PO Box 2157
Los Banos, CA 93635
sldmwa.org

Official Memorandum

To: SLDMWA Water Resources Committee Members and Alternates

From: Scott Petersen, Water Policy Director

Date: December 8, 2025

RE: Update on Water Policy/Resources Activities

Background

This memorandum is provided to briefly summarize the current status of various agency processes regarding water policy activities, including but not limited to the (1) Implementation of Long-Term Operations of the Central Valley Project and State Water Project, including environmental compliance; (2) State Water Resources Control Board action; (3) Central Valley Regional Water Board Action, (4) San Joaquin River Restoration Program; (5) Delta conveyance; (6) Reclamation action; (7) Delta Stewardship Council action; (8) San Joaquin Valley Water Blueprint, and (9) San Joaquin Valley Water Collaborative Action Plan.

Policy Items

Implementation of Executive Order 14181

On January 2024, President Trump issued Executive Order 14181[1], directing analysis of potential changes to the operations in the 2024 Record of Decision ("ROD") for consideration by the Administration. On December 4, 2025, Reclamation executed a Record of Decision on the Long-Term Operations of the Central Valley Project and State Water Project, as a first step towards implementing EO 14181.

Implementation of 2024 Record of Decision on Long-Term Operations of the Central Valley Project and State Water Project

On December 4, 2025, Reclamation executed a Record of Decision[2] on the Long-Term Operations of the Central Valley Project and State Water Project, as a first step towards implementing EO 14181, updating operations associated with the Record of Decision executed by Reclamation and the Biological Opinions issued by the Fish and Wildlife Service and NOAA Fisheries in December 2024. This new operation is described as "Action 5".

Specifically, the Action 5 ROD updates the operations of the Projects by:

(1) **Removing the Delta Smelt Summer and Fall Habitat Action (Fall X2),** in response to findings by the U.S. Fish and Wildlife Service that the action is not anticipated to have observable effects on delta smelt survival,

[1] https://www.govinfo.gov/content/pkg/FR-2025-01-31/pdf/2025-02174.pdf

[2] https://www.usbr.gov/mp/nepa/nepa_project_details.php?Project_ID=54661

(2) **Removing the early implementation measure of the Delta export reduction of the Healthy Rivers and Landscapes ("HRL") program,** in response to uncertainties associated with the timing of potential adoption and implementation of the HRL Program by California's State Water Resources Control Board,

(3) **Updating the Delta operating criteria** to expand the opportunities for Old and Middle River ("OMR") management at no more negative than -5,000 cubic feet per second (cfs), and a stormflex action of -6,500 cfs, including the use of predictive tools for real-time assessment of environmental conditions.

Modeling of these proposed operational changes has estimated between 250 – 400 TAF improvement in combined CVP and SWP export capacity under Action 5 operations, with the SWP benefits being uncertain based on how the SWP operates under the Incidental Take Permit required for compliance with the California Endangered Species Act.

There is additional analysis being performed to assess the efficacy of additional potential operational changes that could improve water supply and maintain species protections, as well as alternative methods to address environmental effects on species listed under the federal Endangered Species Act ("ESA) and advance species recovery efforts.

Note: There are also Endangered Species Act consultations on the Trinity River and Klamath River that may have overlap/interactions with the operations of the CVP/SWP.

State Water Resources Control Board (State Water Board) Activity

Bay Delta Water Quality Control Plan Update

Background

The State Water Board is currently considering updates to its 2006 Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary ("Bay Delta Plan") in two phases (Plan amendments). The first Plan amendment is focused on San Joaquin River flows and southern Delta salinity ("Phase I" or "San Joaquin River Flows and Southern Delta Salinity Plan Amendment"). The second Plan amendment is focused on the Sacramento River and its tributaries, Delta eastside tributaries (including the Calaveras, Cosumnes, and Mokelumne rivers), Delta outflows, and interior Delta flows ("Phase II" or "Sacramento/Delta Plan Amendment").

During the December 12, 2018 Water Board Meeting, the Department of Water Resources ("DWR") and Department of Fish and Wildlife presented proposed "Voluntary Settlement Agreements" ("VSAs") on behalf of Reclamation, DWR, and the public water agencies they serve to resolve conflicts over proposed amendments to the Bay-Delta Plan update.[3] The State Water Board did not adopt the proposed VSAs in lieu of the proposed Phase 1 amendments, but as explained below, directed staff to consider the proposals as part of a future Delta-wide proposal.

[3] Available at https://water.ca.gov/-/media/DWR-Website/Web-Pages/Blogs/Voluntary-Settlement-Agreement-Meeting-Materials-Dec-12-2018-DWR-CDFW-CNRA.pdf.

Phase 1 Status – San Joaquin River and its Tributaries

The State Water Board adopted a resolution[4] to adopt amendments to the Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary and adopt the Final Substitute Environmental Document during its December 12, 2018 public meeting.

On July 18, 2022, the State Water Resources Control Board issued a Notice of Preparation (NOP)[5] and California Environmental Quality Act (CEQA) Scoping Meeting for the Proposed Regulation to Implement Lower San Joaquin River Flows (LSJR) and Southern Delta Salinity Objectives in the Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta (Bay-Delta Plan).

In response to the release of the NOP, the Water Authority and member agencies provided scoping comments[6] and the State Water Board is working through a long-term process to address Phase 1 elements of the Water Quality Control Plan Update.

A long delay in Phase 1 action occurred as legal activity was undertaken.

Recently, on September 19, 2025, the State Water Resources Control Board (Board) released a Notice of Opportunity for Public Comment and Workshop on the Draft Scientific Basis Report Supplement for the Tuolumne River Voluntary Agreement Proposal (Draft TVA Scientific Basis Report), to which the Water Authority provided comments[7].

Next Steps

- Final draft Staff Report for Tuolumne River VA
- Board workshop and consideration of Tuolumne River VA
- Final draft EIR and regulation implementing Lower SJR flows and South Delta Salinity
- Board consideration of regulation implementing Lower SJR flows and South Delta Salinity

Phase 2 Status – Sacramento River and its Tributaries and Bay-Delta

In the State Water Board's resolution adopting the Phase 1 amendments, the Water Board directed staff to assist the Natural Resources Agency in completing a Delta watershed-wide agreement, including potential flow and non-flow measures for the Tuolumne River, and associated analyses no later than March 1, 2019. Staff were directed to incorporate the Delta watershed-wide agreement as an alternative for a future, comprehensive Bay-Delta Plan update that addresses the reasonable protection of beneficial uses across the Delta watershed.

Revised Draft Sacramento/Delta Updates to the Water Quality Control Plan

Background

In July, the Board released a draft Bay Delta Plan (July 2025 revised draft), which included proposed changes to the draft Bay Delta Plan released in October 2024 (2024 draft), based on public input and comments

[4]Available at https://www.waterboards.ca.gov/board_decisions/adopted_orders/resolutions/2018/rs2018_0059.pdf.

[5] Available at https://www.waterboards.ca.gov/public_notices/notices/20220715-implementation-nop-and-scoping-dwr-baydelta.pdf

[6] Request from Authority staff

[7] Request from Authority staff

received throughout the planning process, including comments on several options for possible changes to the plan identified in the 2024 draft. Specifically, the 2024 draft identified the possible inclusion of flow, cold water habitat and related provisions that were based on the proposed Plan amendments and alternatives identified in the 2023 draft Staff Report in support of updates to the Bay Delta Plan, as well as options for these provisions. The 2024 draft also identified the possible inclusion of Voluntary Agreements (VAs) to provide flows and non-flow habitat proposed by state and federal agencies and water users referred to as the Healthy Rivers and Landscapes proposal, as well as options associated with inclusions of VAs. The regulatory provisions would apply to all water right holders if the Board did not move forward with VAs, or in the event the Board moved forward with VAs would apply to water rights not participating in approved VAs. The 2025 revised draft proposes to move forward with the inclusion of VAs in the Bay Delta Plan for water rights included in approved VAs (VA pathway) and the regulatory provisions for water rights not included as part of approved VAs (regulatory pathway). The 2025 revised draft also includes proposals for addressing other options identified in the 2024 draft. The 2025 revised draft also proposes the designation of Tribal Tradition and Culture (CUL) beneficial use as part of the current Bay Delta Plan update.

Current Activity

On September 16, 2025, the State Water Resources Control Board (State Water Board or Board) rescinded the August 22, 2025 Second Revised Notice of Opportunity for Public Comment and Hearing on Revised Draft Sacramento/Delta Updates to the Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Watershed (Bay-Delta Plan or Plan). The Rescinded Notice is available on the Board's website. Accordingly, the hearing previously scheduled for September 24-25, 2025, and the associated public comment period are cancelled and will be rescheduled to a future date.

It is anticipated that a revised release of the Bay-Delta Plan Update will be released for public comment in December 2025.

Additionally, the State Water Board has received term sheets for additional voluntary agreements from Nevada Irrigation District (NID) and South Sutter Water District (SSWD) specific to the Bear River, Yuba River, and Auburn Ravine that are available to the public.

Water Rights

Water Accounting, Tracking, and Reporting System (CalWATRS) Launch

The State Water Resources Control Board has launched the California Water Accounting, Tracking, and Reporting System (CalWATRS). A link to the new system and additional information is posted on the CalWATRS webpage.

If you have questions or would like the CalWATRS team to attend an event in your area, please email CalWATRS-help@waterboards.ca.gov.

Delta Conveyance Project

Petition for Change of Point of Diversion and Rediversion for the Delta Conveyance Project

The State Water Resources Control Board Administrative Hearings Office is holding a Public Hearing on the pending Petitions for Change of Water Right Permits 16478, 16479, 16481, and 16482 (Applications 5630, 14443, 14445A, and 17512, respectively) of the Department of Water Resources.

The evidentiary hearings before the AHO continue and staff will update on issues associated with the DCP as they develop.

U.S. Bureau of Reclamation

Reclamation Manual

Documents out for Comment

Draft Policy

- There are currently no draft Policies out for review.

Draft Directives and Standards

- There are currently no draft Directives and Standards out for review.

Draft Facilities Instructions, Standards, and Techniques (FIST)

- There are currently no draft Facilities Instructions, Standards, and Techniques out for review.

Draft Reclamation Safety and Health Standards (RSHS)

- There are currently no Safety and Health Standards out for review.

Draft Reclamation Design Standards

- There are currently no Design Standards out for review.

San Joaquin Valley Water Blueprint

The Water Blueprint for the San Joaquin Valley (Blueprint) is a non-profit group of stakeholders, working to better understand our shared goals for water solutions that support environmental stewardship with the needs of communities and industries throughout the San Joaquin Valley.

Blueprint's strategic priorities for 2022-2025: Advocacy, Groundwater Quality and Disadvantaged Communities, Land Use Changes & Environmental Planning, Outreach & Communications, SGMA Implementation, Water Supply Goals, Governance, Operations & Finance.

Mission Statement: *"Unifying the San Joaquin Valley's voice to advance an accessible, reliable solution for a balanced water future for all.*

Water Blueprint Board Meeting

The November meeting covered the latest on the unified water plan, which quantifies these challenges and catalogs potential solutions - establishing the baseline understanding that will guide federal and state funding decisions for our region. The monthly board meeting is open to the public, and interested parties can register through the website.

Top 3 Key Takeaways:

- Unified Water Plan Making Significant Progress with Tight Timeline: The Water Blueprint's unified water plan is moving forward rapidly with chapters 1 and 2 already distributed for review. The plan quantifies the San Joaquin Valley's massive water supply gap at 2.5-3 million acre-feet by 2040, incorporating SGMA compliance needs, climate change impacts, and environmental flow requirements. Comments on the initial chapters are due by October 6th, with the full administrative draft expected by year-end.

- **Major Supply-Demand Gap Identified Requiring Immediate Action:** Technical analysis reveals the valley faces a future water shortage of 2.5-3 million acre-feet by 2040, driven by SGMA compliance requirements (1.4-2 million acre-feet), environmental restoration needs, climate change impacts, and groundwater replenishment requirements. This massive gap demonstrates the critical need for comprehensive water infrastructure investments and management changes.
- **Recharge Projects Dominate Solutions:** The latest research points out that nearly 50% of all GSP projects are groundwater recharge projects, including on-farm recharge, injection wells, in-lieu recharge, and constructed basins, with injection wells being the most cost-effective option.

