summarizes the expected annual volume of in-lieu recharge under the OAWD program. Project benefits have been assessed, and may continue to be assessed, using the C2VSimFG-Colusa model developed for GSP development by simulating groundwater conditions with and without the project. Additional information on the project modeling is described in Appendix 6D. Transfer volumes would vary in Shasta Non-Critical years based on the terms of the transfer agreements, and broader water market conditions. It is anticipated that OAWD transfer volumes would vary with availability of CVP supplies in Shasta Non-Critical years. Average CVP contract deliveries were 75 percent between 1990 and 2021, over the more recent 15 years, average deliveries were 67 percent of contracts. At full implementation (in 2025) the expected average annual volume equals 25 taf in Shasta Non-Critical years, with total average annual volume of 23 taf.

Year Type	Total Annual Volume	% of Years	Weighted Avg.
Shasta Non-Critical	Up to 25,000	90%	22,500
Shasta Critical	0	10%	0
Avg. Annual			22,500

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6.3.4.10 Project Costs

Project costs include the cost of purchased water, applicable costs associated with the use of the TC Canal, capital costs associated with construction of new facilities, and OAWD operation and maintenance costs. Efforts are currently underway by OAWD and owners of proposed annexed lands to estimate these project costs, and to identify funding sources and establish repayment terms. Table 6-17 summarizes project costs.

An additional project cost is the cost of purchased and transferred water. Water transfer prices will be defined in the water transfer agreements. A detailed assessment of the water transfer market in the Colusa Subbasin and greater Sacramento Valley is beyond the scope of this initial project investigation for the GSP. Water transfer prices have increased substantially over the last decade. This is due to a combination of more limited supply due to drought, GSP implementation in the San Joaquin Valley, and the biological opinion regarding operation of the CVP system, as well as demand driven by plantings of permanent crops and strong nut prices.

As shown in Table 6-11 in Section 6.3.2, the weighted-average cost for the lower range of within-Sacramento Valley transfer prices is \$83 per af. With approximately 23 taf average annual supply, the expected annual water supply cost (excluding any additional O&M or overhead charges) is \$1.9 million.

Potential funding sources include grants, loans, and potentially, a type of cost-share program where other groundwater-dependent water users in the Colusa Subbasin share a portion of the costs since they will also realize regional benefits through this in-lieu recharge project.

Item	Total Cost	Year Incurred	Notes
Capital Costs			
Distribution system and LAFCO costs	TBD	Start of project	OAWD is currently evaluating the cost of expanding its distribution to serve the annexed lands. Lands would be responsible for additional costs.
O&M Costs			
Water supply cost	\$1.9 million	Annual average	Average annual water purchase cost to acquire water in W, AN, and BN years; costs are incurred in years when water is available.
Other O&M cost	TBD	Annual average	District O&M costs will be established as part of the annexation process.

23 CCR §354.44(b)(8) requires a summary of how OAWD plans to cover the costs of the project. It is anticipated that the cost of transfer purchases would primarily be recovered through OAWD assessments. Landowners in annexed lands would pay for additional distribution system costs. Other potential funding sources include grants, loans, and potentially, a type of cost-share program where other groundwater-dependent water users in the Colusa Subbasin share a portion of the costs since they will also realize

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regional benefits through this project. Appendix 7X¹⁰ in Chapter 7 describes different funding mechanisms, and the conceptual approach for allocating project costs across multiple potential project beneficiaries.

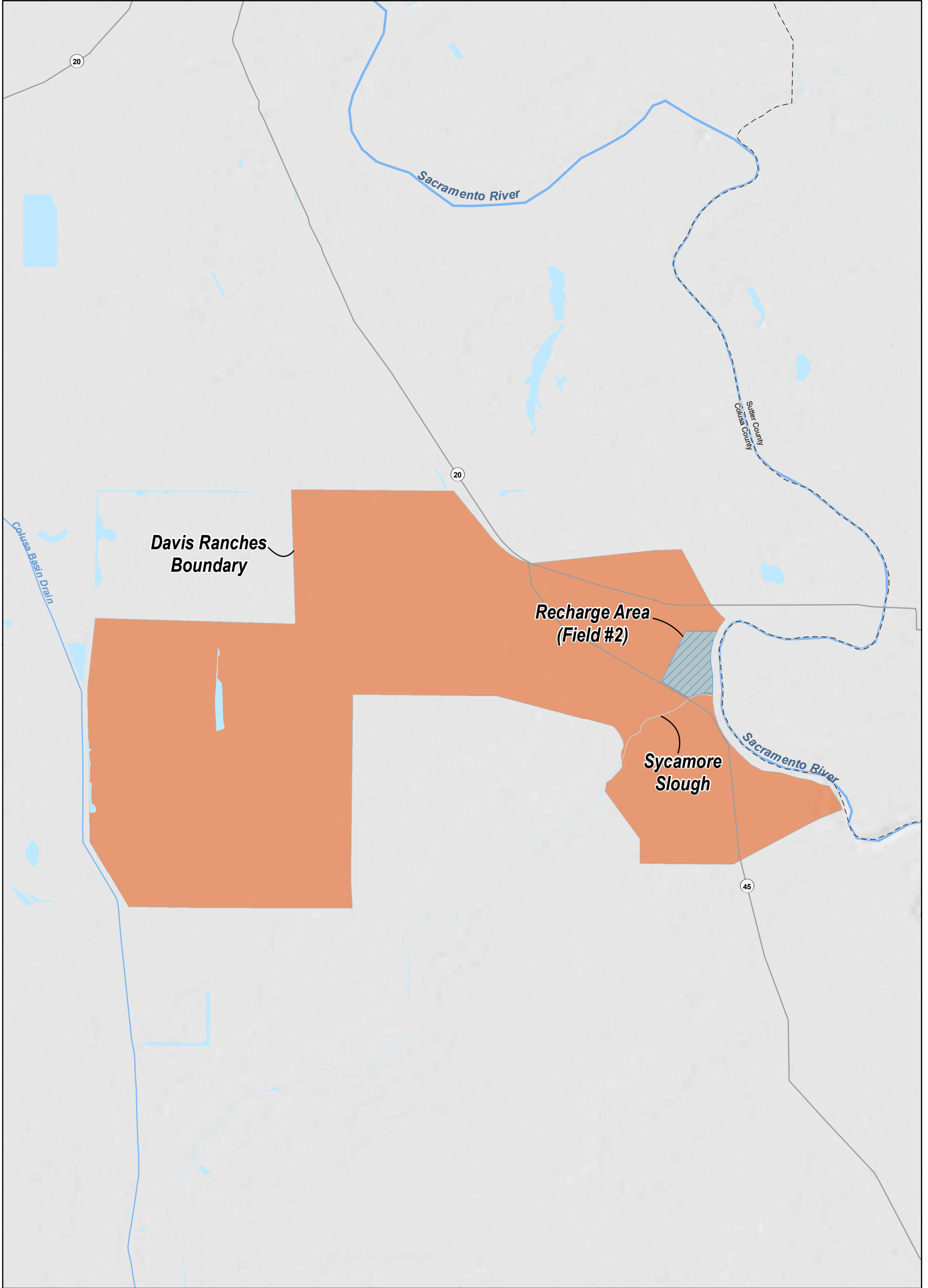
6.3.5 Sycamore Slough Groundwater Recharge Pilot Project

6.3.5.1 Project Overview

Proctor and Gamble (P&G) and Davis Ranches recently entered into a cooperative agreement to implement a 10-year groundwater recharge pilot project. The project will apply surface water diverted from the Sacramento River to a 66-acre field on Davis Ranches for groundwater recharge and to provide habitat for migrating waterfowl for 30 to 45 days in the early fall each year.

Sacramento River water is available to Davis Ranches under riparian rights, a Sacramento River settlement contract with Reclamation, and annual contracts with Reclamation for Section 215 water (flood flows). The objective is to recharge 500 acre-feet per year over the 10-year study period and to revegetate a portion of Sycamore Slough. Monitoring of groundwater conditions will be done in eight existing groundwater wells, including dedicated monitoring wells and agricultural production wells. If the project is successful and cost effective it could be continued in perpetuity to sustain long-term groundwater recharge and environmental benefits. Subject to acquisition of funding, an expansion of the project is planned for recharge and revegetation in the neighboring Sycamore and Dry Sloughs. The general project location is shown in Figure 6-7.

¹⁰ Note to reviewer: Appendix 7X will be released with the complete draft Groundwater Sustainability Plan scheduled for August 31, 2021.





DRAFT Figure 6-7

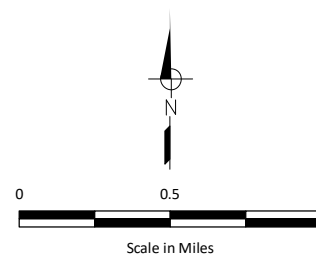
Sycamore Slough Groundwater Recharge Pilot Project Overview

Colusa Groundwater Authority and Glenn Groundwater Authority
Colusa Subbasin Groundwater Sustainability Plan

Horizontal Datum: North American Datum of 1983 (NAD 83), California State Plane Zone II, feet.

Note:
1. Planning for this project is currently ongoing and map depictions are subject to change.

-  Recharge Area (Field #2)
-  Davis Ranches Boundary



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6.3.5.2 Implementation

The project implementation timeline is shown in Table 6-18. The pilot project is scheduled to begin in the early fall of 2021 and will proceed for ten consecutive years. Subject to acquisition of funding, an expansion of the project is planned for neighboring Sycamore and Dry Sloughs in future years.

Phase	Description	Start	End
Pilot Project	Develop and implement pilot project program	2021	2030
Evaluation and Project Updates	Perform periodic project assessments and update project accordingly	2021	2030
Project Expansion	Evaluate opportunities to expand the project to additional lands in Dry and Sycamore Sloughs	2025	2030
Full Program Implementation	Adjust program based on pilot project performance, and scale program based on interest and funding availability; implement full program	2031	Annually, in perpetuity

6.3.5.3 Notice to public and other agencies

Public noticing for this project will be done in accordance with all legal noticing requirements. The project is funded through a private grant, and there is no requirement for public notice at initiation. However, the project proponents plan to host public outreach events and field days to communicate and illustrate project goals, challenges, and successes.

6.3.5.4 Construction activities and requirements

There are no infrastructure construction activities and requirements, as the project will use existing infrastructure and facilities. Minor earthwork would be required on the pilot project field to support increased recharge and bird habitat.

Future expansion of the program to other participating lands may require a similar level of earthwork to increase recharge and habitat benefits. No major construction activities are anticipated at this time.

6.3.5.5 Water source

The surface water source for the project will be Sacramento River water available to Davis Ranches under riparian rights, a Sacramento River settlement contract with Reclamation, and annual contracts with Reclamation for Section 215 water (flood flows). The water would be diverted and conveyed through existing facilities.

6.3.5.6 Circumstances and criteria for implementation

The pilot project is scheduled to begin in the early fall of 2021 and will proceed for ten consecutive years through 2030.

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Subject to acquisition of funding, an expansion of the project is planned for neighboring Sycamore and Dry Sloughs in future years. If the project is successful and cost effective it could be continued in perpetuity to sustain long-term groundwater recharge and environmental benefits.

6.3.5.7 Legal authority, permitting processes, and regulatory control

As a private landowner, Davis Ranches has the legal authority to implement this project. Implementation will be done in accordance with the required permitting processes and regulatory control.

The following agencies have potential permitting roles for the Sycamore Slough groundwater recharge pilot project: the County of Colusa, SWRCB, and Reclamation. Davis Ranches has existing riparian rights and a Sacramento River settlement contract with Reclamation, with potential access to Section 215 water.

Recharge projects may also require an environmental 1199 process under CEQA. If required, this project would need either an Environmental Impact Report and Negative Declaration or Mitigated Negative Declaration.

6.3.5.8 Project Operations and Monitoring

Davis Ranches will operate and maintain project facilities and monitoring equipment. Monitoring will be completed to evaluate the benefits described in the next section. The total amount of surface water applied to the field will be measured, other flow paths will be measured or estimated, and the amount of recharge achieved will be determined using a mass balance approach. Groundwater levels in eight groundwater wells in the project vicinity will be monitored and analyzed to determine the extent and magnitude of benefits to groundwater conditions.

6.3.5.9 Project Benefits

The primary benefits of the project are direct groundwater recharge and temporary bird habitat formation, with benefits to the sustainability indicators previously shown in Table 6-3. The objective of the pilot project is to recharge 500 acre-feet of water each year, with the potential to increase this volume if the project is expanded for neighboring Sycamore and Dry Sloughs in future years. Groundwater recharge benefits could also be assessed using the C2VSimFG-Colusa model developed for GSP development by simulating groundwater conditions with and without the project. Additionally, environmental benefits will occur through habitat for migrating waterfowl and revegetation of a portion of Sycamore Slough.

6.3.5.10 Project Costs

Project costs include costs of land preparation, water application, operations and monitoring, and revegetation costs. The estimated capital cost for monitoring equipment is approximately \$28,000, and the estimated annual costs for project implementation total approximately \$26,000 per year. The pilot project has secured funding through P&G for 10 years, and Davis Ranches is currently working with the Freshwater Trust to identify other potential funders for expansion of the recharge program or longer-term funding beyond the 10-year pilot project.

23 CCR §354.44(b)(8) requires a summary of how P&G and Davis Ranches would cover the costs of the project. Initial program costs are covered under a grant. Potential future funding sources include grants, loans, and potentially, a type of cost-share program where other groundwater-dependent water users in the Colusa Subbasin share a portion of the costs since they will also realize regional benefits through this

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project. Appendix 7X¹¹ in Chapter 7 describes different funding mechanisms, and the conceptual approach for allocating project costs across multiple potential project beneficiaries.

6.4 ONGOING PROJECTS AND MANAGEMENT ACTIONS

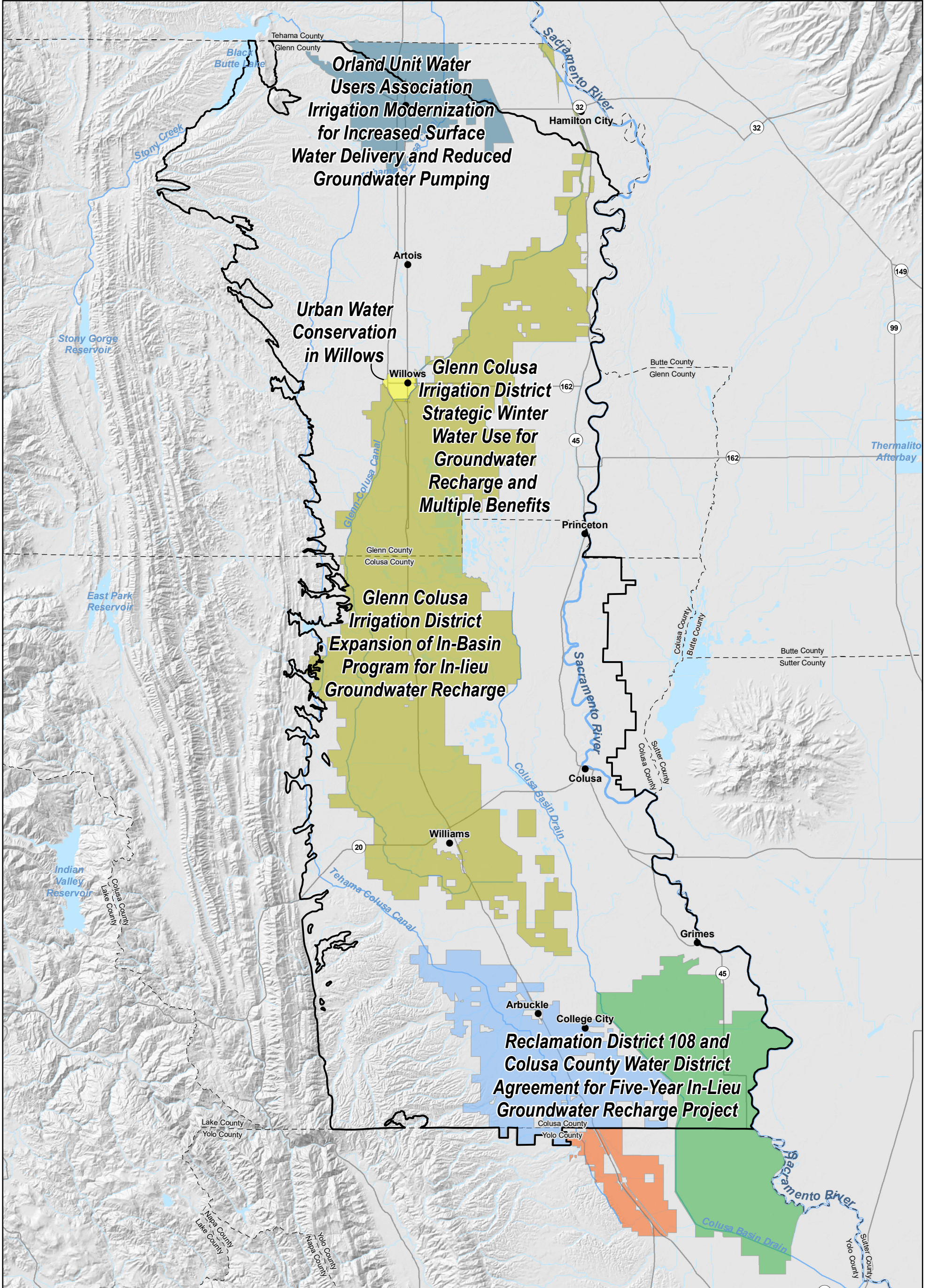
Several agencies and other proponents have ongoing projects and actions which could provide benefits with respect to one or more of the measurable objectives. In accordance with 23 CCR §354.44(a) these are PMAs that would allow GSAs to achieve the sustainability goal for the Colusa Subbasin and avoid minimum thresholds defined in this GSP under future, changing conditions.

