An aerial photograph of a wide river with a large, light-colored sandbar in the foreground. The river flows from the top left towards the bottom right. The banks are lined with dense green trees and shrubs. In the background, there are rolling hills and mountains under a clear blue sky.

CENTRAL VALLEY FLOOD PROTECTION PLAN

CVFPP Conservation Strategy 2022 Update

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CALIFORNIA DEPARTMENT OF WATER RESOURCES

Cover Image: California Department of Water Resources 2007.
General description: An aerial view of the Sacramento River, the largest river in California, near Gerber at Oat Creek and Deer Creek. Photo taken May 25, 2007 by Dale Kolke.

Revised Draft Central Valley Flood Protection Plan Conservation Strategy 2022 Update

December 2021

*This document was prepared for submission to the Central Valley Flood Protection Board
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by

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Acronyms and Abbreviations

Acronym	Definition
BSOG	Butte Slough Outfall Gates
BWFS	Basin-Wide Feasibility Study
California EPA	California Environmental Protection Agency
CDFW	California Department of Fish and Wildlife
CEQA	California Environmental Quality Act
CESA	California Endangered Species Act
CNRA	California Natural Resources Agency
Conservation Strategy (or Strategy)	Central Valley Flood Protection Plan Conservation Strategy
CPA	conservation planning area
CVFPB	Central Valley Flood Protection Board
CVFPP	Central Valley Flood Protection Plan
CVPIA	Central Valley Project Improvement Act
Delta	Sacramento–San Joaquin Delta
DFM	California Department of Water Resources’ Division of Flood Management
DMI	California Department of Water Resources’ Division of Multi-Benefit Initiatives
DNA	deoxyribonucleic acid
DWR	California Department of Water Resources
EcoFIP tool	Ecological Floodplain Inundation Potential tool



Acronym	Definition
eDNA	environmental deoxyribonucleic acid
EIR	environmental impact report
ESA	federal Endangered Species Act
Flood-MAR	flood-managed aquifer recharge
FPTS	Flood Performance Tracking System
FROA	Floodplain Restoration Opportunity Analysis
GIS	geographic information system
GO	general obligation
HCP	habitat conservation plan
IRWM	integrated regional water management
LMA	local maintaining agency
MCA	mitigation credit agreement
MOOM	multiple-objective operations and maintenance
NCCP	natural community conservation plan
NEPA	National Environmental Policy Act
NGO	nongovernmental organization
NMFS	National Marine Fisheries Service
O&M	operations and maintenance
P3	public-private partnership
RCIS	regional conservation investment strategy
RFMP	regional flood management plan
SERP	Small Erosion Repair Program



Acronym	Definition
SGMA	Sustainable Groundwater Management Act
SJRRP	San Joaquin River Restoration Program
SPA	systemwide planning area
SPFC	State Plan of Flood Control
SRA	shaded riverine aquatic
SSIP	State Systemwide Investment Approach
State	State of California
Strategy (or Conservation Strategy)	Central Valley Flood Protection Plan Conservation Strategy
SWIF	Systemwide Improvement Framework
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service



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Species Names

Common Name	Scientific Name
Bank swallow	<i>Riparia riparia</i>
California black rail	<i>Laterallus jamaicensis coturniculus</i>
California Central Valley steelhead distinct population segment	<i>Oncorhynchus mykiss</i>
Chinook salmon—Central Valley fall- and late-fall-run, Central Valley spring-run, and Sacramento River winter-run evolutionarily significant units	<i>Oncorhynchus tshawytscha</i>
Delta button-celery	<i>Eryngium racemosum</i>
Delta smelt	<i>Hypomesus transpacificus</i>
Giant gartersnake	<i>Thamnophis gigas</i>
Giant reed	<i>Arundo donax</i>
Greater sandhill crane	<i>Grus canadensis tabida</i>
Green sturgeon—southern distinct population segment	<i>Acipenser medirostris</i>
Himalayan blackberry	<i>Rubus armeniacus</i>
Least Bell's vireo	<i>Vireo bellii pusillus</i>
Red sesbania	<i>Sesbania punicea</i>
Riparian brush rabbit	<i>Sylvilagus bachmani riparius</i>
Riparian (= San Joaquin Valley) woodrat	<i>Neotoma fuscipes riparia</i>
Slough thistle	<i>Cirsium crassicaule</i>
Swainson's hawk	<i>Buteo swainsoni</i>



Common Name	Scientific Name
Tricolored blackbird	<i>Agelaius tricolor</i>
Valley elderberry longhorn beetle	<i>Desmocerus californicus dimorphus</i>
Western yellow-billed cuckoo	<i>Coccyzus americanus occidentalis</i>
Yellow-breasted chat	<i>Icteria virens</i>



Overview

The Central Valley Flood Protection Plan (CVFPP) Conservation Strategy (Conservation Strategy or Strategy) is a primary component of the CVFPP. It aligns with and contributes to the attainment of all CVFPP goals, while focusing on improving ecosystem quality, quantity, function, and sustainability within the Systemwide Planning Area (SPA). Its purpose is to provide actionable and measurable targets to improve riverine, aquatic, wetland, and riparian habitat in the flood system through the integration of ecological principles with flood risk reduction projects, operation and maintenance activities, institutional support, and other means (e.g., the removal of fish passage barriers). The Conservation Strategy also provides data, information, and guidance to floodplain managers to assist in the development of multi-benefit flood infrastructure improvement projects by integrating project components and management strategies that benefit native species and their habitats.

Despite recent progress implementing multi-benefit projects, which improve environmental conditions at specific locations, the historical configuration of the flood system and various anthropogenic factors continue to inhibit natural processes, fragment riverine habitats, and contribute to the decline of native species throughout the SPA.

Further, the projected impacts of climate change on ecological processes, habitats, and species require an expedited focus on building ecosystem resiliency and restoring ecological and geomorphic processes. This will require the pace of multi-benefit project implementation to increase and an emphasis on nature-based solutions, such as widening river corridors and expanding floodplains to allow riverine habitats and species to be resilient to projected changes in air and water temperatures, precipitation, and hydrology. In addition to providing more resilient ecological conditions, multi-benefit projects that restore geomorphic processes also support a more resilient, adaptive, and sustainable flood management system, particularly in consideration of climate change challenges.

The identification, development, and implementation of multi-benefit projects in the Central Valley is the primary mechanism to improve and restore ecosystems, and gradually build ecological resilience while supporting a more adaptive and resilient flood protection system. It is now more important than ever to identify and leverage opportunities to further develop multi-benefit projects and promote management actions to address climate change risks to ecological conditions.

Every five years, the California Department of Water Resources (DWR) updates the Conservation Strategy to correspond with updates to the CVFPP and meet the following goals:

- Report on progress achieved over the previous five years toward meeting the measurable objectives.
- Support continued alignment with evolving DWR policies, programs, and initiatives.
- Update its content with the latest information, science, and guidance available to support the CVFPP's and DWR's commitment to public safety and environmental stewardship through state-of-the-art flood management practices, wise investments, and multi-benefit project implementation.

1.1 The 2022 Update

This 2022 Update to the Conservation Strategy provides new and updated information, focused on the five following key elements:

1. Update the list of target species; three new species have been added (delta smelt, tricolored blackbird, and yellow-breasted chat).
2. Report on progress towards the measurable objectives and multi-benefit project implementation from 2016 to 2021, and provide detailed information about how progress towards the measurable objectives is tracked and reported.
3. Provide details and further updates to the implementation of the Conservation Strategy and multi-benefit projects, including more details about funding, partnerships and collaboration opportunities, regulatory compliance and mitigation, and impediments to multi-benefit project implementation.
4. Identify a suite of proposed “priority actions” to address implementation barriers and increase the pace and extent of multi-benefit projects.
5. Summarize climate change risks and vulnerabilities for the Conservation Strategy processes, habitats, and species; climate adaptation strategies; and recommended actions.

In addition to these key elements, this update provides additional information about existing and new plans, programs, and scientific research that apply to the CVFPP. This document's information, data, and recommendations are based on collaboration and input from the Central Valley Flood Protection Board (CVFPB), DWR staff from multiple divisions, an array of local



project proponents and maintainers, regulatory agencies, nongovernmental organizations (NGOs), and other stakeholders. The document is organized as follows:

- Chapter 1, “Overview,” describes the background of the 2016 CVFPP Conservation Strategy, introduces the 2022 Update and discusses how it was developed, and explains the organization of this document.
- Chapter 2, “Implementation 2016 to 2021,” summarizes the implementation of CVFPP projects, tracking, and adaptive management.
- Chapter 3, “2022 Conservation Strategy Updates,” summarizes the re-evaluation of, and changes to, the Conservation Strategy’s list of target species and measurable objectives; updates its implementation approach; provides a summary of Conservation Strategy-specific climate change risks, vulnerabilities, and adaptation strategies; suggests additional re-evaluations of and revisions to Strategy components, and identifies “priority actions” to advance the implementation of the Conservation Strategy from 2022 to 2027.
- Chapter 4, “Glossary,” defines terms used in the Conservation Strategy.
- Chapter 5, “References,” provides information on literature and other sources cited in the text by chapter.
- Chapter 6, “Preparers,” lists the authors and reviewers of the Conservation Strategy.
- Appendix A, “Target Species List Review and Update,” provides the rationale for updating the list of target species, discusses the selection process for target species and focused conservation plans, and presents three additions to the target species list for the 2022 Update.
- Appendix B, “Focused Conservation Plans for New Target Species,” addresses needs and opportunities for conserving delta smelt, tricolored blackbird, and yellow-breasted chat in the SPA.
- Appendix C, “Updates to 2016 Conservation Strategy Appendix J, ‘Existing Conservation Objectives from Other Plans,’” summarizes established and ongoing planning efforts with geographic areas and conservation objectives that overlap with those of the Conservation Strategy, and thus present opportunities for collaboration.
- Appendix D, “Updates to 2016 Conservation Strategy Appendix A, ‘Regulatory Setting,’” describes applicable environmental permits and permitting mechanisms.
- Appendix E, “Mitigation Availability,” summarizes the status of advance mitigation projects previously funded by DWR and the availability of compensatory mitigation for unavoidable impacts on the Conservation Strategy’s target habitats and species.



- Appendix F, “Five-year Implementation Summary Memorandum,” summarizes the implementation of multi-benefit projects and other components of the Conservation Strategy from 2016 to 2021.
- Appendix G, “Central Valley Flood Protection Board Advisory Committee Recommendations,” summarizes the recommendations provided by the CVFPB Advisory Committee for consideration by DWR to advance the implementation of the Conservation Strategy and CVFPP from 2022 to 2027. This appendix also provides information about how the recommendations will be potentially addressed, or the rationale if they are not included in either the Conservation Strategy or CVFPP.
- Appendix H, “Climate Change Adaptation for the CVFPP Conservation Strategy Update Memorandum,” describes climate change drivers; considers ecosystem responses to those changes for the ecosystem process, habitats, species, and stressors identified in the Conservation Strategy; and describes preliminary adaptation and management strategies based on identified risks and vulnerabilities.

1.2 The 2016 Conservation Strategy

DWR prepared the Conservation Strategy in 2016 based on the 2012 Conservation Framework (California Department of Water Resources 2012c). These documents were developed in accordance with the Central Valley Flood Protection Act of 2008, which called for a comprehensive approach to improve flood protection, including the promotion of ecosystem functions and multi-benefit projects. The 2016 Conservation Strategy provides information about the ecological conditions within the SPA and the need to improve geomorphological and ecological conditions of rivers and floodplains. Since the 1850s, approximately 95 percent of historical wetlands and riparian habitats in the Central Valley have been eliminated (The Bay Institute 1998). Natural river processes, such as floodplain inundation and channel meander migration, maintain the complex mosaic of riverine and floodplain habitats and support native species abundance and diversity. Natural river functions also provide increased flood management by providing space for floodwater retention and decreasing erosional forces, providing greater resiliency, particularly when factoring effects from climate change.

The 2016 Conservation Strategy provides a comprehensive, long-term, nonregulatory approach to improve riverine aquatic and riparian ecosystems in the SPA primarily through implementation of multi-benefit flood infrastructure improvement projects. The 2016 Conservation Strategy recommends specific types of ecosystem improvements, and sets long-term objectives for the number of these improvements that result from multi-benefit flood projects and operations and maintenance (O&M) in the Central Valley. In the context of the CVFPP, “multi-benefit projects” refers to projects that are designed to reduce flood risk and increase fish and wildlife habitat, and may also provide other public benefits (California Department of Water Resources 2017).



1.2.1 Geographic Scope

The Conservation Strategy's geographic scope is limited to the CVFPP's SPA. The SPA consists of State Plan of Flood Control (SPFC) channels and infrastructure, and lands that receive flood protection through the SPFC. The SPFC is a portion of the Central Valley's flood management system, which the State of California (State) has certain responsibilities for, as defined in the California Water Code (Section 9110[f]).

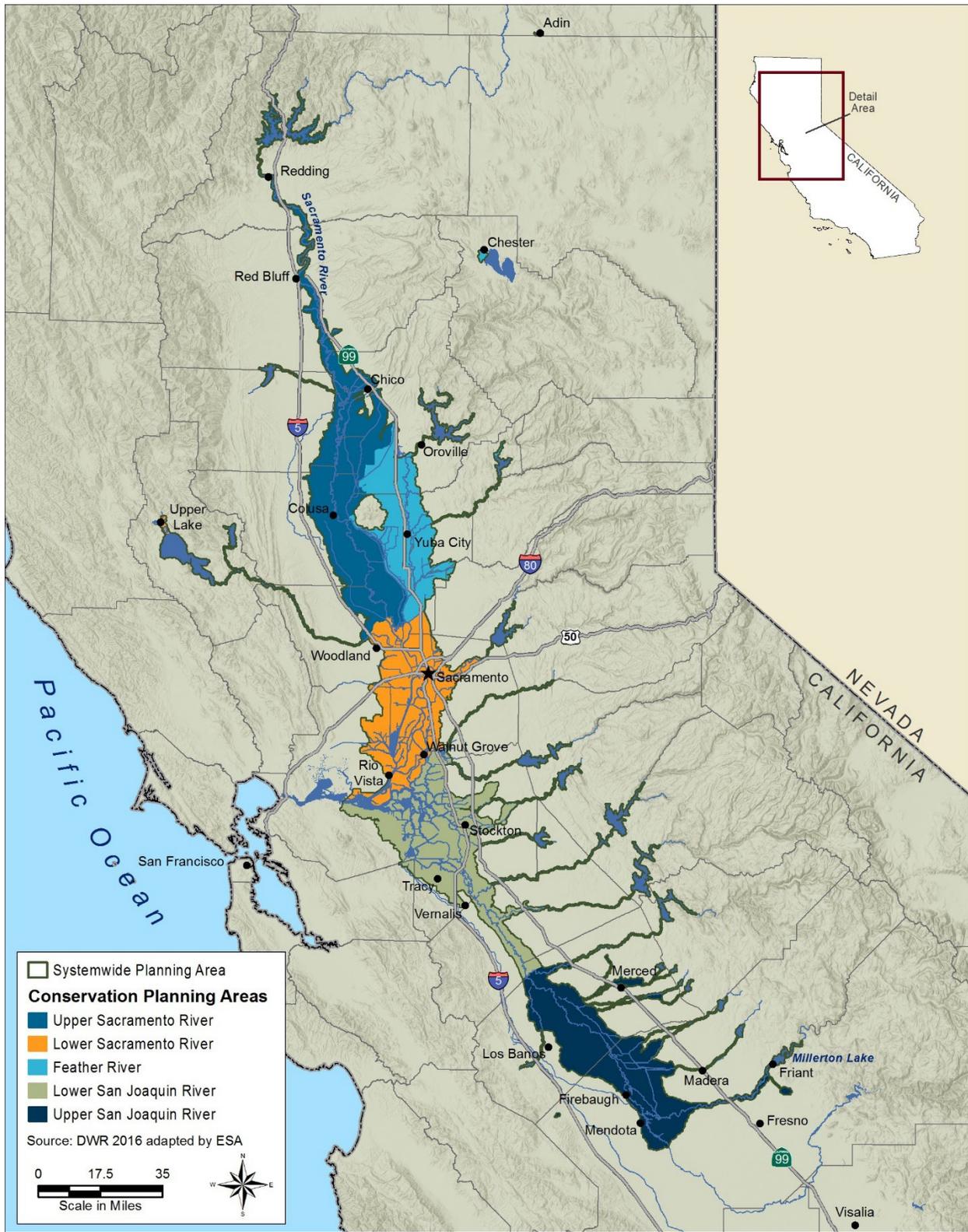
In the 2016 Conservation Strategy, the SPA was divided into five distinct regions, referred to as Conservation Planning Areas (CPAs) (Figure 1-1). The CPAs facilitate planning and management actions to achieve the goals and objectives of the CVFPP and its Conservation Strategy. The five CPAs vary with regard to flood risk management and conservation needs, opportunities, and measurable objectives. Each CPA shares geography with one or two Regional Flood Management Planning groups composed of local maintaining agencies (LMAs), DWR staff, and regional stakeholders to develop regional flood management plans (RFMPs). The RFMPs identify regional priorities to improve the overall system function and O&M. The RFMP recommendations and project plans are aligned with the goals and objectives of the CVFPP and Conservation Strategy.

The five CPAs are described as follows:

1. **Upper Sacramento River CPA:** The Sacramento River and tributaries from Red Bluff to Fremont Weir (the Mid- and Upper Sacramento River RFMP region).
2. **Feather River CPA:** The Feather River, as well as the Yuba and Bear Rivers and other tributaries (the Feather River RFMP region).
3. **Lower Sacramento River CPA:** The Sacramento River and tributaries from Fremont Weir to Isleton (the Lower Sacramento River and Delta-North RFMP region).
4. **Upper San Joaquin River CPA:** The San Joaquin River and tributaries from Friant Dam to the Merced River (the Upper San Joaquin River RFMP region).
5. **Lower San Joaquin River CPA:** The San Joaquin River and tributaries from the Merced River to Stockton (the Lower San Joaquin River and Delta South, and the Mid-San Joaquin River RFMP regions).



Figure 1-1. Conservation Planning Areas in the CVFPP Conservation Strategy



1.2.2 From Goals to Measurable Objectives

The Central Valley Flood Protection Act of 2008 required the CVFPP to describe structural and nonstructural means of improving the performance and eliminating deficiencies of levees, weirs, bypasses, and facilities. Where feasible, it also required the CVFPP to meet multiple objectives, including 14 listed objectives (California Water Code Section 9616[a]). Specifically, it stipulated that the CVFPP provide “a description of structural and nonstructural means for enabling or improving systemwide riverine ecosystem function, including, but not limited to, establishment of riparian habitat and seasonal inundation of available floodplains where feasible.” (California Water Code Section 9614 [j]).

Three of the listed objectives concerned promoting or increasing ecosystem processes, habitats, populations of native species, or overall biotic community diversity, and are the primary basis of the four goals of the 2012 CVFPP’s Conservation Framework (California Department of Water Resources 2012b). These four goals, with only minor revisions, became the goals of the 2016 Conservation Strategy:

1. **Ecosystem Processes: Improve dynamic hydrologic (flow) and geomorphic processes in the SPFC.** These ecosystem processes are critical for maintaining riverine and floodplain habitats and species. They include a diversity of flows, suitable sources of sediment, floodplain inundation, and a sufficiently broad river corridor to allow channel meandering; critical factors in sustaining fisheries and riverine habitat.
2. **Habitats: Increase and improve the quantity, diversity, and connectivity of riverine and floodplain habitats.** These habitats include aquatic, riparian, wetland, shaded riverine aquatic (SRA) cover, and other floodplain habitats, as well as agricultural lands that can provide important wildlife values.
3. **Species: Contribute to the recovery and sustainability of native species populations and overall biotic community diversity.** The native species addressed by the Conservation Strategy include species associated primarily with riverine and floodplain habitats that are at risk of extirpation or extinction. Although the preceding goals are the foundation for species conservation, this goal emphasizes the need to not only avoid, minimize, and mitigate adverse effects on sensitive species, as well as the need to contribute to their recovery.
4. **Stressors: Reduce stressors related to development and operation of the SPFC that negatively affect at-risk species.** These stressors include invasive plant species, constraints on sediment sources and channel meander migration, isolation of floodplains from rivers by levees, and fish passage barriers, all of which contribute to loss and degradation of ecosystem functions and habitat.

To achieve these goals, the 2016 Conservation Strategy focused on the target ecosystem processes, habitats, and species in need of recovery that showed the greatest potential to benefit from conservation actions integrated with flood risk management actions. The 2016



Conservation Strategy also focused on stressors to these processes, habitats, and species that could be addressed by multi-benefit flood risk reduction project implementation.

The 2016 Conservation Strategy targeted two ecosystem processes: riverine geomorphic processes and floodplain inundation; and three habitats: SRA cover, riparian habitats, and marshes and other wetlands. “Target species” are sensitive species that could be most affected by the CVFPP, primarily because of their strong dependence on the river and floodplain ecosystems of the Sacramento and San Joaquin valleys. Table 1-1 lists the 2016 Strategy’s target species.

The 2016 Conservation Strategy also targeted the following stressors:

- Erosion-resistant materials, generally referred to as “revetment,” that reinforce and protect riverbanks.
- Narrowly confining levees.
- Weirs and other structures that are barriers to fish passage.
- Invasive plants.

Measurable objectives for the targets were developed to inform the CVFPP and related State flood management program funding guidelines and grant processes (e.g., the restoration of a given amount of riparian habitat through multi-benefit projects). Each objective was selected to address a targeted ecosystem process, habitat, or stressor in a CPA.

The sizes of the objectives represent net increases in ecosystem processes and habitats, reductions in stressors, and contributions to species recovery that may be achievable through multi-benefit projects and O&M during the CVFPP’s 30-year time frame. The measurable objectives are based on the conservation needs of target species and opportunities for multi-benefit projects to provide that needed conservation. Appendix L of the 2016 Conservation Strategy documents the process for developing the measurable objectives, and provides an assessment of the needs and opportunities (California Department of Water Resources 2016). Appendix L is still being utilized as the guiding document for measurable objectives and is not being updated in the 2022 planning cycle.

To meet the needs of target species, measurable objectives were developed for the ecosystem process and habitat targets, and the fish passage barrier and invasive plant targets (both of which are stressors affecting target species, ecosystem processes, and habitats). Because the conservation needs of target species were a basis for these objectives, separate objectives were not developed for target species. Separate objectives were also not developed for levees as a stressor. Various efforts toward levee modification, removal, or relocation, combined with other actions, could provide comparable increases in ecosystem processes and habitats, and related benefits to species. Therefore, needed changes to levees would be determined during project planning as a means of improving ecosystems, not as objectives in and of themselves.



Table 1-1. Target Species of the 2016 Central Valley Flood Protection Plan Conservation Strategy

Species	Common Name ^[a] Scientific Name	FED Status ^[b]	CA Status ^[b]	CRPR Status ^[b]	USR ^[c]	FR ^[c]	LSR ^[c]	USJR ^[c]	LSJR ^[c]	Habitats ^[d]
Plants	Delta button-celery <i>Eryngium racemosum</i>	None	E	1B.1	No	No	No	Yes	Yes	Riparian scrub, inundated floodplain (in vernal mesic clay depressions)
	Slough thistle <i>Cirsium crassicaule</i>	None	None	1B.1	No	No	No	Yes ^[e]	Yes	Chenopod scrub, riparian scrub, and marsh along sloughs; inundated floodplain
Invertebrates	Valley elderberry longhorn beetle <i>Desmocerus californicus dimorphus</i>	T	None	None	Yes	Yes	Yes	Yes	Yes	Elderberry shrubs in riparian habitat
Fish	California Central Valley steelhead DPS <i>Oncorhynchus mykiss</i>	T	None	None	Yes	Yes	Yes	Yes ^[e]	Yes	Riverine, estuarine, and oceanic waters; SRA cover; inundated floodplain ^[f]
	Chinook salmon—Central Valley fall- and late-fall-run ESU <i>Oncorhynchus tshawytscha</i>	None	CSC	None	Yes	Yes	Yes	Yes ^[e]	Yes	Riverine, estuarine, and oceanic waters; SRA cover; inundated floodplain ^[f]
	Chinook salmon—Central Valley spring-run ESU <i>Oncorhynchus tshawytscha</i>	T	T	None	Yes	Yes	Yes	Yes ^[e]	Yes	Riverine, estuarine, and oceanic waters; SRA cover; inundated floodplain ^[f]
	Chinook salmon—Sacramento River winter-run ESU <i>Oncorhynchus tshawytscha</i>	E	E	None	Yes	No	Yes	No	No	Riverine, estuarine, and oceanic waters; SRA cover; inundated floodplain ^[f]



Species	Common Name ^[a] Scientific Name	FED Status ^[b]	CA Status ^[b]	CRPR Status ^[b]	USR ^[c]	FR ^[c]	LSR ^[c]	USJR ^[c]	LSJR ^[c]	Habitats ^[d]
Fish	Green sturgeon—southern DPS <i>Acipenser medirostris</i>	T	CSC	None	Yes	Yes	Yes	No	Yes	Riverine, estuarine, and oceanic waters; SRA cover; inundated floodplain ^[f]
Reptiles	Giant gartersnake <i>Thamnophis gigas</i>	T	T	None	Yes	Yes	Yes	Yes	Yes	Freshwater emergent wetlands, floodplain agricultural land (drainage canals, irrigation ditches, rice fields, and adjacent vegetation)
Birds	Bank swallow <i>Riparia riparia</i>	None	T	None	Yes	Yes	Yes	No	No	Natural banks and cliffs near aquatic habitat (nesting); riparian, grasslands, wetlands, open water, and croplands (foraging)
	California black rail <i>Laterallus jamaicensis coturniculus</i>	None	T, FP	None	No	No	Yes	No	Yes	Marsh
	Greater sandhill crane <i>Grus canadensis tabida</i>	None	T, FP	None	Yes	Yes	Yes	Yes	Yes	Open grasslands, floodplain agricultural land (grain fields), and open wetlands; does not breed in SPA
	Least Bell's vireo <i>Vireo bellii pusillus</i>	E	E	None	Yes ^[e]	Yes ^[e]	Yes ^[e]	Yes ^[e]	Yes	Riparian, adjacent to open water
	Swainson's hawk <i>Buteo swainsoni</i>	None	T	None	Yes	Yes	Yes	Yes	Yes	Riparian forest, larger trees (nesting); grasslands and croplands (foraging)



Species	Common Name ^[a] Scientific Name	FED Status ^[b]	CA Status ^[b]	CRPR Status ^[b]	USR ^[c]	FR ^[c]	LSR ^[c]	USJR ^[c]	LSJR ^[c]	Habitats ^[d]
Birds	Western yellow-billed cuckoo <i>Coccyzus americanus occidentalis</i>	T	E	None	Yes	Yes	Yes ^[e]	Yes ^[e]	Yes ^[e]	Riparian, inundated floodplain
Mammals	Riparian brush rabbit <i>Sylvilagus bachmani riparius</i>	E	E	None	No	No	No	No	Yes	Riparian
	Riparian (= San Joaquin Valley) woodrat <i>Neotoma fuscipes riparia</i>	E	CSC	None	No	No	No	No	Yes	Riparian

Sources: California Interagency Wildlife Task Group 2008; Shuford and Gardali 2008; California Department of Fish and Wildlife 2020a, 2020b; California Native Plant Society 2020.