Additional Takeaways:

- GSA Project Lists Need Updating: Analysis of Groundwater Sustainability Plans revealed that less than half of the 800+ identified projects have both cost and yield information, necessitating outreach to GSA points of contact for more accurate data.
- Multiple Funding Sources Needed: Projects will require diverse funding streams including flood control, environmental restoration, and water supply funding to address the multi-benefit nature of proposed solutions.
- Water District Partnership Expanding: Blueprint is deepening its relationship with water districts outside the Central Valley. These growing partnerships can create significant opportunities for Valley water interests to tackle water banking and supply management.
- Speakers Bureau Approved: The board approved the creation of a speakers bureau to provide unified messaging about blueprint activities to community meetings, boards of supervisors, and other venues across the valley.
- Large Group Valley Meeting Planned: A major stakeholder meeting is being organized with Bureau of Reclamation's Acting Regional Director Adam Nickels as the headline speaker to discuss partnership opportunities and funding.

Unified Water Plan for the San Joaquin Valley

The purpose of the Unified Valley Plan for the San Joaquin Valley is to identify and present possible solutions for long-term water needs in the San Joaquin Valley by bringing together existing water plans, strategies, and knowledge from across the San Joaquin Valley into one coordinated, valley-wide planning framework.

Bureau of Reclamation Report to Congress:

- Chapter 1. Introduction
- Chapter 2. Overview of the water resource needs and opportunities in the San Joaquin Valley.
- Chapter 3. Overview of flood risks and management in the San Joaquin Valley and opportunities for improving flood management.
- Chapter 4. Illustration of an environmental vision for the San Joaquin Valley and estimates of the water supplies needed to implement that vision.
- Chapter 5. Evaluation of a range of potential solutions.
- Chapter 6. Recommendations for a path forward and a roadmap for implementation. Includes policy recommendations.

Authority staff continues to recommend that Authority member agencies increase their engagement with the Blueprint Technical Committee to ensure accuracy and support of the work product being developed for the westside of the San Joaquin Valley.

Chapter 4 of the Plan is now out for review and comment and is attached herein.

San Joaquin Valley Water Collaborative Action Program (SJV CAP)

Background

The CAP Plenary Group adopted work groups to implement the CAP Term Sheet[8], adopted on November 22, 2022. During Phase II, Work Groups are continuing to meet and discuss priorities and drafting various documents for their respective areas: Safe Drinking Water; Sustainable Water Supplies; Ecosystem Health; Land Use, Demand Reduction and Land Repurposing; Implementation.

The Bureau of Reclamation is currently funding the CAP. This funding supports its management and facilitation of the overall CAP process and the development of a prioritization tool. The tool is envisioned to be used by CAP participants, federal and state agencies, other stakeholders, and the public to evaluate policy recommendations, programmatic changes, and projects to achieve sustainable water management in the San Joaquin Valley.

The Steering Committee created a subgroup and will review several prioritization tools developed by other organizations and use those examples to craft a work plan and initial set of criteria for consideration.

On a parallel track, the subgroup recommends that each caucus develop up to three top-priority actions that will advance the outcomes of the Term Sheet.

[8] Request from Authority staff

ATTACHMENTS

November 10, 2025

Acting Regional Director Adam Nickels
Bureau of Reclamation
California Great Basin – Region 10
2800 Cottage Way
Sacramento, CA 95825

Submitted via email to: sha-MPR-BDO@usbr.gov

Re: Comments on Environmental Compliance Sufficiency Review – Action 5 (CVP and SWP Long-Term Operations Plan)

Dear Acting Regional Director Nickels,

This letter is to provide comments on behalf of the San Luis & Delta-Mendota Water Authority ("Water Authority") and the San Joaquin River Exchange Contractors Water Authority ("Exchange Contractors") on the Environmental Compliance Sufficiency Review for the Central Valley Project ("CVP") and State Water Project ("SWP") Long-Term Operations Plan ("LTO") – Action 5.

The Water Authority is a joint-powers authority that serves two important roles: 1) to provide representation on common interests of the Water Authority's 27 member agencies; and 2) to operate and maintain certain Central Valley Project ("CVP") facilities, including the Jones Pumping Plant, the Delta-Mendota Canal ("DMC") and the O'Neill Pumping Plant, that the Authority's member agencies depend on for delivery of CVP water. Twenty-five of the Water Authority's member agencies contract with the United States for the delivery of water from the CVP as the principal source of water they provide to users within their service areas, including the four member agencies of the Exchange Contractors. That water supply serves approximately 1.2 million acres of agricultural lands within areas of San Joaquin, Stanislaus, Merced, Fresno, Kings, San Benito, and Santa Clara Counties, a portion of the water supply for nearly 2 million people, including in urban areas within Santa Clara County referred to as the "Silicon Valley," and millions of waterfowl that depend upon up to 200,000 acres of managed wetlands and other critical habitat within the largest contiguous wetland in the western United States.

Given this connection, the Water Authority and its member agencies have a strong interest in the operations of the CVP and how sound and effective implementation of the federal Endangered Species Act ("ESA") can influence the reliability and affordability of our member agencies' contracted water supplies, as well as ensure scientifically supported, reasonable protection for species listed under the ESA. The experience of our member agencies, and the farms and communities reliant on their contracted supplies, demonstrates that for the past thirty years, restrictions on the operations of the CVP have resulted in progressively more severe reductions in water supply for the farms, communities, and ecosystems served by our member agencies, with little measurable population-level benefit to species listed under the ESA.

Action 5 was developed to operate the CVP in accordance with *Executive Order 14181 – Emergency Measures to Provide Water Resources in California and Improve Disaster Response in Certain Areas,* dated January 24, 2025 (E.O. 14181), and does so by modifying components included in Alternative 2 in the 2024 LTO Final Environmental Impact Statement ("EIS"). Action 5 operates the CVP to deliver more water to high-need communities by increasing storage and conveyance. Specifically, Action 5: (1) removes the Delta Smelt Summer and Fall Habitat Action ("Fall X2"), (2) removes the Early Implementation Measure of the Delta export reduction of the Healthy Rivers and Landscapes ("HRL") Program, and (3) updates Delta operating criteria and governance.

Water Supply and Species Impacts

Importantly, the changes proposed by Action 5 are anticipated to improve water supply deliveries for south-of-Delta CVP and SWP contractors by an average of 129,000 acre-feet annually, or the equivalent of enough water to support approximately 258,000 households or 36,860 acres of farmland. Importantly, this increased water supply trend holds true for critical and dry years, years when additional water available for deliveries is at its highest value. Action 5 improves water supply conditions without modifying the Proposed Action in a manner that causes an effect to winter-run Chinook salmon or its critical habitat, to spring-run Chinook salmon or its critical habitat, to California Central Valley steelhead species or its critical habitat, to green sturgeon or its critical habitat, or to Southern Resident Killer Whale that were not considered in the National Marine Fisheries Service's 2024 LTO Biological Opinion. We understand that similar findings regarding the effects of Action 5 were made in Reclamation's review of aquatic and terrestrial species covered under the U.S. Fish and Wildlife Service's 2024 LTO Biological Opinion.

Delta Smelt Summer and Fall Habitat Action (Fall X2)

The Water Authority has a long history of investments in research designed to reduce the uncertainties associated with the effects of management actions on listed species in the Delta. One management action that has significant water supply costs and little to no measurable impact on listed species has been the implementation of the Fall X2 action. The U.S. Fish and Wildlife Service ("FWS"), in its 2024 LTO Biological Opinion, determined that Fall X2 is not anticipated to have observable effects on delta smelt survival. We thank the FWS for its acknowledgment of the scientific record and support the removal of Fall X2 in the Proposed Action included as Action 5.

Adaptive Management and Future Operations

The 2024 LTO included a framework for adaptive management of the CVP and SWP in response to the development of new scientific information and analytical tools. The Water Authority supports the expedited development of information and/or modeling tools to analyze the population-level effects of various project operations, including further analysis of the impacts of various operational scenarios on winter-run Chinook salmonid cohort replacement rates, and expediting the development of juvenile population estimates for spring-run chinook salmon and longfin smelt. The development and use of these tools will lead to improved analysis that has the potential to further inform operations in the future and we support coordination with CVP contractors and the scientific community to advance these efforts.

Conclusion

The Water Authority and its member agencies have long supported operating the CVP and SWP in a scientifically supported, adaptive manner that is responsive to real-time conditions and we view Action 5 as a further step towards implementing that vision. We commend Reclamation for

its work in analyzing this proposed change to operations of the CVP and SWP and for advancing efforts to improve water supply conditions in response to E.O. 14181 in a manner that can be implemented for operations in the current water year.

Thank you for your continued leadership on improving operations of the CVP. If you have any further questions, please reach out to J. Scott Petersen, Water Policy Director, at scott.petersen@sldmwa.org.

Sincerely,

Federico Barajas
Executive Director
San Luis & Delta-Mendota Water Authority

Christopher White
Executive Director
San Joaquin River Exchange Contractors Water Authority

cc:
The Honorable Alex Padilla, U.S. Senate
The Honorable Adam Schiff, U.S. Senate
The Honorable Jared Huffman, Ranking Member, House Committee on Natural Resources
The Honorable Harriet Hageman, Chair, House Subcommittee on Water, Wildlife, and Fisheries
The Honorable Val Hoyle, Ranking Member, House Subcommittee on Water, Wildlife, and Fisheries
The Honorable Josh Harder, U.S. House of Representatives
The Honorable Mark DeSaulnier, U.S. House of Representatives
The Honorable Adam Gray, U.S. House of Representatives
The Honorable Eric Swalwell, U.S. House of Representatives
The Honorable Sam Liccardo, U.S. House of Representatives
The Honorable Ro Khanna, U.S. House of Representatives
The Honorable Zoe Lofgren, U.S. House of Representatives
The Honorable Jimmy Panetta, U.S. House of Representatives
The Honorable Vince Fong, U.S. House of Representatives
The Honorable David Valadao, U.S. House of Representatives

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Chapter 6 Environmental Enhancement

Introduction

The San Joaquin Valley has lost ecosystem health, function, and species composition in expansive areas of the Valley floor. With SGMA requiring extensive land repurposing to reduce water demands and efforts to close the water supply-demand gap in several Valley subbasins, opportunity arise to restore and rehabilitate natural land cover in efforts to recover native species, natural habitats, and landscape connectivity for both. Many of the landcover types have a water demand beyond natural precipitation. That demand should be quantified and water supplies and associated conveyance facilities should be identified and included in a water supply plan for the Valley. In addition, inclusion of landscape repurposing into a water plan itself modifies water demands -- decreasing them when irrigated land is being converted to native land cover and increasing them when grasslands are being converted to higher water-use purposes. The latter may result in less water being available for other purposes in certain subbasins. Inclusion of ecosystem needs is especially important in a water plan for the Valley where additional conveyance capacity needs to be provided to meet the needs of restored ecosystems. To be effective and efficient, large-scale ecosystem restoration in the San Joaquin Valley needs to be strategic, drawing on sound ecological principles and building on prior environmental planning efforts.

The purpose of this chapter is to identify and quantify the water needs for environmental purposes in the San Joaquin Valley and to outline the opportunities that exist for meeting those needs in the context of conservation plan for the Valley.

A component of this report involves identifying where repurposing of agricultural lands is appropriate to support a return to natural landcovers and connections between those areas necessary to facilitate dispersal of animals and plants. That effort is essential to guide an overall water plan that meets the agricultural needs, ecological requirements, and economic realities of the San Joaquin Valley. In this report, a four step process is followed (Figure 4.1). The process requires --

1. Understanding and documenting predevelopment conditions and available resources. Knowledge of past and present landcover is essential for building a realistic conservation plan. This chapter begins with an overview of the pre-settlement landcover in the San Joaquin Valley and how land use has changed over the past almost two centuries to help understand where restoration of specific landcover types may be most feasible.

2. Establishing Valley-wide objectives based on reviews of earlier work. An ambitious objective of the environmental vision is to delist all species of concern and avoid future listings under federal and state Endangered Species Acts, with those species recovered to the demographic state where their persistence is no longer threatened. With SGMA implementation resulting in substantial land repurposing, this section of the chapter provides an overview of the opportunities for ecosystem enhancement. It reviews some of the considerable assessment and planning that has already been

completed, providing foundational guidance for plan development. Leveraging previous restoration studies is efficient and fosters collaboration.

3. Designing connectivity/landscape linkages. Connectivity is essential to maintaining demographic stability and genetic diversity in species of concern, as well as species composition in lands committed to natural cover and condition. In this section, a connecting network of landcover types draws on ecological principles, recognizing the historical context and available resources presented in step 1 (Figure 4.1). A network of corridors, core areas, and specialty reserves can then be transposed from a Valley-wide planning level to a regional level for area-specific conservation planning and to the subbasin level for water planning.