Data for these PMAs will be developed under future monitoring, and as the GSAs continue to identify and fill data gaps. Ongoing PMAs are classified by projects and management actions, which are described in the following subsections. Projects are generally structural activities that include recharge and in-lieu recharge. Management actions are activities to improve water management or reduce groundwater pumping. There is one ongoing management action, which is an urban water conservation project in the Willows area. Figure 6-8 illustrates the location of ongoing PMAs in the Colusa Subbasin.

Ongoing PMAs are described at a reconnaissance-level of detail relative to the planned projects described under Section 6.3, above. However, project information is still reported in accordance with 23 CCR §354.44(b). The required information is summarized in a table following the general description for each ongoing PMA. The information provided with each ongoing project table maps to the GSP regulation requirements as follows:

- Implementation (§354.44(b)(1)(A))
- Timeline (§354.44(b)(4))
- Notice to public and other agencies (§354.44(b)(1)(B))
- Water source and reliability (§354.44(b)(6))
- Legal authority, permitting processes, and regulatory control (§354.44(b)(3), (§354.44(b)(7))
- Benefits and benefit evaluation methodology (§354.44(b)(5), (§354.44(b)(9))
- Costs (§354.44(b)(8))

¹¹ Note to reviewer: Appendix 7X will be released with the complete draft Groundwater Sustainability Plan scheduled for August 31, 2021.

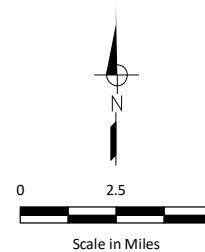


- Colusa Subbasin Boundary
- Colusa County WD Boundary
- Dunnigan WD Boundary
- Orland Unit WUA Boundary
- Reclamation District No. 108 Boundary
- Glenn Colusa ID Boundary
- City of Willows

Horizontal Datum: North American Datum of 1983 (NAD 83), California State Plane Zone II, feet.

Notes:

1. Ongoing projects will take place within the service area boundaries of the project proponents.
2. The Sycamore Marsh Farm Direct Recharge Program is not depicted on the map.



DRAFT Figure 6-8

Ongoing Projects and Management Actions Overview

Colusa Groundwater Authority and Glenn Groundwater Authority
Colusa Subbasin Groundwater Sustainability Plan

6.4.1 Ongoing Projects

This section described ongoing projects. Ongoing projects include direct and in-lieu recharge opportunities being implemented across the Colusa Subbasin. Table 6-19 summarizes the ongoing projects included in the GSP. The following subsections provide project descriptions for each project.

Project	Project Type	Proponent	Year Implemented	Estimated Capital / Establishment Cost, \$M	Gross Average Annual Benefit, af/yr
Reclamation District 108 and Colusa County Water District Agreement for Five Year In-Lieu Groundwater Recharge Project	In-lieu Groundwater Recharge	RD108 and CCWD	Pending Extension	Under Development	8,000
Glenn Colusa Irrigation District Strategic Winter Water Use for Groundwater Recharge and Multiple Benefits	Direct and In-lieu Groundwater Recharge	GCID	2021	Under Development	TBD
Sycamore Marsh Farm Direct Recharge Project ^(a)	Direct Groundwater Recharge	Landowner	2020	Under Development	TBD
Glenn Colusa Irrigation District Expansion of In-Basin Program for In-lieu Groundwater Recharge	In-lieu Groundwater Recharge	GCID	2021	Under Development	TBD
Orland Unit Water Users Association Irrigation Modernization for Increased Surface Water Delivery and Reduced Groundwater Pumping	In-lieu Groundwater Recharge	Ouwua	2021	Under Development	TBD

(a) Project is not depicted on the map in Figure 6-8.

6.4.1.1 Reclamation District 108 and Colusa County Water District Agreement for Five-Year In-Lieu Groundwater Recharge Project

RD108 and CCWD (and Dunnigan Water District located in the neighboring Yolo Groundwater Subbasin) are entering the final year (2022) of a five-year agreement that provides for the purchase of water by CCWD (and DWD) from RD108. The purchased water is available to RD108 through contractual rights under Sacramento River Settlement Contract 14-06-200-876A between RD108 and the Bureau of Reclamation. Under the five-year agreement, 10,000 acre-feet is purchased by and transferred to CCWD and DWD, with 80 percent of the 10,000 acre-feet going to CCWD and 20 percent to DWD. Water purchased under the agreement is diverted at the Red Bluff Pumping Plant and Fish Screen facility and conveyed via the Tehama-Colusa Canal for distribution within CCWD and DWD. The price schedule for the water is tied to Reclamation's annual water rates with an additional charge per acre-foot that depends on CCWD's annual allocation under its CVP contract. The additional charge varies from \$0 per acre-foot to \$50 per acre-foot. However, in years when RD108's water supply under its settlement contract is cut by 75 percent, the price schedule does not govern and instead the price is \$275 per acre-foot. It is expected that the five-year agreement will be extended with the price schedule potentially renegotiated.

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This project supplies additional surface water to CCWD (and DWD) that provides in-lieu recharge to meet water demands that otherwise would be met through groundwater pumping.

A summary of the project is provided in Table 6-20.

Item	Description
Implementation	RD108 and CCWD proposed this project, if extended, for GSP implementation in the CCWD service area. The project provides in-lieu groundwater recharge through utilization of surface water supplies available to RD108. This is an ongoing project, which will be monitored and quantified with respect to groundwater conditions, as needed, if sustainable levels are not reached following implementation of other projects and management actions. This will be done in the context of Sustainable Management Criteria defined in Chapter 5 to ensure sustainable operation of the Colusa Subbasin.
Timeline	The current project is ending, and extension is still pending. Thus, the start and completion dates for this project have yet to be determined and will be provided in GSP annual reports and 5-year updates when known.
Notice to public and other agencies	Public and/or Inter-Agency Noticing is being facilitated through GSA board meetings, GSA and/or cooperating agency website(s), GSA newsletter, member agency newsletter, inter-basin coordination meetings, member agency governing body public meetings, GSP annual report(s), public scoping meetings and environmental/regulatory permitting notification.
Water source & reliability	The source is Sacramento River water available to RD108 through contractual rights under Sacramento River Settlement Contract 14-06-200-876A between RD108 and the Bureau of Reclamation.
Legal authority, permitting processes, and regulatory control	GSAs, Districts, and individual project proponents have the authority to plan and implement projects. Required permitting and regulatory review is project specific and being initiated through consultation with applicable governing agencies. Governing agencies for which consultation is being initiated may include, but is not limited to: DWR, SWRCB, CDFW, Flood Board, Regional Water Boards, USFWS, NMFS, LAFCO, County of Colusa and/or Glenn and CARB.
Benefits and benefit evaluation methodology	The measurable objectives expected to benefit are groundwater levels, groundwater storage, land subsidence, and depletion of interconnected surface water. The expected yield of the project is 8,000 af/yr in Shasta Non-Critical years, and about 7,000 af/yr on average across all years. Evaluation of benefits will be based on analysis of pre- and post-project measurements supported by modeling. Measured parameters will include surface water deliveries, groundwater levels, and land subsidence. Modeling will be done with the C2VSimFG-Colusa model used for GSP development.
Costs	The current project is ending, and extension is still pending. Thus, the anticipated costs of this project have yet to be determined and will be reported in GSP annual reports and 5-year updates when known. The project proponent is identifying funding sources to cover project costs as part of project development. These may include grants, fees, loans, and other assessments.

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6.4.1.2 Glenn Colusa Irrigation District Strategic Winter Water Use for Groundwater Recharge and Multiple Benefits

In addition to the water supply available to Glenn Colusa Irrigation District under its settlement contract with the Bureau of Reclamation, GCID holds a 1999 water right permit¹² to divert Sacramento River water for irrigation and rice straw decomposition annually between November 1 and March 31. Water used under the permit is referred to as “winter water.” Use under the permit began in 2000 and on average between 2000 and 2019, about 43 percent of the district land planted to rice each year has used winter water. Additionally, use for winter irrigation of a variety of permanent and annual crops has gradually expanded, particularly to meet late Fall irrigation demands of almonds. Finally, winter water is occasionally used for frost control purposes, particularly on almonds. Water applied for rice straw decomposition creates multiple benefits, including habitat enhancement for Pacific Flyway migrating waterfowl and groundwater recharge in the Colusa Subbasin. Water used for winter irrigation and frost control of non-rice crops contributes to in-lieu recharge to the extent that groundwater would have been used absent the availability of winter water.

The potential exists to increase the groundwater recharge and habitat enhancement benefits of winter water use by increasing winter use for rice straw decomposition, winter irrigation, and frost control provided that certain constraints can be alleviated. The main constraints include: the current cost of winter water; the labor cost and management effort involved with applying winter water; GCID’s inability to provide of winter water during its annual system construction and maintenance period traditionally from early January through late February each winter; and, water supply constraints posed by water right Term 91, which limits Sacramento River diversions during dry periods.

Under this project, working in collaboration with partners within the Colusa Subbasin and with environmental advocacy groups, GCID will investigate opportunities to increase winter water use by alleviating the constraints mentioned above. The objectives will be to incentivize growers to: 1) maximize winter water use on rice land including targeting rice lands with highest recharge potential, 2) expand use of winter water for irrigation and frost control where groundwater would otherwise be used, and 3) encourage temporary flooding of permanent and annual crop lands including targeting lands with the highest recharge potential. Critical elements of this investigation include demonstration on-farm economic and agronomic feasibility.

A summary of the project is provided in Table 6-21.

¹² GCID is currently preparing to petition the State Water Resources Control Board (SWRCB) to convert its winter water permit to a water right license.

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Table 6-21. Glenn Colusa Irrigation District Strategic Winter Water Use for Groundwater Recharge and Multiple Benefits Summary

Item	Description
Implementation	GCID proposed this ongoing project for GSP implementation in the GCID service area. The project would provide direct and in-lieu groundwater recharge through increased winter water utilization. This is an ongoing project, which will be monitored and quantified with respect to groundwater conditions, as needed, if sustainable levels are not reached following implementation of other projects and management actions. This will be done in the context of Sustainable Management Criteria defined in Chapter 5 to ensure sustainable operation of the Colusa Subbasin.
Timeline	This project is beginning in 2021 and will be ongoing.
Notice to public and other agencies	Public and/or Inter-Agency Noticing is being facilitated through GSA board meetings, GSA and/or cooperating agency website(s), GSA newsletter, member agency newsletter, inter-basin coordination meetings, member agency governing body public meetings, GSP annual report(s), public scoping meetings and environmental/regulatory permitting notification.
Water source & reliability	The source is an appropriative water right for diversion and use of "winter water" from November 1 through March 31 each year. Appropriative winter water supplies are subject to availability and curtailments according to water right Term 91.
Legal authority, permitting processes, and regulatory control	GSAs, Districts, and individual project proponents have the authority to plan and implement projects. Required permitting and regulatory review is being initiated through consultation with applicable governing agencies. Governing agencies for which consultation is being initiated may include, but is not limited to: DWR, SWRCB, CDFW, Flood Board, Regional Water Boards, USFWS, NMFS, LAFCO, County of Colusa and/or Glenn and CARB.
Benefits and benefit evaluation methodology	The measurable objectives expected to benefit are groundwater levels, groundwater storage, and depletion of interconnected surface water. Potential expansion of this project to increase recharge is currently in the early conceptual stage. Thus, the expected yield of this project has yet to be determined and will be reported in GSP annual reports and 5-year updates when known. Other benefits are increased ponded habitat for migrating waterfowl and improved air quality through reduced rice straw burning. Evaluation of benefits will be based on analysis of pre- and post-project measurements supported by modeling. Measured parameters will include surface water deliveries, groundwater levels, and others to be determined. Modeling will be done with the C2VSimFG-Colusa model used for GSP development.
Costs	Project costs are primarily related to the cost of diverting and distributing winter water through the GCID canal network, with costs paid by participating growers. Current rates for winter water service vary between approximately \$9 and \$27 per acre depending on the level of service (duration of flooding), on top of a fixed assessment of about \$42 per acre.

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This project will be implemented by GCID working together with project collaborators by continuing use of winter water and investigating alternatives for alleviating constraints and developing incentives for expanding use of winter water. This will include the following actions, among others:

- Petitioning the SWRCB to license GCID’s current water right permit, including investigation of provisions for relieving water supply limitations posed by Term 91.
- Characterizing baseline winter water use to better understand the destination of winter water to consumptive use, deep percolation (groundwater recharge), and surface return flows.
- Quantifying the groundwater recharge and habitat enhancement benefits derived from winter water use under baseline and potential future conditions with increased winter water use.
- Identifying beneficiaries of baseline and increased winter water use.
- Identifying and addressing data gaps associated characterizing winter water use and identifying beneficiaries.
- Exploring potential financial, operational, and other types of partnerships with beneficiaries and collaborators.
- Conducting temporary pilot programs to test operational and financial collaborations, potentially leading to implementation of permanent or long-term arrangements.
- Assessing environmental impacts and preparing environmental documents, as necessary.

Winter water would be diverted from the Sacramento River and delivered using GCID’s existing distribution system, so no additional conveyance infrastructure is expected to be required. Minor facilities to connect the GCID system to lands currently served by groundwater only might be required.

6.4.1.3 Sycamore Marsh Farm Direct Recharge Project

Sycamore Marsh Farm has been in process of developing a groundwater recharge plan to store water in the aquifer by several different methods. The plan provides for 205 acres of year-round recharge basins and 163 additional acres of winter recharge areas. A summary of the project is provided in Table 6-22.

Item	Description
Implementation	The landowner proposed this ongoing project for GSP implementation which would be located on their property. The project provides direct groundwater recharge through several methods. This is an ongoing project, which will be monitored and quantified with respect to groundwater conditions, as needed, if sustainable levels are not reached following implementation of other projects and management actions. This will be done in the context of Sustainable Management Criteria defined in Chapter 5 to ensure sustainable operation of the Colusa Subbasin.
Timeline	The project began in 2020 and will be ongoing.