^[a] DPS = Distinct Population Segment; ESU = Evolutionarily Significant Unit.

^[b] FED, CA, and CRPR statuses are as follows:

Federal

E = Listed as endangered under the federal Endangered Species Act (ESA). T = Listed as threatened under ESA.

California

E = Listed as endangered under the California Endangered Species Act (CESA). T = Listed as threatened under CESA.

CSC = California Species of Special Concern.

FP = Fully protected under the California Fish and Game Code.

California Rare Plant Rank (CRPR)

1B.1 = Plants rare, threatened, or endangered in California and elsewhere. Seriously endangered in California.

^[c] USR = Upper Sacramento River CPA, FR = Feather River CPA, LSR = Lower Sacramento River CPA, USJR = Upper San Joaquin River CPA, LSJR = Lower San Joaquin River CPA.

Yes = species is a target species in this CPA; No = species is not a target species in this CPA.

^[d] SPA = Systemwide Planning Area; SRA = shaded riverine aquatic.

^[e] Potential distribution in the CPA is based on historical distribution or poorly known.

^[f] Inundated floodplain habitats include both natural and agricultural land covers.



Each of the 2016 Conservation Strategy’s measurable objectives consist of one or more metrics (specific, measurable attributes, such as the acreage of riparian vegetation) and an amount of change in that metric—a magnitude of ecosystem improvement.

Metrics were selected based on several attributes:

- *Relevance:* Metrics are related to the Conservation Strategy’s goals and have implications for conservation and flood risk management activities.
- *Responsiveness:* Metrics are capable of exhibiting changes in response to actions taken in the time frame required for adaptive management (e.g., within five to 10 years).
- *Cost-effectiveness:* Individually and collectively, measuring the metrics will involve a reasonable expenditure relative to other metrics that could effectively assess progress and inform management decisions.
- *Reliability of interpretation:* Changes in the metrics will reliably and clearly document the results of CVFPP implementation (as opposed to other causes, such as environmental fluctuations) and will highlight the types of changes that would improve implementation.
- *Transparency and ease of communication:* As a set, tracking the metrics will tell a clear and concise story to a broad cross-section of the interested public about the progress and results of CVFPP implementation, related to the Conservation Strategy’s goals.

Table 1-2 describes the selected metrics and Table 1-3 provides the measurable objectives.

Apart from objectives for invasive plants and fish passage barriers, the size of ecological objectives was determined as follows:

1. **The identified conservation needs of target species were synthesized.** Adopted plans for the recovery of target species have identified multiple actions and outcomes needed for species recovery. The actions and outcomes identified in adopted plans for the recovery of target species were synthesized for each targeted ecosystem process and habitat.
2. **The extent of opportunities for restoration through the CVFPP’s multi-benefit flood projects was estimated.** These estimates were based on preliminary data from the Basin--Wide Feasibility Studies (BWFS), evaluations conducted for the Conservation Strategy, and evaluations provided by NGOs.
3. **The objective was set to the conservation need or the opportunity for restoration through multi-benefit projects, whichever was smaller.** Consequently, if the need exceeded the opportunity, attaining the objective would contribute to but not fully meet the need; if the opportunity exceeded the need, attaining the objective would fully meet the need.



Table 1-2. Metrics for Ecosystem Process, Habitat, and Stressor Objectives

Conservation Strategy Goal	Targeted Ecosystem Process, Habitats, or Stressors	Metric
Ecosystem Processes	Floodplain Inundation	Inundated Floodplain—total amount (acres) of 50% flows (i.e., a two-year event) with 14-day or longer duration during December to May: This is a metric of the amount of inundated floodplain benefiting riverine ecosystems, particularly target fish species. These amounts are derived from hydraulic modeling, using data developed for planning flood management projects.
	Riverine Geomorphic Processes	Natural Bank—total length (miles): Natural bank is a component of SRA cover and bank habitat and is necessary for migration of a river channel. Its length is related to the area of floodplain potentially reworked by channel migration (river meander). The length of natural bank may be measured by DWR and other agencies, and maintained inventories of revetment measured and verified in the field.
		River Meander Potential—total amount (acres): This is the movement of a river channel across its floodplain regenerates channel and floodplain habitats. River meander potential is the area of floodplain that has the potential to be reworked by the meandering channel because it is within the river’s natural meander zone, not underlain by substrates resistant to erosion and not isolated by revetted banks or levees (project and nonproject). Areas with river meander potential can be mapped using aerial photography, topographic data, inventories of revetment and levees, and existing geologic and soils data.
Habitats	SRA Cover	Natural Bank—total length (miles): This is described under Natural Bank under “Riverine Geomorphic Processes.”
		Riparian-Lined Bank—total length (miles): Riparian-lined banks are natural or revetted banks bordered by trees and shrubs. Riparian-lined banks are an attribute of SRA cover, and because SRA cover only exists along channel margins, length is a direct measure of its quantity.
	Riparian	Habitat Amount—total amount (acres) in floodways: The area of riparian vegetation (i.e., riparian forests, woodlands, and scrub) is a direct measure of its quantity.
Habitats	Marsh (and Other Wetlands)	Habitat Amount—total area (acres) in floodways: The area of marsh and other wetlands is a direct measure of their quantity.



Conservation Strategy Goal	Targeted Ecosystem Process, Habitats, or Stressors	Metric
Stressors	Fish Passage Barriers	Fish Passage Barriers—number of high-priority barriers remediated: This metric documents the number of high-priority barriers modified to improve passage.
	Invasive Plants	Invasive Plant-dominated Vegetation in Channel Maintenance Areas—total area reduced (acres): Land identified in the SPFC Descriptive Document (California Department of Water Resources 2010) as channel maintenance areas includes areas dominated by invasive plants. For species prioritized for treatment, this metric measures reduction in the extent of infested areas.

Source: Data compiled by DWR in 2012.

Notes:

Target species needs were a basis for process, habitat, and stressor objectives and thus are not represented by separate objectives. Amounts of levee and revetment modification would be determined during project and plan formulation as a means of providing needed improvements to processes, habitats, and other stressors; thus, objectives were not established for these two stressors.

DWR = California Department of Water Resources

SPFC = State Plan for Flood Control

SRA = shaded riverine area

Table 1-3. Measurable Objectives by Conservation Planning Area

Conservation Strategy Goal	Targeted Ecosystem Process, Habitat, or Stressor and Metrics	USR ^[a]	FR ^[a]	LSR ^[a]	USJR ^[a]	LSJR ^[a]	Total
Ecosystem Processes	Floodplain Inundation: Inundated floodplain—major river reaches (acres) ^[b]	6,300	3,700	7,650	2,800	11,600	32,050
	Floodplain Inundation: Inundated floodplain—bypasses transient storage areas (acres) ^[c]	9,600	0	7,500	0	200	17,300
	Riverine geomorphic processes: Natural bank (miles) ^[d]	20	0	4	8	13	45
Ecosystem Processes	Riverine geomorphic processes: River meander potential (acres)	5,600	400	1,300	2,100	4,300	13,700



Conservation Strategy Goal	Targeted Ecosystem Process, Habitat, or Stressor and Metrics	USR ^[a]	FR ^[a]	LSR ^[a]	USJR ^[a]	LSJR ^[a]	Total
Habitats	SRA cover: Natural bank ^[d] (miles)	20	0	4	8	13	45
	SRA cover: Riparian-lined bank (miles)	8	0	3	2	6	19
	Riparian habitat (acres) ^[e]	3,400	1,800	1,900	2,100	5,800	15,000
	Marsh and other wetland habitat (acres) ^[f]	2,400	0	3,500	0	100	6,000
Stressors	Fish passage barriers: Channel-wide structures	5	0	4	0	0	9
	Invasive plants: Prioritized species (infested acres)	268	257	363	143	34	1,065

Source: California Department of Water Resources 2016

^[a] USR = Upper Sacramento River CPA, FR = Feather River CPA, LSR = Lower Sacramento River CPA, USJR = Upper San Joaquin River CPA, LSJR = Lower San Joaquin River CPA.

^[b] Area inundated by two-year, 14-day, or longer flows, December–May (acres); includes both natural and agricultural land cover.

^[c] Not inundated in 50 percent of years or more frequently for 14 days or longer; includes both natural and agricultural land cover.

^[d] This condition is provided under both riverine geomorphic processes and SRA cover.

^[e] With grassland inclusions.

^[f] With inclusions of upland vegetation.

Notes:

Values have been rounded to the nearest 100 acres and 1 mile, excluding invasive plant acreages, which are provided to the nearest acre. A significant limitation to this basis for the objectives is the moderate level of uncertainty regarding the conservation needs of target species and the opportunities. To address this limitation, the objectives are re-evaluated during the five-year updates to the CVFPP.

1.2.3 Implementation Approach

The 2016 Conservation Strategy described several key components of its implementation: coordination, collaboration, outreach, and engagement; regulatory compliance; funding; and adaptive management.

1.2.3.1 Coordination, Collaboration, Outreach, and Engagement

The 2016 Conservation Strategy relies on the integration of ecosystem improvements with flood risk management and related conservation planning efforts in actions taken by DWR and other State and federal agencies, LMAs, landowners, local communities, and NGOs.

Consequently, coordination and collaboration among these organizations is a key component of the Strategy's implementation.



1.2.3.2 Regulatory Compliance

Mechanisms to simplify and expedite permitting are particularly important for multi-benefit projects. However, to date, the Conservation Strategy approach is to rely on existing mechanisms to permit restoration actions and multi-benefit projects. Other ongoing efforts include improving collaboration with regulatory agencies to expedite and develop efficient approaches to permitting of multi-benefit projects and related O&M. For example, DWR has been meeting with regulatory agencies to develop advance mitigation and achieve permitting efficiencies through landscape-scale permitting of maintenance activities, as well as collaborating on efforts to develop programmatic approaches for habitat restoration and enhancement, and multi-benefit projects.

1.2.3.3 Funding

Ecosystem improvements in the Central Valley flood system will be funded and implemented as important components of multi-benefit flood projects, consistent with the CVFPP. State policies and legislation have prioritized multi-benefit projects. Section 3.4.3 provides an updated discussion of funding considerations.

1.2.3.4 Adaptive Management

Adaptive management is a decision-making process to continually improve the effectiveness of a program to achieve its objectives. It emphasizes the use of science and monitoring to inform managers making decisions under uncertain conditions. Refinements to the Conservation Strategy are implemented in conjunction with updates to the CVFPP. These adjustments are based not only on changes to the CVFPP, but on the following factors:

- Monitoring (tracking) effectiveness of actions to progress toward measurable objectives.
- New information (e.g., best available science).
- Focused studies.
- Systemwide or regional resource inventories.
- Input solicited from agencies, practitioners, and other stakeholders.



Implementation 2016 to 2021

This chapter summarizes implementation progress toward the goals of the Conservation Strategy from 2016 to 2021. The following sections describe project implementation, progress toward the Strategy’s four goals, and the adaptive management of implementation, including implementation tracking, updates to regional datasets, and solicited input regarding implementation.

2.1 Project Implementation

2.1.1 Multi-benefit and Restoration Projects

The 2016 Conservation Strategy includes the following four goals to attain the Central Valley Flood Protection Act’s objectives of promoting ecosystem functions by integrating recovery and restoration of key physical processes, self-sustaining ecological functions, riverine habitats, and native species into flood management activities:

1. **Ecosystem Processes.** Improve dynamic hydrologic (flow) and geomorphic processes in the SPFC plan area or SPA.
2. **Habitats.** Increase and improve the quantity, diversity, and connectivity of riverine and floodplain habitats.
3. **Species.** Contribute to the recovery and sustainability of native species populations and overall biotic community diversity.
4. **Stressors.** Reduce stressors related to development and operations of the SPFC that negatively affect at-risk species.

To achieve these goals, measurable objectives were developed to target processes, habitats, and species in need of recovery, as well as the associated stressors that could be addressed by implementation of habitat restoration, multi-benefit flood infrastructure improvement projects and improved O&M practices in the flood system. The CVFPP defines multi-benefit projects as follows (California Department of Water Resources 2017):

“projects designed to reduce flood risk and enhance fish and wildlife habitat; multi-benefit projects may also create additional public benefits such as sustaining agricultural production, improving water quality and water supply reliability, increasing groundwater recharge, supporting commercial fisheries, and providing public recreation and educational opportunities, or any combination thereof.”



The targets of the Conservation Strategy's measurable objectives (or the amount of restoration needed) were determined by review and consideration of existing recovery plans for targeted species, consultation with species experts, mapping existing vegetation, research and analysis of historic floodplain records, and evaluating restoration needs and opportunities across the flood system. Progress toward the measurable objectives will inform CVFPP implementation and future State funding guidelines and grant programs.

The multi-benefit flood infrastructure improvement projects identified here have been implemented and meet the following criteria:

- The project was designed after 2012, and completed between 2016 and 2021. Although the planning, permitting, and funding of many projects progressed during the 2016-to-2021 period, only projects, or phases of projects, completed in this period are reported here. In addition, projects that were planned and designed before 2012 were generally considered part of baseline conditions while the measurable objectives were developed, and therefore do not represent ecosystem improvements resulting from the CVFPP's implementation.
- The project implements the CVFPP via a multi-benefit project or through a habitat enhancement project with a positive result for one or more measurable objective, as identified in the Conservation Strategy.
- The project is within the geographic scope of the CVFPP (i.e., the SPA), and within SPFC facilities or on lands protected by the SPFC.

Note, if an identified fish passage barrier from Appendix K of the 2016 Conservation Strategy has been removed as part of the CVFPP or any other program or project (e.g., Fremont Weir Adult Fish Passage Modification Project), it is considered resolved and thus counts toward meeting the measurable objective for this stressor, regardless of the effect on flood risk (i.e., not necessarily a multi-benefit project).

The outcomes reported here are planned project outcomes as reported in environmental documents, permits, and spatial data provided by project managers. These outcomes will be monitored and verified so the achieved outcomes are documented accurately. The Flood Performance Tracking System (FPTS) will be updated once data become available for verified outcomes. When project outcomes are used to mitigate habitat loss caused by other projects, contributions to the measurable objectives will be reduced to account for that debit.

The four multi-benefit projects summarized here were completed between 2016 and 2021, and contributed to the measurable objectives by reconnecting floodplains, restoring riparian habitats, and providing other ecosystem benefits. These projects were funded through DWR's flood management programs and meet the CVFPP criteria for a multi-benefit project:

- **The Oroville Wildlife Area Flood Stage Reduction Project (Feather River CPA)** reduced flood risk, increased the area of inundated floodplain, and restored riparian habitat by augmenting the existing system of inflow and outflow weirs to safely divert additional floodwaters through the Oroville Wildlife Area and by improving drainage to reduce fish



stranding. The project area is approximately 1,500 acres located on the west side of State Route 70 across the Feather River from the Thermalito Afterbay outlet.

- **The Three Rivers Levee Improvement Authority Feather River Conservation Bank (Feather River CPA)** restored 500 acres of a previously created levee setback area to a mosaic of mixed riparian forest and riparian scrub. This project is anticipated to be used as a bank; therefore, measurable objectives contributions will be reduced as credits are used.
- **The Southport Setback Levee Project (Lower Sacramento River CPA)** restored 120 acres of inundated floodplain and riparian habitat by constructing a setback levee along the west bank of the Sacramento River. A portion of this project may be used as a mitigation bank; therefore, contributions to measurable objectives may be reduced as credits are used.
- **The Dos Rios Floodplain Expansion and Ecosystem Restoration Project, Phase I (Lower San Joaquin River CPA)** reconnected approximately 1,000 acres of inundated floodplain by constructing notches in agricultural berms, resulting in restored riparian habitat on most of the reconnected floodplain.

Multi-benefit projects being developed within the legal Sacramento–San Joaquin Delta (Delta) independent of the CVFPP before 2016 (e.g., the McCormack-Williamson Restoration Project) were excluded from the measurable objectives, and thus, are not included in this summary of multi-benefit projects implemented between 2016 and 2021. Other projects were completed during this time frame but may not contribute to the measurable objectives because they do not meet the required criteria. In addition, one project did not meet the criteria as a multi-benefit project and was not implemented under the CVFPP, but it is included because it contributed to addressing a Conservation Strategy measurable objective:

- **The Fremont Weir Adult Fish Passage Modification Project (Lower Sacramento River CPA)** reduced a stressor (fish passage barrier) as identified in Appendix K of the 2016 Conservation Strategy so only the fish passage barrier component of the project is being counted toward that stressor’s measurable objective. This project improved fish passage by replacing the existing fish ladder at Fremont Weir with a step pool channel leading up to the weir and gated notch through the weir.

Additional projects are under construction or are likely to be proposed for consideration by 2027 (i.e., proposed projects between 2022 and 2027). Table 2-1 lists projects that will be constructed, are under construction, or are anticipated to be proposed between 2022 and 2027, by their CPA. For further information on these projects, refer to Appendix F, Attachment F.1, “Five-Year Implementation Summary Memorandum.”



Table 2-1. Constructed, Under Construction, and Proposed 2022 to 2027 Multi-benefit and Restoration Projects by Conservation Planning Area

Conservation Planning Area	Constructed Projects	Under Construction Projects	Proposed Projects
Upper Sacramento River	<ul style="list-style-type: none"> None 	<ul style="list-style-type: none"> None 	<ul style="list-style-type: none"> Knights Landing Flood Management Project Lower Deer Creek Flood and Ecosystem Improvement Project, Phase I Kopta Slough Flood Damage Reduction and Habitat Project Tisdale Weir Rehabilitation and Fish Passage Project Sutter Bypass Weir #1 Remediation Project
Feather River	<ul style="list-style-type: none"> Oroville Wildlife Area Flood Stage Reduction Project Three Rivers Levee Improvement Authority Feather River Setback Conservation Bank ^[a] 	<ul style="list-style-type: none"> None 	<ul style="list-style-type: none"> Sunset Pumps Facility Removal Project
Lower Sacramento River	<ul style="list-style-type: none"> Fremont Weir Adult Fish Passage Modification Project (non-CVFPP) Southport Setback Levee Project 	<ul style="list-style-type: none"> Lower Elkhorn Basin Levee Setback Project 	<ul style="list-style-type: none"> Yolo Bypass Salmonid Habitat Restoration and Fish Passage Project (non-CVFPP) ^[b] Agricultural Road Crossing 4 Fish Passage Project (non-CVFPP) Little Egbert Tract Multi-benefit Project Lookout Slough Tidal Habitat Restoration and Flood Improvement Project (non-CVFPP) ^[c]



Conservation Planning Area	Constructed Projects	Under Construction Projects	Proposed Projects
Lower San Joaquin River	<ul style="list-style-type: none"> • Dos Rios Floodplain Expansion and Ecosystem Restoration Project, Phase 1 	<ul style="list-style-type: none"> • None 	<ul style="list-style-type: none"> • Three Amigos Non-structural Alternative Flood Management Project • Dos Rios Floodplain Expansion and Ecosystem Restoration Project, Phase 2 • Paradise Cut Multi-Benefit Improvement Project
Upper San Joaquin River	<ul style="list-style-type: none"> • None 	<ul style="list-style-type: none"> • Eastside Bypass Improvements Project • Cottonwood, Dry, Berenda Creek Arundo Eradication and Sand Removal Project 	<ul style="list-style-type: none"> • Reach 2B and Mendota Pool Bypass • Arroyo Canal Screening and Sack Dam Passage Project

^[a] Because the Feather River Setback Conservation Bank is intended to provide mitigation, uplift is temporary until credits are used.

^[b] Because the Yolo Bypass Salmonid Habitat Restoration and Fish Passage Project is a non-CVFPP project and possibly designated as mitigation, it may not provide any credits toward Conservation Strategy measurable objectives.

^[c] The Lookout Slough Tidal Habitat Restoration and Flood Improvement Project falls within the footprint of the Lower Sacramento River CPA, and provides flood management benefits, in addition to providing for significant tidal habitat restoration in the lower Yolo Bypass. The restoration component is also expected to contribute towards the Conservation Strategy measurable objectives; thus this project qualifies as a multi-benefit project.

Notes:

CPA = conservation planning area

CVFPP = Central Valley Flood Protection Plan



2.1.1.1 Funding

The total combined cost of the five constructed projects was approximately \$298 million. Table F-5 in Appendix F provides a breakdown of funding by source and Attachment F.1. of Appendix F provides cost and funding sources for each constructed project. Funding for these projects came from a variety of State, local, and federal sources, and the contributions from these sources differed considerably. State bonds from Propositions 1E, 1, 13 and 84 were the greatest source of funding, accounting for 77 percent of the funding for the completed projects. Proposition 1E, which accounted for 61 percent of the funding, does not support ecosystem services beyond mitigation requirements. Multi-benefit projects that use Proposition 1E funds are often supplemented with additional funds from other sources to create beneficial environmental outcomes.

Local funding accounted for 14 percent of funding. Although local contributions are not as great a funding source for completed projects as State bonds, they are a required and important match to other funding. Counties, flood control agencies, and reclamation districts have provided these matching funds for multi-benefit projects. Federal funding and other State funding accounted for 7 percent and 2 percent of total funding, respectively. Currently, over \$300 million is committed to in-progress projects throughout the SPA.

2.1.2 Operations and Maintenance Projects

Between 2016 and 2021, within the Upper Sacramento River and Lower Sacramento River CPAs, O&M projects along Cache Creek and Elder Creek removed approximately 40 acres of giant reed infestations. In-progress and anticipated 2022 to 2027 O&M projects that would remove infestations of prioritized invasive plants include Upper Cache Creek, Chico Creek area, and Sycamore Creek in the Upper Sacramento River CPA; and Bear River and Cherokee Canal in the Feather River CPA.

2.1.3 Advance Mitigation Projects

Advance mitigation projects establish habitat before projects that need mitigation are implemented. Thus, the mitigation credits created (in the form of acres of habitat) are ready to use as needed, avoiding project approval delays and temporary habitat loss.

Support for advance mitigation is part of the Conservation Strategy's approach to regulatory compliance. The 2016 Strategy listed four advance mitigation projects that had received more than \$17 million in funding from DWR and were under development in 2016 (Appendix B, "Advance Mitigation," of the 2016 Conservation Strategy). These projects provide advance mitigation for the habitats and species most commonly affected by flood risk management (i.e., the targets of this Strategy). Their current status is as follows:

- **Grasslands Mitigation Bank.** This 281-acre bank in Merced County has been completed, and DWR has received 130 giant garter snake credits applicable to projects in the San Joaquin Valley and southern portion of the Delta.
- **Hidden Valley Ranch Acquisition.** This 497-acre property in the Lower San Joaquin River CPA has been acquired.



- **Bullock Bend Mitigation Bank.** The development of this 120-acre bank along the Sacramento River (between Colusa and Verona) has been completed; DWR has received 57.5 salmonid credits from this bank, and several of these credits have been used by projects in the service area of the bank.
- **Feather River Setback Conservation Bank.** This approximately 585-acre site has been restored to 502 acres of riparian forest and scrub, and mitigation credits for valley elderberry longhorn beetle and riparian habitat are being determined.

By funding these projects, DWR has contributed to the conservation of 1,483 acres of habitat, most of which has not yet been used as mitigation, and has supported the efficient implementation of flood management projects and maintenance.

2.2 Progress Toward Goals

Figures 2-1 through 2-3 show progress toward each CPA's measurable objectives. Significant additional work is needed in each CPA to meet its objectives. Several additional projects are in the planning or funding stages. These in-progress projects are discussed in Attachment F.1, and will make additional contributions to the measurable objectives in the next few years as they are implemented.



Figure 2-1. Potential Contributions of Completed Projects to Ecosystem Process Objectives

Note 1: Compensatory mitigation and non-mitigation are displayed separately because using restored ecosystem processes as mitigation reduces progress toward the Conservation Strategy’s goals.