4. Analysis, assessment, and review. The water-supply plan to meet environmental needs emerges from the above programmatic approach. Once the estimated change in landcover types necessary to meet ecological objectives has been calculated, it is then possible to quantify projected changes in the water-supply-demand gap and explore opportunities to meet those water-allocation needs in the water-supply plan. .

This chapter begins with Steps 1 and 2 – necessary steps to identify environmental water supply needs in the Valley. Also considered in this chapter is the identification of opportunities for ecosystem conservation and restoration, which is a component of Step 3. The completion of the above process occurs in the final chapter of this report where a better understanding of the land to be retired by subbasin is considered.

There is also an essential fifth step for a conservation plan – plan implementation – the specifics of which are not included in this report. Successful implementation of a conservation plan would begin with governance and leadership both at a Valley-wide level and for each ecological jurisdiction, with the thought that the protected areas and the areas to be restored would be divided into a comprehensive set of jurisdictional areas. Each jurisdictional area would establish measures for success, including abundance and habitat targets for species of concern, and acreage of different land types to be restored. Those targets, summed across jurisdictional areas should meet the Valley-wide objectives established in step 2 above. Having set regional targets, work plans would need to be developed, prioritized and undertaken as funding becomes available. Progress towards objectives should be evaluated within an adaptive resource management framework, wherein the effectiveness of measures and activities are evaluated for monitoring data, and program activities are adjusted where expected results are not being achieved. (see ESA 2025, Section 5.2)

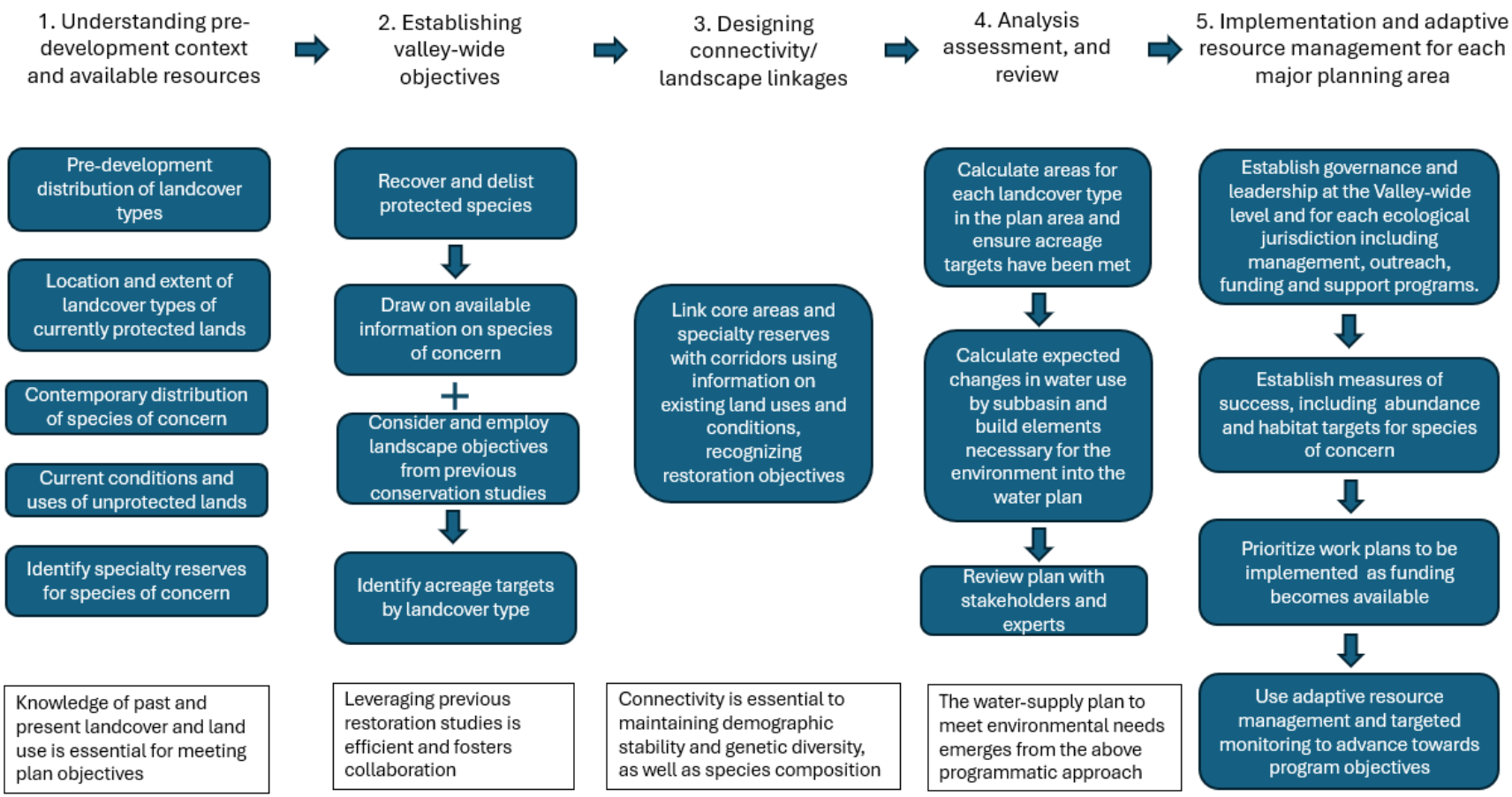


Figure 6-1. The process for developing a conceptual conservation plan for the San Joaquin Valley

Historic and Current Conditions

Environmentally, the San Joaquin Valley is very different from what it was 170 years ago (Figure 4.2). Historic natural, native ecosystems have diminished significantly in extent and some dominant landscape features, including Tulare Lake and the persistent wetlands in the southern Valley no longer exist (Table 4.1, Figure 4.3). As a result, 30 species of animals and 20 species of plants native to the Valley floor have experienced significant habitat loss and are listed as threatened or endangered , with the number of listed varying regionally (Tables 4.2, 4.3, 4.4).

Table 6-1. Current and Historic Landcover in the San Joaquin Valley

Landcover Category	Current Landcover Type Extents (Acres)	Historic Landcover Type Extents (Acres)	Change (Acres)	Change (Square Miles)
Agriculture	5,763,182		5,763,182	9,005
Urban	541,418		541,418	846
Alkali Desert Scrub	86,761	1,527,521	-1,440,760	-2,251
Chaparral	32,317	3,469	28,847	45
Grassland	2,650,489	4,814,106	-2,163,617	-3,381
Riparian and Floodplain Habitats	21,566	1,463,877	-1,442,311	-2,254
Valley/Foothill Hardwood	126,691	93,116	33,575	52
Water	78,117	186,051	-107,934	-169
Wetland	76,830	1,289,384	-1,212,554	-1,895

Source: Central Valley Historic Mapping Project, Chico State, 2003; Fire and Resource Assessment Program (FRAP), 2002

Table 6-2. Listed Animals of the San Joaquin Valley Floor

Common Name	Scientific Name	State Status	Federal Status	Ecosystem
Birds				
California Condor	*Gymnogyps californianus*	E	E	Grasslands, oak savanna [D]
Greater Sandhill Crane	*Grus Canadensis tabida*	T	N	Emergent wetlands, grasslands
Least Bell's vireo	*Vireo bellii pusillus*	E	E	Riparian woodland
Southwestern Willow Flycatcher	*Empidonax traillii extimus*		E	Riparian woodland
Swainson's hawks	*Buteo swainsoni*	T	N	Riparian & grassland
Tricolored Blackbird	*Agelaius tricolor*	T	N	Emergent wetlands, grain fields
Western Yellow-billed Cuckoo	*Coccyzus americanus*	E	T	Riparian
Western Snowy Plover	*Charadrius nivosus nivosus*	N	T	Wetlands
Fish				
Delta smelt	*Hypomesus transpacificus*	E	E	Estuarine

Steelhead	*Oncorhynchus mykiss*	N	T	Riverine
Chinook salmon (fall run)	*Oncorhynchus tshawytscha)*	T	T	Riverine
Longfin smelt	*Spirinchus thaleichthys*	T	N	Estuarine
Green Sturgeon	*Acipenser medirostris*		T	Riverine
Reptiles				
Blunt-nosed Leopard Lizard	*Gambelia sila*	E	E	Arid uplands
Giant Garter Snake	*Thamnophis gigas*	T	T	Wetlands
Northwestern Pond Turtle	*Actinemys marmorata*	N	T	Aquatic & wetlands
Amphibians				
California Tiger Salamander (central California DPS)	*Ambystoma californiense*	T	T	Aquatic & upland [D]
Invertebrates				
Conservency Fairy Shrimp	*Branchinecta conservatio*	N	E	Vernal pools [D]
Longhorn Fairy Shrimp	*Branchinecta longiantenna*	N	E	Vernal pools [D]
Monarch Butterfly	*Danaus plexippus*	N	PT	
Valley Elderberry Longhorn Beetle	*Desmocerus californicus dimorphus*		T	Riparian
Vernal Pool Fairy Shrimp	*Branchinecta lynchi*	N	T	Vernal pools [D]
Vernal Pool Tadpole Shrimp	*Lepidurus packardi*	N	E	Vernal pools [D]
Mammals				
Buena Vista Lake Shrew	*Sorex ornatus relictus*	N	E	Riparian [D]
Fresno Kangaroo Rat	*Dipodomys nitratoides exilis*	E	E	Upland [D]
Giant Kangaroo rat	*Dipodomys ingens*	E	E	Grasslands
Riparian Brush Rabbit	*Sylvilagus bachmani riparius*	E	E	Riparian
San Joaquin Kit Fox	*Vulpes macrotis mutica*	T	E	Upland
Riparian Woodrat	*Neotoma fuscipes riparia*	N	E	Riparian woodland
Tipton Kangaroo Rat	*Dipodomys nitratoides nitratoides*	E	E	Upland

Source: State and Federally Listed Endangered and Threatened Animals of California

IPac IPaC: Explore Location resources

Notes:

Aquatic – ponds, lakes with emergent wetland perimeter

Estuarine – Water bodies where the rivers meet the sea. In the San Joaquin Valley it refers to the Sacramento-San Joaquin Delta.

Grassland - Land on which the natural dominant plant forms are grasses and forbs.

Riverine – a natural body of running water sufficiently deep for fish passage

Uplands – Land on the Valley floor that is unlikely to flood

Vernal pools – seasonal depressional wetlands resulting from rainfall

Wetland - Areas such as marshes or swamps that are covered often intermittently with shallow water or have soil saturated with Moisture

DPS – Distinct Population Segment

E – endangered

N – not listed or information not available

PT – potentially threatened

T- threatened
[D] Indicates critical habitat designated in the San Joaquin Valley.

Table 6-3. Listed Plants of the San Joaquin Valley Floor

Common Name	Scientific Name	State Status	Federal Status	Ecosystem*
Bakersfield Cactus	*Opuntia basilaris var. treleasei*	E	E	sandy soils, arid grassland
California jewelflower	*Caulanthus californicus*	E	E	Grasslands & scrub
Chinese Camp Brodiaea	*Brodiaea pallida*		T	Vernally flooded riparian
Colusa Grass	*Neostapfia colusana*		T	Alkaline basins [D]
Fleshy Owl's-clover	*Castilleja camestris ssp. succulenta*		T	Vernal pools
Greene's Tuctoria	*Tuctoria greenei*		E	Vernal pools [D]
Hairy Orcutt Grass	*Orcuttia pilosa*		E	Vernal pools [D]
Hartweg's Golden Sunburst	*Pseudobahia bahiifolia*		E	Grassland
Hoover's Spurge	*Chamaesyce hooveri*		T	Vernal pools [D]
Hoover's Woolly-star	*Eriastrum hooveri*		T	arid grassland & scrub
Ione Manzanita	*Arctostapphylos myrtifolia*		T	Woodland foothills
Keck's Checker-mallow	*Sidalcea keckii*		E	Grasslands [D]
Kern mallow	*Eremalche kernensis*		E	arid grassland & scrub
Large Flowered Fiddleneck	*Amsinckia grandiflora*		E	Grassland
Palmate-bracted Bird's-Beak	*Cordylanthus palmatus*	E	E	alkaline grasslands
Red Hills Vervain	*Verbena californica*		T	grasslands
San Joaquin Adobe Sunburst	*Pseudobahia peirsonii*		T	Grassland and oak woodland
San Joaquin Valley Orcutt Grass	*Orcuttia inaequalis*		T	Vernal Pools [D]
San Joaquin woolly-threads	*Lembertia congdonii*		E	arid grassland & scrub
Springville Clarkia	*Clarkia springvillensis*		T	Oak woodland