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Table 6-22. Sycamore Marsh Farm Direct Recharge Project Summary

Item	Description
Notice to public and other agencies	Public and/or Inter-Agency Noticing is being facilitated through GSA board meetings, GSA and/or cooperating agency website(s), GSA newsletter, member agency newsletter, inter-basin coordination meetings, member agency governing body public meetings, GSP annual report(s), public scoping meetings and environmental/regulatory permitting notification.
Water source & reliability	The source for this project is the Colusa Basin Drain. The reliability is to be determined.
Legal authority, permitting processes, and regulatory control	GSAs, Districts, and individual project proponents have the authority to plan and implement projects. Required permitting and regulatory review is being initiated through consultation with applicable governing agencies. Governing agencies for which consultation is being initiated may include, but is not limited to: DWR, SWRCB, CDFW, Flood Board, Regional Water Boards, USFWS, NMFS, LAFCO, County of Colusa and/or Glenn and CARB.
Benefits and benefit evaluation methodology	The measurable objectives expected to benefit are groundwater levels, groundwater storage, depletion of interconnected surface water, land subsidence, and potentially groundwater quality. This project is still developing. Thus, the expected yield of this project has yet to be determined and will be reported in GSP annual reports and 5-year updates when known. Other benefits include ponded habitat for migratory waterfowl. Evaluation of benefits will be based on analysis of pre- and post-project measurements supported by modeling. Measured parameters will include surface water deliveries, groundwater levels, and others to be determined. Modeling will be done with the C2VSimFG-Colusa model used for GSP development.
Costs	This project is still developing. Thus, the anticipated costs of this project have yet to be determined and will be reported in GSP annual reports and 5-year updates when known. The project proponent is identifying funding sources to cover project costs as part of project development. These may include grants, fees, loans, and other assessments.

6.4.1.4 Glenn Colusa Irrigation District Expansion of In-Basin Program for In-lieu Groundwater Recharge

In cooperation with the Bureau of Reclamation (Reclamation), GCID has developed temporary arrangements to supply district surface water to neighboring non-district agricultural lands that primarily use groundwater. These temporary arrangements were implemented under agreements that recently expired in 2020. There is continued interest from participating landowners, and interest from landowners in additional closely neighboring areas, in continuing and expanding this in-basin surface water use. GCID is currently working in cooperation with Reclamation to renew these agreements and expand this program for the purpose of reducing groundwater pumping and increasing in-lieu groundwater recharge. Construction of new water delivery infrastructure may be required to deliver surface water to some neighboring lands. GCID is also evaluating the possibility of annexing some or all of these lands into its service area. A summary of the project is provided in Table 6-23.

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Item	Description
Implementation	GCID proposed this recently expired project to become an ongoing project for GSP implementation in GCID and neighboring areas. The project would provide in-lieu groundwater recharge through increased surface water utilization. This is an ongoing project, which will be monitored and quantified with respect to groundwater conditions, as needed, if sustainable levels are not reached following implementation of other projects and management actions. This will be done in the context of Sustainable Management Criteria defined in Chapter 5 to ensure sustainable operation of the Colusa Subbasin.
Timeline	This project would resume in 2021 and be ongoing.
Notice to public and other agencies	Public and/or Inter-Agency Noticing is being facilitated through GSA board meetings, GSA and/or cooperating agency website(s), GSA newsletter, member agency newsletter, inter-basin coordination meetings, member agency governing body public meetings, GSP annual report(s), public scoping meetings and environmental/regulatory permitting notification.
Water source & reliability	The source is the Sacramento River under GCID's contractual and appropriative rights. This is expected to be a reliable source.
Legal authority, permitting processes, and regulatory control	GSAs, Districts, and individual project proponents have the authority to plan and implement projects. Required permitting and regulatory review is being initiated through consultation with applicable governing agencies. Governing agencies for which consultation is being initiated may include, but is not limited to: DWR, SWRCB, CDFW, Flood Board, Regional Water Boards, USFWS, NMFS, LAFCO, County of Colusa and/or Glenn and CARB.
Benefits and benefit evaluation methodology	The measurable objectives expected to benefit are groundwater levels, groundwater storage, and depletion of interconnected surface water. Potential expansion of this project is currently in the early conceptual stage. Thus, the expected yield of this project has yet to be determined and will be reported in GSP annual reports and 5-year updates when known. Evaluation of benefits will be based on analysis of pre- and post-project measurements supported by modeling. Measured parameters will include surface water deliveries, groundwater levels, and others to be determined. Modeling will be done with the C2VSimFG-Colusa model used for GSP development.
Costs	Potential expansion of this project is currently in the early conceptual stage. Thus, the anticipated costs of this project have yet to be determined and will be reported in GSP annual reports and 5-year updates when known. The project proponent is identifying funding sources to cover project costs as part of project development. These may include grants, fees, loans, and other assessments.

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6.4.1.5 Orland Unit Water Users Association Irrigation Modernization for Increased Surface Water Delivery and Reduced Groundwater Pumping

This project continues the modernization of the OUWUA’s southside irrigation conveyance and distribution system involving the following features: regulating reservoirs, expanded and improved flow measurement and water level control, system inerties, and expansion and upgrading of the existing supervisory control and data acquisition (SCADA) system. These improvements are expected to result in more reliable and flexible farm deliveries that will provide incentives for growers to use more surface water and pump less groundwater. In-lieu recharge is expected to increase groundwater levels within and neighboring the OUWUA service area. A summary of the project is provided in Table 6-24.

Item	Description
Implementation	OUWUA proposed this ongoing project for GSP implementation in the OUWUA service area and neighboring areas. The project provides in-lieu groundwater recharge through more efficient utilization of existing surface water. This is an ongoing project, which will be monitored and quantified with respect to groundwater conditions, as needed, if sustainable levels are not reached following implementation of other projects and management actions. This will be done in the context of Sustainable Management Criteria defined in Chapter 5 to ensure sustainable operation of the Colusa Subbasin.
Timeline	This project is still developing. Thus, the start and completion dates for this project have yet to be determined and will be provided in GSP annual reports and 5-year updates when known.
Notice to public and other agencies	Public and/or Inter-Agency Noticing is being facilitated through GSA board meetings, GSA and/or cooperating agency website(s), GSA newsletter, member agency newsletter, inter-basin coordination meetings, member agency governing body public meetings, GSP annual report(s), public scoping meetings and environmental/regulatory permitting notification.
Water source & reliability	The source is Stony Creek water available to the OUWUA under the Angle Decree. This is highly reliable with significant shortages historically occurring once every 10 to 20 years on average.
Legal authority, permitting processes, and regulatory control	GSAs, Districts, and individual project proponents have the authority to plan and implement projects. Required permitting and regulatory review is project specific and being initiated through consultation with applicable governing agencies. Governing agencies for which consultation is being initiated may include, but is not limited to: DWR, SWRCB, CDFW, Flood Board, Regional Water Boards, USFWS, NMFS, LAFCO, County of Colusa and/or Glenn and CARB.
Benefits and benefit evaluation methodology	The measurable objectives expected to benefit are groundwater levels, groundwater storage, and depletion of interconnected surface water. This project is still developing. Thus, the expected yield of this project has yet to be determined and will be reported in GSP annual reports and 5-year updates when known. Evaluation of benefits will be based on analysis of pre- and post-project measurements supported by modeling. Measured parameters will include surface water deliveries, groundwater levels, and others to be determined. Modeling will be done with the C2VSimFG-Colusa model used for GSP development.

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Table 6-24. Orland Unit Water Users Association Irrigation Modernization for Increased Surface Water Delivery and Reduced Groundwater Pumping Summary

Item	Description
Costs	This project is still developing. Thus, the anticipated costs of this project have yet to be determined and will be reported in GSP annual reports and 5-year updates when known. The project proponent is identifying funding sources to cover project costs as part of project development. These may include grants, fees, loans, and other assessments.

6.4.2 Ongoing Management Actions

This section described ongoing management actions. There is one ongoing management action, summarized in Table 6-25. It incentivizes urban water conservation in the Willows area, providing an important benefit in reducing groundwater pumping in the area.

Table 6-25. Summary of Ongoing Management Actions

Management Action	Management Action Type	Proponent	Year Implemented	Estimated Capital Cost	Gross Average Annual Benefit, af/yr
Urban Water Conservation in Willows	Management Action	RD108 and CCWD	2016	TBD	2

6.4.2.1 Urban Water Conservation in Willows

The California Water Service - Willows District is implementing 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. These are described in greater detail in Chapter 9 of the 2020 UWMP for the California Water Service - Willows District. A summary of the management action is provided in Table 6-26.

Table 6-26. Urban Water Conservation in Willows Summary

Item	Description
Implementation	California Water Service - Willows District proposed this ongoing management action for GSP implementation which would occur in the City of Willows. The action would reduce demand for groundwater. This is an ongoing management action, which will be monitored and quantified with respect to groundwater conditions, as needed, if sustainable levels are not reached following implementation of other projects and management actions. This will be done in the context of Sustainable Management Criteria defined in Chapter 5 to ensure sustainable operation of the Colusa Subbasin.
Timeline	This management action began in 2016 and is ongoing.

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Table 6-26. Urban Water Conservation in Willows Summary

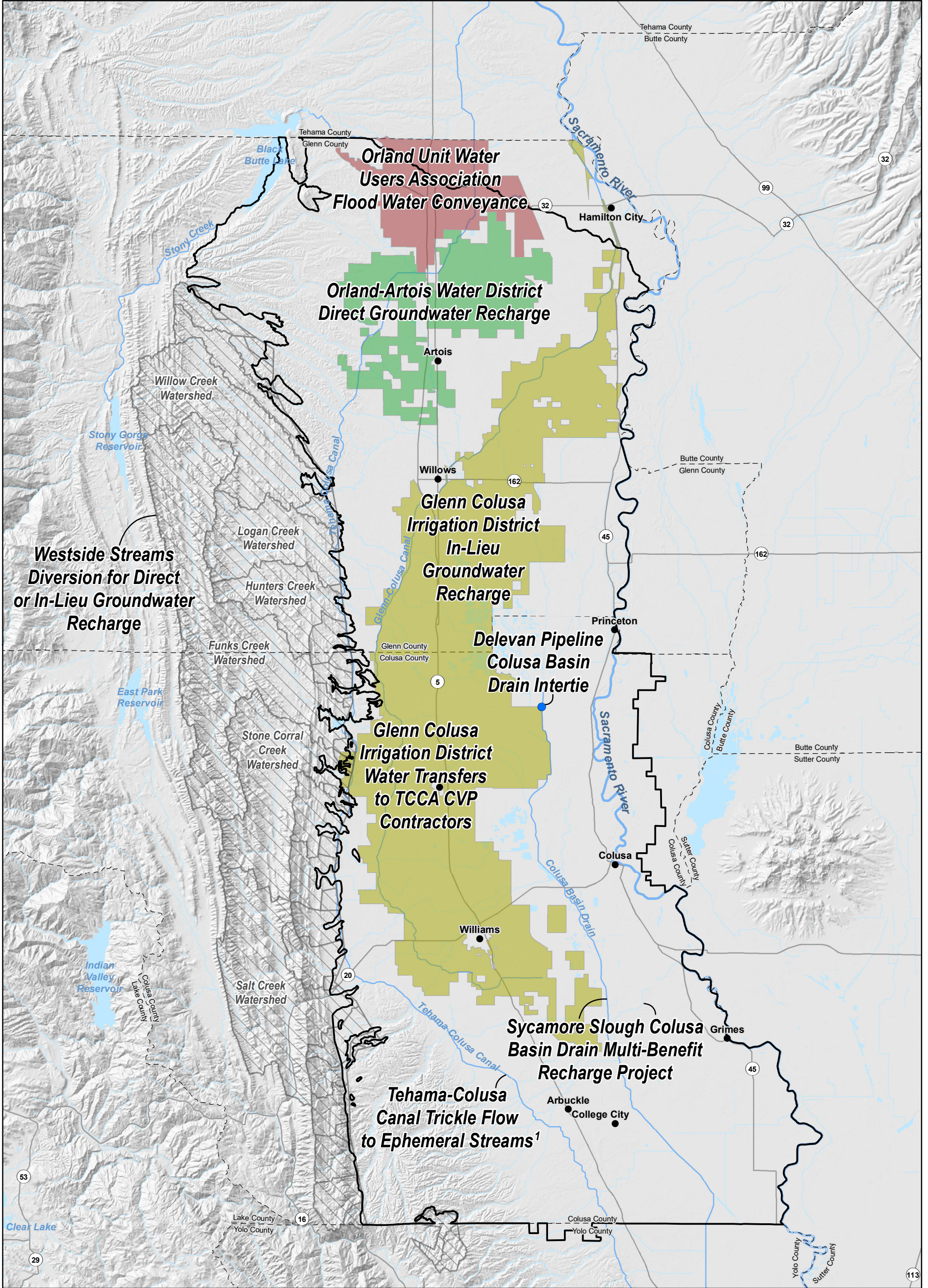
Item	Description
Notice to public and other agencies	Public and/or Inter-Agency Noticing is being facilitated through GSA board meetings, GSA and/or cooperating agency website(s), GSA newsletter, member agency newsletter, inter-basin coordination meetings, member agency governing body public meetings, GSP annual report(s), public scoping meetings and environmental/regulatory permitting notification.
Water source & reliability	Not applicable for this demand management action.
Legal authority, permitting processes, and regulatory control	GSAs, Districts, and individual proponents have the authority to plan and implement management actions. Required permitting and regulatory review is being initiated through consultation with applicable governing agencies. Governing agencies for which consultation is being initiated may include, but is not limited to: DWR, SWRCB, CDFW, Flood Board, Regional Water Boards, USFWS, NMFS, LAFCO, County of Colusa and/or Glenn and CARB.
Benefits and benefit evaluation methodology	The measurable objectives expected to benefit are groundwater levels, groundwater storage, and depletion of interconnected surface water. The expected yield of this management action is 2 af/yr. Evaluation of benefits will be based on analysis of pre- and post-project measurements supported by modeling. Measured parameters will include surface water deliveries, groundwater levels, and others to be determined. Modeling will be done with the C2VSimFG-Colusa model used for GSP development.
Costs	The cost is being covered by rate structure of Cal Water - Willows Division.

6.5 POTENTIAL PROJECTS AND MANAGEMENT ACTIONS

In addition to the planned and ongoing projects and management actions identified above, the GSAs are considering a number of other potential PMAs that could provide benefits with respect to one or more of the measurable objectives. These PMAs are still under development and require additional information that would be developed under future monitoring, and as the GSAs continue to identify and fill data gaps. This section provides descriptions for these identified potential PMAs.

Figure 6-9 illustrates the location of potential PMAs in the Colusa Subbasin.

Potential PMAs are classified by projects and management actions, which are described in the following subsections. Projects are generally structural activities that include direct recharge, in-lieu recharge, and utilization of additional surface water supplies. Management actions are activities to improve water management or reduce groundwater pumping. Potential management actions include two demand management programs, which per 23 CCR §354.44(b)(2), could be rapidly implemented if the Colusa Subbasin is approaching minimum thresholds specified in the GSP.

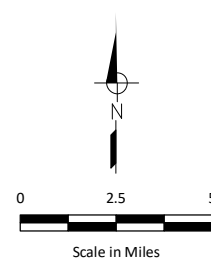


- Potential Project Location
- Orland-Artois WD Boundary
- Orland Unit WUA Boundary
- Glenn Colusa ID Boundary
- Westside Stream Watersheds
- Colusa Subbasin Boundary

Horizontal Datum: North American Datum of 1983 (NAD 83), California State Plane Zone II, feet.

Note:

1. The Tehama-Colusa Canal (TCC) Trickle Flow to Ephemeral Streams project will occur at various points along the TCC where it intersects ephemeral streams, not in the location called out on the map.
2. There are an additional 14 potential projects and management actions that are not depicted on the map. This is due to either subbasin-wide implementation or the planning process not being far enough along to locate these projects at this time.



DRAFT Figure 6-9

Selected Potential Projects and Management Actions Overview

**Colusa Groundwater Authority
and Glenn Groundwater Authority**
Colusa Subbasin
Groundwater Sustainability Plan

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Potential PMAs are described at a reconnaissance-level of detail relative to the planned projects described under Section 6.3, above. However, PMA information is still reported in accordance with 23 CCR §354.44(b). The required information is summarized in a table following the general description for each potential PMA. The information provided with each potential project table maps to the GSP regulation requirements as follows:

- Implementation (§354.44(b)(1)(A))
- Timeline (§354.44(b)(4))
- Notice to public and other agencies (§354.44(b)(1)(B))
- Water source and reliability (§354.44(b)(6))
- Legal authority, permitting processes, and regulatory control (§354.44(b)(3), (§354.44(b)(7))
- Benefits and benefit evaluation methodology (§354.44(b)(5), (§354.44(b)(9))
- Costs (§354.44(b)(8))

6.5.1 Potential Projects

This section describes potential projects that would be implemented if determined to be necessary under future monitoring of the Colusa Subbasin. Potential projects include direct and in-lieu recharge opportunities that could be implemented across the Colusa Subbasin, as well as local and regional (e.g., Sites) storage projects. Table 6-27 summarizes the potential projects included in the GSP. The following subsections provide project descriptions for each project.