Note 2: Floodplain inundation was calculated using the Floodplain Restoration Opportunity Analysis, as described in Appendix I of the 2016 Conservation Strategy

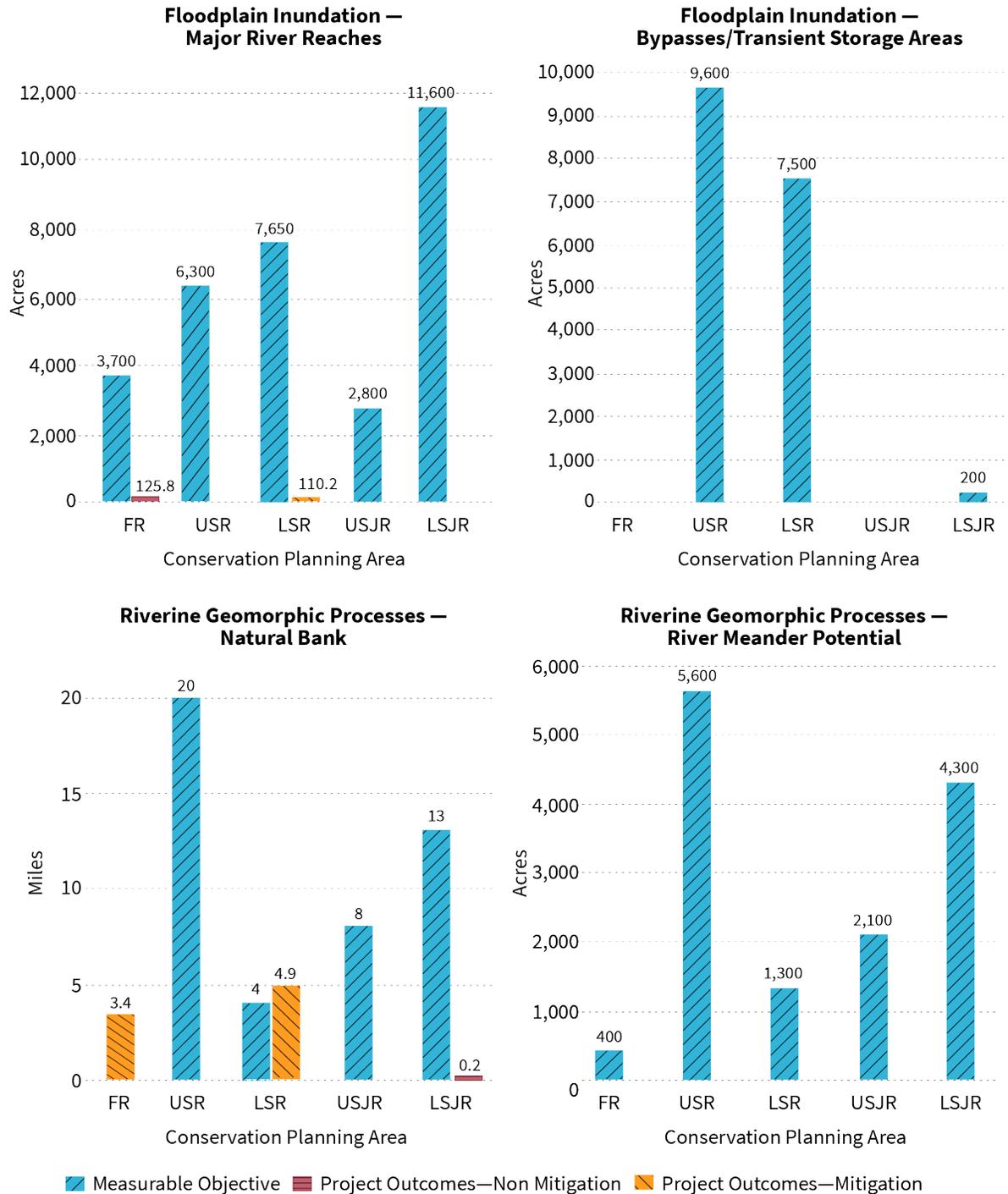


Figure 2-2. Potential Contributions of Completed Projects to Habitat Objectives

Note: Compensatory mitigation and non-mitigation are displayed separately because using restored habitats as mitigation reduces progress toward the Conservation Strategy’s goals.

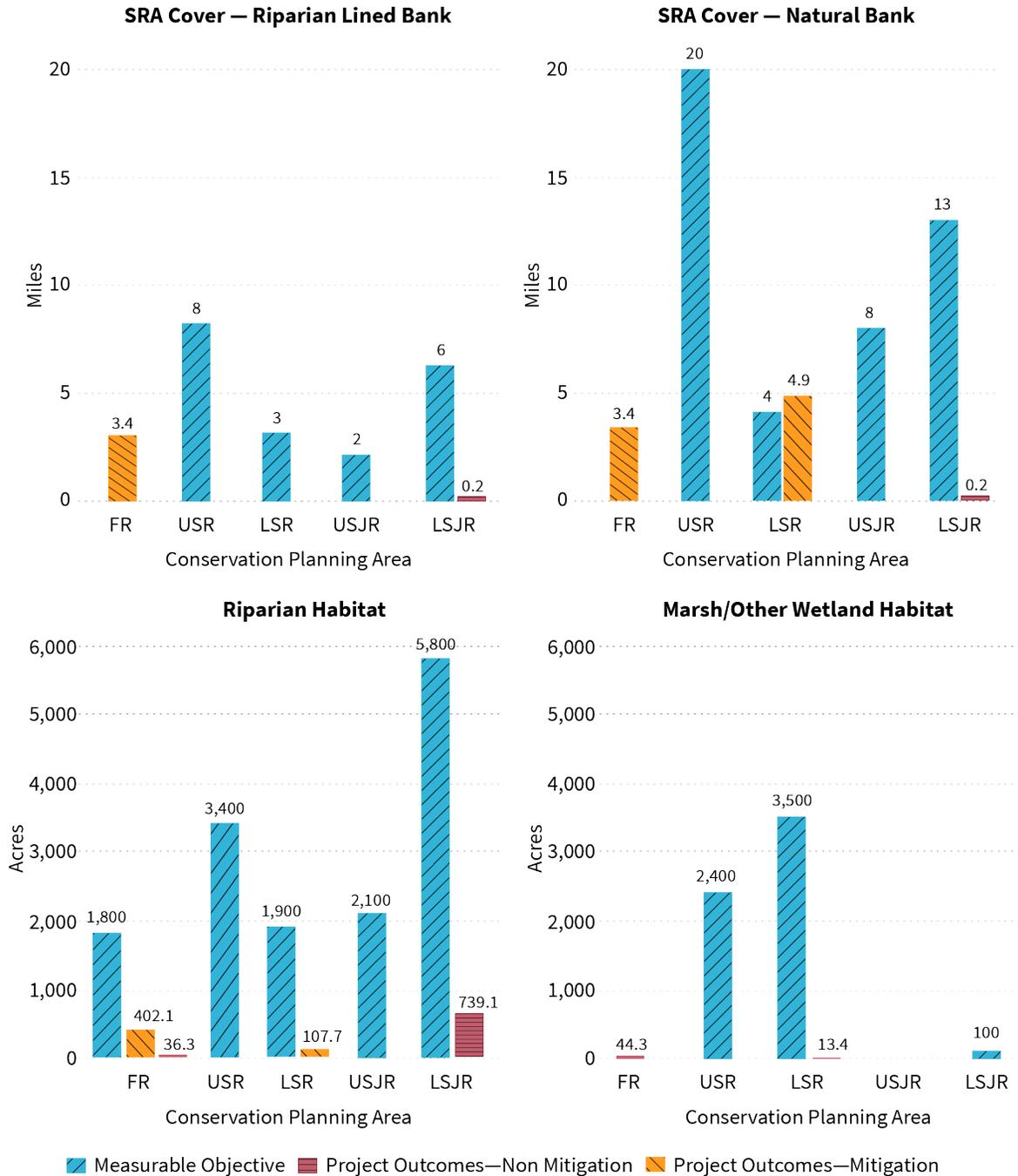
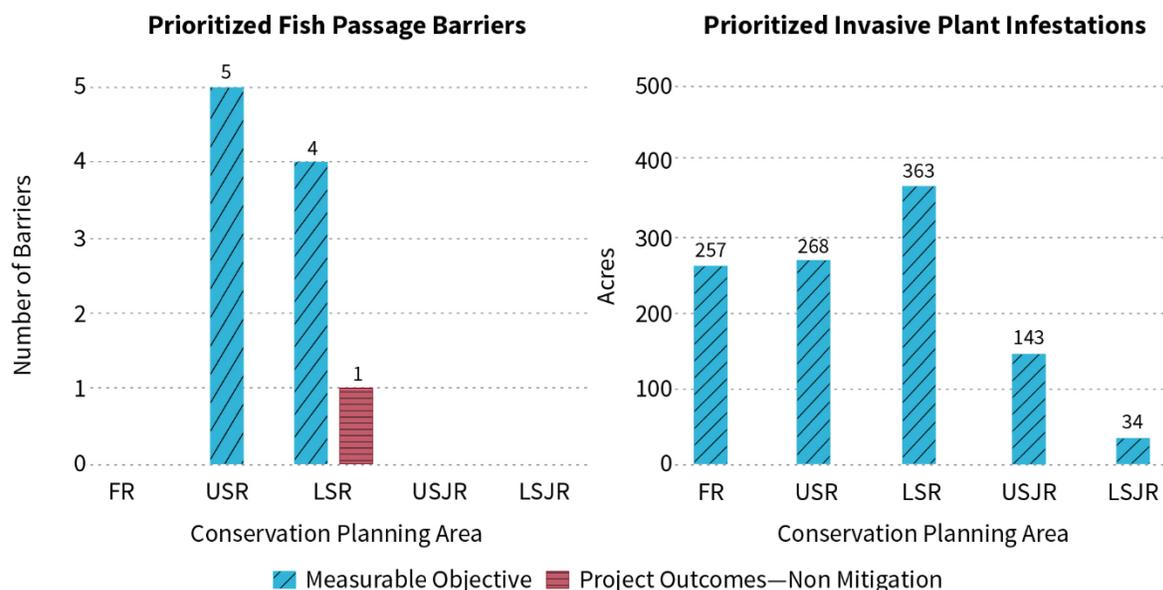


Figure 2-3. Potential Contributions of Completed Projects to Stressor Objectives

Note: Compensatory mitigation and non-mitigation are displayed separately because using reduced stressors as mitigation reduces progress toward the Conservation Strategy's goals.



The figures include restoration outcomes that have been or are planned for use as mitigation (e.g., the Southport Levee Setback Project), but distinguish them from outcomes that will not become mitigation. Mitigation is distinguished from non-mitigation because the former represents reduced or no progress toward the goals of this Conservation Strategy. Section 3.3.1, “Measurable Objectives for Tracking Progress Toward Goals,” provides a complete description of how using a restoration outcome as mitigation reduces or eliminates contributions toward fulfillment of the goals of this Conservation Strategy.

The following sections summarize the progress from completed projects toward each of the Conservation Strategy's goals.

2.2.1 Ecosystem Processes Goal -Improve Dynamic Hydrologic (Flow) and Geomorphic Processes in the SPA

For this goal, the Conservation Strategy's objectives quantify improvements in ecosystem processes as net increases in the acreage or mileage where the processes occur. Each CPA has objectives to restore inundated floodplain along major river reaches, in bypasses, or in transient storage areas, and to restore natural riverbanks and river meander potential.

In the Lower Sacramento River CPA, 122 percent of the objective for natural bank has been achieved (Tables F-2 and F-3 in Appendix F, “Conservation Strategy Five-Year Implementation Summary Memorandum”). The completed projects have achieved less than 5 percent or have

not contributed to the other objectives for ecosystem processes. In-progress and anticipated 2022 to 2027 projects in the Yolo Bypass are anticipated to contribute more than half of the objective for inundated floodplain in bypasses or transient storage areas in the Lower Sacramento River CPA. In -progress and anticipated 2022 to 2027 projects would also contribute to ecosystem process objectives in the other CPAs, but the extent of their contributions is still uncertain.

2.2.2 Habitats Goal - Increase and Improve the Quantity, Diversity, and Connectivity of Riverine and Floodplain Habitats

For this goal, the Conservation Strategy's objectives quantify habitat increases and improvements as net increases in habitat amounts. Each CPA has objectives to restore SRA cover (natural bank and riparian-lined bank), riparian habitat, and marsh (and other wetlands) habitat.

In the Lower Sacramento River CPA, 122 percent of the objective for natural bank SRA cover has been achieved. In the Feather River, Lower Sacramento River, and Lower San Joaquin River CPAs, the completed projects have achieved 24 percent, 5.6 percent, and 12.7 percent of the objective for riparian habitat, respectively. (Tables F-2 and F-4 in Appendix F, "Conservation Strategy Five-Year Implementation Summary Memorandum"). However, completed projects have achieved less than 5 percent of or have not contributed to the other objectives for habitats. In-progress and anticipated 2022 to 2027 projects are anticipated to restore additional riparian habitat and substantial amounts of marsh and other wetland habitats. Most of that restoration will not be used as mitigation for the loss of these habitats. However, the extent of restoration of natural and riparian-lined riverbanks by these projects is still uncertain.

2.2.3 Species Goal - Contribute to the Recovery and Sustainability of Native Species Populations and Overall Biotic Community Diversity

For this goal, the Conservation Strategy focuses on contributing to the recovery of the target species. The species goal has no species-specific measurable objectives separate from the broader objectives to achieve net increases in processes and habitats and reductions in stressors, which are based in part on the target species' conservation needs. The measurable objectives that would contribute to the recovery of each target species are identified in Section 3.3.1, "Measurable Objectives for Tracking Progress Toward Goals."

Progress toward this goal results from progress toward the ecosystem process, habitat, and stressor objectives, and thus, has been limited as described for those objectives (less than 5 percent of most objectives). In addition, the planned use of this restoration as compensatory mitigation will reduce contributions to the recovery of target species, as described in Section 3.3.1, "Measurable Objectives for Tracking Progress Toward Goals."



2.2.4 Stressors Goal - Reduce Stressors Related to the Development and Operations of the SPFC that Negatively Affect At-risk Species

For this goal, the Conservation Strategy identified priority anadromous fish passage barriers and prioritized invasive plant species, both of which are stressors that negatively affect at-risk species.

2.2.4.1 Fish Passage Barriers

The objectives for fish passage barriers were adopted from “Synthesis of Fish Migration Improvement Opportunities in the Central Valley Flood System” (Appendix K of the 2016 Conservation Strategy), which prioritized the specific fish passage barriers for rectification. There is no objective for prioritized fish passage barriers in the Upper San Joaquin River and Lower San Joaquin River CPAs. However, after the objectives were established, DWR prioritized three fish passage barriers in the Upper San Joaquin River CPA: the Mendota Dam, the Sack Dam, and the Eastside Bypass Control Structure.

A prioritized fish passage barrier (Fremont Weir) has been rectified in the Lower Sacramento River CPA, and two planned projects would also remove additional barriers, one each in the Upper Sacramento River and Lower Sacramento River CPAs (Tisdale Weir Rehabilitation & Fish Passage Project and Agricultural Road Crossing 4 Fish Passage Project, respectively). Although Fremont Weir is not a multi-benefit project associated with the CVFPP’s implementation, it has resulted in the removal of a fish passage barrier identified in Appendix K of the 2016 Conservation Strategy, which is considered to have contributed to the measurable objectives of the 2016 Conservation Strategy.

2.2.4.2 Invasive Plants

The objectives for invasive plants were adopted from the Invasive Plant Management Plan (Appendix E of the 2016 Conservation Strategy), to reduce populations of four prioritized species from channel maintenance areas: giant reed, tamarisk, red sesbania, and Himalayan blackberry. For each CPA, the Invasive Plant Management Plan has objectives for each of these species, which were combined into a single objective for the 2016 Conservation Strategy.

Between 2016 and 2021, completed projects achieved 0 percent of the measurable objectives for removal of prioritized invasive plant species (Tables F-2 and F-4 in Appendix F, “Conservation Strategy Five-Year Implementation Summary Memorandum”). The Invasive Plant Management Plan set an approximate 20-percent goal for achieving its objectives in five-year intervals as the adaptive management threshold for review of the plan and its implementation (the 2016 Conservation Strategy combines these species objectives into a single objective per CPA). Documented removals of prioritized invasive species were less than the 20-percent threshold, triggering a review of the plan and its implementation.

2.2.5 Other Contributions of Multi-benefit Projects to Conservation Strategy Goals

The Conservation Strategy’s measurable objectives do not encompass all types of contributions multi-benefit projects and O&M can make toward the Conservation Strategy’s goals. In particular, projects or maintenance activities can reduce stressors that were not prioritized and



thus not included in the measurable objectives (e.g., the removal of aquatic invasive plants). Between 2016 and 2021, maintenance activities and several multi-benefit projects supported the Conservation Strategy’s goals by removing non-prioritized invasive vegetation or impediments to fish passage:

- The Oroville Wildlife Area Flood Stage Reduction Project eradicated infestations of prioritized and non-prioritized species from 700 acres outside of channel maintenance areas in the Feather River CPA.
- The Eastside Bypass Improvements Project eliminated two weirs impeding fish passage in the Upper San Joaquin River CPA.
- Maintenance activities in all CPAs routinely remove invasive plants, and some removals of non-prioritized species substantially benefit target species. For example, the routine removal of invasive aquatic plants from canals (such as parrot’s feather and water primrose) enhances habitat for giant gartersnakes.

2.3 Adaptive Management

The 2016 Conservation Strategy included adaptive management that involved implementation tracking and data dissemination; systemwide or regional inventories of targeted ecosystem processes, habitats, and stressors; studies focused on key uncertainties; and solicited guidance. The following sections describe each of these components between 2016 and 2021.

2.3.1 Implementation Tracking and Data Dissemination

The 2016 Conservation Strategy described a proposed system of tracking and data management to facilitate necessary reporting, information sharing, and adaptive management.

Since 2016, to meet these needs, DWR has been creating new, more efficient systems for data management, including a system to manage data for the Conservation Strategy and other CVFPP metrics. The FPTS compiles and tracks flood management and environmental outcomes to gauge progress toward meeting CVFPP goals. A related system that is in the conceptual design phase would use a “one-landscape” perspective to associate these outcomes with other DWR programs, and would support project prioritization and outcome-based evaluations of those programs. These new, centralized systems use common data from across programs and applications while maintaining the unique functionality of existing applications. This data management infrastructure has the following characteristics:

- Relies on an integrated set of databases and applications.
- Integrates shared data across programs.
- Reduces redundancy and duplicated data management efforts by storing shared data in a single location that can be accessed across DWR.



Together, these data systems manage information about projects, funding, habitat outcomes, and ecosystem metrics across DWR programs. They are described further in Section 3.4.5, “Adaptive Management,” which provides the updated approach to adaptive management.

2.3.2 Inventories

While developing the 2016 Conservation Strategy and 2017 CVFPP Update, DWR produced several systemwide and regional inventories of targeted ecosystem processes, habitats, and stressors. These inventories supported the development of the measurable objectives, and inform project planning. As described in the 2016 Conservation Strategy, updates to these datasets will occur every five to 10 years and document regional changes to the amount and distribution of these targets, thereby supporting adaptive management of implementation and development of multi-benefit projects (Table 8-1 in the 2016 Conservation Strategy).

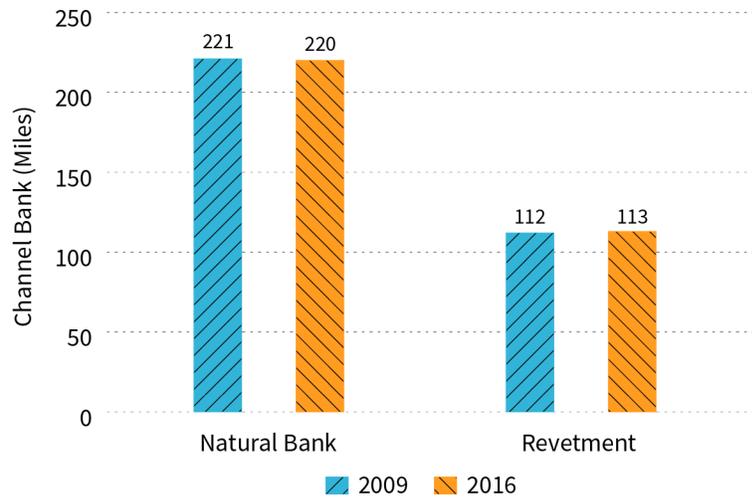
Between 2016 and 2021, DWR updated vegetation mapping systemwide, in three separate efforts: the legal Delta, a portion of the Feather River CPA, and the rest of the SPA. These updates are based on 2016 imagery and field work, and validation studies conducted from 2018 to 2021. The previous map of vegetation in the SPA was based on 2009 imagery.

In addition, channel bank datasets (revetted and natural banks) were updated for the Upper Sacramento River and Lower Sacramento River CPAs. These updates were based on 2016 aerial imagery and field work conducted during 2019 and 2020. The Feather River CPA is scheduled to be updated in 2022. The previous mapping for the Lower Sacramento River CPA was based on a USACE inventory of revetment along the Sacramento River (U.S. Army Corps of Engineers 2007). The previous mapping for the Upper Sacramento River CPA was based on 2009 imagery and field work conducted in 2014.

The updated inventory of revetted and natural banks in the Upper Sacramento River CPA illustrates the value of regional inventories for adaptively managing implementation. During 2009 to 2016, revetment was eroded away from or deposited at nearly 100 locations with a combined length of nearly 3 miles. These changes resulted in a net decrease in natural bank of approximately 1 mile. Figure 2-4 shows this net reduction in ecosystem processes and habitat does not substantially alter 2009 conditions, but continues a trend that has already dramatically reduced ecosystem processes and habitat for target and other native species. Because revetment is placed on the most actively eroding locations along channel banks, the placement of revetment on approximately one-third of bank length has had a disproportionate impact on geomorphic processes and the regeneration of early successional vegetation (Fremier 2003).



Figure 2-4. Length of Revetment and Natural Channel Bank in the Upper Sacramento River CPA in 2009 and 2016



2.3.3 Focused Studies

The 2016 Conservation Strategy recommended using focused studies to complete key datasets and reduce uncertainty regarding the response of targeted habitats and species to management actions. The Strategy identified 17 studies as priorities (Table 8-2 in the 2016 Conservation Strategy). Seven of these studies would complete regional inventories of targeted ecosystem processes or habitats, nine are focused on targeted species, and the remaining one is focused on fish passage barriers.

None of these focused studies were conducted during 2016 to 2021, but their completion remains a priority to advance scientific understanding, as well as the implementation of the CVFPP and related conservation actions. New study priorities have also been identified, particularly related to the need to update older inventories and inform climate change adaptation. These new priorities are provided in Table 3-6, “Data Gaps Related to Targeted Ecosystem Processes, Habitats, and Species.”

2.3.4 Implementation Guidance

As described in the 2016 Conservation Strategy, the adaptive management of implementation must be guided not only by project outcomes, regional resource inventories, and focused studies, but by input from other agencies and scientists. To obtain this guidance, an interagency advisory committee and scientific advisory committee were proposed. Neither of these committees has convened between 2016 and 2021. However, DWR solicited advisory input from agencies, NGOs, and project proponents, as described here.

In addition to its own assessment of implementation of the Conservation Strategy, DWR solicited input from the CVFPB, other project proponents and maintainers, regulatory agencies,



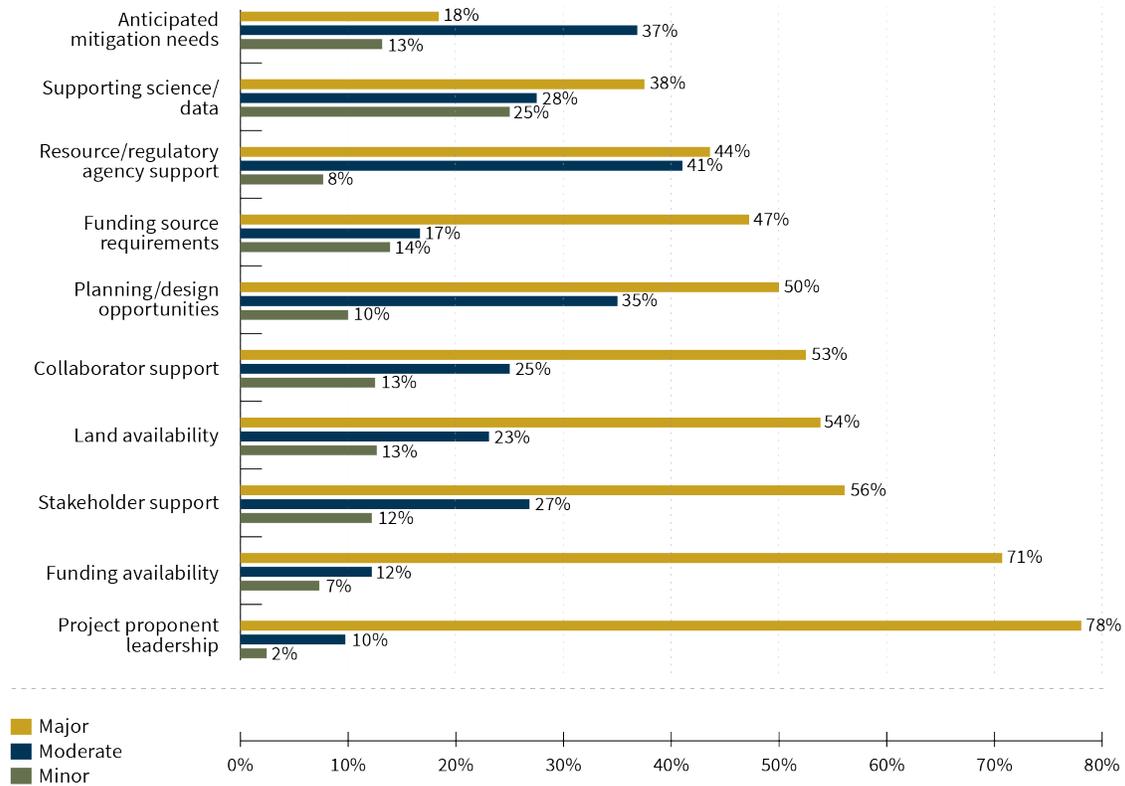
NGOs, and other stakeholders. This input was initially solicited through a survey (distributed to approximately 240 individuals, 42 of whom responded) and 16 interviews, and subsequently through participation in the CVFPB Advisory Committee. The experience of survey recipients and interviewees represented the range of regions, roles, project types, and project phases relevant to the Conservation Strategy's implementation.

Survey respondents identified funding availability, funding source requirements, and regulatory requirements as major factors limiting multi-benefit projects, among other factors. They identified funding availability and project proponent leadership as the major factors contributing to the successful implementation of multi-benefit projects (Figure 2-5).