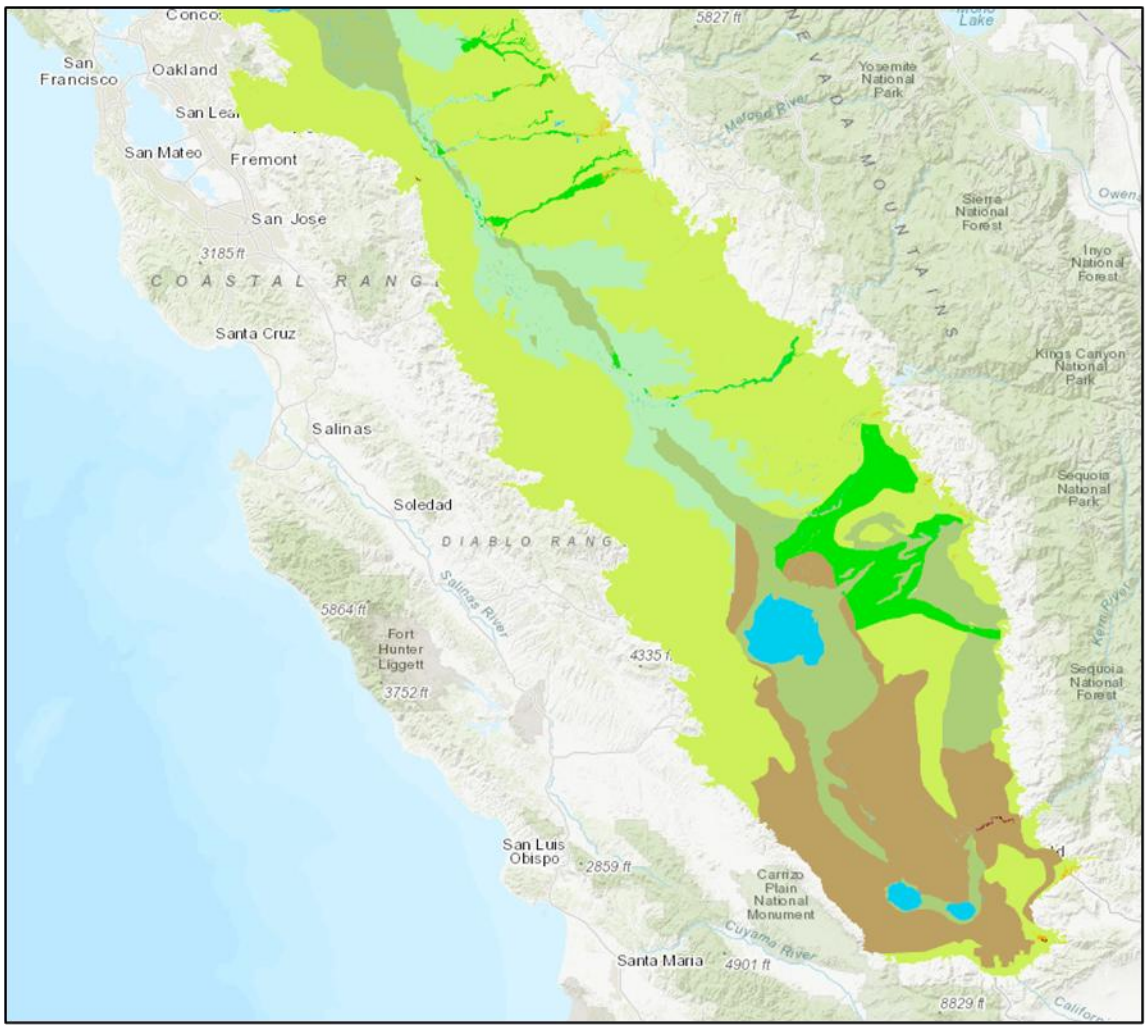
Source: State and Federally Listed Endangered and Threatened Animals of California
Notes: See notes under Table 4.2

Table 6-4. Number of Listed Species by County in the San Joaquin Valley

County	Number of Listed Plant Species	Number of Listed Animal Species
San Joaquin	3	11
Stanislaus	6	10
Merced	5	13
Madera	6	11
Fresno	12	23
Kings	1	10

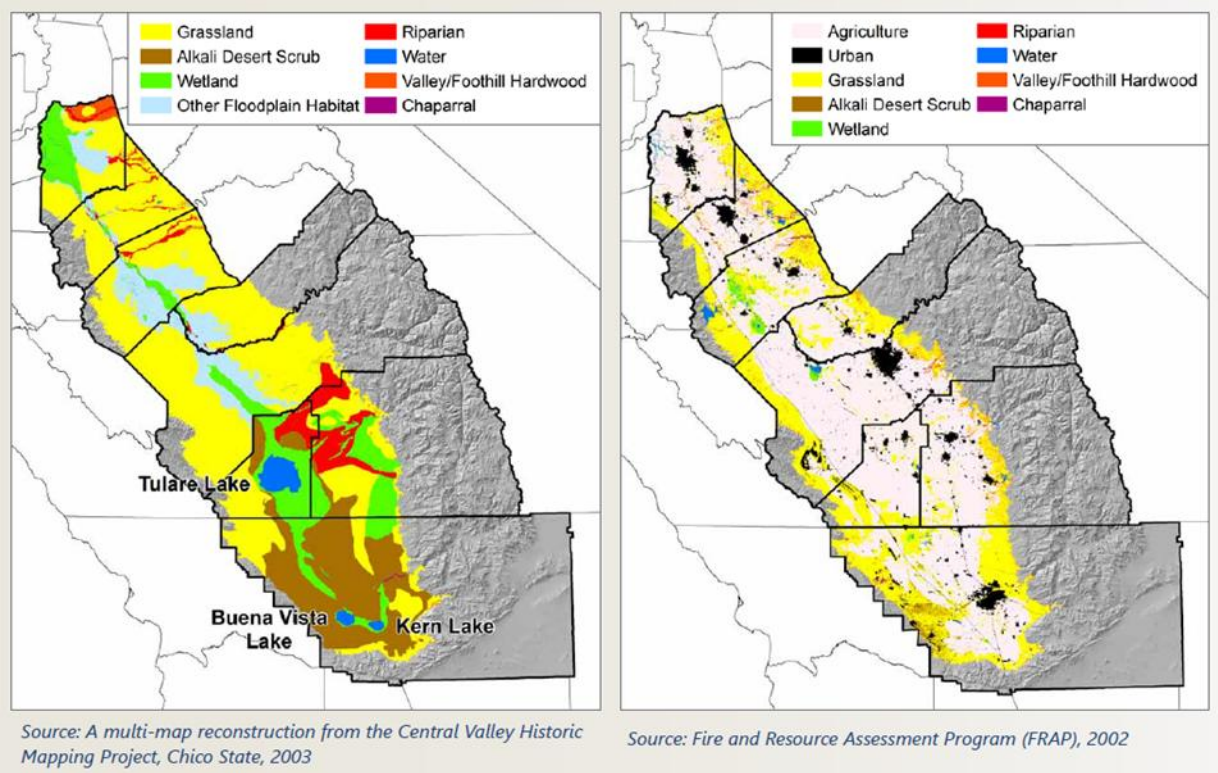
Tulare	10	14
Kern	11	19

Source: Thorne et al (2014), Chapter 4, Table 4



Source: Maps | Data Basin

Figure 6-2. San Joaquin Valley Pre-1900 Historic Vegetation Base Map



Source: Greenprint Figures 4 and 5

Figure 6-3. 3 Historic Landcover Patterns circa 1850 (left), and 2002 Landcover Patterns (right)

Landcover Types of the San Joaquin Valley Floor

Landcover of the San Joaquin Valley floor have been parsed into different categories by different ecologists -- but eight vegetation communities have wide extent and ecological importance: alkali scrub and saltbush, aquatic and permanent wetlands, floodplains, grasslands, riparian communities adjoining rivers and streams, wetlands that are intermittent, woodlands, and vernal pools. Each provides habitat for a wide range of species (Table 4.5) To that list are added the forest lands on the upper watersheds. They are included here because forest management in the upper watersheds greatly affect water supplies reaching the Valley floor.

Alkali scrub

Alkali scrub surrounded the receding shores of large prehistoric lakes or alkali playas that mark the locations of dry lake beds (Fowler and Koch 1982). Alkali scrub vegetation typically occurs at lower- to middle-Valley elevations, often interdigitated with other arid and semiarid plant communities and wildlife habitats. At lower elevations, alkali scrub may occur in patches on barren salt flats and in desert scrub. In the San Joaquin Valley, alkali scrub borders on annual grassland habitat. In many locations, alkali scrub overlaps with perennial grassland (PGS) . Restoration of alkali scrub will occur primarily in the Tulare Lake hydrologic region based on its historical location and distribution (Figure 4.2). Alkali desert soils are generally not suited for farming, therefore much alkali scrub restoration can be expected on land that is not currently farmed.

Aquatic Ecosystems

Aquatic ecosystems include lakes, ponds and permanent wetlands. "Permanent wetlands have standing surface water year-round and include both managed and unmanaged wetlands. They are too wet for most terrestrial vegetation and tend to undergo wet and dry cycles due to fluctuating water levels. Presently, more than 90% of wetlands in the Central Valley are managed, two-thirds of which are in private ownership." (CLCC 2018). Restoration of permanent wetlands and aquatic ecosystems should primarily occur as development of small areas -- less than 50 acres -- throughout the Valley in addition to restoring one thousand or more acres of the historic Tulare Lake footprint.

Floodplains

Stream and river flows that exceed channel conveyance capacity inundate floodplains. Floodplain inundation deposits sediment, facilitates establishment of riparian vegetation, provides for wildlife and fish habitats and other benefits, including additional food resources for fish. Many native wildlife and fish species are dependent on or benefit from inundated floodplains. The floodplain of the San Joaquin River has been greatly reduced compared to its historical extent (CALFED 2000b). From the Chowchilla Bypass to Mendota Dam, berms and levees locally constrain the river and minimize the area of inundated floodplain. In addition, riparian forests have declined by more than 50 percent and riparian scrub by more than 80 percent from 1937 to 1993 (Jones & Stokes 1998). That loss of inundated floodplain and riparian vegetation contributes to a loss of animal and plant habitats and reduced habitat conditions along that section of the San Joaquin River.

Availability of floodplain habitat is essential in the life cycles of many listed species. For one example within the San Joaquin River Basin, about one third of the documented occurrences of Delta coyote-thistle have been extirpated primarily from conversion of riparian vegetation to other land-cover types (Jones & Stokes 2002; CNDDB 2001). Streams and their riparian zones are ecosystems closely linked by flows of organic and inorganic materials, movements of organisms, and are strongly influenced by the exchange of materials, such as nutrients, leaves, and woody debris (Likens & Bormann, 1974; Hynes, 1975). Inundating the floodplain is key to providing organic nutrients to the river ecosystem. Inundated floodplains provide cover, food, and warmer temperatures from late winter through early spring (CDFW 2014). Floodplains provide important benefits to riverine productivity. Typically restoration of floodplains requires the repurposing of agricultural land. The greatest benefits from floodplain restoration will likely occur in the San Joaquin hydrologic region.

Grasslands

"Central Valley grasslands are open grasslands that support a diversity of annual and perennial plant species. These grasslands are characterized by winter precipitation and seasonal summer drought and exhibit high temporal and spatial diversity (Lulow & Young 2011a; Bartolome et al. 2014; Spiegal et al. 2014)."(CLCC 2018). Historically, grasslands habitat dominated the Valley floor north of the Kings River (Figure 4.2). They provide landscape corridors between other ecosystems, buffers for riparian corridors, and foraging habitat for a number of species.

Riparian Ecosystems

"Riparian vegetation/natural riverbank refers to the vegetation that grows along the shores of freshwater rivers and lakes as well as the meander-belt processes that shape this dynamic habitat. As a river meanders, the bank on one side erodes while sediments accumulate on the opposite side,

destroying old habitat and creating new substrate to be colonized, creating a constant succession of vegetation types adapted to this dynamic process. Riparian vegetation is commonly characterized by willow (Salix spp.), mulefat (Baccharis pilularis), Fremont cottonwood (Populous fremontii), Valley oak (Quercus lobata), white alder (Alnus rhombifolia), California bay-laurel (Umbellularia californica), sycamore (Platanus racemosa), and walnut (Juglans californica), depending on location" (CLCC 2018). Restoration of riparian and riparian-woodland habitat is naturally suited along existing rivers and streams. Riparian corridors are key landscape components in maintaining biological connections along extended and dynamic environmental gradients (Naiman et al. 2005). Continuous riparian habitat provides natural corridors to facilitate species movement; however, those lands tend to be expensive to obtain because they generally have fertile soils and reliable water rights.