Project ^(a)	Project Type	Proponent
Glenn Colusa Irrigation District In-lieu Groundwater Recharge	In-lieu Groundwater Recharge	GCID
Westside Streams Diversion for Direct or In-lieu Groundwater Recharge	Direct and In-lieu Groundwater Recharge	CGA and GGA
Sites Reservoir	Direct and In-lieu Groundwater Recharge	Sites Project Authority
Delevan Pipeline Colusa Basin Drain Intertie	Direct and In-lieu Groundwater Recharge	Landowner
Orland Unit Water Users Association Flood Water Conveyance	Direct Groundwater Recharge	Ouwua
Orland-Artois Water District Direct Groundwater Recharge	Direct Groundwater Recharge	OAWD
Sycamore Slough Colusa Basin Drain Multi-Benefit Recharge Project	Direct Groundwater Recharge	Landowner
Tehama-Colusa Canal Trickle Flow to Ephemeral Streams	Direct Groundwater Recharge	RD108
Enhanced Infiltration of Precipitation on Agricultural Lands	Direct Groundwater Recharge	CGA and GGA
Colusa Subbasin Flood-MAR	Direct Groundwater Recharge	CGA and GGA

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Project ^(a)	Project Type	Proponent
Colusa County Public Water System Water Treatment Plant	In-lieu Groundwater Recharge	Landowner
Glenn Colusa Irrigation District Water Transfers to TCCA CVP Contractors	In-lieu Groundwater Recharge	GCID
Colusa Subbasin In-lieu Recharge & Banking Program	In-lieu Groundwater Recharge	South Valley Water Resources Authority
Sycamore Marsh Farm In-lieu Recharge Project	In-lieu Groundwater Recharge	Landowner
Westside Off-stream Reservoir and In-Lieu Groundwater Recharge	In-lieu Groundwater Recharge	TCCA Contractors
<p>(a) Fourteen projects and management actions are not depicted on the map in</p> <p>(b) Figure 6-9. These projects and management actions are excluded either because they will be implemented subbasin-wide or because the planning process is not far enough along to locate these projects at this time.</p>		

6.5.1.1 Glenn Colusa Irrigation District In-lieu Groundwater Recharge

Despite GCID having highly reliable surface water supplies, a small percentage of district lands rely primarily on groundwater for irrigation supply. GCID will investigate, develop, and implement measures to incentivize associated growers to utilize surface water supplied by GCID, which will provide in-lieu recharge through reduced groundwater pumping. A summary of the project is provided in Table 6-28.

Item	Description
Implementation	GCID proposed this planned project for GSP implementation in the GCID service area. The project will provide in-lieu groundwater recharge through increased surface water utilization. This project may be implemented and would be monitored and quantified with respect to groundwater conditions, as needed, if sustainable levels are not reached following implementation of other projects and management actions. This will be done in the context of Sustainable Management Criteria defined in Chapter 5 to ensure sustainable operation of the Colusa Subbasin.
Timeline	This project is currently in the early planning stage. Thus, the start and completion dates for this project have yet to be determined and will be provided in GSP annual reports and 5-year updates when known.
Notice to public and other agencies	Public and/or Inter-Agency Noticing will be facilitated through GSA board meetings, GSA and/or cooperating agency website(s), GSA newsletter, member agency newsletter, inter-basin coordination meetings, member agency governing body public meetings, GSP annual report(s), public scoping meetings and environmental/regulatory permitting notification.
Water source & reliability	The source is the Sacramento River under GCID's contractual rights according to its Sacramento River Water Right Settlement contract and under an appropriative water right for diversion and use of "winter water" from November 1 through March 31 each year. Settlement contract water supplies are subject to 25% reductions in Shasta Critical years; appropriative winter water subject to availability and curtailments according to water right Term 91.

Table 6-28. Glenn Colusa Irrigation District In-lieu Groundwater Recharge Summary

Item	Description
Legal authority, permitting processes, and regulatory control	GSAs, Districts, and individual project proponents have the authority to plan and implement projects. Required permitting and regulatory review will be project specific and initiated through consultation with applicable governing agencies. Governing agencies for which consultation will be initiated may include, but is not limited to: DWR, SWRCB, CDFW, Flood Board, Regional Water Boards, USFWS, NMFS, LAFCO, County of Colusa and/or Glenn and CARB.
Benefits and benefit evaluation methodology	The measurable objectives expected to benefit are groundwater levels, groundwater storage, and depletion of interconnected surface water. This project is currently in the early planning stage. Thus, the expected yield of this project has yet to be determined and will be reported in GSP annual reports and 5-year updates when known. Evaluation of benefits will be based on analysis of pre- and post-project measurements supported by modeling. Measured parameters will include surface water deliveries, groundwater levels, and others to be determined. Modeling will be done with the C2VSimFG-Colusa model used for GSP development.
Costs	This project is currently in the early planning stage. Thus, the anticipated costs of this project have yet to be determined and will be reported in GSP annual reports and 5-year updates when known. The project proponent would identify funding sources to cover project costs as part of project development. These may include grants, fees, loans, and other assessments.

6.5.1.2 Westside Streams Diversion for Direct or In-lieu Groundwater Recharge

There are numerous ephemeral streams that originate in the Coastal Range to the west of the Colusa Subbasin and flow eastward into the Colusa Subbasin. The largest six of these streams are Willow Creek, Logan Creek, Hunters Creek, Funks Creek, Stone Corral Creek, and Salt Creek¹³. A map of these watersheds and streams is shown on Figure 6-10. All of these westside streams are tributary to the Colusa Basin Drain (CBD), which flows southward out of the Colusa Subbasin at the Colusa-Yolo County boundary. The CBD is tributary to the Sacramento River near Knights Landing in Yolo County and has an average annual discharge of 358,000 acre-feet¹⁴, including irrigation return flows as well as westside natural streamflow.

During periods of flow in the winter and spring, some portion of these flows could be diverted for either (1) off-stream storage and subsequent use for irrigation or (2) direct groundwater recharge through Flood-MAR¹⁵, dedicated recharge basins, or modified stream beds. A summary of the project is provided in Table 6-29.

¹³ The location for Sites Reservoir is within the Funks and Stone Corral Creek watersheds. After construction of Sites Reservoir, flow through these creeks would primarily be inflow to Sites Reservoir and would no longer be available for downstream diversion and use within the Colusa Subbasin unless water were released into these creeks from Sites Reservoir in a pattern that matched historical flows.

¹⁴ Average annual discharge of Colusa Basin Drain at Knights Landing, 1986 through 2011.

¹⁵ Flood-MAR stands for Flood-Managed Aquifer Recharge. It is a groundwater recharge strategy that takes advantage of periods of high flow to divert flood waters for aquifer recharge on agricultural lands or other working landscapes (i.e., wildlife refuges or flood bypasses).

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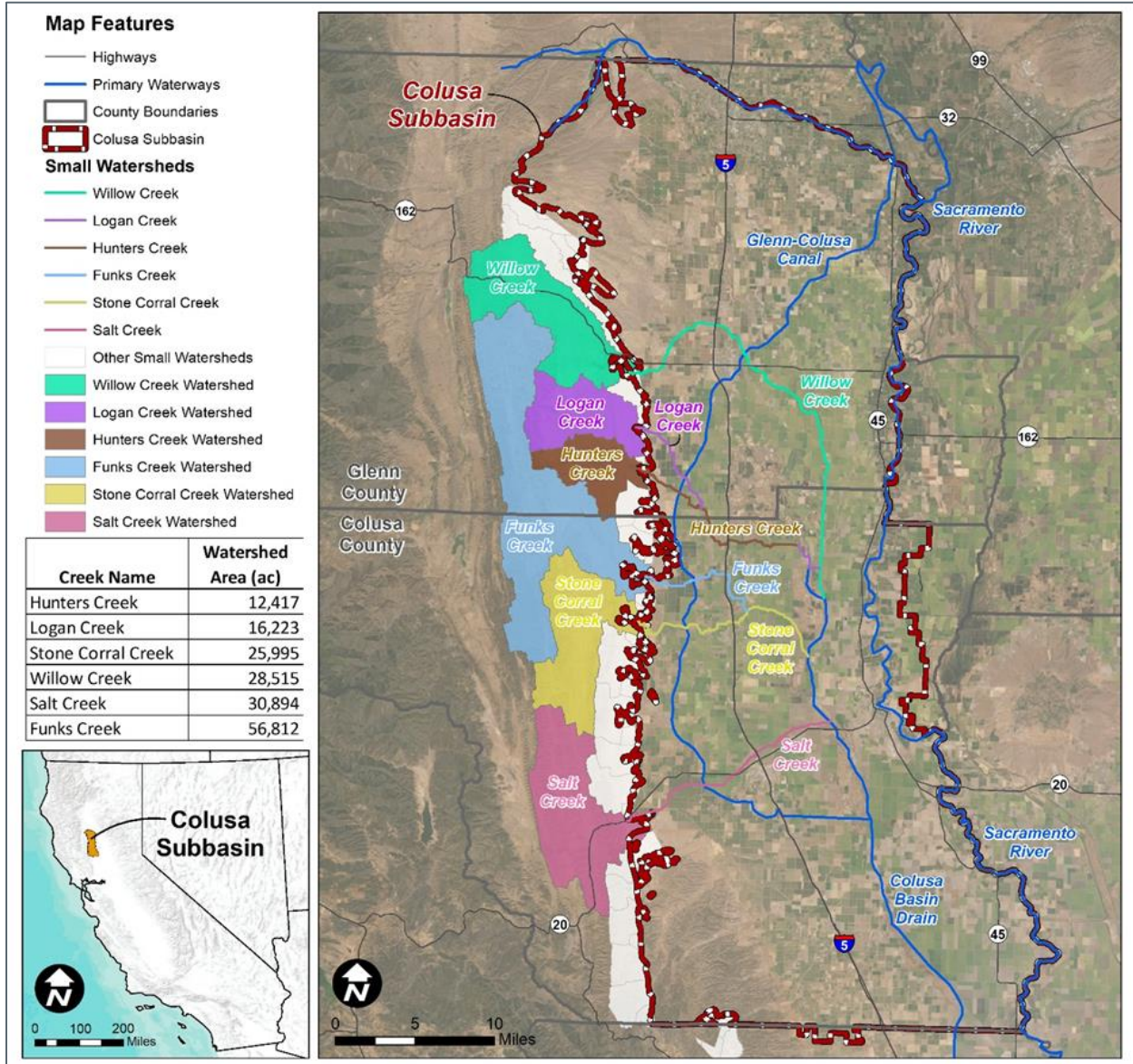


Figure 6-10. Watershed Area and Stream Path through Colusa Subbasin for the Six Largest Westside Streams

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Table 6-29. Westside Streams Diversion for Direct or In-lieu Groundwater Recharge Summary

Item	Description
Implementation	This potential project is proposed by CGA and GGA and would be implemented in Colusa and Glenn Counties. The additional water diverted could be used as supplemental irrigation water to provide in-lieu recharge or be diverted to provide direct recharge through Flood-MAR, dedicated recharge basins, or modified stream beds. This project may be implemented and would be monitored and quantified with respect to groundwater conditions, as needed, if sustainable levels are not reached following implementation of other projects and management actions. This will be done in the context of Sustainable Management Criteria defined in Chapter 5 to ensure sustainable operation of the Colusa Subbasin.
Timeline	This project is currently in the early conceptual stage. Thus, the start and completion dates for this project have yet to be determined and will be provided in GSP annual reports and 5-year updates when known.
Notice to public and other agencies	Public and/or Inter-Agency Noticing would be facilitated through GSA board meetings, GSA and/or cooperating agency website(s), GSA newsletter, member agency newsletter, inter-basin coordination meetings, member agency governing body public meetings, GSP annual report(s), public scoping meetings and environmental/regulatory permitting notification.
Water source & reliability	The water source would be the Westside Streams, which includes Willow Creek, Logan Creek, Hunters Creek, Funks Creek, Stone Corral Creek, Salt Creek, and potentially smaller streams. Water will only be available during periods of runoff occurring during heavy precipitation events or wet years.
Legal authority, permitting processes, and regulatory control	GSAs, Districts, and individual project proponents have the authority to plan and implement projects. Required permitting and regulatory review would be project specific and initiated through consultation with applicable governing agencies. Governing agencies for which consultation would be initiated may include, but is not limited to: DWR, SWRCB, CDFW, Flood Board, Regional Water Boards, USFWS, NMFS, LAFCO, County of Colusa and/or Glenn and CARB.
Benefits and benefit evaluation methodology	The measurable objectives expected to benefit are groundwater levels, groundwater storage, and depletion of interconnected surface water. This project is currently in the early conceptual stage. Thus, the expected yield of this project has yet to be determined and will be reported in GSP annual reports and 5-year updates when known. Multi-benefits would include reduced flood impacts to the extent that diversions reduce the severity of downstream flooding. Evaluation of benefits will be based on analysis of pre- and post-project measurements supported by modeling. Measured parameters will include surface water deliveries, groundwater levels, and others to be determined. Modeling will be done with the C2VSimFG-Colusa model used for GSP development.
Costs	This project is currently in the early conceptual stage. Thus, the anticipated costs of this project have yet to be determined and would be reported in GSP annual reports and 5-year updates when known. The project proponent would identify funding sources to cover project costs as part of project development. These may include grants, fees, loans, and other assessments.

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A new water right (or rights) through the State Water Resources Control Board (SWRCB) would have to be obtained for this water use and new diversion, conveyance, and recharge infrastructure would have to be constructed. This infrastructure would likely be located on private property through collaborative arrangements with landowners. Depending on the scale of implementation, this project would be expected to result in an average annual benefit ranging from roughly 1,000 af to 16,000 af for the Colusa Subbasin. The estimated costs of the project will vary depending on the scale of implementation.

This project concept has already been explored by two private landowners in the Colusa Subbasin and implemented on a small scale. One project captures storm water runoff on private lands for groundwater recharge through an underground recharge structure designed to mimic a residential septic leach field, and the other considers diversion of flood flows off of Sand Creek into an existing gravel pit (former excavation site) adjacent to the creek to facilitate direct groundwater recharge.

As described below, evaluation of this project by the CGA and/or the GGA and interested parties within the Colusa Subbasin will be done in conjunction with evaluation of the full suite of potential PMAs under consideration by the GSAs. A series of increasingly detailed studies, culminating in a feasibility study, would be required to evaluate project costs and benefits to determine whether or not to proceed with implementation. Because the outcomes of these studies are uncertain, the project implementation schedule cannot be determined at this time. Public noticing for this project as it progresses will be done in accordance with the general plan outlined in the Notice/Communication section of the GSP.

The water source would be natural flow from these six ephemeral streams (and potentially other, smaller westside streams) that flow into the Colusa Subbasin from the Coastal Range. To provide preliminary estimates, the timing and volume of these flows, expressed as an average monthly flow, were estimated using C2VSim model rainfall-runoff algorithms. The original C2VSim small watershed rootzone parameters were used in the analysis, and flows runoff from these small Coastal range watersheds into the Colusa Subbasin were extracted from the C2VSim small watershed output file. Substantial flow does not occur through these creeks in every year and depends on the seasonal timing and volume of precipitation. Based on simulated rainfall-runoff, this water source is highly variable from year to year, including years of essentially zero runoff, and from month to month within years. When flow does occur, it is typically between the months of December and June and largely occurs between January and April.

A pre-requisite for studying this project concept would be to install stream gages and conduct monitoring to gather multiple years of streamflow records, including stream discharge, water quality measurements, and sediment loads at different flows and for the rising and falling legs of runoff hydrographs. A design objective would be to divert low sediment load flows, probably on the falling leg of runoff events, to minimize the potential for clogging of recharge facilities. Water quality monitoring would also be required to evaluate flow through these streams and determine whether or not poor water quality exists and may impact beneficial uses provided through diversion for direct or in-lieu recharge.

This project would require the design and construction of new diversion and conveyance facilities, as well as either off-stream storage facilities or recharge facilities (i.e., spreading basins)¹⁶. Further study would need to be conducted to identify estimated volumes of water available for diversion and suitable locations for diversion and recharge facilities; these analyses would result in more detailed information about size and capacity of required infrastructure improvements, construction requirements. and estimated costs.