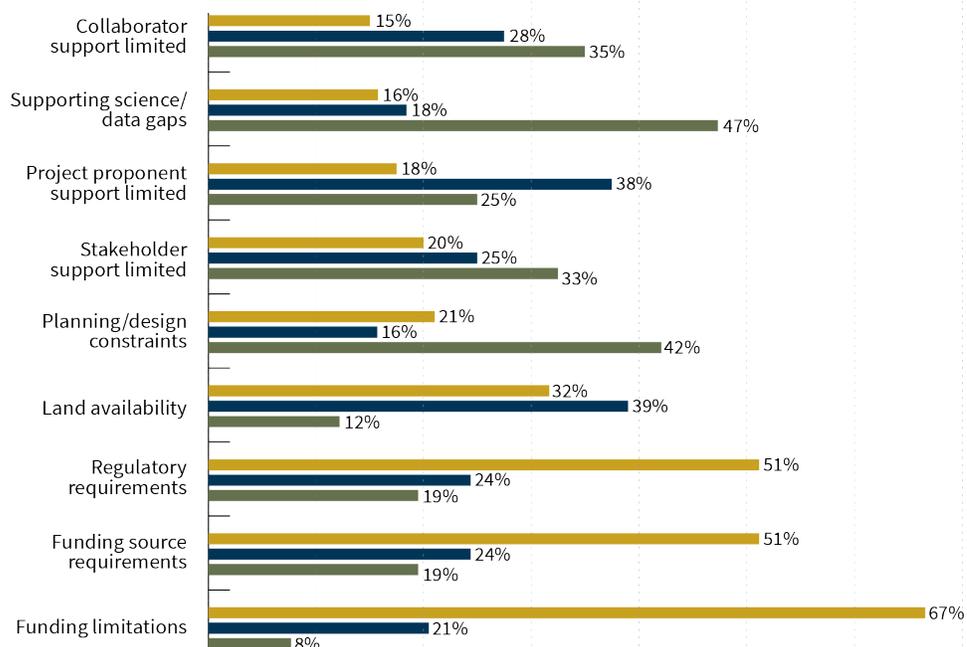


Figure 2-5. Survey Responses Regarding Factors Contributing to or Limiting Ecosystem Improvements by Multi-benefit Projects

A. Contributing Factors



B. Limiting Factors



Interview participants provided more extensive and detailed input regarding implementation needs. Major findings from the interviews included:

- **Better alignment is needed among agency policies, funding sources, and regulatory requirements.** Participants called for better policy integration and coordination within and among agencies to facilitate the development of multi-benefit projects. Such projects are subject to the policy and regulatory requirements of fish and wildlife agencies and USACE, and to the requirements of funding sources; particularly State bonds that often do not align well with the multi-benefit-project objectives described in the CVFPP. Much of this alignment will have to occur at higher State and federal policymaking levels; however, participants also noted the need for a better alignment of divisions and programs within key CVFPP agencies to support the development and implementation of multi-benefit projects.
- **CVFPP criteria are needed that define multi-benefit projects and contributions to measurable objectives.** Participants also called for clearer policy guidance in the CVFPP; particularly regarding criteria that define multi-benefit projects and determine contributions to the measurable objectives (e.g., mitigation contributions, if any).
- **The CVFPP should consider how to strike an appropriate balance between multi-benefit and single-purpose projects.** Some participants expressed concern that because of the difficulty of developing multi-benefit projects, placing substantially greater emphasis on such projects could leave important flood safety needs unaddressed. They were also concerned that it may not be feasible to achieve meaningful ecosystem improvements for every flood management project.
- **Regional planning is working well, but more early engagement is needed between project proponents, stakeholders, and regulatory agencies.** Developers of multi-benefit projects reported that early engagement with local stakeholders and State and federal agencies, particularly regulators, is essential to a successful project. Participants considered the collaborative environments established by the RFMP process and the CVFPP's Advisory Committee to be effective at the planning level; however, they also identified the need for additional, earlier engagement among all stakeholders and agencies (including divisions and programs within agencies) in the project development process.
- **Funding requirements are a major constraint, including the lack of funding for monitoring and long-term O&M associated with ecosystem improvements.** Project developers consistently cited the divergent requirements of various funding sources as a significant barrier to project development. Multi-benefit projects usually package funds from multiple sources, many of which can be used only for specified purposes, and which may have different deadlines and administrative requirements. The perennial lack of funding for post-construction O&M and monitoring is an even larger problem for restoring habitats through multi-benefit projects.



- **Improved post-construction monitoring, data management, and documentation of project outcomes are needed to adaptively manage implementation.** Participants reported that funding for postconstruction activities, including monitoring, is generally inadequate. Some noted that data are recorded inconsistently and project outcomes are documented insufficiently. Without more complete, consistent methods of tracking and recording project features and outcomes, it will be difficult to accurately assess progress toward the Conservation Strategy’s measurable objectives, or to improve management strategies in response to ecological conditions and lessons learned from previous implementation experiences.

During the summer of 2020, the CVFPB Advisory Committee formed three stakeholder-led subgroups to provide input into the update of this Strategy and its implementation. The topics for the subgroups were:

- Implementation of multi-benefit projects.
- Permitting.
- Performance tracking.

Each subgroup met multiple times between August 2020 and February 2021 to formulate recommendations. DWR requested that these recommendations be grouped to distinguish those pertaining to this update of the Conservation Strategy from others. These subgroup -specific recommendations were finalized in January 2021. Cross-cutting themes (e.g., topics applicable to all three subgroups) were also identified and include: funding, O&M support, technical assistance for disadvantaged communities, and clarification on the definitions of mitigation and allocation of multi-benefit project features toward meeting the Conservation Strategy’s measurable objectives. The recommendations from each subgroup are provided in Appendix G, along with their status for incorporation into the Conservation Strategy Update or public draft of the CVFPP.

2.3.5 Implementation Summary

During the past five years, DWR has developed a preliminary performance tracking system; updated vegetation mapping systemwide; updated mapping of natural and riparian-lined banks in the Upper Sacramento River and Feather River CPAs; developed permitting mechanisms for O&M activities; continued development of previously funded advance mitigation; funded and developed multi-benefit projects; and sought input on the implementation of this Strategy from resource agencies, project proponents, maintainers, and other stakeholders.

Overall, completed projects have attained only a small portion of most measurable objectives (less than 5 percent). In-progress and anticipated 2022 to 2027 projects are expected to result in contributions to additional objectives, and for multiple objectives, cumulative contributions could exceed 20 percent of the objective by 2027. Nonetheless, for the majority of the objectives, the cumulative contributions of projects could still be less than 20 percent of the objective in 2027.



Opportunities are likely missed by not implementing projects that effectively integrate ecological restoration with flood risk reduction projects. The pace of implementation indicates without systemic changes that address major impediments and expedite the development of multi-benefit projects, particularly those that expand the footprint of the flood system, multiple measurable objectives may not be attained, leaving the goals of this Conservation Strategy and CVFPP unfulfilled. The input solicited from DWR staff, survey respondents, interviewees, and the CVFPB's Advisory Committee indicated that project funding and permitting have been major impediments and that multiple factors are important contributors to the successful implementation of multi-benefit projects. This input also provides numerous recommendations to facilitate multi-benefit projects, which have been applied to updated content for the Conservation Strategy and priority actions for 2022 to 2027, provided in Chapter 3, "2022 Conservation Strategy Update."



2022 Conservation Strategy Update

This chapter re-evaluates the list of target species, discusses how to make habitats and target species more resilient to climate change, and clarifies and re-evaluates the measurable objectives. This chapter also presents updates to the Conservation Strategy’s approach to guide implementation, whose main components are collaboration, coordination, and alignment; outreach and engagement; funding; regulatory compliance; and adaptive management.

3.1 Target Species

As described in the 2016 Conservation Strategy, one of its primary goals is to support the recovery and stability of native species populations and overall biotic community diversity. To address this goal, a broad set of species associated with Central Valley river and floodplain ecosystems was first identified; next, focused conservation planning took place for species with the greatest need for recovery and that could be most affected by implementation of the CVFPP (“target species”). Target species are selected based on their ability to meet the following three criteria:

1. **Sensitive or special-status.** The species is identified as sensitive or special-status in local or regional plans, policies, or regulations, or by the California Department of Fish and Wildlife (CDFW), National Marine Fisheries Service (NMFS), or U.S. Fish and Wildlife Service (USFWS). Sensitive or special-status species include those listed as threatened or endangered under the federal Endangered Species Act (ESA) or the California Endangered Species Act (CESA); candidates for listing; species identified as fully protected under the California Fish and Game Code or as California Species of Special Concern; and species with California Rare Plant Rank 1A, 1B, or 2.
2. **Associated with target habitats.** The species requires riverine aquatic (including SRA cover), riparian, marsh, or periodically inundated floodplain or associated habitats as the primary habitat for one or more life stages or ecological needs (e.g., reproduction or foraging).
3. **Potential CVFPP effect.** Based on the species’ distribution, habitat associations, and ecology, implementing the CVFPP will temporarily or permanently affect California populations of the species.

A focused conservation plan was developed for each target species. These plans explain the relationship between the species’ conservation needs and flood management activities in



sufficient detail to support the development of the Strategy. Appendix G of the 2016 Conservation Strategy provided further details about target species selection and the focused conservation plans.

3.1.1 Target Species Review

For this update to the Conservation Strategy, all information relevant to determining target species was reviewed, including adopted conservation plans, status reviews and critical habitat designations, regional conservation planning documents, and relevant scientific literature. This review included target species as well as the potentially suitable species that were not selected as target species in the 2016 Strategy (i.e., non-target species). This information is summarized in Appendix A, “Target Species List Review and Update.” The 2016 Strategy includes provisions for amending the list of target species as part of the five-year update process to reflect changing conservation needs and habitats. In addition to the 17 target species identified in the 2016 Conservation Strategy, three additional target species were identified:

1. **Delta smelt.** The recent precipitous decline of this San Francisco Bay and Delta estuary--endemic species has led to its “warranted-but-precluded” uplisting from threatened to endangered under ESA since the completion of the 2016 Conservation Strategy. The delta smelt’s recovery depends on existing and additional habitat in the SPFC’s river corridors, sloughs, and the Yolo Bypass.
2. **Tricolored blackbird.** The recent precipitous decline of this near-California-endemic species (Figure 3-1), of which the Central Valley holds the vast majority of the largest colonies, has led the species’ status to be elevated from California Species of Special Concern to listed as threatened under CESA since the completion of the 2016 Conservation Strategy. Existing and additional nesting habitats along SPFC river corridors and in SPFC bypasses are important to this species’ recovery.
3. **Yellow-breasted chat.** Yellow-breasted chat (Figure 3-1) is a riparian-obligate bird associated with early successional habitat. Flood management activities have caused substantial adverse effects to this California Species of Special Concern; conversely, the implementation of this Conservation Strategy would substantially benefit yellow-breasted chat and contribute to the recovery of its Central Valley population.

A focused conservation plan has been prepared for each of these species (Appendix B, “Focused Conservation Plans for New Target Species”). Their conservation needs are considered in this update’s review of the measurable objectives.



Figure 3-1. Two Bird Species Added to Target Species: Yellow-Breasted Chat (left) and Tricolored Blackbird (right)



Source: H. T. Harvey & Associates

3.2 Increasing the Resilience of Target Species and Habitats to Climate Change

A key theme of the 2022 update to the CVFPP and Conservation Strategy is climate resilience, supported by a body of work to describe and better understand flood and ecosystem management-related risks and vulnerabilities, and to provide a set of recommendations and adaptation strategies related to climate change. Climate change is a critically important issue for ecosystems in the Central Valley, with major ecological consequences leading to changes in the abundance and distribution of native habitats and species as a result of physical changes to the environment (Dunn and Møller 2019; Rosenzweig et al. 2008). These changes will include higher air and water temperatures, increased evapotranspiration, less precipitation falling as snow and reduced spring snowpack, increased precipitation intensity, increased winter runoff volumes and higher peak-winter runoff rates, changes in the seasonality of flows, more frequent and intense droughts, more frequent and intense wildfires, and sea level rise (Point Reyes Bird Observatory Conservation Science 2011; Central Valley Landscape Conservation Project 2017a; Bedsworth et al. 2018). Relative to historical patterns of precipitation, temperature, and hydrology, these changes will amplify in the coming decades, and will be especially pronounced by the end of this century.

The ability of native habitats and species to withstand the stressors associated with climate change depends on functioning natural physical processes that provide resiliency within the system. Climate change affects ecosystems and species directly, and also interacts with other human stressors that have already negatively affected physical processes, habitats, and native species. Traditionally, the potential vulnerability of an ecosystem to climate change impacts has been measured in relation to the historical condition of the ecosystem, with the logic that populations, communities, and ecosystems will be best prepared to cope with new or variable conditions if that condition falls within the historical range of variability to which they are

adapted. However, the realized and potential rates of change in temperature, precipitation, and hydrology as a result of climate change are outside the range of the natural variability current ecosystems in the Central Valley historically have occurred under. In addition, the increase in climatic extremes increases the frequency and magnitude of natural ecological disturbances such as fire, flood, and drought; the stress these climatic changes and ecological disturbances will impart on natural communities may exceed the ecosystem's ability to recover.

Species differ in their vulnerability to impacts from climate change and their ability to recover from those impacts (i.e., their resilience). Unfortunately, a large portion of California's flora and fauna is moderately to highly vulnerable to climate change impacts (California Department of Fish and Wildlife 2015), including most of this Conservation Strategy's target species and habitats (Gardali et al. 2009; Moyle et al. 2012; Thorne 2016; Central Valley Landscape Conservation Project 2017b). Chinook salmon runs and delta smelt are particularly vulnerable. However, a species' vulnerability and its resilience are a product of many aspects of its ecology, population and conservation status, and current habitat conditions. Consequently, actions can be taken to reduce vulnerability or increase resilience.

Appendix H, "Climate Change Adaptation for the CVFPP Conservation Strategy Update" uses recent climate modeling analyses that have been developed to inform the 2022 CVFPP Update, extends these data to determine climate risks and vulnerabilities, and proposes adaptation strategies focusing on the objectives and target species at the CPA scale, including:

- Building system resiliency by restoring critical landscape-level hydrologic, geomorphic, and ecological processes related to improving river functionality, floodplain activation, and habitat connectivity and complexity.
- Opportunistically incorporating habitat and species-specific adaptation measures into multi-benefit project planning and design.
- Further incentivizing, prioritizing, and removing impediments to multi-benefit project implementation.
- Performing more detailed analyses and developing additional tools and processes to better evaluate vulnerabilities and risks of Conservation Strategy processes, habitats, and species to climate change at regional and project-specific scales.
- Developing better communications and outreach protocols to convey the ecological risks and adaptation opportunities associated with climate change, and forming more effective partnerships with federal, regional, and local stakeholders.



These adaptations are guided by the following key principles of conservation biology and adaptive management (National Fish, Wildlife, and Plants Climate Adaptation Partnership 2012; California Natural Resources Agency 2014; Stein et al. 2014; Keeley et al. 2018):

- Protecting remaining habitats from loss and fragmentation and increase the size of protected areas.
- Providing for species movement and migration through habitat protection and restoration, and through compatible design of infrastructure.
- Reducing other (non-climatic) stressors on species through management actions.
- Using adaptive management to take action under uncertain and changing climatic conditions to increase understanding and inform actions.
- Increasing institutional capacity for effective management.

The 2022 update to the CVFPP and Conservation Strategy provides a critical opportunity to increase the climate change resiliency of riverine habitats and species. This is primarily because rivers and floodplains are particularly important as corridors for the movement and migration of aquatic and terrestrial species (Seavy et al. 2009). The Central Valley's rivers and floodplains are also highly managed systems, and many opportunities are available to act to reduce vulnerability to climate change impacts and increase resilience. As DWR, regional/local maintaining agencies, and other State and federal resource managers continue to advance multi-benefit projects within the SPA, floodplain managers will need to strive to build resilience into the system and develop countermeasures to mitigate the impacts of climate change by employing effective adaptation approaches.

The Conservation Strategy provides the guidance to make progress on developing the planning processes, strategies, and multi-benefit projects that increase system resilience. The main challenge DWR and its partners face in relation to climate change is primarily one of timing – the pace and scope of multi-benefit project implementation must increase, which will require the resolution of the fundamental policy issues already identified in the CVFPP and Conservation Strategy, including funding, permitting, long-term O&M, and performance accounting. This will also require impediments to multi-benefit project development to be addressed and resolved.

3.2.1 Climate Adaption Opportunities for Regional Multi-benefit Projects

Of the multi-benefit projects currently identified and evaluated in the CVFPP, those that will most effectively build resilience are those that are being developed at a landscape or regional scale, and focus on the restoration of geomorphic, hydrologic, and ecological processes along the primary river corridors. Strategically restoring riverine geomorphic processes and providing sufficient river corridor widths will provide the greatest degree of resilience for the Conservation Strategy habitats and species, and simultaneously provide flood risk reduction



benefits for communities located along these channels. Chapter 5 of Appendix H provides a preliminary analysis of the potential opportunities to enact adaptation strategies along river corridors for identified reaches in each CPA. Due to the extreme risk and potential vulnerabilities of the Conservation Strategy habitat and species to the impacts of climate change, it is imperative that a more detailed analysis of regional multi-benefit opportunities is performed, followed by planning, design, and implementation once high-priority opportunities are identified. This will likely require conversion of lands from agriculture, and the removal, modification, or setting back of levee systems, which poses significant challenges politically and financially for the State and its federal, regional, and local partners.

Historically, the bypass systems have been a primary focus of regional flood system improvement projects in the Central Valley, since they provide large flood risk reduction benefits for urban areas and agricultural lands. However, these bypass systems are not as ideal for restoring ecological resilience, because they are only secondarily connected (during flood flows) to the river channels that drive the fundamental geomorphic and hydrologic processes that support the diversity and resilience of native habitats and many target species. Despite this, there are some significant opportunities to approach bypass expansion and improvements in a manner that is consistent with the adaptation strategies identified in Appendix H.

For example, the Yolo Bypass Master Plan effort (currently in development) is evaluating how a suite of recently implemented, ongoing, and proposed projects in the bypass can improve the form, function, and habitat diversity of the Yolo Bypass at a landscape scale. These efforts will also improve floodplain connectivity and activation, and potentially provide aquatic, riparian, and floodplain habitat improvements for a wide range of native species (including anadromous fish). By purposefully designing and/or maintaining habitat connectivity along areas in the bypass such as along the Tule Canal, and between different multi-benefit projects proposed in the Bypass, migratory corridors can be established that might not otherwise occur if the projects are planned and implemented individually. In this region, by designing, operating, and maintaining a group of projects to function as a system, landscape-scale ecological processes can be leveraged, increasing habitat and species resilience to the impacts of climate change.

In the San Joaquin watershed, the proposed Paradise Cut multi-benefit project is another a project that is leveraging the restoration of landscape-level processes, such as floodplain reconnection and sediment management, to develop a suite of complex, interconnected habitats across a broad project footprint. In doing so, it can significantly improving the quality and quantity of riverine habitats while providing much-needed flood risk reduction in one of the most vulnerable regions of the Central Valley.

This Update is the first version of the Conservation Strategy to directly address the impacts of climate change to natural resources in the SPA. Climate adaption will likely be the central theme of future updates, and due to the urgency and need for action, will influence many facets of the plan formulation approach and execution of the Conservation Strategy and the CVFPP.



3.3 Measurable Objectives

This section describes how progress toward the measurable objectives indicates progress toward the Conservation Strategy’s goals, and summarizes the re-evaluation of the measurable objectives.

3.3.1 Measurable Objectives for Tracking Progress Toward Goals

As described in the 2016 Conservation Strategy and the CVFPP Final Supplemental Program Environmental Impact Report (EIR) (California Department of Water Resources 2017a), the measurable objectives are guidance for planning purposes. The size of the objectives represents net increases in ecosystem processes and habitats, reductions in stressors, and contributions to species recovery that may be achievable via multi-benefit projects and O&M during the CVFPP’s 30-year time frame (i.e., its planning horizon).

Therefore, the objectives represent potential contributions to solutions for environmental problems, not entire solutions. The objectives do not represent the total amount of habitat to be restored on the landscape (and within the flood system) by all mitigation and habitat restoration projects. In fact, the recovery of some species likely depends on the substantial restoration of ecosystem processes and habitats within the flood system in addition to that provided by the CVFPP’s multi-benefit projects (Appendix L of the 2016 Strategy and Dybala et al. 2017).

In part, the objectives guide planning by tracking progress toward the Conservation Strategy’s goals, which are to improve and increase ecosystem processes and habitats, reduce stressors, and recover species. Attaining the measurable objectives would correspond to the achievement of these goals.

Within each CPA, a project could contribute to the measurable objectives and represent progress toward the corresponding goals if it were a multi-benefit flood project constructed after 2016 that would result in a net increase in a targeted ecosystem process or habitat, or would reduce a targeted stressor. In the Lower Sacramento River and Lower San Joaquin River CPAs, there is an exception to this rule: multi-benefit projects being developed within the Delta independent of the CVFPP before 2016 (e.g., the McCormack-Williamson Restoration Project) were excluded from the measurable objectives, and thus, their outcomes do not contribute to attainment.

For each CPA, the measurable objectives are used to measure progress toward each goal. However, the Conservation Strategy does not have separate measurable objectives for the recovery of target species. Rather, contributions toward target species recovery are measured by the applicable ecosystem process, habitat, and stressor objectives.

Table 3-1 summarizes each objective and metric related to each target species’ recovery. Note, this table is currently unchanged from the 2016 Strategy; however, its contents are not static. The assessments for each species are ongoing and this table will likely be updated for the next iteration of the Strategy. That is to say, a “not applicable” status may change in the future. In



addition, while some aquatic and avian species may be categorized as “not applicable” in a given reach, there is still the possibility that they can benefit from habitat enhancement in the future.

Table 3-1. Measurable Objectives Contributing to the Recovery of Each Target Species ^[a]

Species	Objective and Metric	USR ^[b]	FR ^[b]	LSR ^[b]	USJR ^[b]	LSJR ^[b]	Total
Delta Button- Celery	Inundated floodplain— major river reaches (acres) ^[c]	N/A	N/A	N/A	2,800	11,600	14,400
	Inundated floodplain— bypasses and transient storage areas (acres) ^[d]	N/A	N/A	N/A	NA	200	200
	Riparian habitat (acres) ^[e,f]	N/A	N/A	N/A	2,100	5,800	7,900
	Invasive plants (acres eradicated)	N/A	N/A	N/A	143	34	177
Slough Thistle	Inundated floodplain— major river reaches (acres) ^[c]	N/A	N/A	N/A	2,800	11,600	14,400
	Inundated floodplain— bypasses transient storage areas (acres) ^[d]	N/A	N/A	N/A	NA	200	200
	Riparian habitat (acres) ^[e,f]	N/A	N/A	N/A	2,100	5,800	7,900
	Marsh and other wetland habitat (acres)	N/A	N/A	N/A	None	100	100
	Invasive plants (acres eradicated)	N/A	N/A	N/A	143	34	177
Valley Elderberry Longhorn Beetle	Riparian habitat (acres) ^[e]	3,400	1,800	1,900	2,100	5,800	15,000
	Invasive plants (acres eradicated)	268	257	363	143	34	1,065



Species	Objective and Metric	USR ^[b]	FR ^[b]	LSR ^[b]	USJR ^[b]	LSJR ^[b]	Total
California Central Valley Steelhead DPS and Chinook Salmon—Central Valley Fall- and Late-Fall-Run ESU and Central Valley Spring-Run ESU	Inundated floodplain— major river reaches (acres) ^[c]	6,300	3,700	7,650	2,800 ^[g]	11,600	32,050
	Inundated floodplain— bypasses and transient storage areas (acres) ^[d]	9,600	N/A	7,500	None	200	17,300
	Riverine geomorphic processes—river meander potential (acres)	5,600	400	1,300	2,100 ^[g]	4,300	13,700
	Riverine geomorphic processes and SRA cover—natural bank (miles)	20	None	4	8 ^[g]	13	45
	SRA cover—riparian-lined bank (miles)	8	None	3	2 ^[g]	6	19
	Fish passage barriers— channel-wide structures	5	None	4	None	None	9
	Chinook Salmon— Sacramento River Winter-Run ESU	Inundated floodplain— major river reaches (acres) ^[c]	6,300	N/A	7,650	N/A	N/A
Inundated floodplain— bypasses transient storage areas (acres) ^[d]		9,600	N/A	7,500	N/A	N/A	17,100
Riverine geomorphic processes—river meander potential (acres)		5,600	N/A	1,300	N/A	N/A	6,900



Species	Objective and Metric	USR ^[b]	FR ^[b]	LSR ^[b]	USJR ^[b]	LSJR ^[b]	Total
Chinook Salmon— Sacramento River Winter-Run ESU	Riverine geomorphic processes and SRA cover—natural bank (miles)	20	N/A	4	N/A	N/A	24
	SRA cover—riparian-lined bank (miles)	8	N/A	3	N/A	N/A	11
	Fish passage barriers— channel-wide structures	5	N/A	4	N/A	N/A	9
Green Sturgeon— Southern DPS	Inundated floodplain— major river reaches (acres) ^[c]	6,300	3,700	7,650	N/A	11,600	29,250
	Riverine geomorphic processes—river meander potential (acres)	5,600	400	1,300	N/A	4,300	11,600
	Riverine geomorphic processes and SRA cover—natural bank (miles)	20	None	4	N/A	13	37
	SRA cover—riparian-lined bank (miles)	8	None	3	N/A	6	17
	Riparian habitat (acres) ^[e]	3,400	1,800	1,900	NA	5,800	12,900
	Fish passage barriers— channel-wide structures	5	None	4	N/A	None	9
Delta Smelt	Inundated floodplain— major river reaches (acres) ^[c]	N/A	N/A	7,650	N/A	11,600	19,250
	Inundated floodplain— bypasses and transient storage areas (acres) ^[d]	N/A	N/A	7,500	N/A	200	7,700
	Marsh and other wetland habitat (acres)	N/A	N/A	3,500	N/A	100	3,600



Species	Objective and Metric	USR ^[b]	FR ^[b]	LSR ^[b]	USJR ^[b]	LSJR ^[b]	Total
Giant Gartersnake	Marsh and other wetland habitat (acres)	2,400	None	3,500	None	100	6,000
	Invasive plants (acres eradicated)	268	257	363	143	34	1,065
Bank Swallow	Inundated floodplain— major river reaches (acres) ^[c]	6,300	3,700	7,650	N/A	N/A	17,650
	Riverine geomorphic processes and SRA cover—natural bank (miles)	20	None	4	N/A	N/A	24
	SRA cover—riparian-lined bank (miles)	8	None	3	N/A	N/A	11
	Riparian habitat (acres) ^[e]	3,400	1,800	1,900	N/A	N/A	7,100
	Marsh and other wetland habitat (acres)	2,400	None	3,500	N/A	N/A	5,900
	Invasive plants (acres eradicated)	268	257	363	N/A	N/A	888
California Black Rail	Riparian habitat (acres) ^[e]	N/A	N/A	1,900	N/A	5,800	7,700
	Marsh and other wetland habitat (acres)	N/A	N/A	3,500	N/A	100	3,600
Greater Sandhill Crane	Inundated floodplain— major river reaches (acres) ^[c]	6,300	3,700	7,650	2,800	11,600	32,050
	Inundated floodplain— bypasses and transient storage areas (acres) ^[d]	9,600	N/A	7,500	None	200	17,300
	Marsh and other wetland habitat (acres)	2,400	None	3,500	None	100	6,000
	Invasive plants (acres eradicated)	268	257	363	143	34	1,065



Species	Objective and Metric	USR ^[b]	FR ^[b]	LSR ^[b]	USJR ^[b]	LSJR ^[b]	Total
Least Bell's Vireo, Swainson's Hawk, Yellow-Breasted Chat, and Western Yellow-billed Cuckoo	Inundated floodplain— major river reaches (acres) ^[c]	6,300 ^[h]	3,700 ^[h]	7,650 ^[i]	2,800 ^[i]	11,600 ^[j]	32,050
	Riverine geomorphic processes—river meander potential (acres)	5,600 ^[h]	400 ^[h]	1,300 ^[i]	2,100 ^[i]	4,300 ^[j]	13,700
Least Bell's Vireo, Swainson's Hawk, Yellow-Breasted Chat, and Western Yellow-billed Cuckoo	Riverine geomorphic processes and SRA cover—natural bank (miles)	20 ^[h]	None ^[h]	4 ^[i]	8 ^[i]	13 ^[j]	45
	SRA cover—riparian-lined bank (miles)	8 ^[h]	None ^[h]	3 ^[i]	2 ^[i]	6 ^[j]	19
	Riparian habitat (acres) ^[e]	3,400 ^[h]	1,800 ^[h]	1,900 ^[i]	2,100 ^[i]	5,800 ^[j]	15,000
	Invasive plants (acres eradicated)	268 ^[h]	257 ^[h]	363 ^[i]	143 ^[i]	34 ^[j]	1,065
Tricolored Blackbird	Inundated floodplain— major river reaches (acres) ^[c]	6,300	3,700	7,650	2,800	11,600	32,050
	Inundated floodplain— bypasses and transient storage areas (acres) ^[d]	9,600	N/A	7,500	None	200	17,300
	Riverine geomorphic processes—river meander potential (acres)	5,600	400	1,300	2,100	4,300	13,700
	Riparian habitat (acres) ^{[e],f}	3,400	1,800	1,900	2,100	5,800	15,000
	Marsh and other wetland habitat (acres)	2,400	None	3,500	None	100	6,000



Species	Objective and Metric	USR ^[b]	FR ^[b]	LSR ^[b]	USJR ^[b]	LSJR ^[b]	Total
Riparian Brush Rabbit and Riparian (= San Joaquin Valley) Woodrat	Riparian habitat (acres) ^[e]	N/A	N/A	N/A	N/A	5,800	5,800

Sources: Objectives contributing to each species recovery are from Appendix G, “Identification of Target Species and Focused Conservation Plans,” and objective amounts are from Section 5.0, “Ecological Objectives,” of the 2016 CVFPP Conservation Strategy (California Department of Water Resources 2016). This table is provided verbatim from the 2016 Conservation Strategy; corrections and revisions will occur during future updates. For delta smelt, yellow-breasted chat, and tricolored blackbird; considerations when implementing flood-related projects that could contribute to recovery are identified in Appendix B, “Focused Conservation Plans for new Target Species.”