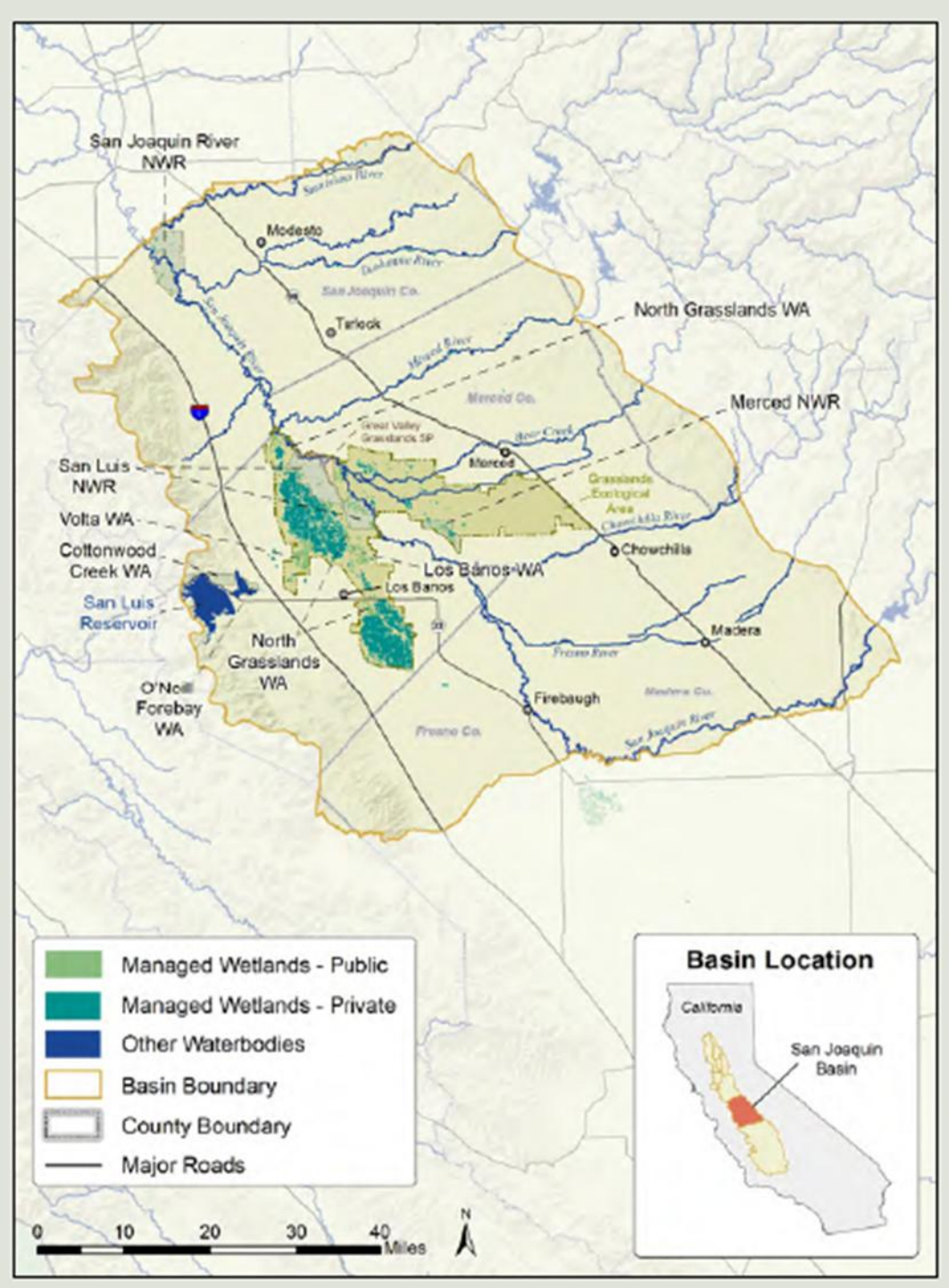
Vernal Pools

"Vernal pools and swales are ephemeral wetlands that form in landscape depressions where soil characteristics limit water infiltration. Vernal pools are characterized by a wet period in winter, drying during spring, and complete desiccation during late spring and summer. Swales connect or feed vernal pools but typically experience less extensive inundation. This unique habitat is home to highly specialized plants, animals, and insects, many of them endemic to the region and listed as threatened or endangered." (CLCC 2018). In 2018 there were approximately 207,000 acres of vernal pool grassland (Figure 4.6) of which 125,500 acres were estimated to be protected (USFWS) . The goal in this Conservation Plan is to protect existing vernal pools in the context of a wider conservation strategy.

Seasonal Wetlands

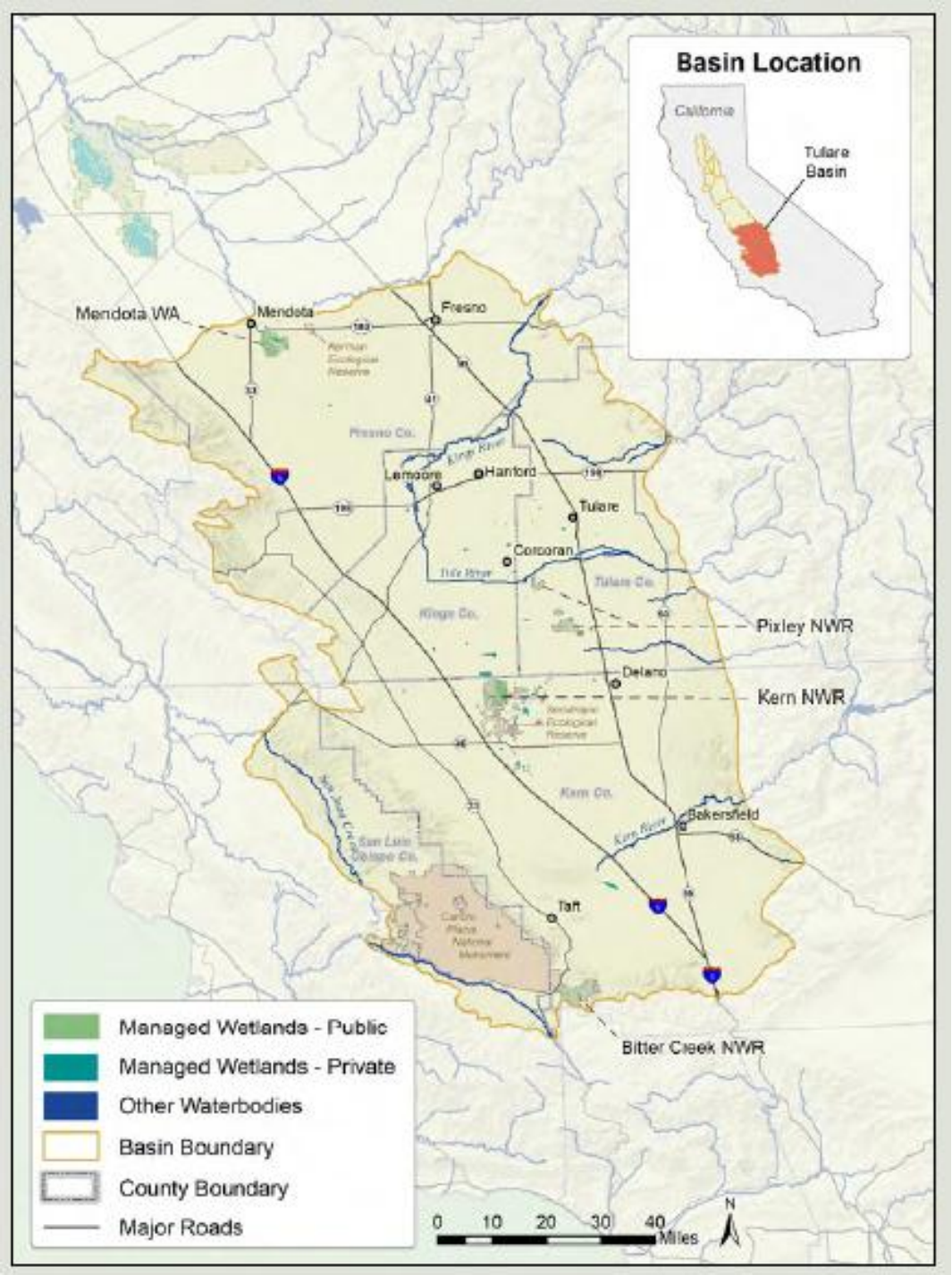
"Seasonal wetlands are inundated during part of the year; most are managed by flooding, disking, and burning. Typical hydrological cycles include fall flooding and drawdown in the spring followed by irrigation to maintain soil moisture. Seasonal wetlands are dominated by herbaceous vegetation, including sedges (Carex spp.), rushes (Eleocharis spp. and Scirpus spp.), bulrushes (Schoenoplectus spp.), cattails (Typha spp.), and other emergent hydrophytic species. Species composition is determined partially by water depth, and many wetlands are managed for seed production of swamp Timothy (Heleochloa schenoides) and smartweed (Polyganum spp.; Ortega 2009)." Around 94% of the historic wetland habitat in the San Joaquin Valley has been lost (Table 4.1). Most of the historic wetland habitat occurred along the old Kern River, which ran through Kern Lake and Buena Vista Lake, around Tulare Lake, and along the San Joaquin River. Those wetlands provided important habitat for waterfowl. The locations of remaining wetlands are depicted in Figure 4.4 and 4.5. Analyses in Chapter 2 indicate that around 135,000 acres of recharge facilities are needed to capture surplus local water supplies. The need for additional recharge facilities will determine new wetland acreage requirements in most of the subbasins. To maximize environmental benefits, these recharge ponds could be designed and operated as multi-purpose ponds – that is, providing habitat as well as recharge. The more effective recharge lands are generally located east of the Corcoran Clay on river fans resulting in a geographic shift of wetland locations from historic conditions.

Estimates of remaining wetlands in the San Joaquin Valley vary from 58,000 acres (CVJV 2020, Table 7.9) to 77,000 acres (Thorne et al. 2014, See Table 4.7).



Source: CVJV (2020) Figure 4.1.10

Figure 6-4. Managed wetlands in the San Joaquin Hydrologic Region



Source: CVJV (2020) Figure 4.1.11

Figure 6-5. Managed wetlands in the Tulare Lake Hydrologic Region

Source Vollmar et al (2023)

Figure 6-6. General Locations of Vernal Pools in the San Joaquin Valley

Valley Woodlands

"Oak woodlands in the Central Valley include Valley oak woodlands, blue oak woodlands, and blue oak-foothill pine woodlands. These vegetation types often grade into each other, with Valley oak woodlands occurring at the lowest elevations, and blue oak-foothill pine woodlands occupying higher elevations in the foothills." (CLCC 2018). Most of the woodland habitat restoration is expected to occur in the foothills surrounding the Valley floor. While that acreage could be large, the restoration target for the Valley floor is relatively small in this analysis.

Forests of the Upper Watersheds

While this report focuses on water management on the Valley floor, the majority of the water in the Valley originates in the watersheds above the Valley floor.

"The Sierra Nevada contains the headwaters of 24 major river basins, with the majority of the runoff being on the west side and draining into the Central Valley. Most of these are east-west trending watersheds that dissect the Sierra into steep canyons. The major vegetation zones of the Sierra form readily apparent large-scale elevational patterns. A broad conifer zone begins at 300-900 m (1000-3000 feet) elevation on the west and 900-1500 m (3000 -5000 feet) on the east side. Under pre-European conditions, fires and other disturbance events regularly burned patches of trees, leaving openings that passed through continuous but distinctive phases as they aged. This succession of a forest through time between major disturbances is important for plants and animals that use different stages as habitat. Within the last 100 years, human influence increased in which resource use was more regulated and forest and range protection was emphasized. Suppression of fires became a primary goal of federal, state and private efforts (Fites-Kaufmann et al. 2007)."

There is a potentially manageable connection between the upper-watershed forest management and the quantity and quality of water reaching the Valley floor. "Fire suppression and logging practices in the Sierra Nevada have resulted in large areas of forest that are overly dense with small trees and brush. Large-scale forest and meadow restoration is needed across the Sierra Nevada to reduce the risk of mega-fires and improve ecosystem health. Mega-fire are large, severe wildfires that burn larger and hotter than historic fires, and have more lasting unwanted human, economic, and environmental consequences."