¹⁶ In some cases, these facilities may already be in place and would only need to be repurposed to facilitate this new water use.

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Further investigation into this project will provide more detailed information of project costs and benefits, which, in comparison with the current and projected conditions of the Colusa Subbasin, will allow for determination of whether or not the project should be implemented, and at what scale, to contribute to sustainable operation of the Colusa Subbasin. If implemented, monitoring and quantification of benefits would be accomplished by the GSAs in coordination with other stakeholders and partners.

The timing and volume of flows into the Colusa Subbasin through these six creeks have been modeled and evaluated to estimate preliminary potential project benefits. Assuming a range of maximum flow thresholds that can be diverted from each of the six streams when they are flowing, the volumes available for diversion can be calculated. These numbers are long-term annual averages; in some years, no water would be available, while in other years volumes greater than those seen in Table 6-30 would be available. These numbers only represent an initial estimate of potential project benefit volumes and require more in-depth evaluation to verify their accuracy. As shown, initial estimated volumes range from roughly 1,000 af to 16,000 af at different levels of implementation.

Maximum Flow Threshold	Dec.	Jan.	Feb.	March	April	May	June	Total
Flow = 10 cfs	170	240	204	186	157	165	30	1,153
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

Project costs will depend on the scale of implementation and other factors and will need to be estimated through further study, including an economic analysis and finance strategy designed to outline alternatives for meeting the costs for project implementation.

6.5.1.3 Sites Reservoir

The Sites Project would utilize existing infrastructure to divert unregulated and unappropriated flow from the Sacramento River at Red Bluff and Hamilton City and convey water to a new off stream reservoir west of the town of Maxwell. New and existing facilities would move water into and out of the reservoir, with ultimate release back to the Sacramento River system via existing canals and a new pipeline located near Dunnigan. The reservoir capacity would be between 1.3 million acre-feet (MAF) and 1.5 MAF depending on the project alternative selected. The reservoir would be operated in coordination with the State Water Project and Central Valley Project, yielding approximately 250,000 to 300,000 acre-feet in dry and critical years, and more in other year types. The managing agency is the Sites Project Authority. A summary of the project is provided in Table 6-31.

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Table 6-31. Sites Reservoir Summary	
Item	Description
Implementation	The Sites Project Authority proposed this project concept which would be located in the Antelope Valley west of the Colusa Subbasin. The project may provide direct and in-lieu groundwater recharge through utilization of surface water from this project, as available. This project may be implemented and would be monitored and quantified with respect to groundwater conditions, as needed, if sustainable levels are not reached following implementation of other projects and management actions. This will be done in the context of Sustainable Management Criteria defined in Chapter 5 to ensure sustainable operation of the Colusa Subbasin.
Timeline	This project is currently in the early conceptual stage. Thus, the start and completion dates for this project have yet to be determined and would be provided in GSP annual reports and 5-year updates when known.
Notice to public and other agencies	Public and/or Inter-Agency Noticing will be facilitated through GSA board meetings, GSA and/or cooperating agency website(s), GSA newsletter, member agency newsletter, inter-basin coordination meetings, member agency governing body public meetings, GSP annual report(s), public scoping meetings and environmental/regulatory permitting notification.
Water source & reliability	The source would be Sacramento River under new appropriative water rights. Settlement contract water supply is subject to 25% reductions in Shasta Critical years. New water rights would have junior priority and therefore would be subject to senior rights and water right Term 91
Legal authority, permitting processes, and regulatory control	GSAs, Districts, and individual project proponents have the authority to plan and implement projects. Required permitting and regulatory review will be project specific and initiated through consultation with applicable governing agencies. Governing agencies for which consultation is being initiated may include, but is not limited to: DWR, SWRCB, CDFW, Flood Board, Regional Water Boards, USFWS, NMFS, LAFCO, County of Colusa and/or Glenn and CARB.
Benefits and benefit evaluation methodology	The measurable objectives expected to benefit are groundwater levels, groundwater storage, and depletion of interconnected surface water (to the extent that project yield is dedicated to recharge projects). This project is currently in the early conceptual stage. Thus, the expected yield of this project for the Colusa Subbasin specifically has yet to be determined and will be reported in GSP annual reports and 5-year updates when known. Evaluation of benefits is being quantified through post project monitoring. Additional benefits could include increased local, regional, and statewide water supply reliability, climate change resiliency, recreation, and increased cold water pool for endangered salmon. Evaluation of benefits will be based on analysis of pre- and post-project measurements supported by modeling. Measured parameters will include surface water deliveries, groundwater levels, and others to be determined. Modeling will be done with the C2VSimFG-Colusa model used for GSP development.
Costs	The full cost of the project is \$5.2 billion. The portion of this which would be covered by Colusa Subbasin water users specifically is uncertain at this time.

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6.5.1.4 Delevan Pipeline Colusa Basin Drain Intertie

This project would construct an intertie between the proposed Delevan Pipeline component of the Sites Reservoir Project and the Colusa Basin Drain. Currently, the only proposed intertie is the Dunnigan intertie. This intertie would provide a connection to downstream water users to utilize surface water storage from Sites Reservoir, improve conjunctive use, and potentially decrease groundwater pumping. This intertie would also provide protection for the ecosystems upstream of the proposed Dunnigan intertie and redundancy in case the TCC becomes inoperable due to subsidence or earthquake damage. A summary of the project is provided in Table 6-32.

Item	Description
Implementation	A landowner proposed this project concept, which would be located at the intersection of Colusa Basin Drain and the proposed Delevan Pipeline. The project would provide direct and in-lieu groundwater recharge through utilization of surface water. This project may be implemented and would be monitored and quantified with respect to groundwater conditions, as needed, if sustainable levels are not reached following implementation of other projects and management actions. This will be done in the context of Sustainable Management Criteria defined in Chapter 5 to ensure sustainable operation of the Colusa Subbasin.
Timeline	This project is currently in the early conceptual stage. Thus, the start and completion dates for this project have yet to be determined and will be provided in GSP annual reports and 5-year updates when known.
Notice to public and other agencies	Public and/or Inter-Agency Noticing would be facilitated through GSA board meetings, GSA and/or cooperating agency website(s), GSA newsletter, member agency newsletter, inter-basin coordination meetings, member agency governing body public meetings, GSP annual report(s), public scoping meetings and environmental/regulatory permitting notification.
Water source & reliability	The source would be Sacramento River under new appropriative water rights (conveyed to Sites Reservoir and through Delevan Pipeline). The reliability is uncertain at this time.
Legal authority, permitting processes, and regulatory control	GSAs, Districts, and individual project proponents have the authority to plan and implement projects. Required permitting and regulatory review would be project specific and initiated through consultation with applicable governing agencies. Governing agencies for which consultation would be initiated may include, but is not limited to: DWR, SWRCB, CDFW, Flood Board, Regional Water Boards, USFWS, NMFS, LAFCO, County of Colusa and/or Glenn and CARB.
Benefits and benefit evaluation methodology	The measurable objectives expected to benefit are groundwater levels, groundwater storage, and depletion of interconnected surface water. This project is currently in the early conceptual stage. Thus, the expected yield of this project has yet to be determined and will be reported in GSP annual reports and 5-year updates when known. Evaluation of benefits will be based on analysis of pre- and post-project measurements supported by modeling. Measured parameters will include surface water deliveries, groundwater levels, and others to be determined. Modeling will be done with the C2VSimFG-Colusa model used for GSP development.

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Table 6-32. Delevan Pipeline Colusa Basin Drain Intertie Summary

Item	Description
Costs	This project is currently in the early conceptual stage. Thus, the anticipated costs of this project have yet to be determined and would be reported in GSP annual reports and 5-year updates when known. The project proponent would identify funding sources to cover project costs as part of project development. These may include grants, fees, loans, and other assessments.

6.5.1.5 Orland Unit Water Users Association Flood Water Conveyance

During periods of high flow and reservoir release on Stony Creek, water would be diverted at OUWUA's south diversion and conveyed to various locations for direct recharge within the OUWUA service area. Types of recharge facilities include creek beds, existing irrigation canals and laterals, agricultural fields, new, dedicated recharge basins, and, potentially, dry groundwater production wells. A summary of the project is provided in Table 6-33.

Table 6-33. Orland Unit Water Users Association Flood Water Conveyance Summary

Item	Description
Implementation	OUWUA proposed this potential project for GSP implementation in the OUWUA service area. The project would provide direct groundwater recharge through utilization of high flow and reservoir release on Stony Creek. This project may be implemented and would be monitored and quantified with respect to groundwater conditions, as needed, if sustainable levels are not reached following implementation of other projects and management actions. This will be done in the context of Sustainable Management Criteria defined in Chapter 5 to ensure sustainable operation of the Colusa Subbasin.
Timeline	This project is currently in the early conceptual stage. Thus, the start and completion dates for this project have yet to be determined and would be provided in GSP annual reports and 5-year updates when known.
Notice to public and other agencies	Public and/or Inter-Agency Noticing would be facilitated through GSA board meetings, GSA and/or cooperating agency website(s), GSA newsletter, member agency newsletter, inter-basin coordination meetings, member agency governing body public meetings, GSP annual report(s), public scoping meetings and environmental/regulatory permitting notification.
Water source & reliability	The source would be Stony Creek flood releases that cannot be held in Stony Creek reservoirs. This would be highly variable year to year depending on hydrology.
Legal authority, permitting processes, and regulatory control	GSAs, Districts, and individual project proponents have the authority to plan and implement projects. Required permitting and regulatory review would be project specific and initiated through consultation with applicable governing agencies. Governing agencies for which consultation would be initiated may include, but is not limited to: DWR, SWRCB, CDFW, Flood Board, Regional Water Boards, USFWS, NMFS, LAFCO, County of Colusa and/or Glenn and CARB.

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Table 6-33. Orland Unit Water Users Association Flood Water Conveyance Summary

Item	Description
Benefits and benefit evaluation methodology	Ouwua would be responsible for operating and monitoring the project. This project is currently in the early conceptual stage. Thus, the expected yield of this project has yet to be determined and would be reported in GSP annual reports and 5-year updates when known. Evaluation of benefits will be based on analysis of pre- and post-project measurements supported by modeling. Measured parameters will include surface water deliveries, groundwater levels, and others to be determined. Modeling will be done with the C2VSimFG-Colusa model used for GSP development.
Costs	This project is currently in the early conceptual stage. Thus, the anticipated costs of this project have yet to be determined and would be reported in GSP annual reports and 5-year updates when known. The project proponent would identify funding sources to cover project costs as part of project development. These may include grants, fees, loans, and other assessments.

6.5.1.6 Orland-Artois Water District Direct Groundwater Recharge

OAWD is interested in recharging groundwater through Managed Aquifer Recharge (MAR) on agricultural land to improve aquifer conditions, especially in the groundwater cone of depression to the west of Artois. A pilot project for MAR was conducted in 2017 on the VanTol site using water from a Section 215 Temporary Water Contract from USBR. The 215 water is low-cost but is only available during high flow conditions in rivers and streams. A summary of the project is provided in Table 6-34.

Table 6-34. Orland-Artois Water District Direct Groundwater Recharge Summary

Item	Description
Implementation	OAWD proposed this project concept for GSP implementation in the OAWD service area. The project would provide direct groundwater recharge through MAR. OAWD completed a pilot project for MAR in 2017. This project may be implemented and would be monitored and quantified with respect to groundwater conditions, as needed, if sustainable levels are not reached following implementation of other projects and management actions. This will be done in the context of Sustainable Management Criteria defined in Chapter 5 to ensure sustainable operation of the Colusa Subbasin.
Timeline	This project is currently in the early conceptual stage. Thus, the start and completion dates for this project have yet to be determined and would be provided in GSP annual reports and 5-year updates when known.
Notice to public and other agencies	Public and/or Inter-Agency Noticing would be facilitated through GSA board meetings, GSA and/or cooperating agency website(s), GSA newsletter, member agency newsletter, inter-basin coordination meetings, member agency governing body public meetings, GSP annual report(s), public scoping meetings and environmental/regulatory permitting notification.
Water source & reliability	The source would be Sacramento River Section 215 water. This would be highly variable, and available only during periods of high flow in Sacramento River and tributaries.

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Item	Description
Legal authority, permitting processes, and regulatory control	GSAs, Districts, and individual project proponents have the authority to plan and implement projects. Required permitting and regulatory review would be initiated through consultation with applicable governing agencies. Governing agencies for which consultation would be initiated may include, but is not limited to: DWR, SWRCB, CDFW, Flood Board, Regional Water Boards, USFWS, NMFS, LAFCO, County of Colusa and/or Glenn and CARB.
Benefits and benefit evaluation methodology	The measurable objectives expected to benefit are groundwater levels, groundwater storage, and depletion of interconnected surface water. This project is currently in the early conceptual stage. Thus, the expected yield of this project has yet to be determined and would be reported in GSP annual reports and 5-year updates when known. An additional benefit would be possible ponded habitat for migratory waterfowl depending on timing of flooding. Evaluation of benefits will be based on analysis of pre- and post-project measurements supported by modeling. Measured parameters will include surface water deliveries, groundwater levels, and others to be determined. Modeling will be done with the C2VSimFG-Colusa model used for GSP development.
Costs	This project is currently in the early conceptual stage. Thus, the anticipated costs of this project have yet to be determined and would be reported in GSP annual reports and 5-year updates when known. The project proponent would identify funding sources to cover project costs as part of project development. These may include grants, fees, loans, and other assessments.

6.5.1.7 Sycamore Slough Colusa Basin Drain Multi-Benefit Recharge Project

This project would restore portions of the Sycamore Slough through voluntary landowner participation as part of a newly formed water storage district. Excess flows in the winter could be diverted from the Colusa Basin Drain for recharge and restoration and could include a multi-benefit focus with environmental benefits such as habitat restoration for monarch butterflies and other pollinator species. A summary of the project is provided in Table 6-35.

Item	Description
Implementation	A landowner proposed this project concept which would be located on the Sycamore Slough. The project would provide direct groundwater recharge through utilization of surface water. This project may be implemented and would be monitored and quantified with respect to groundwater conditions, as needed, if sustainable levels are not reached following implementation of other projects and management actions. This will be done in the context of Sustainable Management Criteria defined in Chapter 5 to ensure sustainable operation of the Colusa Subbasin.
Timeline	This project is currently in the early conceptual stage. Thus, the start and completion dates for this project have yet to be determined and will be provided in GSP annual reports and 5-year updates when known.

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Item	Description
Notice to public and other agencies	Public and/or Inter-Agency Noticing would be facilitated through GSA board meetings, GSA and/or cooperating agency website(s), GSA newsletter, member agency newsletter, inter-basin coordination meetings, member agency governing body public meetings, GSP annual report(s), public scoping meetings and environmental/regulatory permitting notification.
Water source & reliability	The source would be the Colusa Basin Drain. The reliability is uncertain at this time.
Legal authority, permitting processes, and regulatory control	GSAs, Districts, and individual project proponents have the authority to plan and implement projects. Required permitting and regulatory review would be project specific and initiated through consultation with applicable governing agencies. Governing agencies for which consultation would be initiated may include, but is not limited to: DWR, SWRCB, CDFW, Flood Board, Regional Water Boards, USFWS, NMFS, LAFCO, County of Colusa and/or Glenn and CARB.
Benefits and benefit evaluation methodology	The measurable objectives expected to benefit are groundwater levels, groundwater storage, and depletion of interconnected surface water. This project is currently in the early conceptual stage. Thus, the expected yield of this project has yet to be determined and would be reported in GSP annual reports and 5-year updates when known. Multi-benefits include ponded habitat for migratory waterfowl, along with other environmental benefits. Evaluation of benefits will be based on analysis of pre- and post-project measurements supported by modeling. Measured parameters will include surface water deliveries, groundwater levels, and others to be determined. Modeling will be done with the C2VSimFG-Colusa model used for GSP development.
Costs	This project is currently in the early conceptual stage. Thus, the anticipated costs of this project have yet to be determined and will be reported in GSP annual reports and 5-year updates when known. The project proponent would identify funding sources to cover project costs as part of project development. These may include grants, fees, loans, and other assessments.