^[a] A portion or all of identified objectives contribute to recovery of species as described in the focused conservation plans.

^[b] FR = Feather River CPA, LSJR = Lower San Joaquin River CPA, LSR = Lower Sacramento River CPA, USJR = Upper San Joaquin River CPA, USR = Upper Sacramento River CPA.

^[c] Area inundated by two-year, 14-day, or longer flows, December to May (acres); includes both natural and agricultural land cover.

^[d] Not inundated in 50 percent of years or more frequently for 14 days or longer.

^[e] With grassland inclusions.

^[f] Habitat provided by portion restored as riparian scrub, inclusions.

^[g] Potential distribution in CPA based on historical distribution or poorly known.

^[h] Potential distribution of Least Bell’s vireo in CPA based on historical distribution or poorly known.

^[i] Potential distribution of Least Bell’s vireo and yellow-billed cuckoo in CPA based on historical distribution or poorly known.

^[j] Potential distribution of yellow-billed cuckoo in CPA based on historical distribution or poorly known.

Notes:

CPA = conservation planning area

N/A = not applicable

SRA = shaded riverine aquatic

The restoration outcomes of multi-benefit projects used as compensatory mitigation are tracked and evaluated separately from outcomes that are not used as mitigation. Depending on its timing, amount, location (e.g., proximity to existing habitat), and type, mitigation can improve ecological conditions (i.e., result in uplift) for some resources. However, the purpose of compensatory mitigation is to reduce or offset unavoidable impacts to a resource, which substantially limits its potential to improve ecological conditions for resources in general, and reduces or eliminates their contribution toward the Strategy’s goals as follows:

- **Goal 1. Ecosystem Processes:** Improve dynamic hydrologic (flow) and geomorphic processes in the SPFC. This Conservation Strategy’s objectives quantify improvements in ecosystem processes as net increases in the area or length where the processes occur (e.g., acreage of inundated floodplain). If restored processes are used as compensatory mitigation, they represent gross increases, not net increases. To determine the net increase



in amount, the permanent loss being mitigated must be subtracted (e.g., length of restored natural bank minus length of revetted bank being mitigated).

- **Goal 2. Habitats:** Increase and improve the quantity, diversity, and connectivity of riverine and floodplain habitats. This Conservation Strategy’s objectives quantify habitat increases and improvements as net increases in habitat amounts. If used as compensatory mitigation, habitats restored by multi-benefit projects represent gross increases, not net increases. To determine the net increase in amount, the permanent habitat losses being mitigated must be subtracted.
- **Goal 3. Species:** Contribute to the recovery and sustainability of native species populations and overall biotic community diversity. This Conservation Strategy has no measurable objectives for species recovery separate from the objectives for the net increases in processes and habitats, and reductions in stressors, which would contribute to species recovery as described previously. Restoration used as compensatory mitigation of impacts on populations of ESA- or CESA-listed species does not contribute to the recovery of those species or to the recovery of other target species that use the affected habitats, and thus does not contribute to this goal.
- **Goal 4. Stressors:** Reduce stressors related to the development and operations of the SPFC that negatively affect at-risk species. This Conservation Strategy has objectives to reduce two stressors that negatively affect at-risk species: rectifying a list of priority barriers to anadromous fish passage, and eliminating infestations of prioritized invasive plant species (which is quantified as acreage of infestations eliminated). If used as compensatory mitigation, the elimination of prioritized fish passage barriers or infestations of invasive plants still contributes to the attainment of this goal (but does not contribute to the attainment of Goal 3, Species).

3.3.2 Re-evaluation of Measurable Objectives

The 2016 Conservation Strategy established measurable objectives based on estimates of the conservation needs of target species and opportunities for multi-benefit flood projects to contribute to those needs (Appendix L, “Measurable Objectives Development: Summary of Conservation Needs and Scale of Restoration Opportunities,” in California Department of Water Resources 2016). It also acknowledged uncertainty regarding the size of conservation needs, and that circumstances could change during the CVFPP’s implementation. This Strategy addresses these uncertainties by including a re-evaluation of the measurable objectives in conjunction with the five-year updates.

As part of this five-year update, the measurable objectives were re-evaluated by reviewing relevant conservation planning since 2016, the conservation needs of the three new target species, changes to the CVFPP, and related scientific literature. Appendices A, B, and C of this document include summaries of new relevant conservation planning and literature, and



focused conservation plans for delta smelt, yellow-breasted chat, and tricolored blackbird. The results of this review are:

- Conservation planning for delta smelt, yellow-breasted chat, and tricolored blackbird has not identified a need for greater amounts of restoration than that already included in the measurable objectives (but the following discussion of underestimated conservation needs provides more information). Conservation planning for tricolored blackbird, however, indicates a potential conflict between the objectives for the removal of invasive plants and those for the recovery of tricolored blackbird. The invasive Himalayan blackberry has been prioritized for removal and accounts for a substantial portion of the invasive plant objectives, yet this species provides nesting habitat for tricolored blackbird. The avoidance of occupied habitat and replacement of Himalayan blackberry infestations with riparian scrub dominated by native species would reduce this conflict.

Updated recovery plans for giant gartersnake and valley elderberry longhorn beetle have been published since 2016, but those plans do not identify additional conservation needs greater than the needs the measurable objectives are based on. The *Recovery Plan for Giant Gartersnake (Thamnophis gigas)* (U.S. Fish and Wildlife Service 2017) included the same wetland habitat needs as the draft revised recovery plan (U.S. Fish and Wildlife Service 2015), which were considered in establishing the measurable objectives for the 2016 Conservation Strategy. The *Revised Recovery Plan for Valley Elderberry Longhorn Beetle (Desmocerus californicus dimorphus)* includes a need for riparian habitat in all of this Strategy's CPAs (U.S. Fish and Wildlife Service 2019); however, the need is focused on preservation and is smaller than the restoration amounts in the measurable objectives for riparian habitat. Therefore, it does not increase the overall need for riparian habitat restoration the objectives are based on.

- The *Central Valley Flood System Fish Migration Improvement Opportunities Report* (California Department of Water Resources 2014) prioritized fish passage barriers for the Upper San Joaquin River CPA, including three high-priority barriers that were inadvertently not included in the 2016 measurable objectives: the Sack Dam, the Mendota Dam, and the Eastside Bypass Control Structure.
- Since the 2017 update to the CVFPP (California Department of Water Resources 2017b), no substantial changes have been made to the plan's approach to system improvements, the major projects proposed to accomplish them, or the scale of the improvements in the CVFPP overall. Therefore, the extent of opportunities for multi-benefit projects to provide restored processes and habitats remains comparable to previous estimates.
- This Strategy's reliance on adopted recovery plans to determine conservation needs has likely caused needs to be underestimated, which has implications for the scope of this Strategy. Not all target species are addressed by adopted recovery plans, and some are addressed by an outdated plan. Also, some adopted plans have underestimated conservation needs; for example, recent research (Dybala et al. 2017) estimates that



riparian birds' conservation needs are much greater than identified in the *Central Valley Joint Venture 2006 Implementation Plan* (Central Valley Joint Venture 2006). Because most conservation needs identified in the 2016 Conservation Strategy exceed or greatly exceed the potential contributions of multi-benefit projects, and those needs are likely underestimated, substantial amounts of restoration through single-purpose habitat restoration projects or habitat restoration with other water management purposes (e.g., not flood management) would also be needed for the recovery of target species. The 2016 Strategy acknowledges the need for habitat projects and acknowledges that the SPFC's design, performance, and O&M requirements are major constraints on their implementation. However, this Conservation Strategy has no objectives for reducing constraints on single-purpose habitat projects, nor have these constraints been systematically evaluated by State or regional flood planning efforts.

- New assessment methods (e.g., tools that quantify the value of habitat based on its amount and quality) and improved hydraulic models have been developed since 2016. These analytical tools are aiding restoration planning, and could provide metrics for revised or additional measurable objectives, particularly objectives for enhancing the value of habitats for target species. (The Strategy's existing objectives focus on the quantity of land cover types that provide habitat, not the value of that land cover for individual species.)

Based on this re-evaluation two revisions have been made to the measurable objectives:

1. Based on the *Central Valley Flood System Fish Migration Improvement Opportunities Report* (California Department of Water Resources 2014), an objective to remove three high-priority fish passage barriers (the Sack Dam, the Mendota Dam, and the Eastside Bypass Control Structure) has been added for the Upper San Joaquin River CPA.
2. The Sutter-Butte Basin is a priority area identified in the NMFS 2012 Central Valley Recovery Plan for steelhead and salmon. Within the basin, Butte Creek is only one of two creeks with naturally occurring spring-run salmon. The Butte Basin and the main-stem Sacramento River around the Butte Slough Outfall Gates (BSOG) structure is critical habitat under the ESA and identified for priority recovery actions. The BSOG connecting the basin and creek to the Sacramento River are known for stranding and delaying migration. NMFS has identified BSOG as a high-priority project. DWR is exploring options for remediating this barrier.

DWR is continuing to explore the application of tools that quantify habitat values for particular species to permitting, mitigation crediting agreements, and the Strategy's objectives. Habitat quantification tools provide a standardized means of quantifying the benefits of habitat restoration and enhancement for individual species (such as giant gartersnake [Environmental Defense Fund and Stillwater Sciences 2019]). O&M can and often does enhance habitats for target species. Thus, the metrics of habitat quantification tools could serve as the basis of measurable objectives for benefits from O&M activities that do not contribute to this Strategy's current objectives, most of which are for an increase in the amount of ecosystem processes or land cover types, rather than enhancing the value of existing processes or habitats for individual target species.



In flood planning and through coordination and collaboration with conservation planning efforts, DWR is also seeking to reduce the system’s constraints on ecosystem processes and habitat restoration, confirm compatibility of restored habitat with O&M of the flood system, and increase the portion of restoration implemented by multi-benefit projects as opposed to single-purpose habitat and mitigation projects. This planning, coordination, and collaboration could also result in future revisions to this Strategy’s measurable objectives.

As part of the next five-year update of the CVFPP and Conservation Strategy, it is anticipated that new measurable objectives may be added, and targets may be revised to reflect the most current understanding of ecological conditions and needs, and to identify how those can be addressed given the State’s emphasis on multi-benefit projects and the urgency related to climate change impacts.

3.4 Implementation Approach

DWR and other state and federal agencies, LMAs, local communities, and NGOs work together to develop and implement multi-benefit projects and achieve the Conservation Strategy’s objectives, and thereby attain the CVFPP’s goal of promoting ecosystem functions. This section describes five key components of this Strategy’s implementation that support these partnerships:

1. Coordination, collaboration, and alignment.
2. Outreach and engagement.
3. Funding.
4. Regulatory compliance.
5. Adaptive management.

For each of these key implementation components, a set of prioritized actions and recommendations are in the process of being developed for the 2022 to 2027 planning cycle based on identified impediments to multi-benefit project implementation, policy issues, and opportunities that have been recognized by DWR and the diverse range of stakeholders contributing to the Conservation Strategy Update process. Section 3.4.6 describes these actions and recommendations.

3.4.1 Coordination, Collaboration, and Alignment

The update, refinement, and implementation of the CVFPP, including the Conservation Strategy, relies on coordination, collaboration, and alignment among federal, State, and local agency partners and other stakeholders, including landowners, land conservancies, and NGOs. Projects are most successful in being efficiently implemented when there is a strong local/State/federal collaboration. Many of these partners are involved in land use, flood management, water, or conservation planning efforts that overlap with the CVFPP (California Department of Water Resources 2012b). Therefore, the effective implementation of the Conservation Strategy relies not only on coordination and collaboration among numerous actors,



but on extensive alignment and integration with many other policies, plans, and programs that co-occur within the boundaries of the SPA.

This section identifies mechanisms for the coordination and collaboration needed to implement the Strategy. It is organized into the following subsections:

- Integration and alignment within DWR.
- Alignment with federal and State natural resource plans and programs.
- Coordination and collaboration with partners in flood management.
- Coordination and collaboration with other habitat restoration and regional conservation planning efforts.

This alignment, integration, and coordination is applied at the landscape scale. The varied requirements of flood management, conservation, agriculture, water supply, and recreation must be met on landscapes of limited extent, each with their own unique set of opportunities and constraints. The achievement of multiple important State goals and objectives will require coordination among the various plans and programs operating within these landscapes to avoid conflicts and counterproductive “crowding out” of some priorities at the expense of others.

Updates to the Conservation Strategy’s implementation approach will therefore facilitate a more coordinated, place-based application of plans and programs—a “one-landscape” approach—to river and floodplain management, to make better and more efficient use of land, water, and funding. A one-landscape approach recognizes that although there are many critical habitat- and species-based drivers (all with corresponding laws, plans, and programs), each competing to complete projects specific to individual species or habitats, they must all be completed on a single Central Valley landscape. A one-landscape approach assumes (potentially conflicting) plans and programs must undergo adaptive management and agile review and reconciliation to avoid conflicts and counterproductive outcomes that would limit the ultimate success of a restored Central Valley landscape reflecting all these plans and programs.

3.4.1.1 Integration Within the California Department of Water Resources

The formation of DWR’s Division of Multi-Benefit Initiatives (DMI) in 2019 was a foundational step toward greater integration of flood management and habitat restoration planning within DWR. DMI is responsible for producing the CVFPP and this Conservation Strategy, with matrix team support and close collaboration with the Division of Flood Management (DFM) and Division of Planning (DOP). DMI also provides funding and support for the DFM-led RFMP process to advance priorities for policy and multi-benefit project implementation across the Central Valley. In addition, DMI’s formation helps to strengthen alignment between the CVFPP, California EcoRestore and the Delta Levees Program, In-Delta Investments, and Delta Ecosystem Enhancement programs, each of which is also housed within DMI and as such, are collaboratively developing multi-benefit projects with local, State, and federal partners. The activities and projects of California EcoRestore and Delta programs described below extend beyond the SPA of the CVFPP into the Delta.



- **California EcoRestore.** EcoRestore is a multi-agency effort to restore ecosystems in the south Delta and Yolo Bypass – Cache Slough region. EcoRestore will address legacy impacts as well as effects from the ongoing operation of the state and federal water projects by coordinating and advancing at least 30,000 acres of tidal and floodplain habitat restoration.
- **Delta Levees Program, In-Delta Investments Program, and the Delta Ecosystem Enhancement Program.** DWR supports the maintenance and improvement of levees and ecosystems in the Delta through these three programs, which are part of DWR’s Delta Levee System Integrity and Delta Habitat Restoration Branch. These programs build flood management projects (including required mitigation) and are charged with providing a net increase in fish and wildlife habitat.

The collective outcomes of implementation surpass individual programs, including the Strategy, to provide broader value to the State and its citizens. Other programs within DWR (outside of DWR’s flood management programs) have a direct relationship to this Conservation Strategy. Strengthened alignment and integration with the following programs would help to attain the Strategy’s goals:

- **Sustainable Groundwater Management Program.** The Sustainable Groundwater Management Act (SGMA) requires governments and water agencies of high- and medium-priority groundwater basins to halt overdraft and bring the basins into balance by 2040 and 2042, respectively. This law authorizes local agencies to form groundwater sustainability agencies to manage basins according to groundwater sustainability plans they adopt. The Sustainable Groundwater Management Program provides ongoing support, guidance, financing, and technical assistance to the local groundwater sustainability agencies. As land use changes are expected (such as agricultural land retirement) in the Central Valley due to implementation of SGMA, there may be opportunities for habitat restoration that contribute to the goals of the Conservation Strategy and CVFPP.
- **Flood-Managed Aquifer Recharge (Flood-MAR).** This is a voluntary resource management strategy that uses Flood-MAR on agricultural lands and working landscapes. DWR is pursuing expanded implementation of Flood-MAR projects in collaboration with landowners and other federal, State, tribal, and local entities. Opportunities for ecosystem enhancement that contribute to the goals of the Conservation Strategy may be realized as part of Flood-MAR projects.
- **Integrated Regional Water Management (IRWM).** The Division of Regional Assistance is leading a collaborative effort to identify and implement water management solutions on a regional scale to increase regional self-reliance, reduce conflicts, and manage water concurrently to achieve social, environmental, and economic objectives. With DWR’s assistance, regional water management groups develop, adopt, and update regional plans to identify specific strategies and projects to address the unique water needs of their regions.



Integration with the Sustainable Groundwater Management Program and Flood-MAR will be enhanced by improving internal collaboration. This collaboration will involve assessing the potential consistency of multi-benefit projects and Flood-MAR projects with local groundwater sustainability plans developed under SGMA, and collaborating with local agencies to advance projects that meet those criteria. To the extent that such projects also enhance water supplies, the implementation of this Conservation Strategy will also involve collaboration to incorporate those projects into pertinent IRWM plans, alongside their incorporation into RFMPs and, if appropriate, the CVFPP itself.

As an example of this type of recent cross-program collaboration, the DMI Conservation Strategy team is working closely with the Flood-MAR program on the development of the Ecological Floodplain Inundation Potential (EcoFIP) tool. This will update and improve the Floodplain Restoration Opportunity Analysis (FROA), a key component of DWR's CVFPP and the 2016 Conservation Strategy. The FROA provided a systematic approach to rapidly identify habitat restoration opportunities for topographic modification or levee setbacks on floodplains for select ecological flows. This pilot study is evaluating how a refined set of modeling tools could be used to assess floodplain inundation, salmonid habitat suitability, and floodplain recharge for the current or future flow regimes. The floodplain recharge quantification tool will support efforts to link Flood-MAR with restoration planning. The resulting information will provide an updated framework for FROA, with potential application in future Conservation Strategy Updates, and for screening potential project suitability for Flood-MAR.

The integration of DWR programs will also be enhanced by the development of new decision support and analysis capabilities (Section 3.4.5.1, "Implementation Tracking and Data Dissemination"). These tools will integrate the environmental objectives and mitigation obligations of multiple DWR initiatives into a single decision-making environment. This consolidation will allow DWR to plan, track, and achieve these objectives and mitigation obligations in a mutually supportive, complementary manner that enhances the integration of various DWR program activities. For example, these decision support capabilities will assist with the identification of specific opportunities for integrated project planning and development among multiple DWR programs. This is an important consideration, because the projects of multiple DWR programs will likely be located in the same relatively constrained geographical areas.

3.4.1.2 Alignment with Federal and State Natural Resource Plans and Policies

Alignment with federal and other State policies and plans is a focus of the 2022 CVFPP Update and an objective of this Conservation Strategy update. To meet that objective, this Strategy must align with natural resource policies, plans, and initiatives, including but not limited to:

- **Governor's Water Resilience Portfolio.** Executive Order N-10-19 directs the secretaries of the California Natural Resources Agency (CNRA), the California Environmental Protection Agency (EPA), and the California Department of Food and Agriculture to identify and assess a suite of complementary actions to provide safe and resilient water supplies, flood protection, and healthy waterways for the State's communities, economy, and environment.



- 2021 California Climate Adaptation Strategy.** The Newsom Administration is currently updating California's Climate Adaptation Strategy, as required by the Legislature. The 2021 strategy outlines the state's key climate resilience priorities, includes specific and measurable steps, and serves as a framework for action across sectors (including flood and ecosystem management) and regions in California (including the Sacramento and San Joaquin watersheds and the Central Valley).
- Bay-Delta Water Quality Control Plan and voluntary agreements.** CNRA and the California EPA are leading an effort to negotiate voluntary agreements with water diverters and local agencies to improve conditions for native fish. The voluntary agreements, if reached, would implement the State Water Resources Control Board's Bay-Delta Water Quality Control Plan. They would increase flows for the environment, create 60,000 acres of new and restored habitat, and allocate \$5 billion in new funding for environmental improvements and science.
- Delta Plan.** The Delta Plan is a comprehensive, legally enforceable plan that guides how multiple federal, State, and local agencies manage the Delta's water and environmental resources. The Delta Stewardship Council coordinates and oversees State and local agencies' proposals to fund, carry out, and approve Delta-related activities. The council has regulatory and appellate authority over certain actions that take place in the Delta and Suisun Marsh.
- California Water Plan.** The California Water Plan is the State's strategic plan, updated every five years in years ending in "3" and "8," to sustainably manage and develop water resources for current and future generations statewide. California Water Plan updates typically lag the CVFPP and Conservation Strategy by one year.
- California Biodiversity Initiative.** Executive Order B-54-18, issued September 7, 2018, directs CNRA and the California Department of Food and Agriculture to implement the California Biodiversity Initiative, which identifies broad strategies to secure the futures of all native California species.
- Safeguarding California Plan 2018.** This document is the 2018 update of California's Climate Adaptation Strategy, a compendium of current and planned actions by State agencies to protect communities, infrastructure, services, and the natural environment from the impacts of climate change.
- San Joaquin River Restoration Program (SJRRP).** The SJRRP is a comprehensive, long-term, multi-agency effort to restore flows to the San Joaquin River from Friant Dam to the confluence with the Merced River and to restore a self-sustaining Chinook salmon fishery in the river, while reducing or avoiding adverse water supply effects from restoration flows. The SJRRP is being implemented within the Upper San Joaquin River CPA.
- Natural Community Conservation Plans (NCCPs) and associated habitat conservation plans (HCPs).** NCCPs are legally binding regional plans written under the aegis of the Natural Communities Conservation Planning Act and approved by CDFW. They protect species,



contribute to their conservation, and serve as the basis for take authorizations for species listed under CESA. An NCCP is generally prepared in conjunction with an HCP that serves as the basis for take authorization for species listed under the ESA.

- **Regional Conservation Investment Strategies (RCISs).** California’s RCIS program, authorized under legislation (Assembly Bill 2087) is in its fifth year of implementation. These voluntary, nonregulatory, regional plans identify conservation and enhancement opportunities that are intended to protect, create, restore, and reconnect habitat and contribute to species recovery. RCISs provide the basis for the development of mitigation credit agreements (MCAs) that may be used as compensatory mitigation for impacts under the California Environmental Quality Act (CEQA), CESA, and the Lake and Streambed Alteration Program. Several RCISs focus on flood and other water management issues and are in various stages of development or have been approved, including for Yolo County (approved October 2020) and the Mid-Upper Sacramento Valley (approved December 2020). The guidelines for MCAs are still in draft form, and no RCIS has successfully developed a MCA. However, the West Sacramento Flood Control Agency is in the process of developing a pilot MCA.
- **Central Valley Project Improvement Act (CVPIA).** Passed by Congress in 1992, the CVPIA mandates changes in management of the Central Valley Project, particularly for the protection, restoration, and enhancement of fish and wildlife. The CVPIA has resulted in the development of restoration actions and projects to avoid significant adverse effects to species, including several within the SPA (such as the Yolo Bypass Salmonid Habitat Restoration and Fish Passage Project, which will include modifications to the Fremont Weir, and a connecting channel in the Yolo Bypass to improve fish passage).
- **USACE Engineering With Nature Initiative.** The Engineering With Nature Initiative enables USACE to deliver economic, social, and environmental benefits associated with infrastructure in a more sustainable manner. This is accomplished by:
 - Using natural processes to maximum benefits, thereby reducing demands on limited resources, minimizing the environmental footprint of projects, and enhancing the quality of project benefits.
 - Broadening and extending the base of benefits provided by projects to include substantiated economic, social, and environmental benefits.
 - Using science-based collaboration to organize and focus interests, stakeholders, and partners to reduce social friction, resistance, and project delays while producing more broadly acceptable projects.
- **Federal Interagency Floodplain Management Task Force.** This Task Force was authorized and established by Congress in 1975 to carry out the President’s responsibility to prepare for the Congress proposals necessary for a Unified National Program for Floodplain Management. In 1994, the Task Force submitted to the President “A Unified National Program for Floodplain Management,” which called for the formulation of a more



“comprehensive, coordinated approach to protecting and managing human and natural systems” in a sustainable development context. This includes defining the “wise use” of floodplains, which means enjoying the benefits of floodplain lands and waters while minimizing the loss of life and damage from flooding and preserving and restoring the natural resources of floodplains as much as possible.