Table 6-5. Species Associated with San Joaquin Valley Landcover Types

Landcover Type	Species/Groups of Interest
Alkali scrub & saltbush	San Joaquin kit fox (E), blunt nose leopard lizard (E), kangaroo rats (E), Bakersfield cactus (E), California jewelflower (E), Colusa grass (T), Hoover's woolly-star (T), Kern mallow (E), palmate-bracted bird's beak (E), San Joaquin woolly-threads (E)
Aquatic and permanent wetlands	Wetland dependent reptiles and mammals, western pond turtle (T), wetland obligate plants, waterbirds and shorebirds, amphibians, dragonflies and damselflies, delta smelt (E), longfin smelt (T), California tiger salamander (T)
Floodplains	Salmonids (T), green sturgeon, river otter, American beaver, common muskrat, American mink, Chinese Camp Brodiaea (T)

Grasslands and uplands	Tule elk, mule deer, pronghorn, bobcat, gray fox, burrowing mammals (ground squirrel, kangaroo rats (E), San Joaquin kit fox (E), American badger), bumblebees and pollinators, California condor (E), Swainson's hawk (T), California jewelflower (E), Hartweg's golden sunburst (E), Keck's checker-mallow (E), large flowered fiddleneck (E), red hills vervain (T), San Joaquin adobe sunburst (T)
Riparian and river corridors	Riparian birds (yellow billed cuckoo, Least Bell's vireo (E), yellow warbler, black-headed grosbeak, bank swallow, Southwestern willow flycatcher (E), Wilson's warbler, yellow breasted chat, wood ducks), Swainson's hawk (T), amphibians (Foothill Yellow-legged frog, California Red-legged frog, California tiger salamander), giant garter snake (T), riparian brush rabbit (E), riparian wood rat (E), Buena Vista Lake shrew (E), Valley elderberry longhorn beetle (T), steelhead (T), chinook salmon (T), green sturgeon (T). Vegetation is commonly characterized by willow, mulefat, cottonwood, Valley oak, white alder, California bay-laurel, sycamore, and walnut.
Wetlands (seasonal)	Waterbirds and shorebirds such as gadwall, mallard, black-necked stilts, American avocet, and killdeer, tricolored blackbird (T), greater sandhill crane (T), western snowy plover (T), tule elk, giant garter snake (T). Dominant herbaceous vegetation includes sedges, rushes, bulrushes, cattails
Woodlands	Valley oak, yellow billed magpie, mule deer, bobcat, gray fox, burrowing mammals, cavity nesters and roosters (owls woodpeckers, nuthatches, wrens, tree swallows, bluebirds, wood ducks), lone manzanita (T), San Joaquin adobe sunburst (T), Springville clarkia (T)
Vernal Pools	Fairy shrimp (E), tadpole shrimp (E), fleshy owl's-clover (T), Greene's tuctoria (E), hairy Orcutt grass (E), Hoover's spurge (T), San Joaquin Valley Orcutt grass (T)

Notes:

(E) – state or federally listed as endangered

(T) – state or federally listed as threatened

Currently Protected Lands

Currently protected lands form the foundation of an environmental restoration program for the San Joaquin Valley. They provide the core areas from which ecosystems can be expanded and connections to other areas established. These lands include 1) government owned land such as national wildlife refuges, ecological reserves and wildlife areas managed by the California Department of Fish and Wildlife, and State Recreation areas managed by California Department of Parks.; 2) lands with conservation easements and protections such as lands governed by habitat conservation plans, and 3) land owned by environmental organizations such as Wind Wolves Preserve. The existing inventory of these lands in the Valley exceeds 350,000 acres (Table 4.6).

Table 6-6. Large Blocks and Core Areas of Protected Natural Lands

Map Label	Core Areas	Acres	Landcover Types
	Alameda County		
1	Bethany Reservoir State Recreation Area	608	Aquatic, grasslands
	Fresno County		

2	Kerman Ecological Reserve	1,800	Grasslands with some vernal pools, alkali scrub
3	Little Panoche Reservoir Wildlife Area	828	Aquatic, shrub and grasslands
4	Mendota Wildlife Area & Alkali Sink Ecological Reserve	12,730	Seasonal wetlands, grasslands
5	Pleasant Valley Ecological Reserve	1,200	Grasslands and saltbush
	Upper San Joaquin River Ecological Area		
	Big Table Mountain Ecological Reserve	1,000	Grasslands and volcanic vernal pools
	Millerton State Recreation Area	4,900	Aquatic, riparian, grasslands
	San Joaquin River Ecological Reserve	958	Riparian
6	Subtotal	6,858	
	Kern County		
7	Buttonwillow Ecological Reserve	1,400	Alkali scrub and grasslands
8	Elk Hills	24,650	Alkali scrub and grasslands
9	Kern National Wildlife Refuge	11,249	Seasonal Wetlands
8	Kern Water Bank	20,600	Alkali scrub and grasslands, seasonal wetlands
10	Lokern Ecological Reserve	3,100	Saltbush scrub
9	Semitropic Ecological Reserve	14,900	Grasslands, alkali scrub
11	Tule Elk Reserve	960	Grasslands, seasonal wetlands
12	Windwolves Preserve	93,000	Grasslands, woodlands
	Merced County		
	Grassland Ecological Area:		
	George J Hatfield State Recreation Area	47	Riparian
	Great Valley Grasslands State Park	2,826	Grasslands, wetlands, riparian woodlands
	Los Banos Wildlife Area	6,275	Wetlands
	North Grasslands Wildlife Area	7,354	Wetlands, riparian, grasslands
	San Luis National Wildlife Refuge	26,800	Wetlands
13	Subtotal	43,273	
17	McConnell State Recreation Area	74	Riparian
18	Merced National Wildlife Refuge	10,200	Wetlands, grasslands, vernal pools, riparian
	San Luis Reservoir Ecological Area		
	Cottonwood Creek Wildlife Area	6,300	Woodlands, grasslands
	O'Neill Forebay Wildlife Area	700	Riparian, wetlands
	Pacheco State Park	6,890	Woodlands, grasslands
	San Luis Reservoir Wildlife Area	902	Woodlands, grasslands
	San Luis Reservoir State Recreation Area	64,000	Aquatic, woodlands, grasslands, aquatic
19	Subtotal	78,792	
20	Volta Wildlife Area	3,758	Wetlands and alkali scrub

21	West Hilmar Wildlife Area	346	Woodlands and grasslands
	San Joaquin County		
22	Woodbridge Ecological Reserve	354	Wetlands
	Stanislaus County		
23	Caswell Memorial State Park	258	Riparian woodland
24	Dos Rios State Park	1,563	Riparian, wetlands, grasslands
25	San Joaquin River National Wildlife Refuge	7,300	Riparian woodlands, grasslands, wetlands
26	Turlock Lake State Recreation Area	3,500	Grasslands, aquatic
	Tulare County		
	Pixley Ecological Area		
	Allensworth Ecological Reserve	5,100	Alkali scrub and saltbush
	Colonel Allensworth State Historic Park	240	Alkali scrub and saltbush
	Pixley National Wildlife Refuge	6,939	Seasonal Wetlands
27	Subtotal	12,279	
28	Stone Corral Ecological Reserve	981	Vernal pool, wetlands
	Total	356,634	ac

Specialty Reserves

USFWS (1998) recognized the need to include specialty reserves as a necessary part of the proposed habitat protection network. They are important for recovery of certain species with highly restricted geographic ranges or specialized habitat requirements. These reserves may be small areas surrounded by developed land, or they may be portions of larger conservation areas that require special management.

Table 6-7. Natural Lands Targeted for Protection and Specialty Reserves.

Map Symbol	Location	Species of Interest
1	Springtown Alkali Sink	Palmate-bracted bird's-beak
2	Lower Stanislaus River	Riparian brush rabbit, riparian wood rat,
4	SJR Riparian Community	Riparian brush rabbit, riparian wood rat, San Joaquin kit fox
5	Lemoore Naval Air Station	San Joaquin kit fox, blunt nose leopard lizard,
6	North of Tulare Lake Bed	San Joaquin kit fox, blunt nose leopard lizard,
7	Granite Station	Bakersfield cactus
8	Devils Den Area	Bakersfield cactus, San Joaquin kit fox, blunt nose leopard lizard, Hoover's wooly star, Jared's peppergrass, California jewel flower, Tremblor buckwheat, short nose kangaroo rat, San Joaquin Le Conte's thrasher, Tulare grasshopper mouse, San Joaquin antelope squirrel
9	Lost Hills-Buena Vista Slough	Bakersfield cactus, San Joaquin kit fox, blunt nose leopard lizard, Hoover's wooly star, San Joaquin wooly threads, Lost Hills saltbush, Munz's tidy tips, short nose kangaroo rat, San Joaquin antelope squirrel
10	Jerry Slough to Hwy 58	Hoover's wooly star, lesser salt scale

11	Greater Bakersfield, North of Kern River	Bakersfield cactus, San Joaquin kit fox, blunt nose leopard lizard,
12	Fairfax Rd – Hwy 178	Bakersfield cactus
13	Kern Bluffs	Bakersfield cactus, San Joaquin kit fox, blunt nose leopard lizard, short nose kangaroo rat
14	Fuller Acres	Bakersfield cactus
15	Mouth of Kern Canyon	Bakersfield cactus
16	Cottonwood Creek	Bakersfield cactus
17	Bena Hills – Caliente Hills	Bakersfield cactus, Vazek's clarkia, California jewel flower, Comanche Point layia, Tejon poppy
18	Sand Ridge	Bakersfield cactus, short nose kangaroo rat, San Joaquin kit fox, San Joaquin wooly thread
19	Comanche-Tejon Hills	Bakersfield cactus, San Joaquin kit fox, blunt nose leopard lizard, Comanche Point layia, Tejon poppy, short nose kangaroo rat
20	Kern Lake – Gator Pond	Buena Vista Lake shrew, Bakersfield smallscale, Comanche Point layia
21	Mettler-Wheeler Ridge	Bakersfield cactus, San Joaquin kit fox, blunt nose leopard lizard, short nose kangaroo rat

Source: USFWS (1998), Table 8

Notes: Locations are shown in orange squares in Figure 4.8

Environmental Enhancement – Opportunities and Objectives

There are now immediate opportunities for substantial ecosystem restoration in the San Joaquin Valley. Even with maximum use of local supplies and increased exports from the Delta there is simply not enough water to sustain the current extent of irrigated lands in the San Joaquin Valley. Without a comprehensive conservation plan, retirement of agricultural land will result in a fragmented landscape of fallowed agricultural land, dust from fallowed land resulting in poor air quality, conditions for the proliferation of pests and weeds, and the continued decline of remnant native ecosystems. While uncoordinated retirement of irrigated lands can create certain problems, it also presents two key opportunities (Kelsey et al 2018). It provides for the reorganization and enhancement of landscape mosaics to restore and protect habitat needed for native species and serves as a means to eliminate the primary cause of land subsidence impacting infrastructure.

The San Joaquin Valley is home to a variety of natural land-cover types, including wetlands, grasslands, woodlands, and riparian communities where numerous species reside, including endangered species and species of conservation concern. The Valley is a critical component of the Pacific flyway for migratory birds. In addition, reconnecting floodplains with rivers provides flood protection and improves habitat extent and quality for aquatic species. The repurposing of irrigated lands in a coordinated manner can therefore provide substantial environmental benefits, restoring ecosystems that have diminished in size and have been deteriorating for a century and a half.

The ambitious objective of the environmental vision presented here is to restore and repurpose lands to provide environmental conditions that can enable the recovery and delisting of species of concern that inhabit the Valley by providing protected habitats of adequate extent and condition species of concern. A number of environmental initiatives have been undertaken or are underway in the Valley that provide informed components necessary to advance that objective. Nearly all of those projects will require some form of land re-purposing and many projects would require

repurposing of water supplies. Some of these are geographically specified, such as restoration projects undertaken by The Nature Conservancy, Ducks Unlimited, River Partners and the Groundwater Sustainability Agencies that are developing multi-benefit recharge basins.

At a broader scale, numerous planning efforts have already recognized needs and opportunities on lands requiring environmental restoration, providing helpful guidance to water planning for the Valley. Those efforts include work from the following organizations:

- A Conservation Strategy for restoration of the Sacramento-San Joaquin Delta, Sacramento Valley and San Joaquin Valley Regions (CDFW, USFWS, NOAA 2014).

- Willams et al. (1998) "The Endangered Species Recovery Program is a cooperative research program on biodiversity conservation in central California, administered at California State University, Stanislaus. The program was established in August 1992 at the request and with the support of the U.S. Fish and Wildlife Service and the Bureau of Reclamation, under the direction of Dan Williams at CSU Stanislaus. Over the past decade, ESRP has grown into a cooperative research program working with local, State, and Federal agencies, non-governmental organizations, corporations, and private landowners."