6.5.1.8 Tehama-Colusa Canal Trickle Flow to Ephemeral Streams

The Tehama-Colusa Canal (TCC) has existing gates that are used to dewater sections of the canal. The gates discharge into ephemeral streams that intersect the canal. Water could be discharged from the TCC into these streams at a rate where they do not flow out of the Colusa Subbasin but recharge the groundwater system. Flow measurement devices would need to be added to the gates. Surface water for recharge would be Sacramento River available water under existing Bureau of Reclamation water supply contracts held by Tehama-Colusa Canal contractors, existing water rights settlement contracts, and annual Section 215 contracts. A summary of the project is provided in Table 6-36.

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Table 6-36. TCC Trickle Flow to Ephemeral Streams Summary

Item	Description
Implementation	RD108 proposed this project concept which would be located at TCC and ephemeral stream crossings. The project would provide direct groundwater recharge through utilization of surface water. This project may be implemented and would be monitored and quantified with respect to groundwater conditions, as needed, if sustainable levels are not reached following implementation of other projects and management actions. This will be done in the context of Sustainable Management Criteria defined in Chapter 5 to ensure sustainable operation of the Colusa Subbasin.
Timeline	This project is currently in the early conceptual stage. Thus, the start and completion dates for this project have yet to be determined and would be provided in GSP annual reports and 5-year updates when known.
Notice to public and other agencies	Public and/or Inter-Agency Noticing would be facilitated through GSA board meetings, GSA and/or cooperating agency website(s), GSA newsletter, member agency newsletter, inter-basin coordination meetings, member agency governing body public meetings, GSP annual report(s), public scoping meetings and environmental/regulatory permitting notification.
Water source & reliability	The source would be the Sacramento River (conveyed through TCC). The reliability is uncertain at this time.
Legal authority, permitting processes, and regulatory control	GSAs, Districts, and individual project proponents have the authority to plan and implement projects. Required permitting and regulatory review would be project specific and initiated through consultation with applicable governing agencies. Governing agencies for which consultation would be initiated may include, but is not limited to: DWR, SWRCB, CDFW, Flood Board, Regional Water Boards, USFWS, NMFS, LAFCO, County of Colusa and/or Glenn and CARB.
Benefits and benefit evaluation methodology	The measurable objectives expected to benefit are groundwater levels, groundwater storage, and depletion of interconnected surface water. This project is currently in the early conceptual stage. Thus, the expected yield of this project has yet to be determined and would be reported in GSP annual reports and 5-year updates when known. Evaluation of benefits will be based on analysis of pre- and post-project measurements supported by modeling. Measured parameters will include surface water deliveries, groundwater levels, and others to be determined. Modeling will be done with the C2VSimFG-Colusa model used for GSP development.
Costs	This project is currently in the early conceptual stage. Thus, the anticipated costs of this project have yet to be determined and would be reported in GSP annual reports and 5-year updates when known. The project proponent would identify funding sources to cover project costs as part of project development. These may include grants, fees, loans, and other assessments.

6.5.1.9 Enhanced Infiltration of Precipitation on Agricultural Lands

Current cultural practices, particularly in almond orchards, tend to reduce infiltration and increase runoff of precipitation. Development and adoption of on-farm cultural practices to reduce precipitation runoff and increase infiltration would result in increased storage of precipitation in the crop root zone, thereby reducing irrigation water requirements and groundwater pumping. Additionally, to the extent that infiltrated precipitation percolates through the root zone, this would result in increased direct groundwater recharge.

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The resulting in-lieu and direct recharge would benefit groundwater levels and reducing runoff could reduce soil erosion and provide water quality benefits. This project is proposed as a potential research management action; for example, a collaborative initiative between the GSAs and UC Cooperative Extension, the Natural Resources Conservation Service, local resource conservation district, California State University Chico, or other interested organizations. A summary of the project is provided in Table 6-37.

Item	Description
Implementation	This potential project is proposed by CGA and GGA and would be implemented across the Colusa Subbasin through cooperating growers. The project would provide in-lieu groundwater recharge through storage of precipitation in the root zone, and direct groundwater recharge through increased percolation of precipitation. This project may be implemented and would be monitored and quantified with respect to groundwater conditions, as needed, if sustainable levels are not reached following implementation of other projects and management actions. This will be done in the context of Sustainable Management Criteria defined in Chapter 5 to ensure sustainable operation of the Colusa Subbasin.
Timeline	This project is currently in the early conceptual stage. Thus, the start and completion dates for this project have yet to be determined and would be provided in GSP annual reports and 5-year updates when known.
Notice to public and other agencies	Public and/or Inter-Agency Noticing would be facilitated through GSA board meetings, GSA and/or cooperating agency website(s), GSA newsletter, member agency newsletter, inter-basin coordination meetings, member agency governing body public meetings, GSP annual report(s), public scoping meetings and environmental/regulatory permitting notification.
Water source & reliability	The main source of water providing additional recharge is precipitation. The reliability would be variable.
Legal authority, permitting processes, and regulatory control	GSAs, Districts, and individual project proponents have the authority to plan and implement projects. Required permitting and regulatory review would be project specific and initiated through consultation with applicable governing agencies. Governing agencies for which consultation would be initiated may include, but is not limited to: DWR, SWRCB, CDFW, Flood Board, Regional Water Boards, USFWS, NMFS, LAFCO, County of Colusa and/or Glenn and CARB.
Benefits and benefit evaluation methodology	The measurable objectives expected to benefit are groundwater levels, groundwater storage, and depletion of interconnected surface water. This project is currently in the early conceptual stage. Thus, the expected yield of this project has yet to be determined and would be reported in GSP annual reports and 5-year updates when known. Other benefits would include reduction of soil erosion and water quality benefits.
Costs	This project is currently in the early conceptual stage. Thus, the anticipated costs of this project have yet to be determined and would be reported in GSP annual reports and 5-year updates when known. The project proponent would identify funding sources to cover project costs as part of project development. These may include grants, fees, loans, and other assessments.

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6.5.1.10 Colusa Subbasin Flood-MAR

The CGA and GGA, in coordination with landowners and other agencies, would investigate, develop, and implement a program to divert flood waters within the Colusa Subbasin, when available, for spreading across agricultural lands or other working landscapes for direct groundwater recharge. A summary of the project is provided in Table 6-38.

Item	Description
Implementation	CGA and GGA proposed this project concept which would be implemented across the Colusa Subbasin with cooperating growers. The project would provide direct groundwater recharge through cooperating grower properties using flood waters when available. This project may be implemented and would be monitored and quantified with respect to groundwater conditions, as needed, if sustainable levels are not reached following implementation of other projects and management actions. This will be done in the context of Sustainable Management Criteria defined in Chapter 5 to ensure sustainable operation of the Colusa Subbasin.
Timeline	This project is currently in the early conceptual stage. Thus, the start and completion dates for this project have yet to be determined and would be provided in GSP annual reports and 5-year updates when known.
Notice to public and other agencies	Public and/or Inter-Agency Noticing would be facilitated through GSA board meetings, GSA and/or cooperating agency website(s), GSA newsletter, member agency newsletter, inter-basin coordination meetings, member agency governing body public meetings, GSP annual report(s), public scoping meetings and environmental/regulatory permitting notification.
Water source & reliability	The source and reliability of flood water for recharge are to be determined.
Legal authority, permitting processes, and regulatory control	GSAs, Districts, and individual project proponents have the authority to plan and implement projects. Required permitting and regulatory review would be project specific and initiated through consultation with applicable governing agencies. Governing agencies for which consultation would be initiated may include, but is not limited to: DWR, SWRCB, CDFW, Flood Board, Regional Water Boards, USFWS, NMFS, LAFCO, County of Colusa and/or Glenn and CARB.
Benefits and benefit evaluation methodology	The measurable objectives expected to benefit are groundwater levels, groundwater storage, and depletion of interconnected surface water. This project is currently in the early conceptual stage. Thus, the expected yield of this project has yet to be determined and would be reported in GSP annual reports and 5-year updates when known. Evaluation of benefits will be based on analysis of pre- and post-project measurements supported by modeling. Measured parameters will include surface water deliveries, groundwater levels, and others to be determined. Modeling will be done with the C2VSimFG-Colusa model used for GSP development.
Costs	This project is currently in the early conceptual stage. Thus, the anticipated costs of this project have yet to be determined and would be reported in GSP annual reports and 5-year updates when known. The project proponent would identify funding sources to cover project costs as part of project development. These may include grants, fees, loans, and other assessments.

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6.5.1.11 Colusa County Public Water System Water Treatment Plant

This project would construct a water treatment plant on the Sacramento River between Colusa and Grimes to provide fresh drinking water to public water supply systems in Colusa and possibly Sutter and Yolo Counties. A summary of the project is provided in Table 6-39.

Item	Description
Implementation	A landowner proposed this potential project which would be implemented in Colusa County. By increasing the surface water available for drinking water supply this project would provide in-lieu groundwater recharge. This project may be implemented and would be monitored and quantified with respect to groundwater conditions, as needed, if sustainable levels are not reached following implementation of other projects and management actions. This will be done in the context of Sustainable Management Criteria defined in Chapter 5 to ensure sustainable operation of the Colusa Subbasin.
Timeline	This project is currently in the early conceptual stage. Thus, the start and completion dates for this project have yet to be determined and will be provided in GSP annual reports and 5-year updates when known.
Notice to public and other agencies	Public and/or Inter-Agency Noticing would be facilitated through GSA board meetings, GSA and/or cooperating agency website(s), GSA newsletter, member agency newsletter, inter-basin coordination meetings, member agency governing body public meetings, GSP annual report(s), public scoping meetings and environmental/regulatory permitting notification.
Water source & reliability	The water source would be the Sacramento River under new appropriative water rights. The reliability is uncertain at this time.
Legal authority, permitting processes, and regulatory control	GSAs, Districts, and individual project proponents have the authority to plan and implement projects. Required permitting and regulatory review would be project specific and initiated through consultation with applicable governing agencies. Governing agencies for which consultation would be initiated may include, but is not limited to: DWR, SWRCB, CDFW, Flood Board, Regional Water Boards, USFWS, NMFS, LAFCO, County of Colusa and/or Glenn and CARB.
Benefits and benefit evaluation methodology	The measurable objectives expected to benefit are groundwater levels, groundwater storage, and depletion of interconnected surface water. This project is currently in the early conceptual stage. Thus, the expected yield of this project has yet to be determined and would be reported in GSP annual reports and 5-year updates when known. Other benefits would be improved drinking water quality, and less threat to 1) Arbuckle and Dunnigan facing loss of well supply, 2) Grimes and Princeton's drinking well arsenic contamination, and 3) Williams' elevated salinity (TDS) levels. Evaluation of benefits will be based on analysis of pre- and post-project measurements supported by modeling. Measured parameters will include surface water deliveries, groundwater levels, and others to be determined. Modeling will be done with the C2VSimFG-Colusa model used for GSP development.
Costs	This project is currently in the early conceptual stage. Thus, the anticipated costs of this project have yet to be determined and will be reported in GSP annual reports and 5-year updates when known. The project proponent would identify funding sources to cover project costs as part of project development. These may include grants, fees, loans, and other assessments.

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6.5.1.12 Glenn Colusa Irrigation District Water Transfers to TCCA CVP Contractors

GCID is exploring the possibility of transferring surface water to Central Valley Project (CVP) contractors served by the Tehama Colusa Canal to provide in-lieu groundwater recharge and reduce groundwater pumping. The water to be transferred would be Sacramento River water available to GCID under its water rights settlement contract that is temporarily surplus to GCID's needs under certain conditions. Transferred water would be diverted into the Tehama-Colusa Canal at the Red Bluff Pumping Plant and Fish Screen facility rather than at the GCID pumping plant and fish screen facility north of Hamilton City. Priority would be placed on transfers to CVP contractors in areas where groundwater levels have been declining over the past approximately 20 years, particularly in the areas around the cities of Orland and Arbuckle. A summary of the project is provided in Table 6-40.

Item	Description
Implementation	GCID proposed this potential project for GSP implementation with participating TCCA CVP contractors. The project would provide in-lieu groundwater recharge through increased CVP water utilization. This project may be implemented and would be monitored and quantified with respect to groundwater conditions, as needed, if sustainable levels are not reached following implementation of other projects and management actions. This will be done in the context of Sustainable Management Criteria defined in Chapter 5 to ensure sustainable operation of the Colusa Subbasin.
Timeline	This project is currently in the early conceptual stage. Thus, the start and completion dates for this project have yet to be determined and would be provided in GSP annual reports and 5-year updates when known.
Notice to public and other agencies	Public and/or Inter-Agency Noticing would be facilitated through GSA board meetings, GSA and/or cooperating agency website(s), GSA newsletter, member agency newsletter, inter-basin coordination meetings, member agency governing body public meetings, GSP annual report(s), public scoping meetings and environmental/regulatory permitting notification.
Water source & reliability	The source would be the Sacramento River under GCID's contractual rights according to its Sacramento River Water Right Settlement contract. Settlement contract water supplies are subject to 25% reductions in Shasta Critical years.
Legal authority, permitting processes, and regulatory control	GSAs, Districts and individual project proponents have the authority to plan and implement projects. Required permitting and regulatory review would be project specific and initiated through consultation with applicable governing agencies. Governing agencies for which consultation would be initiated may include, but is not limited to: DWR, SWRCB, CDFW, Flood Board, Regional Water Boards, USFWS, NMFS, LAFCO, County of Colusa and/or Glenn and CARB.
Benefits and benefit evaluation methodology	The measurable objectives expected to benefit are groundwater levels, groundwater storage, and depletion of interconnected surface water. This project is currently in the early conceptual stage. Thus, the expected yield of this project has yet to be determined and would be reported in GSP annual reports and 5-year updates when known. Evaluation of benefits will be based on analysis of pre- and post-project measurements supported by modeling. These analyses may include: flow measurement consistent with SBx7-7 (23 CCR §931-938), ET analysis, reductions in GW use, well monitoring, determination of infiltration rates, water balance analysis, as-built drawings and stream gaging. Modeling will be done with the C2VSimFG-Colusa model used for GSP development.

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Table 6-40. Glenn Colusa Irrigation District Water Transfers to TCCA CVP Contractors Summary

Item	Description
Costs	This project is currently in the early conceptual stage. Thus, the anticipated costs of this project have yet to be determined and would be reported in GSP annual reports and 5-year updates when known. The project proponent would identify funding sources to cover project costs as part of project development. These may include grants, fees, loans, and other assessments.

6.5.1.13 Colusa Subbasin In-Lieu Recharge & Banking Program

The project would incentivize landowners to take surplus contract surface water in-lieu of pumping groundwater by providing financial incentives (subsidizing surface water costs) to make surface water less expensive than groundwater. If needed, South Valley would subsidize the cost of new distribution systems to facilitate the delivery of additional surface water or provide funds to districts to implement other programs. The magnitude of such payments would depend on the size of the banking project but could exceed \$100,000 per year per district. A predetermined portion of the additional water brought into the districts would be dedicated to contributing to local groundwater sustainability and some portion of the remaining quantities would be available for delivery, directly or by exchange, to South Valley members in the San Joaquin Valley. Additional groundwater production wells may need to be constructed to enable recovery of banked water. Such facilities would be paid for by South Valley but located and constructed in coordination with local districts. A summary of the project is provided in Table 6-41

Table 6-41. Colusa Subbasin In-Lieu Recharge & Banking Program Summary

Item	Description
Implementation	The South Valley Water Resources Authority proposed this project concept which would be located within the districts who participate. The project would provide direct and in-lieu groundwater recharge through utilization of surface water from this project, as available. This project may be implemented and would be monitored and quantified with respect to groundwater conditions, as needed, if sustainable levels are not reached following implementation of other projects and management actions. This will be done in the context of Sustainable Management Criteria defined in Chapter 5 to ensure sustainable operation of the Colusa Subbasin.
Timeline	This project is currently in the early conceptual stage. Thus, the start and completion dates for this project have yet to be determined and would be provided in GSP annual reports and 5-year updates when known.
Notice to public and other agencies	Public and/or Inter-Agency Noticing would be facilitated through GSA board meetings, GSA and/or cooperating agency website(s), GSA newsletter, member agency newsletter, inter-basin coordination meetings, member agency governing body public meetings, GSP annual report(s), public scoping meetings and environmental/regulatory permitting notification.
Water source & reliability	To be determined.