Table 3-2 provides a high-level summary of several federal and State policies and plans that contain objectives, targets, approaches, or guidance that are relevant to this Conservation Strategy and the measurable objectives. DWR supports alignment with these and other relevant efforts, and when possible, will take actions within the context of this Strategy consistent or collaboratively with these policies and plans.

Finally, there is a need for more effective coordination between DWR and other State partners with the Federally Recognized Tribes in the context of flood and ecosystem management. The Tribes recognize ongoing efforts to protect the health and safety of the communities and continued efforts to make that a priority. Additionally, they have a strong interest in the preservation of riparian habitats and the continued management and restoration of natural systems that will provide habitat for native wildlife and plant species, while protecting water resources.

To increase and strengthen the role of the Tribes in future planning and implementation of the Conservation Strategy, DWR will need to increase its outreach to maximize Tribal representation in advisory committees and regional planning efforts, and further explore nature-based solutions to restore floodplains, and reduce disruption to Tribal cultural resources, sacred sites, and burials from levee construction as part of multi-benefit project implementation. The Conservation Strategy provides guidance for the development of a nature-based approach to flood management; however, more engagement with the Tribes is needed to ensure compatibility and leverage Tribal knowledge within the Strategy. In addition, better engagement with the Tribes in planning, management, performance accounting, and adaptive management will assist in the early identification and prioritization of alternative solutions that are compatible with Tribal interests and priorities.



Table 3-2. Alignment of Conservation Strategy Goals and Objectives with Federal and California Natural Resources Agency Plans and Programs

Area	Supporting Plan	Ecosystem Processes – Floodplain Inundation	Ecosystem Processes – Riverine Geomorphic Process	Habitats – SRA Cover	Habitats – Riparian	Habitats – Marsh/Other Wetlands	Stressors – Fish Passage Barriers	Stressors – Invasive Plants
Entire Systemwide Planning Area	Governor’s Water Resilience Portfolio	Direct Policy Support	Direct Policy Support	Indirect Policy Support	Indirect Policy Support	Direct Policy Support	Direct Policy Support	Direct Policy Support
	Bay Delta WQCP /Voluntary agreements	Direct Program Support	Direct Program Support	Direct Program Support	Direct Program Support	Direct Program Support	Not Applicable	Not Applicable
	California Biodiversity Initiative	Indirect Policy Support	Indirect Policy Support	Indirect Policy Support	Indirect Policy Support	Indirect Policy Support	Indirect Policy Support	Indirect Policy Support
	Safeguarding California Plan 2018	Indirect Policy Support	Not Applicable	Indirect Policy Support	Indirect Policy Support	Indirect Policy Support	Indirect Policy Support	Not Applicable
	California Water Plan	Indirect Policy Support	Indirect Policy Support	Indirect Policy Support	Indirect Policy Support	Indirect Policy Support	Indirect Policy Support	Indirect Policy Support



Area	Supporting Plan	Ecosystem Processes – Floodplain Inundation	Ecosystem Processes – Riverine Geomorphic Process	Habitats – SRA Cover	Habitats – Riparian	Habitats – Marsh/Other Wetlands	Stressors – Fish Passage Barriers	Stressors – Invasive Plants
Upper Sacramento River and Feather River CPAs	Butte Regional Conservation Plan (HCP/NCCP)	Not Applicable	Not Applicable	Direct Program Support	Direct Program Support	Direct Program Support	Direct Program Support	Not Applicable
	Mid-Sacramento Valley RCIS	Direct Policy Support	Direct Policy Support	Direct Policy Support	Direct Policy Support	Direct Policy Support	Direct Policy Support	Direct Policy Support
Upper and Lower Sacramento River CPAs	Yolo NCCP/HCP	Not Applicable	Not Applicable	Direct Program Support	Direct Program Support	Direct Program Support	Not Applicable	Not Applicable
Lower Sacramento River and Lower San Joaquin River CPAs	Delta Plan	Direct Policy Support	Indirect Policy Support	Indirect Policy Support	Direct Policy Support	Direct Policy Support	Indirect Policy Support	Direct Policy Support
	EcoRestore	Direct Program Support	Direct Program Support	Direct Program Support	Direct Program Support	Direct Program Support	Direct Program Support	Direct Program Support



Area	Supporting Plan	Ecosystem Processes – Floodplain Inundation	Ecosystem Processes – Riverine Geomorphic Process	Habitats – SRA Cover	Habitats – Riparian	Habitats – Marsh/Other Wetlands	Stressors – Fish Passage Barriers	Stressors – Invasive Plants
Lower Sacramento River and Lower San Joaquin River CPAs	Delta Levees Program and Delta Ecosystem Enhancement Program	Not Applicable	Not Applicable	Direct Program Support	Direct Program Support	Direct Program Support	Not Applicable	Direct Program Support
	Delta Conservancy Strategic Plan	Direct Policy Support	Indirect Policy Support	Indirect Policy Support	Direct Policy Support	Direct Policy Support	Indirect Policy Support	Indirect Policy Support
Upper San Joaquin River CPA	San Joaquin River Restoration Program	Direct Program Support	Not Applicable	Direct Program Support	Direct Program Support	Not Applicable	Direct Program Support	Indirect Program Support

Notes:

“Program support” indicates the potential for direct collaboration in the development of multi-benefit projects; “policy support” indicates consistency of objectives, goals, and strategies between the Supporting Plan and the Conservation Strategy for the targeted item.

WQCP = water quality control plan.

For additional information on conservation programs in this table and HCPs not associated with an NCCP, refer to Appendix C, “Updates to 2016 Conservation Strategy Appendix J, ‘Existing Conservation Objectives from Other Plans’.”



3.4.1.3 Coordination with Partners in Multi-benefit Flood Management

Multi-benefit projects in the Central Valley will be developed and constructed by DWR with State, local, and federal partners in flood management. Consequently, although the system improvements studied in the BWFS would make major contributions to the Conservation Strategy's objectives, the attainment of the measurable objectives also depends on the implementation of other multi-benefit projects that may be planned and driven to implementation by other programs in DWR and by DWR's State, federal, regional, and local partners. Thus, the successful implementation of this Strategy requires robust coordination and partnerships between DWR and these other entities.

In addition to the support and guidance identified elsewhere in this Strategy, DWR will continue to coordinate actively with the sponsors of individual multi-benefit projects as they are planned, permitted, and constructed. Among its specific actions, DWR will share data and modeling resources with sponsors of multi-benefit projects, identify O&M strategies helpful to the development of such projects, and facilitate information sharing among LMAs, other partners, and DWR.

It is also critical that DWR continue to leverage existing partnerships and explore new, innovative partnership opportunities and models to facilitate multi-benefit project identification, funding, design, permitting, and implementation. Over the past several decades, some of the most iconic and successful multi-benefit projects in the Central Valley have been developed in a very collaborative manner. DWR has contributed planning, funding, and technical support to local agencies, NGOs, and land trust partners to facilitate land acquisition and entitlement, enable project implementation, and coordinate long term operations and maintenance. Some examples include the Bear River and Feather River Levee Setback Projects, the Dos Rios Floodplain Expansion and Ecosystem Restoration Project, Phase I, and the Southport Levee Setback Project. These successful, collaborative, multi-partner models for project implementation should be leveraged and expanded in the coming years, especially considering the need to accelerate the pace and extent of multi-benefit projects to build ecosystem resiliency and mitigate the impacts of climate change.

Proponents of multi-benefit projects have cited a need for improved coordination between DWR, the CVFPB, and the fish and wildlife agencies regarding the permitting of multi-benefit projects. To help improve coordination, DWR will seek opportunities to collaborate with the CVFPB, CDFW, USFWS, and NMFS to develop a clear set of permitting conditions and methods to expedite permitting for multi-benefit projects. (Section 3.4.4.2, "Permitting Ecological Restoration by Multi-benefit Projects," describes existing mechanisms for expediting permitting for multi-benefit projects.) Ultimately, this effort can serve as the basis for greater policy alignment and more specific guidance from DWR and the CVFPB to project proponents.

Developers of multi-benefit projects have also identified improved post-construction monitoring as a significant need. To improve construction and maintenance practices in the future, monitoring should be designed to inform the implementation and widespread sharing of monitoring results (Section 3.4.5, "Adaptive Management"). It is difficult, however, for project



proponents to fund and conduct such monitoring on a project-by-project basis, and no mechanism is available to ensure methods are consistent across projects.

DWR's ongoing investments in performance tracking and integrated planning-decision support includes the development of an overall performance tracking framework (the FPTs). This system uses an outcome-based planning approach to track the Conservation Strategy measurable objectives and other CVFPP-specific metrics over time to better understand how they contribute to regional flood management and conservation goals as a result of investments in project implementation and ongoing O&M actions (described in more detail in the 2022 CVFPP Update).

This overall effort includes the development of specific tools and processes that will improve the collection and sharing of multi-benefit project performance data from project proponents and O&M practitioners. This will require extensive collaboration between multiple divisions within DWR and partner agencies, local districts, regulators, researchers, and project developers.

3.4.1.4 Coordination and Collaboration with Other Habitat Conservation and Regional Conservation Planning Efforts

The Conservation Strategy is not designed or intended to achieve full recovery of its target species; rather, it provides guidance for how DWR can contribute to the recovery of those species by implementing the CVFPP. USFWS, CDFW, and NMFS have developed legally required recovery plans for target species listed under ESA or CESA, and multiple agencies have adopted plans for the recovery of other, non-listed, target species (e.g., the Central Valley Joint Venture Implementation Plan [Central Valley Joint Venture 2006]). These plans identify the actions necessary for species' recovery. The Conservation Strategy is designed to contribute to the recovery of its target species by restoring ecosystem processes and habitats through multi-benefit flood projects. Also, habitat restoration, mitigation, multi-benefit flood projects, and single-purpose flood projects on a landscape affect each other's design and outcomes. Therefore, by implementing the CVFPP, DWR will seek to coordinate and integrate with other habitat restoration efforts in the Central Valley's riparian landscapes, even if those efforts do not provide direct flood management benefits. This integration is desirable for several reasons:

- Habitat restoration projects on active floodplains could affect O&M of the flood system.
- DWR's hydraulic models could be used to evaluate the potential benefits and impacts of restoration projects, and could provide a standardized modeling environment from which to plan and optimize habitat restoration projects.
- The design or feasibility of future flood or multi-benefit projects could be affected by habitat restoration that occurs beforehand.
- Opportunities may be available to integrate flood management benefits into projects that were initially conceived only as habitat improvements.



- Opportunities for building ecological resilience to climate change by implementing climate adaptation measures identified in Appendix H may occur for a wide variety of projects along the river corridors.
- DWR’s project tracking and decision support capabilities will support coordinated planning of multi-benefit, habitat restoration, and mitigation projects so that multiple goals and objectives can be met across the flood system as a whole (Section 3.4.5.1, “Implementation Tracking and Data Dissemination”).

In addition, the CVFPP will be implemented alongside existing and in-progress regional conservation plans, including NCCPs, HCPs, RCISs, species recovery plans, and management plans for conserved lands. DWR will continue to coordinate and, where possible, collaborate with conservation plans that overlap with the CVFPP SPA and contain objectives, strategies, or program actions that pertain to the measurable objectives. This Strategy supports coordination and collaboration with related conservation plans in six ways:

1. Identifying and resolving potential conflicts with regional conservation plans during CVFPP updates.
2. Minimizing SPFC-related constraints on the success of other regional conservation plans in attaining their objectives.
3. Collaborating on, and sharing the funding of, projects of common interest.
4. Implementing conservation actions that complement, and do not preclude, those of other conservation plans (e.g., restoration projects that increase regional habitat connectivity).
5. Implementing conservation actions that contribute directly to the attainment of the objectives of other conservation plans.
6. Participating in regional conservation plans, when such participation contributes to attainment of this Strategy’s objectives.

3.4.2 Outreach and Engagement

As described here, DWR will continue to share work products as they are developed, interact with stakeholders and the public, and report on the CVFPP’s implementation, including its environmental conservation components. Through this investment of time and resources in transparent communication and outreach and engagement, DWR will increase project benefits to the people and ecosystems of California.

DWR plans to continue to:

- Engage with LMAs through the RFMP process and other forums, with a particular focus on determining how to best apply the Strategy to RFMPs, and on successfully planning and implementing multi-benefit projects.



- Participate in the CVFPB Advisory Committee, CVFPB Coordinating Committee, and other stakeholder forums, as appropriate.
- Engage on proposals for multi-benefit projects and needs for long-term maintenance.

DWR also commits to increasing the level of engagement and participation with the Federally Recognized Tribes in the development and implementation of the Conservation Strategy, including the encouragement of increased Tribal participation in the planning forums identified here.

This approach to outreach and engagement focuses DWR efforts on the venues that have been most successful to date, particularly the CVFPB Advisory Committee and the RFMP process. The CVFPB Advisory Committee provides a productive, collaborative forum for dialogue on a wide range of matters pertinent to the successful implementation of the CVFPP and its Conservation Strategy. DWR is committed to continuing its participation in the CVFPB Advisory Committee to maintain and expand collaboration with all stakeholders, including NGOs not otherwise directly engaged in the development of multi-benefit projects. It is also committed to continued engagement on proposals such as the potential revival of the Sacramento–San Joaquin Drainage District as a mechanism for funding the long-term maintenance of multi-benefit projects and other flood management infrastructure. DWR will also seek to engage with other important stakeholder forums, such as the Flood Study Group, as appropriate.

One of DWR’s most successful outreach and engagement efforts has been with local agencies in a bottom-up approach to identify and address deficiencies in the flood control system. Using local knowledge and initiatives, the RFMP process has successfully engaged local stakeholders and facilitated dialogue with DWR. This open communication has helped to elevate local concerns regarding the highest-priority projects and needs (such as the need to work with local landowners).

DWR will continue its outreach and engagement with local agencies through the RFMP process and other forums, with a particular focus on how to incorporate the Conservation Strategy into RFMPs and how to successfully plan and implement multi-benefit projects. DWR will continue to engage with RFMP leads routinely in the development of the 2022 RFMP content (e.g., primarily white papers), and will seek to maintain such engagement periodically after the RFMPs are complete, as resources allow. Through these engagements, DWR will emphasize the importance of early local engagement with landowners to project success, as they are generally more effectively engaged by local agencies than by DWR and other State partners.

3.4.3 Funding

The funding approach for the 2016 Conservation Strategy relied on the CVFPP’s Investment Strategy, which was then under development and was completed the following year (California Department of Water Resources 2017c). This approach described achieving the Conservation Strategy’s measurable objectives through ecological restoration as an integral part of implementing the CVFPP and its refined State Systemwide Investment Approach (SSIA) portfolio



of management actions. The SSIA portfolio is made up of a diverse collection of individual projects, concepts, and management actions (including many that are multi-benefit) from multiple sources and partners that help support the implementation of the CVFPP and the Conservation Strategy.

As described in the 2017 CVFPP Investment Strategy (California Department of Water Resources 2017c), the CVFPP's funding priorities are to support the equitable distribution of project costs among beneficiaries and to encourage actions that provide broad public benefits (including ecosystem vitality) and help achieve added flexibility in the SPFC. Consistent with the 2008 Central Valley Flood Protection Act, the State has prioritized investment needed, advocated for a greater State cost-share for multi-benefit projects, and communicated those priorities broadly to State elected officials and decision makers.

The 2017 CVFPP Investment Strategy provided an approach, shared among State, federal, and local cost-sharing partners, to fund and implement the SSIA portfolio over the next 30 years. Multi-benefit projects are part of the integrated approach to fund and implement the SSIA portfolio. The following sections draw on the work performed since the 2017 CVFPP Update, summarizing CVFPP's role with regards to funding. This information is intended to help provide the background and context for how multi-benefit projects that advance the Conservation Strategy measurable objectives are currently funded, as well as to identify additional funding mechanisms and programs that are available to multi-benefit projects.

3.4.3.1 Summary of CVFPP Role for Funding

The CVFPP's role with regard to funding is to describe, estimate, and highlight the investment needed across the SPFC, while supporting the societal values of public health and safety, ecosystem vitality, economic stability, and opportunities for enriching experiences, such as outdoor recreation. A key piece of CVFPP's role is to educate a broader base of decision-makers at the State, federal, and local levels on the investment needed and the resulting benefits. This translates into how policies are created and, ultimately, how grant and direct funding programs are administered.

It is recognized that within the CVFPP planning process, part of the key to success is that project proponents get the support and funding they need to implement multi-benefit projects. The CVFPP attempts to bridge that information gap between project proponents and State and federal policy. This motivates the bottom-up formulation of projects and the high-level attempt to identify current and future funding.

CVFPP's role can be summarized by the following actions:

- **Understanding and collecting** the types of management actions and projects that will be most effective as a portfolio to support the CVFPP goals, measurable objectives, and societal values. Varying levels of detail are presently available for management actions required over the 30-year period, which creates difficulty in the prioritization and phasing of actions. A portfolio approach is key to maximizing the CVFPP's ability to work toward



achieving its goals, while continuing the planning process for actions that are not yet fully developed.

- **Defining and quantifying** changes in flood risk, ecosystem uplift, and climate adaptation, as well as the estimated costs associated with implementing different types of management actions and multi-benefit projects. This includes design and construction costs, but also operational costs to implement non-structural types of actions.
- **Educating** State, federal, local, public/private partners, and elected officials about the anticipated flood, climate change, and ecological risks in the SPFC, what is needed to address those risks, and how much that risk reduction is projected to cost.
- **Sparking action** by others to create policy or funding opportunities. For example, the CVFPP can provide the information and highlight needs for a General Obligation (GO) bond and increased general fund contributions, but action is needed from the State legislature, elected officials, and the public to ultimately support and pass a GO bond that could provide funding opportunities for multi-benefit projects.

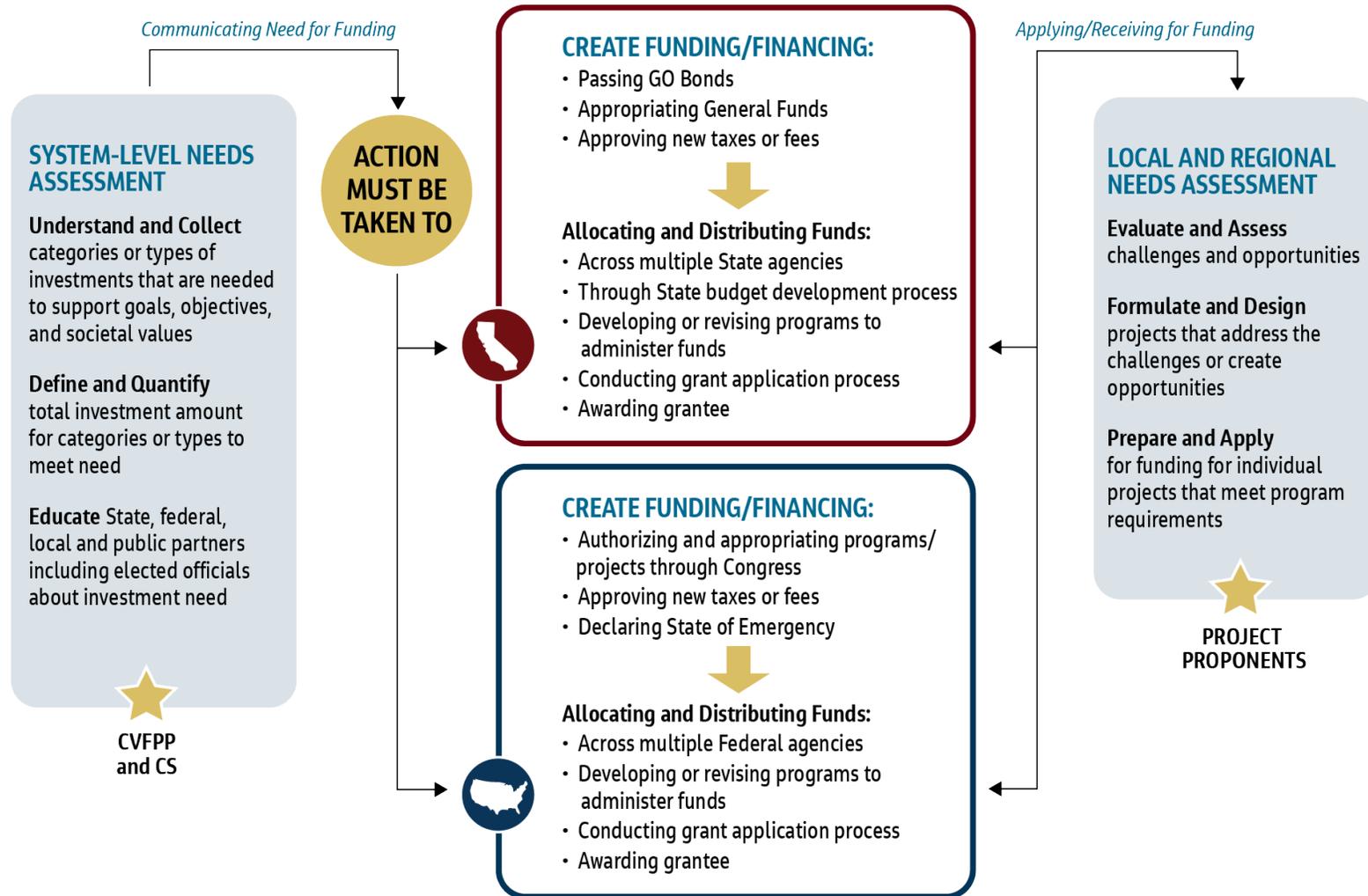
CVFPP's role with regards to funding does not include:

- Endorsing individual projects or programs for funding decisions.
- Directly appropriating funding to individual projects or programs.
- Generating cash flow to grant or direct assist programs to be administered to individual projects.

For State and federal funding to be awarded to individual projects, an extensive process applies. In some cases, this process can take multiple years and even decades, depending on the scale and complexity of the project. This is often frustrating for local project proponents because funding projects at the local level can be more straightforward and shorter in duration. However, the magnitude of funding can be much greater from State and federal sources. The key is to understand the funding process and the avenues that make the most sense for individual project needs. The CVFPP plays an indirect role in the extensive process that individual project proponents and State and federal programs engage in to fund specific projects. The CVFPP's role is primarily to communicate the needs of the SPFC and educate elected officials and decision makers. Figure 3-2 illustrates the many steps involved in creating funding opportunities at the State and federal level, and ultimately providing those funds to individual multi-benefit projects, as well as CVFPP's specific role in the process.



Figure 3-2. Budget Development Process for Programs and Projects



3.4.3.2 Updating the CVFPP Investment Need

Building on the 2017 CVFPP Investment Strategy, investment information, financial drivers, and costs are being updated for the 2022 CVFPP Update, using new information and with the help of State, federal, regional and local partners. The 2022 CVFPP Update estimates that at this time, with best available information, \$25 to \$30 billion dollar investment is needed for ongoing and capital investments over the next 30 years. This includes investment needs such as the Yolo Bypass multi-benefit improvements, urban levee improvements, rural levee setbacks and floodplain storage actions, O&M activities, and emergency management actions, among many others, and includes multi-benefit projects that have been identified by the State and RFMPs. Chapter 4 of the 2022 CVFPP Update provides more information and lists the cost sources that provided the updated information.

As in 2017, the investment needed is largely informed by the proposed actions from the BWFS and RFMP planning processes. The restoration of ecosystem processes and habitats as components of multi-benefit projects are included in the proposed actions through BWFSs and RFMPs. Because such restoration is an integrated component of multi-benefit projects, restoration funding is part of the funding appropriation process for the overall project that includes flood risk reduction and other public benefits. BWFS and RFMP processes and their relevance to incorporating multi-benefit projects into those efforts are described briefly as follows:

- **Basin-Wide Feasibility Studies.** The BWFSs for the Sacramento River and San Joaquin River basins identified projects with the potential to improve systemwide functions and resiliency (system improvements). The planning effort for these studies formulated options for system improvements consisting of combinations of bypass, storage, and weir expansions; these options were a basis for the 2017 CVFPP Update (California Department of Water Resources 2017b, 2017c). Many of these system improvements are expected to be multi-benefit projects that restore ecosystem processes and habitats. There is not an update to the BWFSs for the 2022 CVFPP Update. However, DWR has advanced several multi-benefit projects through its flood management programs with State, federal, and local partners, and costs have been updated for all improvements based on new information or cost escalation.
- **Regional Flood Management Plans.** Following the adoption of the 2012 CVFPP, DWR funded six regionally led RFMPs that listed regional and local flood management priorities (California Department of Water Resources 2017c). These six plans provided information about various regionally supported management actions and project opportunities, along with associated costs and timelines. RFMPs also identified opportunities to promote habitat restoration and reconnection projects in rural areas and small communities. These habitat restoration and reconnection projects are intended to supplement systemwide improvements and to focus more closely on improving or connecting habitat areas than on reducing flood risk. As part of the 2022 CVFPP Update, RFMP efforts were re-initiated to provide updated recommendations and cost information regarding local flood-related priorities, projects, and concepts. The RFMP planning process provides a platform for



meaningful engagement among DWR and regional and local flood planning entities. It also allows for collaboration with the proponents of related planning efforts for water management and conservation across the Sacramento River and San Joaquin River basins.