- The Tulare Basin Wildlife Partners (TBWP) was established in May 2005 to serve as a catalyst for protecting and restoring natural communities and is solely focused on creating integrated land and water management solutions in the Tulare Basin. About - Tulare Basin Watershed Network

- Conservation Strategy for Restoration of the Sacramento-San Joaquin Delta, Sacramento Valley and San Joaquin Valley Regions (ERP 2014) serves as a conceptual framework to guide environmental restoration, including development of conservation priorities and processes to identify and implement restoration opportunities, and monitoring to guide and improve its success in the Sacramento-San Joaquin Delta, and the Sacramento Valley and the San Joaquin Valley regions.

- San Joaquin Valley Greenprint (Thorne et al 2014). The San Joaquin Valley Greenprint was created as a voluntary, stakeholder-driven project to help the eight counties of the San Joaquin Valley create long-term environmental and economic sustainability in the face of challenges associated with economic growth, climate change and environmental protection and enhancement.

- Central Valley Joint Venture (2020). "The CVJV is one of 21 habitat-based Migratory Bird Joint Ventures in North America, all of which work to protect and restore bird habitat. The U.S. Fish and Wildlife Service (USFWS) provides guidance for the establishment and organization of Joint Ventures. The USFWS defines Joint Ventures as self-directed partnerships of agencies, organizations, corporations, tribes and individuals that have formally accepted the responsibility of implementing national or international bird conservation plans within a specific geographic area or for a specific taxonomic group and have received general acceptance in the bird conservation community for such responsibility

(USFWS 2005). The CVJV is a self-directed coalition consisting of 19 public and private organizations. For more than 30 years, the partnership has directed its efforts toward the common goal of meeting the habitat needs of migrating and resident birds in California's Central Valley".

- Sequoia Riverlands Trust is a regional nonprofit land trust dedicated to strengthening California's heartland and the natural and agricultural legacy of the southern Sierra Nevada and San Joaquin Valley. About Us — Sequoia Riverlands Trust

- Kaweah Groundwater Subbasin Regional Conservation Investment Strategy (ICF 2022) was developed to advance the conservation of focal species and their habitats, including working lands and natural communities, to sustain those species over time as environmental conditions in the planning area change.

- San Joaquin Valley Regional Conservation Investment Strategy (ESA 2025) is a conservation vision to help guide beneficial actions to improve region-wide species and habitat recovery efforts. It is a conservation planning tool to promote the conservation of species, habitats, and other natural resources in the San Joaquin Valley.

- California State Wildlife Action Plan (CDFW 2025) SWAP 2025 icludes conservation strategies that respond to current and future challenges with specific objectives and actions. The conservation strategies consider the anthropogenic pressures imposed by the legitimate need for food, housing, transportation, and recreation, taken together with the recognition of limited funding and time. The strategies focus on restoring ecological function and processes capable of withstanding the stresses imposed by a changing environment.

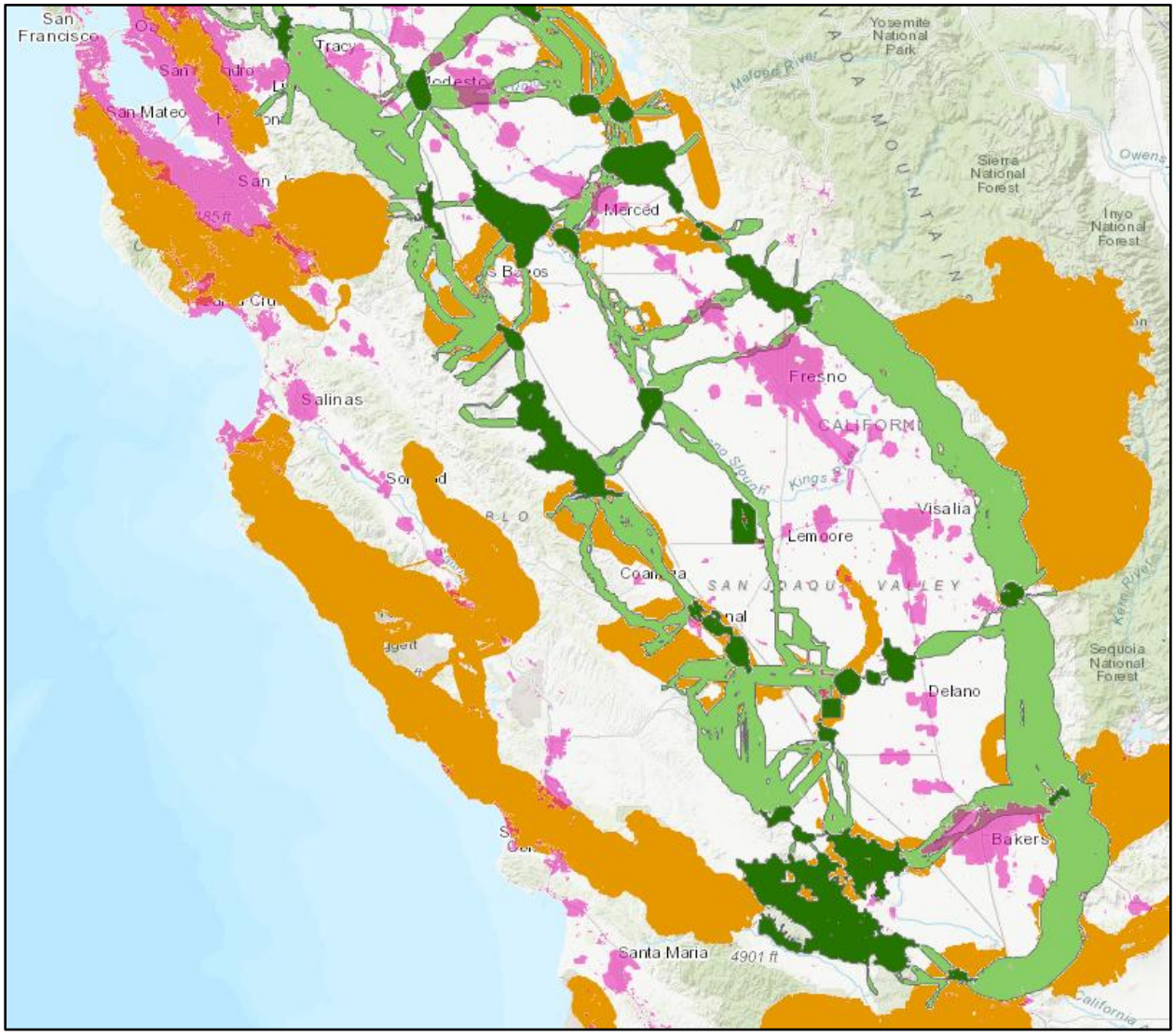
Most of these projects and programs recognize fundamental ecological principles including the establishment of core areas and connecting corridors (Huber et al. 2010, Figure 4.7, Tulare Basin Watershed Partnership). Landscape corridors provide linkages that allow terrestrial species to migrate through and to move from areas experiencing temporally adverse environmental conditions. Corridors also facilitate inter-mixing of otherwise separated populations, thereby maintaining genetic diversity within populations and species.

Collectively, work products from the above efforts offer support and planning opportunities that can be woven into a conceptual conservation plan for the San Joaquin Valley.

Acreage objectives by landcover type were specified in some of these efforts (Table 4.8) and vary, partly because they were focused on sub-areas of the whole Valley or because of their particular focus. Not included in Table 4.8 are the water requirements to meet in-stream flow requirements. Those are provided in Tables 2.3 for The San Joaquin River Restoration and Table 2.5 for the Healthy Rivers and Landscape program. Restoration of all habitats is needed to ensure the protection of endangered species listed above.

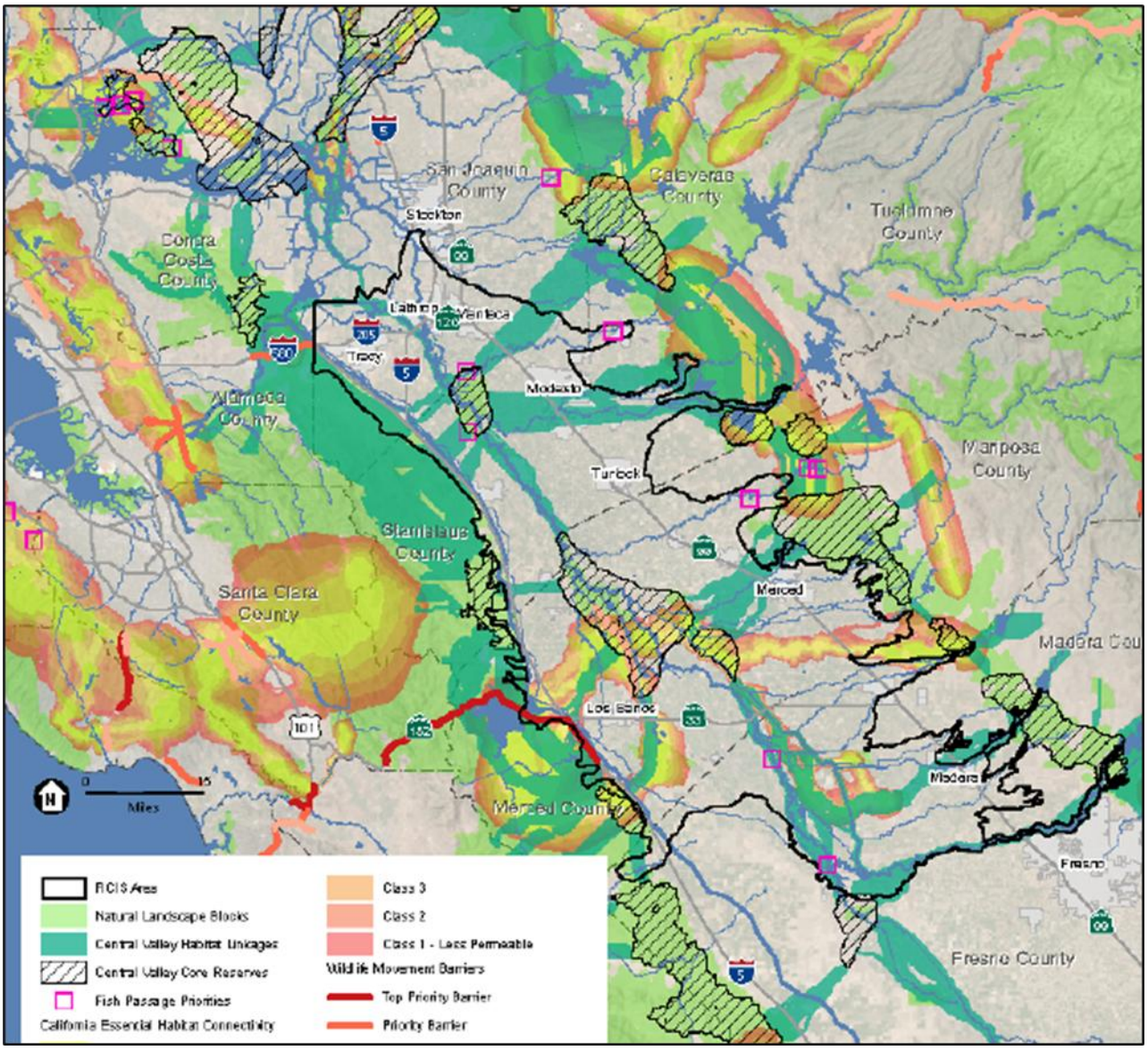
The Central Valley Joint Venture quantified targets for restoration of certain ecosystems. The Collaborative Action Program for the San Joaquin Valley is working on updating those targets. They

have not been published and are subject to further review, but the most recent objectives are provided in Table 4.8.