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Table 6-41. Colusa Subbasin In-Lieu Recharge & Banking Program Summary

Item	Description
Legal authority, permitting processes, and regulatory control	GSA, Districts and individual project proponents have the authority to plan and implement projects. Required permitting and regulatory review would be project specific and initiated through consultation with applicable governing agencies. Governing agencies for which consultation would be initiated may include, but is not limited to: DWR, SWRCB, CDFW, Flood Board, Regional Water Boards, USFWS, NMFS, LAFCO, County of Colusa and/or Glenn and CARB.
Benefits and benefit evaluation methodology	The measurable objectives expected to benefit are groundwater levels, groundwater storage, depletion of interconnected surface water, land subsidence, and potentially groundwater quality. This project is currently in the early conceptual stage. Thus, the expected yield of this project has yet to be determined and would be reported in GSP annual reports and 5-year updates when known. Evaluation of benefits will be based on analysis of pre- and post-project measurements supported by modeling. Measured parameters will include surface water deliveries, groundwater levels, and others to be determined. Modeling will be done with the C2VSimFG-Colusa model used for GSP development.
Costs	This project is currently in the early conceptual stage. Thus, the anticipated costs of this project have yet to be determined and would be reported in GSP annual reports and 5-year updates when known. The project proponent would identify funding sources to cover project costs as part of project development. These may include grants, fees, loans, and other assessments.

6.5.1.14 Sycamore Marsh Farm In-Lieu Recharge Project

Sycamore Marsh Farm is in the process of developing an in-lieu groundwater recharge plan. Sycamore Marsh Farm encompasses approximately 420 acres in the Colusa Drain Mutual Water Company (CDMWC) and has an additional 449 acres that could potentially be annexed into the CDMWC, allowing for diversion of surface water from CDMWC. A summary of the project is provided in Table 6-42.

Table 6-42. Sycamore Marsh Farm In-Lieu Recharge Project Summary

Item	Description
Implementation	The landowner proposed this project concept for GSP implementation which would be located on their property. The project would provide in-lieu groundwater recharge through annexation into CDMWC. This project may be implemented and would be monitored and quantified with respect to groundwater conditions, as needed, if sustainable levels are not reached following implementation of other projects and management actions. This will be done in the context of Sustainable Management Criteria defined in Chapter 5 to ensure sustainable operation of the Colusa Subbasin.
Timeline	This project is currently in the early conceptual stage. Thus, the start and completion dates for this project have yet to be determined and would be provided in GSP annual reports and 5-year updates when known.

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Table 6-42. Sycamore Marsh Farm In-Lieu Recharge Project Summary

Item	Description
Notice to public and other agencies	Public and/or Inter-Agency Noticing would be facilitated through GSA board meetings, GSA and/or cooperating agency website(s), GSA newsletter, member agency newsletter, inter-basin coordination meetings, member agency governing body public meetings, GSP annual report(s), public scoping meetings and environmental/regulatory permitting notification.
Water source & reliability	The source for this project would be the Colusa Basin Drain. The reliability is still to be determined.
Legal authority, permitting processes, and regulatory control	GSAs, Districts, and individual project proponents have the authority to plan and implement projects. Required permitting and regulatory review would be initiated through consultation with applicable governing agencies. Governing agencies for which consultation would be initiated may include, but is not limited to: DWR, SWRCB, CDFW, Flood Board, Regional Water Boards, USFWS, NMFS, LAFCO, County of Colusa and/or Glenn and CARB.
Benefits and benefit evaluation methodology	The measurable objectives expected to benefit are groundwater levels, groundwater storage, depletion of interconnected surface water, land subsidence, and potentially groundwater quality. This project is currently in the early conceptual stage. Thus, the expected yield of this project has yet to be determined and would be reported in GSP annual reports and 5-year updates when known. Evaluation of benefits will be based on analysis of pre- and post-project measurements supported by modeling. Measured parameters will include surface water deliveries, groundwater levels, and others to be determined. Modeling will be done with the C2VSimFG-Colusa model used for GSP development.
Costs	This project is currently in the early conceptual stage. Thus, the anticipated costs of this project have yet to be determined and would be reported in GSP annual reports and 5-year updates when known. The project proponent would identify funding sources to cover project costs as part of project development. These may include grants, fees, loans, and other assessments.

6.5.1.15 Westside Off-stream Reservoir and In-Lieu Groundwater Recharge

TCCA Contractors would construct off-stream surface reservoirs along the western edge of the Colusa Subbasin and up-slope from the Tehama-Colusa Canal (TCC). They would divert surplus Sacramento River flows (e.g., Section 215 water) at the Red Bluff Pumping Plant and Fish Screen, and convey water through the TCC and pump water up into storage reservoir(s). Stored water would be released into the TCC for irrigation supply to enable reduction of groundwater pumping (i.e., in-lieu groundwater recharge). New pumping plants on the TCC and new storage impoundments would need to be planned, designed, and constructed subject to a determination of economic and environmental feasibility. A summary of the project is provided in Table 6-43.

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Item	Description
Implementation	TCCA Contractors proposed this project concept for GSP implementation which would be located on the western edge of the Colusa Subbasin. The project would provide in-lieu groundwater recharge through increased storage of surface water. This project may be implemented and would be monitored and quantified with respect to groundwater conditions, as needed, if sustainable levels are not reached following implementation of other projects and management actions. This will be done in the context of Sustainable Management Criteria defined in Chapter 5 to ensure sustainable operation of the Colusa Subbasin.
Timeline	This project is currently in the early conceptual stage. Thus, the start and completion dates for this project have yet to be determined and would be provided in GSP annual reports and 5-year updates when known.
Notice to public and other agencies	Public and/or Inter-Agency Noticing would be facilitated through GSA board meetings, GSA and/or cooperating agency website(s), GSA newsletter, member agency newsletter, inter-basin coordination meetings, member agency governing body public meetings, GSP annual report(s), public scoping meetings and environmental/regulatory permitting notification.
Water source & reliability	The source for this project would be Sacramento River Section 215 water. The reliability is highly variable; available only during periods of high flow in the Sacramento River and tributaries.
Legal authority, permitting processes, and regulatory control	GSAs, Districts, and individual project proponents have the authority to plan and implement projects. Required permitting and regulatory review would be initiated through consultation with applicable governing agencies. Governing agencies for which consultation would be initiated may include, but is not limited to: DWR, SWRCB, CDFW, Flood Board, Regional Water Boards, USFWS, NMFS, LAFCO, County of Colusa and/or Glenn and CARB.
Benefits and benefit evaluation methodology	The measurable objectives expected to benefit are groundwater levels, groundwater storage, and depletion of interconnected surface water. This project is currently in the early conceptual stage. Thus, the expected yield of this project has yet to be determined and would be reported in GSP annual reports and 5-year updates when known. Evaluation of benefits will be based on analysis of pre- and post-project measurements supported by modeling. Measured parameters will include surface water deliveries, groundwater levels, and others to be determined. Modeling will be done with the C2VSimFG-Colusa model used for GSP development.
Costs	This project is currently in the early conceptual stage. Thus, the anticipated costs of this project have yet to be determined and would be reported in GSP annual reports and 5-year updates when known. The project proponent would identify funding sources to cover project costs as part of project development. These may include grants, fees, loans, and other assessments.

6.5.2 Potential Management Actions

This section describes potential management actions that would be implemented if determined to be necessary under future monitoring of the Colusa Subbasin. Potential management actions include two potential demand reduction programs, one targeted to areas of concern, and a second more general program that could be applied in the Colusa Subbasin to avoid undesirable results. Table 6-44 summarizes the potential management actions included in the GSP. The following subsections provide descriptions for each management action.

Management Action ^(a)	Management Action Type	Proponent
Domestic Well Mitigation Program	Management Action	CGA and GGA
Drought Contingency Planning for Urban Areas	Management Action	CGA, GGA, and cities (GSA member agencies)
Demand Management Action	Management Action	CGA and GGA
Strategic Short-Term Demand Management	Management Action	CGA and GGA
Well Abandonment Outreach and Funding Program	Management Action	CGA and GGA
Preservation of Lands Favorable for Recharge	Management Action	CGA and GGA
Reduce Non-beneficial Evapotranspiration/Invasive Species Eradication	Reduce Groundwater Demand	CGA and GGA

(a) Fourteen projects and management actions are not depicted on the map in

(b) **Figure 6-9.** These projects and management actions are excluded either because they will be implemented subbasin-wide or because the planning process is not far enough along to locate these projects at this time.

6.5.2.1 Domestic Well Mitigation Program

Groundwater level measurable objectives (MOs) adopted for sustainable management of the Colusa Subbasin operation are based on the most recent five years of measured water levels in each representative monitoring well (generally 2015 through 2020 with some exceptions), and therefore should be highly protective of domestic water supply wells. However, it is possible that in certain portions of the Colusa Subbasin groundwater levels will fall below the adopted MOs and approach the adopted minimum thresholds (MTs) as projects and management actions are being implemented for recovery of groundwater levels. As a consequence, it is possible that that some domestic wells will go dry in the future. 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 Colusa Subbasin. Program development would involve establishing a funding mechanism to accumulate mitigation funds, establishing a process and criteria for determining when dewatered wells are eligible for mitigation funding, and establishing criteria for scaling mitigation payments (for example, relatively new dewatered wells might qualify for more funding than old wells). Possible mechanisms that could be used to generate well mitigation funds include a groundwater extraction fee (which would require flow measurement at each well) and a per well assessment (which would not require measurement). A summary of the program is provided in Table 6-45.

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Item	Description
Implementation	CGA and GGA proposed this potential management action for GSP implementation which would occur across the Colusa Subbasin. The action would respond to potentially changing conditions in the basin and would be implemented as needed if groundwater levels fall. This will be done in the context of Sustainable Management Criteria defined in Chapter 5 to ensure sustainable operation of the Colusa Subbasin.
Timeline	This action is currently in the early conceptual stage. Thus, the start and completion dates have yet to be determined and would be provided in GSP annual reports and 5-year updates when known.
Notice to public and other agencies	Public and/or Inter-Agency Noticing would be facilitated through GSA board meetings, GSA and/or cooperating agency website(s), GSA newsletter, member agency newsletter, inter-basin coordination meetings, member agency governing body public meetings, GSP annual report(s), public scoping meetings and environmental/regulatory permitting notification.
Water source & reliability	Not applicable for this demand management action.
Legal authority, permitting processes, and regulatory control	GSAs, Districts, and individual proponents have the authority to plan and implement management actions. Required permitting and regulatory review would be initiated through consultation with applicable governing agencies. Governing agencies for which consultation would be initiated may include, but is not limited to: DWR, SWRCB, CDFW, Flood Board, Regional Water Boards, USFWS, NMFS, LAFCO, County of Colusa and/or Glenn and CARB.
Benefits and benefit evaluation methodology	The measurable objectives expected to benefit is groundwater levels, as this management action would alleviate problems associated with potential changes in conditions. The expected yield of this management action is not quantified as it is proposed for responding to changing conditions. Evaluation of benefits will be based on analysis of pre- and post-project measurements supported by modeling. Measured parameters will include surface water deliveries, groundwater levels, and others to be determined. Modeling will be done with the C2VSimFG-Colusa model used for GSP development.
Costs	This management action is currently in the early conceptual stage. Thus, the anticipated costs have yet to be determined and would be reported in GSP annual reports and 5-year updates when known. The proponent would identify funding sources to cover costs as part of development of this management action. These may include grants, fees, loans, and other assessments.

6.5.2.2 Drought Contingency Planning for Urban Areas

The CGA and GGA will coordinate with cities, towns, and other municipal and industrial water suppliers, which are all fully dependent on groundwater in the Colusa Subbasin, to encourage drought contingency planning and drought preparedness in a manner consistent with sustainable groundwater management according the GSP. A summary of the management action is provided in Table 6-46.

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Table 6-46. Drought Contingency Planning for Urban Areas Summary

Item	Description
Implementation	CGA, GGA, and cities (GSA member agencies) proposed this potential management action for GSP implementation which would occur across the Colusa Subbasin. The action would reduce the demand for groundwater pumping. This action may be implemented and would be monitored and quantified with respect to groundwater conditions, as needed, if sustainable levels are not reached following implementation of other projects and management actions. This will be done in the context of Sustainable Management Criteria defined in Chapter 5 to ensure sustainable operation of the Colusa Subbasin.
Timeline	This action is currently in the early conceptual stage. Thus, the start and completion dates have yet to be determined and will be provided in GSP annual reports and 5-year updates when known.
Notice to public and other agencies	Public and/or Inter-Agency Noticing would be facilitated through GSA board meetings, GSA and/or cooperating agency website(s), GSA newsletter, member agency newsletter, inter-basin coordination meetings, member agency governing body public meetings, GSP annual report(s), public scoping meetings and environmental/regulatory permitting notification.
Water source & reliability	Not applicable for this management action.
Legal authority, permitting processes, and regulatory control	GSAs, Districts, and individual project proponents have the authority to plan and implement management actions. Required permitting and regulatory review would be initiated through consultation with applicable governing agencies. Governing agencies for which consultation would be initiated may include, but is not limited to: DWR, SWRCB, CDFW, Flood Board, Regional Water Boards, USFWS, NMFS, LAFCO, County of Colusa and/or Glenn and CARB.
Benefits and benefit evaluation methodology	The measurable objectives expected to benefit are groundwater levels, groundwater storage, and depletions of interconnected surface water. This management action is currently in the early conceptual stage. Thus, the expected yield has yet to be determined and would be reported in GSP annual reports and 5-year updates when known. Evaluation of benefits will be based on analysis of pre- and post-project measurements supported by modeling. Measured parameters will include surface water deliveries, groundwater levels, and others to be determined. Modeling will be done with the C2VSimFG-Colusa model used for GSP development.
Costs	This management action is currently in the early conceptual stage. Thus, the anticipated costs have yet to be determined and would be reported in GSP annual reports and 5-year updates when known. The proponent would identify funding sources to cover costs as part of development of this management action. These may include grants, fees, loans, and other assessments.

6.5.2.3 Long-Term Demand Management Action

The planned PMAs described in this chapter will be pursued by the Colusa Subbasin GSAs to achieve and maintain sustainable groundwater conditions. The GSAs have also included a potential demand management program as a “backstop” to other PMAs. Events that may trigger this management action include, but are not limited to: severe, prolonged drought conditions result in groundwater levels approaching MT or MO in specific parts of the Colusa Subbasin; other PMAs are not achieving the

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expected level of benefits; or new information about projected future conditions show that sustainability objectives will not be met. This section describes the demand management action.

Demand management broadly refers to any water management activity that reduces the consumptive use of irrigation water. To be effective for purposes of sustainable groundwater management, demand management must result in a reduction in net groundwater pumping (pumping net of recharge). That is, it must reduce consumptive use or irrecoverable losses into a saline water body. Activities that, for example, reduce canal seepage or reduce deep percolation from irrigation will not be effective. They may decrease quantity of water diverted or applied but they also reduce recharge to usable groundwater, so do not improve the net pumping from the aquifer.

For purposes here, a demand management action is one that incentivizes, enables, or requires water users to reduce their consumptive use, but does not dictate exactly how users have to do it. Users can respond to demand management by changing to lower water-using crops, water-stressing crops (providing less water than the crop would normally consume for full yield), reducing evaporation losses, and reducing irrigated acreage.

The following types of demand management activities are included under this management action:

Allocation. Under an allocation, the different sources of groundwater are quantified and allocated to individual parcels, wells, or entities (such as, for example, farming operations). Sources of groundwater that can be included in the allocation can include the sustainable yield, natural recharge, imported water recharge, new developed recharge sources, and, for a limited period of time, overdraft (sometimes called “transitional water”). By defining the quantities of groundwater available to individuals this can incentivize reductions in use and development of new recharge opportunities.

Implementing an allocation does not necessarily result in reducing groundwater use. For example, if the allocation is greater than historical use this would not be a constraint for groundwater users and would not result in less consumptive groundwater use. In the context of GSP implementation, the allocation is typically tied to the sustainable yield of the Colusa Subbasin. When the sustainable yield (including yield of other PMAs like recharge projects) is less than current pumping, the effect of an allocation is an overall reduction in net groundwater use.

An allocation is a rigid method for implementing demand management. It effectively limits water use on a well, parcel, or operation basis. This could require idling land or switching crop on lands that have insufficient allocation to meet crop demand, which imposes costs on water users (e.g., growers). There are ways to increase the flexibility of allocations to reduce the costs of demand management. For example, the allocation could be defined as an average over a period of time rather than a fixed amount every year, or users could be allowed to carry over unused allocation into the next year.