3.4.3.3 Identifying Funding Mechanisms

Investments in management actions that incorporate ecosystem restoration benefits and other multi-benefit aspects have a wide variety of funding mechanisms available to them. Typically, monies are created through funding or financing mechanisms such as a passage of GO bonds, appropriation of State general funds, passage of a new tax or fee, authorization and appropriation through Congress, etc. Funding is then allocated or distributed to corresponding direct-assistance, competitive-grant, or budget processes across a multitude of State, federal, and local agencies. These opportunities for funding are then considered funding sources and create cash flow that can be applied to individual projects that meet the criteria, guidelines, or specific requirements of those programs.

Primary State mechanisms include:

- **State General Fund:** The General Fund has traditionally funded a portion of flood management planning and implementation activities. DWR typically receives between 0.1 and 0.2 percent of State General Fund revenues, and approximately 25 percent of that contributes to Central Valley flood management. The applicability of this mechanism is high as there is a nexus between lowering the risk of flooding and benefits to the State economy.
- **State GO Bonds:** The issuance of new State general obligation bonds requires a statewide vote. This mechanism requires time to prepare language for the bond measure for the statewide vote, as well as a two-year lag before funds become available following bond passage. The applicability of this mechanism is high due to the nexus of reducing the flood risk with the benefits to the State economy. It is important to note that since 2006, State GO bonds have been the primary mechanism for funding implementation of the CVFPP, with almost \$5 billion provided through Proposition 1E and Proposition 84. Subsequently, Proposition 1 allocated \$395 million and Proposition 68 allocated \$536 million to flood management.

GO bonds can be used separately to fund or cost-share portions of projects that may provide greater benefits consistent with the State's broader interest and policies; they are generally a good fit for multi-benefit projects. However, practitioners and project proponents have noted challenges when expending GO bond funds on their projects. Some of these issues have revolved around the inability to effectively blend different funds. For example, although the cost allocations for Proposition 68 have seemed effective, some GO bonds—such as Proposition 1E—have stipulated that funds for creating habitat can be used only when called “mitigation,” putting them into conflict with other funding opportunities. These requirements have resulted in piecemeal funding, and in other delays and inefficiencies that increase costs without notable benefits. Developing language to



alleviate these issues while maintaining the objective of the funding mechanism could more efficiently support implementing multi-benefit projects.

The 2022 CVFPP Update recommends greater use of existing and the establishment of new State mechanisms to create the funding and financing capacity to implement the CVFPP. New mechanisms could provide stable and consistent cash flow streams that could sustain implementation over the 30-year planning horizon. The following new mechanisms are recommended in the 2022 CVFPP Update:

- Sacramento and San Joaquin Drainage District.
- State River Basin Assessment or Tax.
- State Flood Insurance Program.

Chapter 4 of the 2022 CVFPP Update provides more information on each of the new recommended mechanisms, along with their applicable management actions, revenue generation potential, and development status. Chapter 4 also provides more detail on federal and local mechanisms that are included in the CVFPP 30-year funding plan.

Other primary mechanisms include:

- **Federal authorization and appropriation process through Congress** for multiple federal agencies, such as USACE, U.S. Department of Agriculture, and U.S. Bureau of Reclamation, among others.
- **Local-level mechanisms**, such as benefit assessments and special taxes, enhanced infrastructure financing districts, and developer fees.
- **Public-private partnerships (P3s)**. These are also viable mechanisms that apply to multi-benefit projects. P3 agreements are generally between a private financial institution and State, local, or federal agencies. The private financial institution provides the public asset or service that is repaid, with interest, through a revenue source related to the investment. The private financial institution bears the risk and may have management responsibility. Current California water resources management P3 agreements are primarily between local agencies and private financial institutions. P3 agreements do not operate like traditional funding sources. Cost-sharing could be up to 100-percent, with potential reductions from innovation and cost savings. P3 agreements apply to management actions in all water sectors that can qualify for a partnership with a private financial institution. P3 agreements may be subject to external market forces; otherwise, they are a potential reliable funding mechanism for water resources management in California.

3.4.3.4 Identifying Potential Funding Programs

Once funding mechanisms have created the monies for funding or financing opportunities, funding is then allocated or distributed to corresponding direct-assistant and competitive grant programs within State and federal agencies. Individual programs have criteria, guidelines, or specific requirements that project proponents must comply with to be eligible for funding.



Generally, the program criteria and guidelines must also comply with requirements of how the funding mechanism was created to ensure the entitled benefit is received or the distribution of funds is legal.

Table 3-3 describes existing funding programs that are available from State and federal sources. It also identifies the following information for each program:

- **Funding Program Name and Description:** The agency that administers program, general purpose of the program, and information about the program.
- **Applicability: The geographic scope and** types of management actions that have a strong nexus with the funding program. Applicability is rated as high if targeted management activities include multi-benefit projects specifically, or flood and conservation-related activities individually, over a broad geographic swath of the SPFC footprint. Applicability is rated as low if the geographic scope is limited to small portions of the SPFC footprint. Funding programs are rated as moderate if they target only conservation activities, but cover a wide geography.
- **Program Type and Current Funding Level:** The available information on how much the program is funding, what is to be expected in the future based on historical trends, and what type of program it is (e.g., competitive-grant, direct-assistance, etc.).

To further aid in connecting project proponents to appropriate funding programs, the State has centralized its available programs, grants, and loans through the *California Grants Portal* (www.grants.ca.gov). The *California Grants Portal* provides information and links to all grants and loans offered on a competitive or first-come basis by California State agencies.



Table 3-3. Potential State and Federal Funding Programs for Multi-benefit Projects

Funding Program	Description	Applicability	Program type and Current Funding Level
Department of Water Resources – Flood Management Programs and SubPrograms	DWR implements a range of grant programs related to flood management and risk reduction, including multi-benefit projects, through their Flood Management Programs and SubPrograms. See the 2022 CVFPP Update for more detail on these programs.	High. Funding is available to flood managers for multi-benefit flood projects.	Competitive Grants and Direct Local Assistance.
California Department of Conservation – Working Lands and Riparian Watershed Restoration Grants	Watershed restoration grants fund restoration and enhancement efforts on working agricultural lands, with the goal of improving climate adaptation and resilience by improving soil health, sequestering carbon, and improving habitat.	Moderate. Funding is available to Resource Conservation Districts for restoration on working lands.	Annual Competitive Grant. Total estimated funding available is \$8.5 million. (CNRA 2021)
California Department of Fish and Wildlife – Endangered Species Conservation and Recovery Grant Program and Land Acquisition Program	This grant program promotes the conservation and recovery of special status species under the federal Endangered Species Act, particularly on non-federal land. Covers a variety of funded activities, including habitat restoration, species status surveys, and development of management plans.	Moderate. Funding is available to a variety of entities for the covered activities and could apply to the conservation component of a multi-benefit project.	Annual Competitive Grant. Approximately 11 projects are funded per year. \$1.9 million was allocated in the 2020 funding cycle. Program requires a 25% funding match. (CNRA 2021)
California Department of Fish and Wildlife – California State Duck Stamp Project Grant Program	The State Duck Stamp Accounts funds projects beneficial to California’s waterfowl species. The grant program funds projects that preserve, restore, enhance, and develop migratory waterfowl breeding and wintering habitat and carry out waterfowl related assessments and research.	Moderate. Funding is available to nonprofit organizations, local government agencies, state departments, and federal agencies.	Annual Competitive Grant. Approximately 6 projects are funded per year. Total estimated available funding is \$1.5 million. (CNRA 2021)



Funding Program	Description	Applicability	Program type and Current Funding Level
California Department of Fish and Wildlife – Fisheries Restoration Grants Program	The Fisheries Restoration Grants Program funds ecological restoration projects in coastal and Central Valley streams and watersheds that benefit salmon and steelhead recovery. Applicable project types include riparian and stream restoration, sediment reduction, fish passage improvement, education, water conservation, and organizational support.	Moderate. Funding is available to public agencies and nonprofits. Matching funds are not required, but projects without matching funds lose points in the evaluation process.	Annual Competitive Grant. Approximately 35 projects are funded per year. Total estimated available funding is \$14 million. (CNRA 2021)
California Department of Fish and Wildlife – California Winter Rice Habitat Improvement Program	The California Winter Rice Habitat Improvement Program provides incentive payments for winter flooding of harvested rice fields to enhance habitat for wintering waterbirds in the Sacramento and San Joaquin Valleys. Flooding is to be carried out as prescribed in a management plan for each enrolled property.	Low. Funding is available to private landowners who have grown rice on at least 40 acres of land and are able to flood their fields in the fall and winter.	Annual Competitive Enrollment Process. Approximately 35 projects are funded a total of \$500,000 per cycle. The program pays participants an annual incentive of \$15 per acre. (CNRA 2021)
California Department of Fish and Wildlife – Endangered Species Conservation and Recovery Habitat Conservation Planning Assistance Grant Program	This grant program provides funding for tasks necessary in the planning phase of a HCP for endangered species, such as baseline surveys, preparation of planning documents, and outreach.	Moderate. Funding available to public, nonprofit, academic, and tribal entities for HCP planning activities. A 25% match is required.	Annual Competitive Grant. Approximately 10 projects are funded per cycle. (CNRA 2021)



Funding Program	Description	Applicability	Program type and Current Funding Level
California Department of Fish and Wildlife – Wetlands Restoration for Greenhouse Gas (GHG) Reduction Grant Program	The Wetlands Restoration for GHG Reduction Grant Program funds restoration and enhancement of wetlands and watersheds that provide GHG sequestration and other co-benefits such as habitat provision, water quality, and climate adaptation benefits. The program is focused on coastal wetlands, inland seasonal wetlands, Sacramento-San Joaquin Delta wetlands, and Mountain meadows.	Moderate. Funding available to public and nonprofit entities for HCP planning activities.	Annual Competitive Grant. Total estimated available funding is \$500,000. Last award was 2019. (CNRA 2021)
California Department of Fish and Wildlife – Prop 1 Delta Water Quality and Ecosystem Restoration Grant Program	This grant program aims to fund multi-benefit ecosystem and watershed protection projects that benefit the Delta. Its three broad objectives are to provide more reliable water supplies, restore important species habitat, and create a more sustainably managed water resources system (including water quality and flood protection) that can better weather a changing climate.	High. Public entities and nonprofits are eligible to apply for funding to pursue multi-benefit restoration projects in the Sacramento-San Joaquin Delta.	Annual Competitive Grant. Total estimated available funding is \$35 million. Approximately 11 projects are funded per cycle. (CNRA 2021)
California Department of Fish and Wildlife – Prop 1 Watershed Restoration Grant Program	This grant program aims to fund multi-benefit ecosystem and watershed protection projects that are located outside of the Sacramento-San Joaquin Delta. It's three broad objectives are to provide more reliable water supplies, restore important species habitat, and create a more sustainably managed water resources system (including water quality and flood protection) that can better weather a changing climate.	High. Public entities and nonprofits are eligible to apply for funding to pursue multi-benefit restoration projects outside of the Sacramento-San Joaquin Delta.	Annual Competitive Grant. Total estimated available funding is \$96 million. Approximately 21 projects are funded per cycle with \$15 million allocated in the most recent funding cycle. (CNRA 2021)



Funding Program	Description	Applicability	Program type and Current Funding Level
California Department of Fish and Wildlife – Prop 68 Habitat Restoration and Protection	The Habitat Restoration and Protection Grant Program provides funding from Prop 68 funds to restore rivers and streams in support of fisheries and wildlife. Covered activities include reconnection of rivers with their flood plains, riparian and side channel habitat restoration, and restoration and protection of upper watershed systems.	Moderate. Public entities and nonprofits are eligible to apply for funding.	Annual Competitive Grant. Total estimated available funding is \$21 million. (CNRA 2021)
California Department of Fish and Wildlife – Prop 68 Improve Conditions for Fish and Wildlife	This grant program provides funding from Prop 68 funds to improve conditions for fish and wildlife in streams, rivers, wildlife refuges, wetland habitat areas, and estuaries. Eligible projects include water and land acquisition and improvement of aquatic or riparian habitat conditions.	Moderate. Public entities and nonprofits are eligible to apply for funding.	Annual Competitive Grant. Total estimated available funding is \$25 million. (CNRA 2021)
California Department of Fish and Wildlife – Environmental Enhancement Fund	The Environmental Enhancement Fund supports projects that acquires habitat for preservation or improves habitat quality and ecosystem function above baseline conditions. Projects must be within or adjacent to waters of the state, have measurable outcomes, and be designed to acquire, restore, or improve habitat or ecosystem function to benefit fish and wildlife.	Moderate. Public entities and nonprofits are eligible to apply for funding.	Annual Competitive Grant. Total estimated available funding is \$2 million. \$850,000 available in the most recent funding cycle. (CNRA 2021)



Funding Program	Description	Applicability	Program type and Current Funding Level
Sacramento-San Joaquin Delta Conservancy – Prop 1 Ecosystem Restoration and Water Quality Grant Program	This grant program makes funding available to multi-benefit projects that restore important species and habitat, improve water quality, and support sustainable agriculture within the legal Delta and Suisun Marsh.	Low. Public entities and nonprofits are eligible to apply for funding. Projects must be located in the Delta or Suisun Marsh. Some projects outside the Delta that meet certain specifications may also qualify.	Annual Competitive Grant. Total estimated available funding is \$3 million. (CNRA 2021)
San Joaquin River Conservancy – San Joaquin River Conservancy Prop 1 Grant Program	The San Joaquin River Conservancy Grant Program funds projects that demonstrate multiple benefits to water quality, water supply, and or ecosystem and watershed protection and restoration within the Conservancy’s jurisdiction.	Moderate. Public entities and nonprofits are eligible to apply for funding. Projects must be located in the Conservancy’s planning area along the San Joaquin River, from Friant Dam to Highway 99.	Annual Competitive Grant. Total estimated available funding is \$5.6 million. (CNRA 2021)
Wildlife Conservation Board – Pacific Flyway	The purpose of this grant program is to fund the acquisition, development, rehabilitation, restoration, protection, and expansion of wildlife corridors and open space to improve connectivity and reduce barriers between habitat areas. Priority may be given to projects that protect wildlife corridors.	Moderate. Public entities and nonprofits are eligible to apply for funding. Projects must be located in the Pacific Flyway.	Annual Competitive Grant. Total estimated available funding is \$7.5 million with \$3 million in potential funding available in the most recent funding cycle. (CNRA 2021)



Funding Program	Description	Applicability	Program type and Current Funding Level
United States Army Corps of Engineers – Congressional Authorizations	The WRDA authorizes the Secretary of the Army to study and/or implement various projects and programs for improvements and other purposes to rivers and harbors of the United States. In California, the majority of federal flood protection projects are the responsibility of USACE. Federal authorized funds would require appropriation by Congress.	High. Applicable projects must demonstrate national benefits. Project types range from capital improvements, land acquisition, levee setbacks, floodplain storage, habitat restoration, floodproofing and planning.	From 2003 to 2019 average annual expenditures ranged from \$64 million to \$97 million (depending on whether the Folsom Joint Federal Project is included). The maximum over the period (which includes the Folsom Joint Federal Project) was \$139 million.
United States Bureau of Reclamation - Central Valley Project Improvement Act Conservation Program and Habitat Restoration Program	The CVPIA Conservation Program and Habitat Restoration Program are integrated efforts with the goal of improving conditions for CVP impacted species and habitats. The programs were originally formed to address Reclamation’s Endangered Species Act requirements. The programs targets actions that will protect, restore and enhance special-status species that are impacted by the CVP and their habitats.	Moderate. Funds apply to the Central Valley Project Area. CVPIA funds are applicable to programs and activities that support fish and wildlife protection, restoration, and mitigation.	Annual Competitive Grant. The Conservation Program is typically funded at between \$1 and 2 million annually. The Habitat Restoration Program is usually funded at \$1.5 million annually.
National Park Service - Land and Water Conservation Fund	The Land and Water Conservation Fund provides grants to states and localities for acquisition, development, and planning of outdoor recreation opportunities in the United States. Grants have supported purchase and protection of 3 million acres of recreation lands and over 29,000 projects to develop basic recreation facilities in every State and territory of the nation (NPS 2021a).	Moderate. Program funds could be applied to the recreation component of a multi-benefit project. Grants apply to public recreation areas, facilities, and conservation strategies.	Annual Competitive Grant. The LWCF is permanently funded going forward, with a portion of funding going to state grants. In FY2018 and FY2019, CA awarded \$16.4 and \$10.4 million in LWCF grants, respectively.



Funding Program	Description	Applicability	Program type and Current Funding Level
United States Fish and Wildlife Service - Cooperative Endangered Species Conservation Fund (Endangered Species Act Section 6 Grant Program)	USFWS's Cooperative Endangered Species Conservation Fund Grants provide funding to states for species and habitat conservation on private lands (USFWS 2021a). The program's goal is to work with landowners, communities, and Tribes to foster voluntary stewardship efforts for the recovery of endangered species. The program has four specific grant programs: Conservation, HCP Planning Assistance, HCP Land Acquisition, and Recovery Land Acquisition.	Moderate. Program funds can apply to species and habitat conservation projects that are located in floodplains. Program provides funding for land acquisition.	Annual Competitive Grant. The maximum grant through this program is \$1 million dollars per project.
United States Fish and Wildlife Service - North American Wetlands Conservation Act Program	The USFWS administers the North American Wetlands Conservation Act program, which provides grant funding for wetland protection, restoration, and enhancement. The program provides matching grants to projects that benefit wetlands-associated migratory birds and wildlife. Program includes a Standard and a Small Grants Program.	High. These funds apply to multi-benefit projects that provide improved flood management, as well as ecosystem enhancement.	Annual Competitive Grant. The Small Grants program awarded \$3.2 million in 2020, with maximum awards of \$100,000. The Standard Grants program awarded \$46 million in 2020 for projects over \$100,000.
United States Fish and Wildlife Service - Anadromous Fish Restoration Program	The AFRP, administered by USFWS, aims to expand and improve fish habitat in the Central Valley in an effort to restore natural stocks of anadromous fish. The AFRP brings together federal, State, and local agencies, as well as non-profit organizations and private landowners on projects that increase available juvenile and adult salmon habitat (USFWS 2021c).	High. Funds can apply to multi-benefit projects targeted at improving fish habitat, as well as flood management. The AFRP explicitly calls for coordination with flood management activities to ensure the protection of fishery resources, habitats, and spawning grounds (USFWS 2001).	Annual Competitive Grant. \$11 million was available for grants in FY 2017. Projects would have to compete yearly with other potential projects for annual appropriations.



Funding Program	Description	Applicability	Program type and Current Funding Level
United States Department of Agriculture - Natural Resource Conservation Service	The NRCS is part of the United States Department of Agriculture, providing funding for farmers, ranchers, and forest landowners to boost agricultural productivity and protect natural resources through conservation (NRCS 2021a). Individual grant programs include Conservation Innovation Grants and the Regional Conservation Partnership Program	Moderate to High. These funds could be used for easements, improving habitat, and flood protection. Some of the NRCS programs have provided funding for floodplain easements, and others will fund improving or restoring habitat.	Annual Competitive Grant. The maximum amount for each fiscal year is established by the Chief for NRCS.
United States Department of Agriculture - Watershed and Flood Prevention Program	The Watershed and Flood Prevention Program is implemented through three sub-programs: Watershed Surveys and Planning, WFPO, and Watershed Rehabilitation. The WFPO Program provides funding to protect and restore watersheds that are up to 250,000 acres in size; funding can be used to prevent damage as well as for conservation development. The Watershed Rehabilitation program focuses on the rehabilitation of dams originally constructed under Public Law 83-566, Public Law 78-534, the Pilot Watershed Program, or the Resource Conservation Program (NRCS 2021b).	Moderate. Authorized project purposes include, but are not limited to, flood prevention and flood damage reduction, watershed protection, public recreation, fish and wildlife conservation, and agricultural water management. At least 20% of total project benefits must go to agricultural and rural communities.	Annual Competitive Grant. \$150 million was invested in 2017 (NRCS, 2021c). However, the program has not been authorized since FY 2010. Cost-share requirements for wetland and floodplain conservations easement acquisition ranges from 50 to 100 percent.



Funding Program	Description	Applicability	Program type and Current Funding Level
National Fish and Wildlife Foundation - National Coastal Resilience Fund	Established in 2018, the National Coastal Resilience Fund is administered by the NFWF and seeks to benefit coastal communities, as well as fish and wildlife by reducing coastal flooding, improving water quality and recreation, and enhancing ecosystems (NFWF 2021a).	Low. Funds could be used for coastal flood protection as well as habitat restoration and enhancement.	Annual Competitive Grant. The 2020 round of funding provided \$37 million in coastal resilience grants. \$34 million will be awarded in 2021.
National Fish and Wildlife Foundation - Emergency Coastal Resiliency Fund	Established in 2019, the Emergency Coastal Resiliency Fund is administered by the National Fish and Wildlife Foundation and aims to support conservation and resilience projects in areas impacted by past disasters, including 2018 wildfires. Funding is focused on recovery from past natural disasters, reducing the impact of future events, and enhancing fish, wildlife, and ecosystems (NFWF 2021b).	Low. Funds are applicable to coastal flood protection as well as habitat restoration and enhancement in disaster-impacted areas.	Annual Competitive Grant. The NFWF awarded \$48 million in grants in 2019.
Natural Resource Conservation Service – Agricultural Conservation Easement Program. Replaced the Wetland Reserve Program in 2014	USDA NRCS Agricultural Conservation Easement Program, includes a Wetland Reserve Easement component, which offers landowners the opportunity to protect, restore, and enhance wetlands on their property. The program provides technical and financial support to help landowners with their wetland restoration efforts, including the opportunity to establish long-term conservation and wildlife practices and protection. (NRCS 2021d).	Moderate. Funds apply to working agricultural lands that are enrolled through a permanent, 30-year, or term easement.	Non-competitive enrollment process. After a one-time enrollment, NRCS pays 75 to 100 percent of restoration costs on permanent easements, and 50 to 75 percent of restoration costs on 30-year and term easements.



Funding Program	Description	Applicability	Program type and Current Funding Level
Natural Resource Conservation Service - Environmental Quality Incentives Program	The Environmental Quality Incentives Program (EQIP) is a voluntary program that provides financial and technical assistance to agricultural producers to plan and implement conservation practices that improve soil, water, plant, animal, air and related natural resources on agricultural land and non-industrial private forestland. The program also may help producers comply with environmental permits and regulations (NRCS, 2021e).	Moderate. Funds apply to agricultural lands, ranchlands, and non-industrial private forestland.	Non-competitive enrollment process. NRCS provides financial assistance through 5-to-10-year contracts with a maximum payment of \$200,000 upon completion and certification of conservation practices. For FY 2020, California received roughly \$100 million in EQIP funds (NRCS, 2021f).
Federal Emergency Management Agency - Hazard Mitigation Grant Program	The purpose of the HMGP is to help communities implement hazard mitigation measures following a major Presidential disaster declaration. The HMPG is authorized under Section 404 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act (FEMA 2021a).	High. Funds apply to flood risk reduction projects; an ecosystem service component improves project competitiveness. Funding is available after a presidential major disaster declaration in the state.	Annual Competitive Grant. There is \$484 million allocated to California for the 2021 grant cycle, based on the Covid disaster declaration. The cost share for HMGP funded projects is 75% federal/25% non-federal.



Funding Program	Description	Applicability	Program type and Current Funding Level
Federal Emergency Management Agency - Building Resilient Infrastructure and Communities	The BRIC program replaces the previous Pre-Disaster Mitigation program. Established in 2020, this program aims to provide funding to states, local communities, tribes, and territories for hazard mitigation projects that reduce the impacts of natural hazards (FEMA 2021b).	High. Funds apply to flood risk reduction projects; an ecosystem service improvement component improves project competitiveness.	Annual Competitive Grant. For Fiscal Year 2020, \$33.6 million was available to states and territories, \$20 million for tribes, and \$446.4 million for the national competition for mitigation projects. The cost share for BRIC funded projects is 75% federal/ 25% non-federal. \$600,000 max allocation for states, and \$50 million max for subapplicant projects.

Notes:

% = percent

AFRP = Anadromous Fish Restoration Program

BRIC = Building Resilient Infrastructure and Communities

CNRA = California Natural Resources Agency

CVFPP = Central Valley Flood Protection Plan

CVP = Central Valley Project

CVPIA = Central Valley Project Improvement Act

DWR = California Department of Water Resources

FEMA = Federal Emergency Management Agency

GHG = greenhouse gas

HCP = habitat conservation plan

HGMP = Hazard Mitigation Grant Program

NFWF = National Fish and Wildlife Foundation

NPS = National Park Service

NRCS = Natural Resource Conservation Service

Prop = proposition

USACE = U.S. Army Corps of Engineers

Reclamation = U.S. Board of Reclamation

USFWS = U.S. Fisheries and Wildlife Service

WFPO = Watershed and Flood Prevention Operations



3.4.4 Regulatory Compliance

The CVFPP's implementation involves numerous flood risk management and conservation actions over a 30-year time frame. Actions to implement the CVFPP generally need to comply with a variety of federal and State environmental laws, such as the National Environmental Policy Act (NEPA), the Rivers and Harbors Act of 1899, the federal Clean Water Act, the federal ESA, CEQA, and CESA. Typically required approvals and laws are described in Appendix D, "Updates to 2016 Conservation Strategy Appendix A, 'Regulatory Setting'." In some situations, project proponents or maintainers comply with these laws by implementing activities in a manner that avoids or minimizes environmental effects. In most situations, however, permits and other types of regulatory approvals are also required, including those associated with the public safety requirements of the CVFPB and USACE.

The 2016 Conservation Strategy envisioned that multi-benefit projects could be implemented with more predictable and cost-effective permitting than single-purpose projects. This cost-effectiveness would result from greater support from the public and the regulatory agencies; more efficient permitting mechanisms for multi-benefit projects; and the ability to meet conservation and flood management needs through a smaller number of projects relative to separate, single-purpose, habitat and flood projects.

To date, that vision has not materialized. Furthermore, project proponents and other stakeholders have identified permitting requirements as a major impediment to implementing multi-benefit projects (Section 2.3.4, "Implementation Guidance"). Uncertainties regarding measures that will be required to avoid or minimize impacts, mitigation requirements, and the duration of the permitting process add to the challenges of permitting projects.