Source: Conservation Biology Institute (2020)

Figure 6-7. Candidate core areas and potential landscape corridors



Source: ESA (2025) Figure 2-7

Figure 6-8. Habitat Connectivity in the San Joaquin Hydrologic Region

Table 6-8. Restoration Goals by Habitat Type for the San Joaquin Valley (acres)

Landcover Type	CVFPP	CVJV	TNC	TBWP	RCIS	CAP	UVP Target
Focus of Scope for Acreages cited	San Joaquin River	Bird habitat	Upland habitat	Tulare Lake Hydrologic Region	San Joaquin Hydrologic Region	SJV floor	San Joaquin Valley floor
Alkali Desert Scrub			47,000	144,500	4,230	50,000	120,000
Aquatic & Semi-permanent					8,200	16,500	16,500
Floodplain	14,600			37,700	57,600	80,000	80,000

Grassland		10,300		235,300		50,000	80,000
Riparian	7,900	17,600		28,600	8,368	17,650	30,000
Vernal Pools					49,224		20,000
Wetlands		25,100		49,900	36,300	8,650	50,000
Woodland Habitat		8,500		23,100			4,000
Total	22,500	61,500	47,000	519,100	~164,000	222,800	~400,000

Sources:
CVFPP (2022) Table 1.3 Sum of Lower and Upper San Joaquin River. SEV\CVFPP
CVJV (2020) Table ES-1, sum of semi-permanent and managed seasonal wetlands.
TNC (2020) Focused on Upland Species
TBWP Tulare Basin Watershed Partnership - focused on Tulare Lake Hydrologic Region and included lands above the Valley floor. Estimates of habitat type were derived from corridor acreages and are approximations.
RCIS (ESA, 2025) Floodplain acreage includes river meander.
CAP (2021) San Joaquin Valey Collaborative Action Program Ecosystem Workgroup Presentation. Upland acreage objective divided equally between scrub and grasslands. Floodplain acreage was increased to 80,000 ac in subsequent versions of the CAP plan.
Notes:
Reported targets have been rounded to the nearest 100 acres.

Planning Considerations

As noted previously, ad hoc environmental restoration is unlikely to maximize environmental benefits. Rather, environmental objectives are more likely to be achieved by developing and implementing a strategic plan that employs widely accepted ecological principles.

Williams et al. (1998) formalized a multiple species recovery plan for imperiled species of plants and animals in the San Joaquin Valley. They developed an endangered species recovery plan for imperiled upland species of plants and animals. While their focus was on upland species the planning principles they employed are broadly applicable. They listed six key elements that comprised their recovery strategy: recovery criteria, habitat protection, emphasis on umbrella and keystone species, a monitoring and research program, adaptive management, and economic and social considerations. They go on to explain their concept for habitat protection:

"Considering that habitat loss is the primary cause of species endangerment in the San Joaquin Valley, a central component of species recovery is to establish a network of conservation areas and reserves that represent all of the pertinent terrestrial and riparian natural communities in the San Joaquin Valley.

"Existing natural lands, occupied by covered species, are targeted for conservation in preference to unoccupied natural land or retired farmland. This greatly reduces or eliminates the need for expensive and untested restoration work to make the land suitable to those species. Many covered species are concentrated in the natural communities that persist in the San Joaquin Valley. The recommended approach is to protect land in large blocks wherever possible. Large landscape blocks minimize edge effects, increase the likelihood that ecosystem functions will remain intact, and facilitate effective management.

"Another recommendation of the plan is that, wherever possible, blocks of conservation lands should be connected by natural landscape or land with compatible uses to allow for movement of

species between blocks. Linkages are proposed both on the floor of the San Joaquin Valley and in foothills along the margins of the Valley. Few Valley floor linkages exist at this time; restoration of continuous corridors or islands of suitable vegetation that can act as "stepping stones" will be necessary to provide movement corridors. Natural land remaining along the fringes of the San Joaquin Valley will provide both habitat and landscape linkages.

"Plants and animals depend on habitat connectivity, which is the degree to which organisms or natural processes can move unimpeded across habitats. Animals move between different patches of habitat to feed, rest, and reproduce as part of their daily and seasonal activities. Individuals disperse in search of unoccupied habitat, and some embark on long migrations on which their species depend. As fruits and seeds, plants move between patches of habitat adhered to or in the guts of animals and floating on air or water. Together these movements sustain the diversity and functioning of biological communities. They allow populations to persist through the colonization and recolonization of habitats, and the interchange of individuals and their genes. They also result in habitat patches containing greater numbers and variety of species—thereby having greater resilience." (ESA 2025)

These principles and other considerations are incorporated in the development of a conceptual conservation plan for the San Joaquin Valley presented later in this report.

Water Use Requirements

Development of a water plan requires the new and unmet environmental water needs to be quantified. This section explains how those calculations were made.

Applied water use for wetlands will vary from site to site based on soil types and infiltration rates with deep infiltration eventually supplementing groundwater supplies. Estimates for consumptive water use by landcover type were estimated based on evapotranspiration rates that vary regionally within the Valley (Figure 4.9). The water-use assumptions for each landcover type are as follows:

- Alkali Desert Scrub - natural precipitation

- Aquatic – 4.4 to 5.2 feet being the 12-month Et by region as specified in Table 4.9. Semipermanent wetlands are assumed to have an applied water demand of 7.4 feet to maintain wetlands from October through mid-July (CVJV 2020). It is assumed wetland vegetation will continue to draw water for the soil for the period from mid-July through September, resulting in a full 12 months of evapotranspiration. Thus, for planning purposes, the evapotranspiration for semi-permanent wetlands is assumed to be the same as for aquatic habitats.

- Floodplain – assumes eight months of flooding and evapotranspiration by vegetation resulting from that flooding (2.9 to 3.4 feet for December through July, Table 4.9) in wet years and three months of flooding and evapotranspiration (1.3 to 1.5 feet for March through May, Table 4.9) in above-normal years. Wet years are assumed to have a frequency

of 32% and above-normal years of 14% (Dayflow SJR Index) resulting in an annual average use of 1.1 to 1.3 acre-feet per acre.

- Grassland - natural precipitation

- Riparian - 4.4 to 5.2 feet being the 12-month Et by region as specified in Table 4.9. Vegetation is assumed to be mostly deciduous hardwood with grass and shrub undercover resulting in year-round evapotranspiration.

- Vernal Pools - natural precipitation

- Seasonal Wetlands are assumed to have an applied water demand of 5.1 feet for August through March with one or two irrigations between April and July to ensure adequate seed production (CVJV 2020). Assuming full evapotranspiration for August through March and 50% evapotranspiration April through July results in an annual use of 3.2 to 3.9 acre-feet per acre.

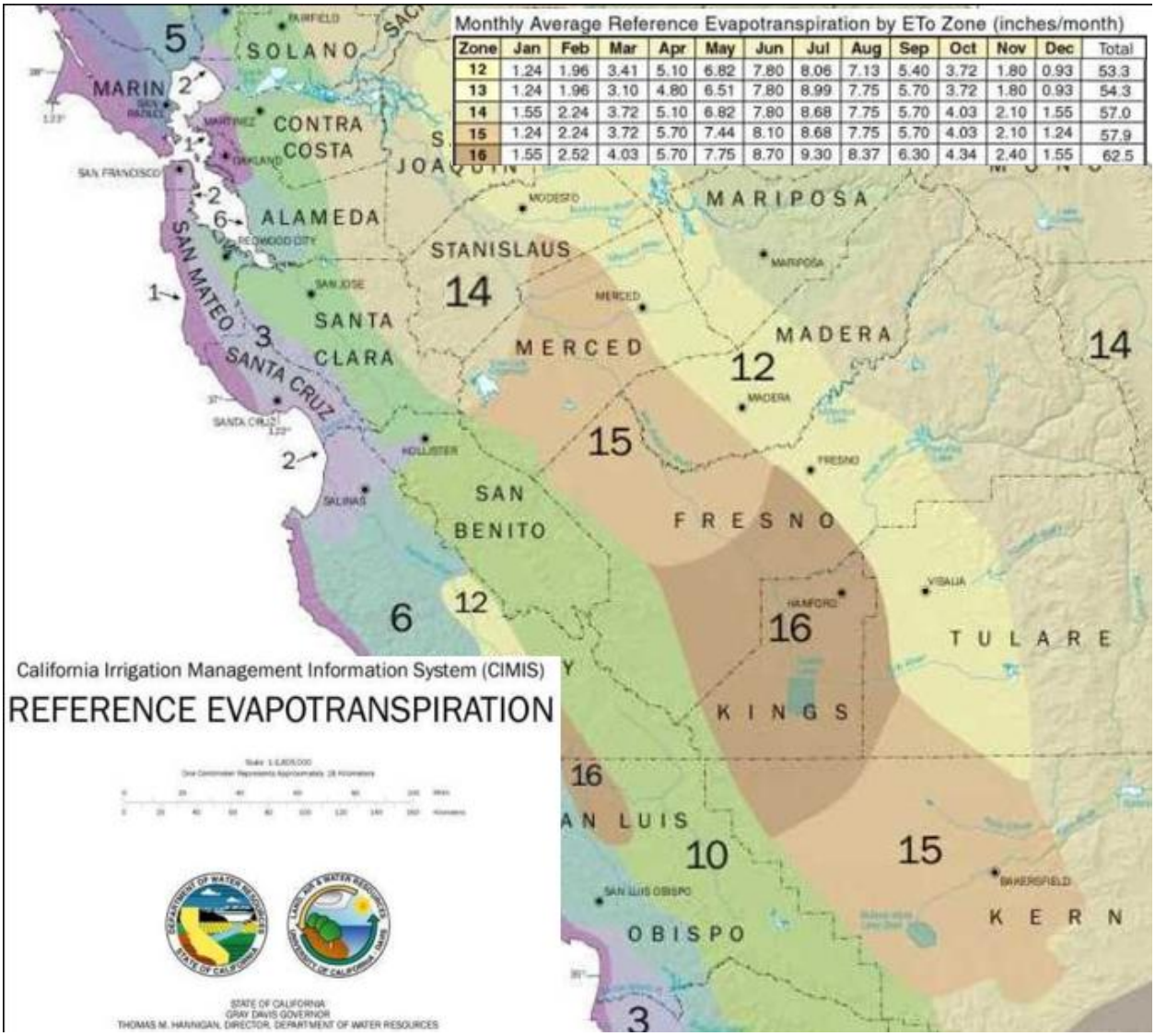
- Woodland Habitat - natural precipitation

Table 6-9. Evapotranspiration by Region

Month	Region 12	Region 14	Region 15	Region 16
	Pan Evapotranspiration (inches)			
January	1.24	1.55	1.24	1.55
February	1.96	2.24	2.24	2.52
March	3.41	3.72	3.72	4.03
April	5.10	5.10	5.70	5.70
May	6.82	6.82	7.44	7.75
June	7.80	7.80	8.10	8.70
July	8.06	8.68	8.68	9.30
August	7.13	7.75	7.75	8.37
September	5.40	5.70	5.70	6.30
October	3.72	4.03	4.03	4.34
November	1.80	2.10	2.10	2.40
December	0.93	1.55	1.24	1.55
Total (inches)	53.37	57.04	57.94	62.51
Total (feet)	4.4	4.8	4.8	5.2
Precipitation (feet)	11-17.3	12-12.5	6.4 to 12.5	8.5
Seasonal Wetlands & floodplains (feet)	1.1	1.2	1.2	1.3

Source:
Evapotranspiration *etozonemap.jpg (1462×1693) (ca.gov)*
Precipitation data *Average Yearly Precipitation for California Cities - Current Results*
Notes:
Total Evapotranspiration is used for the water use by aquatic and riparian ecosystems.

Precipitation is used for the water use of grassland, vernal pool, desert scrub and woodland ecosystems.
Water use by seasonal wetland and floodplain ecosystems is calculated in wet years as evapotranspiration from December through July and in above-normal years from March through May. Flows are assumed to cease in June in wet years and in April in above normal years with the use of soil moisture accounting for another month of evapotranspiration. An annual weighted average is calculated assuming a wet year frequency is 32% and above-normal frequency of 14%.



Source: CA DWR CIMIS EToZone map

Figure 6-9. Reference Evapotranspiration by Region

Table 6-10. Estimated Water Needs for Environmental Restoration in the San Joaquin Valley

Landcover Type	Unit Water Use (feet)	Goal (acres)	Additional Water Supply Objective (acre feet)
Alkali Desert Scrub	Precipitation	120,000	0
Aquatic & Semi-permanent	4.4 to 5.2	16,500	72,600 to 85,800

Floodplain	1.1 to 1.3	80,000	88,000 to 104,000
Grassland	Precipitation	80,000	0
Riparian	4.4 to 5.2	30,000	132,000 to 156,000
Vernal Pools	Precipitation	20,000	0
Wetlands (Seasonal)	3.2 to 3.9	50,000	160,000 to 195,000
Woodland Habitat	Precipitation	4,000	0
Total		~400,000	452,600 to 540,800

Conclusion

Retiring extensive areas of irrigated land to reduce water demands and to close the water-supply demand gap offers the potential for restoration of ecosystems that were once expansive in the San Joaquin Valley. Numerous planning efforts have established targets for restoration. Based on those efforts, the needs for environmental purposes were estimated to range from 450,000 acre-feet to 540,000 acre-feet. These quantities do not include additional water for instream flow requirements or supplemental water needs for wildlife refuges, both of which are included in Chapter 2.

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