Allocation + Water Market. An allocation that is less than historical water use can be coupled with a water market. A groundwater market is another way to increase the flexibility of an allocation to reduce costs of demand management. A market is an institution that allows willing buyers and sellers to exchange groundwater allocation (“credits”). The market allows groundwater users to shift allocation to higher-valued uses. Defining an allocation across an entire farming operation establishes a kind of market in which the owner or manager moves water to produce the highest return (e.g., remove an older block of an orchard and use the allocation to meet crop demand on a more productive block). More broadly, a market allows a means to exchange allocation with another groundwater user, whether for a single season or using a multi-year trade. Willing sellers trade a part of their allocation to willing buyers in exchange for

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a payment that the seller expects will exceed the return he/she would have earned from using the water for irrigation. This additional flexibility reduces the cost to the GSA's users of achieving demand reduction under an allocation.

Development of a water market institution is a complex process that encompasses more than defining the groundwater allocation. The water market requires an administrator (e.g., the GSA or a third party) and methods for monitoring, enforcement, and accounting of groundwater use. It also requires development of market rules that determine what sources of the allocation are tradeable, under what conditions, and over what periods of time. For example, market rules would consider, and possibly limit, the potential impacts of local concentrations of groundwater pumping if trades occur within specific areas. Finally, the water market requires a marketplace for buyers and sellers to post bids, review prices, and execute deals. The GSAs would consider these factors in the future if a groundwater market is considered.

Land Repurposing. Land repurposing programs are more targeted than an allocation or market program but maintain flexibility for participants by its voluntary nature. Such a program would provide a financial incentive to willing participants for their currently irrigated lands to be repurposed into other, non-irrigated uses. Programs can focus on short-term drought conditions, or they can provide multi-year reductions in demand if that is needed under some conditions. For longer-term programs, lands can be repurposed to achieve other multi-benefit objectives - for example, to create habitat corridors or to support local endangered species¹⁷.

Land repurposing programs typically include incentives to stop irrigating. These incentives need, at minimum, to exceed the return to farming on a parcel. An additional incentive may be provided to convert land into an alternative use. For example, the United States Department of Food and Agriculture (USDA) Conservation Reserve Enhancement Program (CREP¹⁸) will pay lands to forgo irrigation and offer an additional per acre payment to convert lands into different types of habitats.

Other financial incentives. Demand management can also be achieved through a range of other financial incentives. This could include positive financial incentives to reduce consumptive groundwater use. It could also include groundwater extraction fees that disincentivize groundwater use.

As described above, the demand management action will only be triggered if required under future monitoring by the GSAs. The following principles would guide development of the demand management program. These are in no order of preference and the GSAs recognize that tradeoffs exist among these principles.

- Minimize the economic impacts of any demand management
- Maintain established water rights
- Incentivize investment in water supply infrastructure
- Incentivize economically efficient water use
- Complement other PMAs such as direct and in-lieu recharge projects in aggregate, and in specific regions

¹⁷ See, for example: Environmental Defense Fund, Strategic Land Repurposing. The Nature Conservancy, Rewilding Agricultural Lands.

¹⁸ Note that CREP is state-specific and is not currently being implemented in California.

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- Allow sufficient program flexibility for groundwater pumpers to adjust over time
- Ensure access for domestic water users (de minimis domestic use as defined by SGMA is less than 2 acre-feet annually per user)

This potential management action will be evaluated further in annual updates and 5-year reports, as required by conditions in the Colusa Subbasin. Appendix 6B summarizes the economic value of irrigated agriculture to the Colusa Subbasin and quantifies the direct economic costs of demand management. Table 6-47 summarizes GSP regulation requirements and describes how the management action meets those requirements.

Item	Description
Implementation	CGA and GGA proposed this management action for GSP implementation, but it would only be implemented if groundwater conditions in the Colusa Subbasin, or specific areas of the Colusa Subbasin, require it. This will be done in the context of Sustainable Management Criteria defined in Chapter 5 to ensure sustainable operation of the Colusa Subbasin.
Timeline	This action is currently in the early conceptual stage. Thus, the start and completion dates have yet to be determined and would be provided in GSP annual reports and 5-year updates when known, and only if the management action is triggered for implementation.
Notice to public and other agencies	Public and/or Inter-Agency Noticing would be facilitated through GSA board meetings, GSA and/or cooperating agency website(s), GSA newsletter, member agency newsletter, inter-basin coordination meetings, member agency governing body public meetings, GSP annual report(s), public scoping meetings and environmental/regulatory permitting notification.
Water source & reliability	Not applicable for this demand management action.
Legal authority, permitting processes, and regulatory control	GSAs, Districts, and individual project proponents have the authority to plan and implement management actions. Required permitting and regulatory review would be initiated through consultation with applicable governing agencies. This would likely include local county agencies, as appropriate.
Benefits and benefit evaluation methodology	The measurable objective expected to benefit is groundwater levels, as this management action would reduce net pumping to achieve sustainability conditions in specific areas. The expected yield of this management action is not quantified because: (i) it will only be triggered if necessary and (ii) the scale of the demand management program is flexible. Evaluation of benefits will be based on analysis of pre- and post-project measurements supported by modeling. Measured parameters will include surface water deliveries, groundwater levels, and others to be determined. Modeling will be done with the C2VSimFG-Colusa model used for GSP development.
Costs	This management action is currently in the early conceptual stage. Thus, the anticipated costs have yet to be determined and would be reported in GSP annual reports and 5-year updates when known, and only if the management action is triggered for implementation. The proponent would identify funding sources to cover costs as part of development of this management action. These may include grants, fees, loans, and other assessments.

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6.5.2.4 Strategic Temporary Land Idling for Drought and Localized Short-Term Groundwater Management

The Colusa Subbasin GSP identified potential areas of concern in the Colusa Subbasin where groundwater levels have declined significantly over recent years due to disproportionate reliance on groundwater to meet crop irrigation demands. Planning and constructing projects (e.g., conveyance or recharge) to offset short-run impacts of drought and local groundwater level impacts would take time and require substantial capital costs. This program is a potential management action that would provide the GSAs with a voluntary, flexible, short-run response to alleviate impacts in local areas of concern.

The program would be focused on specific drought-affected areas with sustainability challenges. It would be voluntary and provide financial incentives (payments) to encourage participation. Payment terms and other conditions would be specified as part of program design. Two potential structures for the program are: (i) participating groundwater-using lands in drought-affected areas in the Colusa Subbasin would be idled and the quantified groundwater saved would be left in the ground to alleviate sustainability challenges, or (ii) participating surface water-using lands anywhere in the basin would be idled, and the saved surface water would be conveyed to replace groundwater pumping in other areas of the basin with groundwater sustainability challenges.

Appendix 6B summarizes the economic value of irrigated agriculture to the Colusa Subbasin and quantifies the direct economic costs of demand management in the potential areas of concern. A summary of the management action is provided in Table 6-48.

Item	Description
Implementation	CGA and GGA proposed this management action concept for GSP implementation which would occur across the Colusa Subbasin. The action would reduce the demand for groundwater pumping. This action may be implemented and would be monitored and quantified with respect to groundwater conditions, as needed, if sustainable levels are not reached following implementation of other projects and management actions. This will be done in the context of Sustainable Management Criteria defined in Chapter 5 to ensure sustainable operation of the Colusa Subbasin.
Timeline	This action is currently in the early conceptual stage. Thus, the start and completion dates have yet to be determined and would be provided in GSP annual reports and 5-year updates when known.
Notice to public and other agencies	Public and/or Inter-Agency Noticing would be facilitated through GSA board meetings, GSA and/or cooperating agency website(s), GSA newsletter, member agency newsletter, inter-basin coordination meetings, member agency governing body public meetings, GSP annual report(s), public scoping meetings and environmental/regulatory permitting notification.
Water source & reliability	Not applicable for this demand management action.

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Item	Description
Legal authority, permitting processes, and regulatory control	GSAs, Districts, and individual proponents have the authority to plan and implement management actions. Required permitting and regulatory review would be initiated through consultation with applicable governing agencies. Governing agencies for which consultation would be initiated may include, but is not limited to: DWR, SWRCB, CDFW, Flood Board, Regional Water Boards, USFWS, NMFS, LAFCO, County of Colusa and/or Glenn and CARB.
Benefits and benefit evaluation methodology	The measurable objectives expected to benefit are groundwater levels, groundwater storage, and depletions of interconnected surface water in areas with potential sustainability challenges. The expected yield of this management action will depend on the level of participation and water needs. There is also potential for multi-benefits on temporarily idled lands, depending on program design.
Costs	This management action is currently in the early conceptual stage. Thus, the anticipated costs have yet to be determined and would be reported in GSP annual reports and 5-year updates when known. The proponent would identify funding sources to cover costs as part of development of this management action. These may include grants, fees, loans, and other assessments.

6.5.2.5 Well Abandonment Outreach and Funding Program

The CGA and GGA will coordinate with Colusa and Glenn counties, respectively, to create a program providing outreach and education to landowners regarding the proper procedures for well decommissioning and abandonment, as well as a funding source to assist landowners with these procedures. This program is anticipated to improve the Colusa Subbasin well inventory and potentially have water quality benefits, as improperly abandoned wells are a potential point source for water quality contaminant transport from the ground surface to the underlying groundwater system. A summary of the management action is provided in Table 6-49.

Item	Description
Implementation	CGA and GGA proposed this management action concept for GSP implementation which would occur across the Colusa Subbasin. The action would respond to potentially changing conditions in the basin and would be implemented as needed based on the number of wells abandoned and water quality concerns. This will be done in the context of Sustainable Management Criteria defined in Chapter 5 to ensure sustainable operation of the Colusa Subbasin.
Timeline	This action is currently in the early conceptual stage. Thus, the start and completion dates have yet to be determined and would be provided in GSP annual reports and 5-year updates when known.
Notice to public and other agencies	Public and/or Inter-Agency Noticing would be facilitated through GSA board meetings, GSA and/or cooperating agency website(s), GSA newsletter, member agency newsletter, inter-basin coordination meetings, member agency governing body public meetings, GSP annual report(s), public scoping meetings and environmental/regulatory permitting notification.

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Table 6-49. Well Abandonment Outreach and Funding Program Summary

Item	Description
Water source & reliability	Not applicable for this management action.
Legal authority, permitting processes, and regulatory control	GSA, Districts, and individual project proponents have the authority to plan and implement management actions. Required permitting and regulatory review would be initiated through consultation with applicable governing agencies. Governing agencies for which consultation would be initiated may include, but is not limited to: DWR, SWRCB, CDFW, Flood Board, Regional Water Boards, USFWS, NMFS, LAFCO, County of Colusa and/or Glenn and CARB.
Benefits and benefit evaluation methodology	The measurable objective expected to benefit is water quality. The expected yield of this management action is not quantified as it is proposed for responding to changing conditions. Evaluation of benefits will be based on analysis of pre- and post-project measurements supported by modeling. Measured parameters will include surface water deliveries, groundwater levels, and others to be determined. Modeling will be done with the C2VSimFG-Colusa model used for GSP development.
Costs	This management action is currently in the early conceptual stage. Thus, the anticipated costs have yet to be determined and would be reported in GSP annual reports and 5-year updates when known. The proponent would identify funding sources to cover costs as part of development of this management action. These may include grants, fees, loans, and other assessments.

6.5.2.6 Preservation of Lands Favorable for Recharge

The CGA and GGA will coordinate with those agencies having authority over land use planning in Colusa and Glenn counties, respectively, to 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 will be possible in perpetuity. A summary of the management action is provided in Table 6-50.

Table 6-50. Preservation of Lands Favorable for Recharge Summary

Item	Description
Implementation	CGA and GGA proposed this management action concept for GSP implementation which would occur across the Colusa Subbasin. The action could help create additional direct groundwater recharge in the future. This action may be implemented and would be monitored and quantified with respect to groundwater conditions, as needed, if sustainable levels are not reached following implementation of other projects and management actions. This will be done in the context of Sustainable Management Criteria defined in Chapter 5 to ensure sustainable operation of the Colusa Subbasin.
Timeline	This action is currently in the early conceptual stage. Thus, the start and completion dates have yet to be determined and would be provided in GSP annual reports and 5-year updates when known.

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Table 6-50. Preservation of Lands Favorable for Recharge Summary

Item	Description
Notice to public and other agencies	Public and/or Inter-Agency Noticing would be facilitated through GSA board meetings, GSA and/or cooperating agency website(s), GSA newsletter, member agency newsletter, inter-basin coordination meetings, member agency governing body public meetings, GSP annual report(s), public scoping meetings and environmental/regulatory permitting notification.
Water source & reliability	Not applicable for this management action.
Legal authority, permitting processes, and regulatory control	GSAs, Districts, and individual project proponents have the authority to plan and implement management actions. Required permitting and regulatory review would be initiated through consultation with applicable governing agencies. Governing agencies for which consultation would be initiated may include, but is not limited to: DWR, SWRCB, CDFW, Flood Board, Regional Water Boards, USFWS, NMFS, LAFCO, County of Colusa and/or Glenn and CARB.
Benefits and benefit evaluation methodology	The measurable objectives expected to benefit are groundwater levels, groundwater storage, and depletions of interconnected surface water. This management action is currently in the early conceptual stage. Thus, the expected yield has yet to be determined and would be reported in GSP annual reports and 5-year updates when known. Evaluation of benefits will be based on analysis of pre- and post-project measurements supported by modeling. Measured parameters will include surface water deliveries, groundwater levels, and others to be determined. Modeling will be done with the C2VSimFG-Colusa model used for GSP development.
Costs	This management action is currently in the early conceptual stage. Thus, the anticipated costs have yet to be determined and would be reported in GSP annual reports and 5-year updates when known. The proponent would identify funding sources to cover costs as part of development of this management action. These may include grants, fees, loans, and other assessments.

6.5.2.7 Reduce Non-beneficial Evapotranspiration

This project would remove the invasive, non-native plant species (i.e., arundo donax, eucalyptus, tamarisk, etc.) from riparian corridors and other areas they may be present. This would provide both a reduction in evapotranspiration from shallow groundwater and native ecosystem restoration. A summary of the management action is provided in Table 6-51.

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Table 6-51. Reduce Non-beneficial Evapotranspiration Summary

Item	Description
Implementation	This potential project is proposed by CGA and GGA and would be implemented across the Colusa Subbasin. The project would reduce groundwater demand by reducing evapotranspiration. This action may be implemented and would be monitored and quantified with respect to groundwater conditions, as needed, if sustainable levels are not reached following implementation of other projects and management actions. This will be done in the context of Sustainable Management Criteria defined in Chapter 5 to ensure sustainable operation of the Colusa Subbasin.
Timeline	This project is currently in the early conceptual stage. Thus, the start and completion dates for this project have yet to be determined and would be provided in GSP annual reports and 5-year updates when known.
Notice to public and other agencies	Public and/or Inter-Agency Noticing would be facilitated through GSA board meetings, GSA and/or cooperating agency website(s), GSA newsletter, member agency newsletter, inter-basin coordination meetings, member agency governing body public meetings, GSP annual report(s), public scoping meetings and environmental/regulatory permitting notification.
Water source & reliability	Not applicable.
Legal authority, permitting processes, and regulatory control	GSAs, Districts, and individual project proponents have the authority to plan and implement projects. Required permitting and regulatory review would be project specific and initiated through consultation with applicable governing agencies. Governing agencies for which consultation would be initiated may include, but is not limited to: DWR, SWRCB, CDFW, Flood Board, Regional Water Boards, USFWS, NMFS, LAFCO, County of Colusa and/or Glenn and CARB.
Benefits and benefit evaluation methodology	The measurable objectives expected to benefit are groundwater levels, groundwater storage, and depletion of interconnected surface water. This project is currently in the early conceptual stage. Thus, the expected yield of this project has yet to be determined and would be reported in GSP annual reports and 5-year updates when known. Other benefits would include decreased ET, increased native vegetation and habitat, and decreased sediment trapping.
Costs	This project is currently in the early conceptual stage. Thus, the anticipated costs of this project have yet to be determined and would be reported in GSP annual reports and 5-year updates when known. The proponent would identify funding sources to cover costs as part of development of this management action. These may include grants, fees, loans, and other assessments.