To address this persistent need for more efficient permitting of multi-benefit projects, DWR and others have been seeking additional efficiencies. Their efforts include mechanisms for all of the following:

- Permitting O&M at the landscape scale.
- Permitting restoration and multi-benefit projects.
- Increasing the availability of compensatory mitigation.

The following sections describe each of these efforts and identify regulatory compliance recommendations prioritized for 2022 to 2027.

3.4.4.1 Permitting Operations and Maintenance

Because they vary and are implemented in and around sensitive habitats, the permitting requirements for flood system O&M activities can be particularly complex. Routine O&M activities fall into four broad categories:

1. Levee maintenance, which includes erosion repair, rodent abatement and damage repair, vegetation management, and toe drain and pressure relief well repairs; levee crown and access road maintenance; unauthorized encroachment removals; and fencing and levee protection.



2. Channel maintenance, which includes sediment removal, debris and obstruction removal, vegetation management, and erosion (scour) repair.
3. Maintenance of flood control structures, which includes the repair, replacement, and abandonment of pipes and culverts, pumping plants, weirs, outfall gates, and bridges.
4. Data collection.

These activities have been chronically underfunded, resulting in deferred maintenance that increases flood risk and the eventual cost of maintenance (California Department of Water Resources 2017b). Regulatory compliance exacerbates this situation by adding to O&M costs and prolonging the schedules for completing O&M activities.

Consequently, as described in the 2016 Conservation Strategy, DWR collaborates with regulatory agencies and other flood system stakeholders to reduce or offset environmental impacts of O&M and to improve the efficiency of environmental compliance. Through the DWR's Flood Maintenance and Operations Branch's Environmental Initiatives Program, DWR has continued this collaboration, with initiatives that include:

- Environmental Permitting for O&M EIR.
- Routine maintenance agreements.
- Small Erosion Repair Program (SERP).
- Systemwide Improvement Frameworks (SWIFs).
- "Low-effect" HCPs.
- MCAs.
- New methodologies for detecting endangered species.

Most of these initiatives address multiple activities at a landscape scale, which is a key aspect of how they improve the effectiveness and efficiency of environmental compliance. Also, each initiative not only improves the effectiveness and efficiency of DWR's maintenance activities, but also serves as a model that may be adapted by other maintainers. These initiatives are described as follows:

- **Environmental Permitting for O&M EIR.** Through this EIR, DWR evaluated its O&M of a portion of the Sacramento River Flood Control Project and Middle Creek Project in Lake County, which are components of the SPFC. Besides providing up-to-date CEQA compliance required for State permits, the project description of this EIR is a comprehensive, detailed description of O&M activities.
- **Routine maintenance agreements.** For the Sacramento and Sutter yards, DWR has worked with CDFW to establish 12-year-long lake and streambed alteration agreements for routine maintenance activities. These routine maintenance agreements apply standardized measures to DWR's routine maintenance activities, which are disclosed in annual maintenance plans and reports from DWR to CDFW, and are more efficient than obtaining numerous separate agreements for individual activities.



- SERP.** DWR has developed a regulatory review and authorization process for annual repairs of small erosion sites on levees in the Sacramento River Flood Control Project to improve levee reliability, facilitate more efficient project delivery, and often provide environmental benefits. The SERP, developed by a working group of the Interagency Flood Management Collaborative, covers approximately 300 miles of levees maintained by the State in the Sacramento River Flood Control Project. Regulatory approvals have been secured, with a goal of making the permitting process more efficient, cost-effective, and consistent. In addition, more timely repairs of small sites will prevent more extensive erosion (to reduce the risk to public safety, prevent greater environmental damage, and reduce maintenance costs). DWR and agency partners are evaluating whether the program can be replicated by other maintaining agencies throughout the SPA.
- SWIFs.** For SPFC facilities, DWR has been working with USACE to develop the first SWIF in the nation with an associated ESA compliance mechanism. A SWIF is a plan developed to address systemwide levee issues, including those found during inspections. USACE would append SWIF activities to the applicable O&M manual for the duration of the proposed activities, along with any requirements of the associated Section 7 biological opinion. For grouting of levees in MA05 and Butte Creek, which may adversely affect the federally listed giant gartersnake, DWR is developing a SWIF and biological assessment (to support the biological opinion). This SWIF is a pilot effort that may subsequently be expanded to cover a larger area and other activities that potentially affect additional federally listed species.
- “Low-effect” HCPs.** DWR has been developing a “low-effect” HCP for a set of locations in the Sutter and Sacramento maintenance yards where maintenance activities cannot avoid affecting elderberry shrubs, which are the host of the federally listed valley elderberry longhorn beetle. This HCP may serve as a model for similarly focused HCPs covering valley elderberry longhorn beetle or other species.
- New methodologies for detecting endangered species.** DWR has been funding the development of protocols for detecting giant gartersnakes using scent dogs and environmental deoxyribonucleic acid (DNA) (eDNA). Because of the species’ use of small subterranean spaces, the detection of giant gartersnakes is problematic and costly. Scent dogs and eDNA are promising technologies to detect giant gartersnakes more effectively than the current technologies. If these new technologies are demonstrated to be effective, and are approved by USFWS and CDFW, they would reduce harm to and mortality of snakes while reducing the cost of environmental compliance. Protocols using these technologies may also be developed for the detection of other endangered species.

Multiple-objective Operations and Maintenance

CVFPP implementation includes multi-benefit projects throughout the SPA that would need to be maintained for the variety of benefits they are intended to provide (e.g., flood risk reduction, ecosystem vitality, recreation, water quality, and agricultural production). The long-term O&M of those multi-benefit SPFC improvements would need to include activities to maintain both flood protection and habitat quality. In addition to the strategies described, DWR



and several local agencies are currently evaluating the feasibility of developing regional multiple-objective operations and maintenance (MOOM) programs in the SPA (e.g., Yolo Bypass-Cache Slough Partnership O&M efforts). MOOM programs are a flood system maintenance approach that incorporates other non-flood objectives, such as habitat stewardship and enhancement. System maintenance activities are still focused on flood management, but also include objectives and activities related to managing ecosystem processes, habitats, species, and stressors, and prioritization of investments in the system are allocated based on monitoring data and adaptive management.

MOOM programs identify the synergies between flood and ecosystem management, and provide a framework, processes, and mechanisms that can improve collaboration, efficiencies, and cost-savings in relation to permitting O&M. By definition, MOOM programs seek to improve the condition of ecosystem processes, habitats, and species, and alleviate stressors, both through impact avoidance and direct resource maintenance and restoration actions performed as part of routine maintenance activities, and thus can help to avoid the need for mitigation and help reduce some the complexities and costs of permitting.

Several MOOM programs are in place in California; some programs have been in operation for many years, and others have been implemented as recently as five years ago. General characteristics include the following:

- Establishes a common vision among the flood management and resource agencies that includes goals related to each of the program objectives.
- Includes habitat management and enhancement activities in the program, rather than implementing environmental measures solely in response to environmental compliance requirements.
- Incorporates hydrologic, geomorphic, and biological processes, and adaptively manages and maintains the system based on those underlying processes.
- Has a programmatic environmental permitting process based on interagency collaboration, including during program development.
- Provides organization around a single plan or document and an annual planning process that includes resource agency review.
- Has an emphasis on finding solutions that are compatible with each of the program objectives, which leads to creative management techniques.
- Includes performance-based and data-driven adaptive management.
- Provides reliable and adequate funding for system management for all program objectives.



Performance tracking and an annual maintenance planning cycle are important components of a MOOM program’s effective implementation.

3.4.4.2 Permitting Ecological Restoration by Multi-benefit Projects

Both single-purpose and multi-benefit projects that create habitat produce long-term benefits for ecosystems, habitats, and species. Nonetheless, these projects may require the disturbance of existing habitats and the displacement—and potentially injury or death—of the animals using them. Consequently, projects restoring habitat typically require the same permits and other approvals as other projects and are subject to the same permitting inefficiencies.

Because they contain both habitat and flood management components, multi-benefit projects can even have more complex permitting requirements than single-purpose habitat or flood management projects. The CNRA, along with regulatory agencies, have been developing more efficient mechanisms for permitting ecological restoration through habitat and multi-benefit projects. These compliance mechanisms are potentially applicable to the full range of ecological restoration actions, which include the following:

- Improvements to stream crossings and fish passage.
- Removal of pilings and other in-water structures.
- Removal of small dams, tide gates, and legacy structures.
- Bioengineered bank stabilization.
- Restoration of off-channel and side-channel habitat features.
- Restoration of floodplains.
- Restoration of tidal and nontidal wetlands.
- Restoration of riparian habitat.
- Removal of non-native invasive plants and native plant revegetation.

Although focused on restoration actions, some of the expedited compliance mechanisms identified in Table 3-4 are intended to apply to multi-benefit projects in their entirety. However, most of these permitting mechanisms have criteria that must be satisfied for their use, particularly regarding the project’s design (e.g., the inclusion of specific protection measures). For a comprehensive description of the statutes and typical authorizations required by multi-benefit flood projects, refer to Appendix D.



Table 3-4. Expedited Compliance Mechanisms for Restoration and Multi-Benefit Flood Projects

Agency	Statute	Expedited Compliance Mechanisms
Federal Agencies	Lead Federal Agency—NEPA	<ul style="list-style-type: none"> National Oceanic and Atmospheric Administration Restoration Center Programmatic Environmental Impact Statement
	U.S. Army Corps of Engineers—Section 404 of the Clean Water Act; Section 10 of the Rivers and Harbors Act of 1899	<ul style="list-style-type: none"> NWP 13 Bank Stabilization ^[a] NWP 27 Aquatic Habitat Restoration NWP 33 Temporary Construction Access and Dewatering RGP 16 Anadromous Salmonid Fisheries Restoration
	U.S. Army Corps of Engineers—Section 14 of the Rivers and Harbors Act of 1899 (33 USC 408)	<ul style="list-style-type: none"> Categorical Permission Alteration 8 Environmental Restoration
	U.S. Fish and Wildlife Service—ESA	<ul style="list-style-type: none"> Statewide Programmatic Section 7 Consultation Multi-Agency Program to Facilitate Implementation of Restoration Projects in California (pending)
	National Marine Fisheries Service—ESA; Magnuson-Stevens Fishery Conservation and Management Act ^[c]	<ul style="list-style-type: none"> Programmatic Biological Opinion for Restoration Projects in the Central Valley of California
State Agencies	Lead State or Local Agency—CEQA	<ul style="list-style-type: none"> Categorical Exemption 15333 Small Habitat Restoration Projects ^[b,c] Categorical Exemption 15304 Minor Alterations to Land ^[d]
	California Department of Fish and Wildlife— Section 1600 of the California Fish and Game Code	<ul style="list-style-type: none"> Habitat Restoration and Enhancement Act ^[e]
	California Department of Fish and Wildlife—CESA	<ul style="list-style-type: none"> Habitat Restoration and Enhancement Act ^[e]



Agency	Statute	Expedited Compliance Mechanisms
State Agencies	Central Valley Regional Water Quality Control Board—Clean Water Act (Section 401); Porter-Cologne Water Quality Control Act	<ul style="list-style-type: none"> • Clean Water Act Section 401 Water Quality Certification for Small Habitat Restoration Projects ^[f] • Clean Water Act Section 401 Water Quality Certification and Waste Discharge Requirements for Implementation of Large Habitat Restoration Projects Statewide (pending) ^[g]

^[a] Applicable to projects directly affecting 500 linear feet of streambank or less.

^[b] Consultations on actions that may adversely affect essential fish habitat (required by the Magnuson-Stevens Fishery Conservation and Management Act) may be conducted in conjunction with NEPA compliance, ESA compliance, or USACE permitting, or as a separate consultation.

^[c] Applicable to projects not exceeding 5 acres.

^[d] State CEQA Guidelines Section 15300.2 describes exceptions to categorical exemptions (e.g., if the project could cause a substantial adverse change in the significance of a historical resource).

^[e] To qualify for the Habitat Restoration and Enhancement Act, projects must meet eligibility requirements for the Clean Water Act Section 401 Water Quality Certification for Small Habitat Restoration Projects. Restoration and enhancement projects approved by CDFW pursuant to the Habitat Restoration and Enhancement Act do not require additional permits from CDFW, such as a lake and streambed alteration agreement or CESA permit.

^[f] Applicable to projects not exceeding 5 acres or a cumulative total of 500 linear feet of stream bank or coastline, and that also qualify for a CEQA Class 33 categorical exemption.

^[g] Anticipated to be considered for approval by the State Water Resources Control Board in 2022.

Notes:

CDFW = California Department of Fisheries and Wildlife

CEQA = California Environmental Quality Act

CESA = California Endangered Species Act

ESA = federal Endangered Species Act

NWP = Nationwide Permit

RGP = Regional General Permit

These compliance mechanisms benefit ecological restoration and multi-benefit projects in several ways. They may expedite the permitting process for ecological restoration and multi-benefit projects. With their standardized measures and other requirements, they also provide greater certainty regarding the cost, timeline, and other implications of compliance with environmental laws and regulations. In addition, these compliance mechanisms and their associated environmental impact statements and EIRs are sources of design and planning practices and avoidance and minimization measures that can be adapted to projects. The design and planning practices (such as including biologists and regulatory agency staff in project planning) facilitate permitting; the avoidance and minimization measures are broadly applicable and acceptable to multiple regulatory agencies.

Appendix F provides guidance about what constitutes a multi-benefit project, and identifies project components that meet Conservation Strategy measurable objectives. To effectively convey these project attributes to the regulatory agencies, it is recommended that project



proponents clearly identify features that meet these criteria. Working with the agencies early in the process can help highlight and maximize the ecological benefits of a project and potentially expedite the permitting process. DWR is considering developing guidance to help project proponents include these key components in early project planning design.

3.4.4.3 Operations and Maintenance of Multi-benefit Projects

The long-term permitting needs related to O&M of multi-benefit projects are often not considered during the initial regulatory compliance process. Agencies and project proponents have both advocated for a need to include this up front to reduce costs and delays related to performing needed O&M in areas that will potentially contain wildlife habitat and sensitive species. The development of a long-term O&M plan for multi-benefit projects can also provide predictability and assurances about the types of maintenance actions that are likely to occur, and provide measures to minimize and avoid impacts. Implementers of multi-benefit projects should be encouraged to develop O&M plans and incorporate this into their overall project description and regulatory applications.

3.4.4.4 Advance Mitigation and the Availability of Compensatory Mitigation

Compensatory mitigation reduces or offsets the unavoidable impacts of project activities on regulated biological resources through restoration, enhancement, or preservation. Therefore, to support the CVFPP's implementation, the Conservation Strategy supports the funding of projects that provide mitigation in advance of impacts. Advance mitigation provides temporary uplift that will be used as mitigation for future projects, but does not substitute for net increases and contributions to the recovery of target species once the advance mitigation gains are used to compensate for project impacts.

Advance mitigation can reduce delays in project approval and temporary loss of habitat. These mitigation projects can also provide better conservation outcomes than project-by-project mitigation: They can be larger and better connected to existing conservation areas, easier to maintain, and more viable over the long term.

The availability of compensatory mitigation can have substantial consequences for the implementation of the CVFPP. Regulatory compliance requires that compensatory mitigation be provided for unavoidable impacts on sensitive habitats and species, including the habitats and target species of the Conservation Strategy. When the supply of mitigation is insufficient, mitigation may cost more, projects may be delayed, or mitigation amounts may be increased to account for the temporal loss of habitats during the interval between when impacts occur and when mitigation is provided.

Also, when the supply of compensatory mitigation is insufficient, more of the ecological restoration resulting from multi-benefit projects may be needed to meet the mitigation needs of other projects, reducing contributions toward species recovery and the goals of this Conservation Strategy. This has already been occurring. As described in Section 2.1, "Project Implementation," and Appendix F, "Five-Year Implementation Summary Memorandum," a considerable portion of the restoration by multi-benefit projects is being used as compensatory mitigation for other projects.



Current and planned projects, such as Sacramento River Bank Protection Project Phase II and the projects of the *American River Watershed Common Features General Reevaluation Report* (U.S. Army Corps of Engineers 2015, 2020), will require substantial amounts of compensatory mitigation for impacts on this Strategy’s target species and habitats. However, as summarized in Appendix E, “Mitigation Availability,” and in Table 3-5, the amount of such mitigation available is quite limited and subject to change as other projects purchase credits. In fact, for more than half of the target species that are federally listed or State-listed, no mitigation credits were available for purchase from a bank, nor were they available from an in-lieu fee program. When not available from banks or an in-lieu fee program, required compensatory mitigation could be provided by a permittee-responsible mitigation project, but this is not practical for smaller projects or O&M activities. Compensatory mitigation could also be provided by multi-benefit projects, but this would effectively reduce their contributions to species recovery and to net increases in ecosystem processes or habitats.

Therefore, to avoid inefficiencies and reductions in the contributions of multi-benefit projects to this Conservation Strategy’s goals, DWR has been pursuing opportunities to develop advance mitigation for CVFPP projects and routine O&M, including:

- Pursuing advance credits.
- Supporting MCAs.

The following subsections further describe these opportunities.

Table 3-5. Compensatory Mitigation for Target Habitats and Federally Listed or State-Listed Species Available at Mitigation and Conservation Banks as of November 2021

Habitat ^[a]	Species ^[a]	Credits ^[b]
Riparian Habitat	Acres	105
SRA Habitat	SRA—acres	9
	SRA—miles	8.8
Marsh and Other Wetlands Habitat	Marsh—acres	19
	Seasonal wetlands—acres	32
	Floodplain wetland mosaic—acres	4
Species—Acres	Delta button-celery	0
	Valley elderberry longhorn beetle ^[c]	1,060
	Green sturgeon	0
	Salmonids	135
	Delta smelt	7
	Giant gartersnake	181
	Bank swallow	0
	California black rail	0



Habitat ^[a]	Species ^[a]	Credits ^[b]
Species—Acres	Greater sandhill crane	0
	Least Bell's vireo	0
	Tricolored blackbird	17
	Swainson's hawk—nest tree and nest buffer	57
	Swainson's hawk—foraging	1,050
	Western yellow-billed cuckoo	0
	Riparian brush rabbit	0
	Riparian woodrat	0

Source: U.S. Army Corps of Engineers 2021.

^[a] Only federally listed or State-listed target species are included in the table.

^[b] Credit types grouped at the bank are included in totals for each species or habitat in the group.

^[c] Unit is approximately 1,800 square feet.

Note:

SRA = shaded riverine aquatic

Pursuing Advance Credits

Mitigation projects include projects that develop mitigation to be sold by the unit (credit) to unspecified projects by mitigation and conservation banks or in-lieu fee programs, and projects that develop mitigation for specified projects (“permittee-responsible” mitigation). Because they entail real estate transactions, management plans, endowment establishment, and multiple approvals from regulatory agencies, and can also include restoration actions, mitigation projects often require at least two years to implement.

By funding such projects to develop compensatory mitigation in advance of anticipated needs, particularly for this Strategy’s target species and habitats, DWR can expedite flood projects and help O&M avoid inefficiencies. Having readily available sources to provide mitigation may also reduce the incentive to use multi-benefit projects as mitigation for other projects.

Supporting Mitigation Credit Agreements

Advance mitigation credits may be created through an MCA based on an RCIS approved by CDFW. RCISs are locally developed conservation plans that identify conservation priorities and preservation, enhancement, and restoration actions for focal species and other natural resources (California Department of Fish and Wildlife 2018). An MCA establishes the terms for creating mitigation credits that support the conservation goals of an RCIS, including the methods for quantifying habitat improvements and financial and other requirements.

By supporting the development of RCISs and MCAs, DWR provides a mechanism for creating advance mitigation credits, and potentially for creating a basis for credits based on O&M actions benefiting special-status species (e.g., the removal of giant reed). As described in Section 3.3.2, “Re-evaluation of Measurable Objectives,” these benefits may be quantified by habitat quality evaluation tools.



In 2018, DWR sponsored the Mid-Sacramento Valley RCIS (Reclamation District 108 2019), a recommendation of the Mid and Upper Sacramento River Region RFMP. It provides a framework for the regional integration of conservation and flood management, and identifies conservation and habitat enhancement actions that could provide compensatory mitigation for flood management actions. Under this RCIS, DWR’s Flood Maintenance and Operations Branch is pursuing a MCA for giant gartersnake credits.

3.4.5 Adaptive Management

Adaptive management uses new information, gathered from monitoring and other sources, to adjust plans and practices. It allows managers to make decisions and take actions under uncertain conditions, rather than waiting until more information is available to make necessary decisions. Given scientific and institutional uncertainties around multi-benefit floodplain management, this Conservation Strategy requires a flexible approach to be able to quickly adapt to new information, including new project and program outcomes.

Adjustments to the Strategy are made at five-year intervals as part of the CVFPP updates. These adjustments are based on a re-evaluation of the Strategy’s target species, measurable objectives, and implementation approach. The overall CVFPP performance tracking and adaptive management approach, and the integration of the Conservation Strategy goals and objectives into that framework, is described in greater detail in the 2022 CVFPP Update.

Besides other updates to the CVFPP, and a review of new science and conservation planning, these re-evaluations are informed by the following sources of information (described in the following sections):

- Monitoring (tracking) of progress toward measurable objectives.
- Focused studies.
- New information.
- Systemwide or regional resource inventories.
- Input solicited from agencies, practitioners, and other stakeholders.

3.4.5.1 Implementation Tracking and Data Dissemination

For this Conservation Strategy, implementation tracking and data dissemination serve three general purposes:

1. Monitor and document the effects and effectiveness of CVFPP and Conservation Strategy activities (which are primarily “projects” but are also related to ongoing flood system O&M activities), particularly as they contribute to the Strategy’s goals and measurable objectives.
2. Allow agencies and the public to review the progress of Strategy implementation and compliance with associated regional permits.
3. Allow access to, and use of, information to support adaptive management.



To track project implementation, DWR uses data tracking and information sharing systems. These systems allow for numerous related queries, reports, and data views to facilitate reporting, information sharing, and adaptive management. The following section describe these data systems in more detail.

Past and Current Data Management Systems

Historically, DWR has employed several separate applications to manage information across programs, with project data stored in multiple applications and different formats. This often resulted in duplicated or inconsistent data collection processes and outcomes, and it limited DWR's ability to integrate and report data across projects and programs.

However, since 2016, DWR has been coordinating and creating more efficient systems for data management. As a result, common data are being integrated across programs and applications, while maintaining the unique functionality of existing applications and the discrete needs of programs. This data management integrates shared data across programs, and reduces redundancy and duplicated data management efforts. Shared data are stored in a single location that can be accessed across DWR. This data system encompasses the information about projects, funding, habitat outcomes, and ecosystem metrics used across DWR programs.

Flood Performance Tracking System

The FPTS allows DWR to monitor progress on flood planning efforts related to the CVFPP, including this Conservation Strategy. Specifically, the FPTS archives data on actions that contribute to the FSSR's content or this Strategy's measurable objectives. It is a retrospective data tracking tool that captures what has been done to date and determines how those accomplishments compare to flood risk reduction and ecosystem objectives. It provides a simple, clear process for collecting and managing data around project outcomes. The FPTS also increases DWR's ability to internally track the status and outcomes of both multi-benefit and single-purpose projects across the flood system.

Detailed procedures for data collection are being provided to all project proponents that enter project-level inputs into DWR's FPTS. DWR also uses methodology sheets for each tracked metric in the system to capture definitions and accounting rules aligned with specific data tracking fields.

Habitat and Mitigation Tracking Systems

DWR has been developing internal data management and decision support tools to balance its compensatory mitigation needs and other habitat obligations, while working toward goals for increasing the quantity and quality of habitats and contributing to species' recovery. These decision support tools complement the FPTS in that they are forward-looking, comparing project data from the FPTS to forecasted needs and objectives across DWR programs.

The decision support tools apply the one-landscape approach to managing the flood system and planning future projects. This one-landscape approach recognizes that there is a finite amount of available land for projects, but that each acre can create multiple different values



(e.g., flood risk reduction, high-quality habitat, recreation). This approach helps DWR to coordinate implementation to meet mitigation needs and other permitting obligations, while making progress toward conservation objectives across programs and plans.

In their tracking of habitats and compensatory mitigation obligations, these tools provide the following benefits:

- Track DWR’s past, present, and planned conservation, restoration, and mitigation actions in the flood system.
- Enable DWR to identify future habitat needs and opportunities.
- Provide decision support to align project development timeliness and funding with identified needs.
- Document the habitat outcomes of specific programs, plans, and funding sources, and allow DWR to communicate progress externally to create a clear recognition of the habitat values that DWR provides and maintains.

By providing data on project outcomes and near-term project needs, habitat and compensatory mitigation tracking helps DWR prioritize projects and determine where to focus efforts and funds. While still these systems are currently still in development, they will leverage DWR’s existing Enterprise geographic information system (GIS) capacity and FPTs outputs to meet a variety of user data needs.

3.4.5.2 Focused Studies

Data on the Central Valley’s habitats, processes, species, and stressors have generally been sufficient for developing the Conservation Strategy and implementing multi-benefit actions and projects, with a few exceptions. This finding is supported by the fact that most project proponents and other stakeholders consider data gaps to be a relatively minor limitation on the implementation of multi-benefit projects (Figure 2-5). Current data gaps include existing conditions for some metrics used in this Strategy’s objectives (e.g., the extent of natural bank in the Upper San Joaquin River CPA) and uncertainties about the population status and ecological relationships of target species and their response to climate change.

While developing the Strategy and its conservation plans for targeted species, data gaps were identified and prioritized based on their significance:

- Lack of data for objective metrics was considered to have high significance.
- Uncertainties with the potential to substantially affect the size of objectives were considered of moderate significance.
- Data gaps were considered of moderate or low significance depending on their potential effect on conservation at a regional scale.



Table 3-6 provides an updated list of important data gaps, and notes their significance and size. (Size is the relative level of effort and expenditure required to fill the data gap.) These updated priorities are focused on supporting restoration planning and adaptive management for this Strategy; however, most would also support other conservation programs.

Table 3-6. Data Gaps Related to Targeted Ecosystem Processes, Habitats, and Species

Type of Data Gap by Conservation Strategy Goal	Description of Data Gap	Size ^[a]	Significance ^[b]
Ecosystem Processes	Floodplain Inundation—Projected Floodplain Inundation Potential. Identify anticipated future hydrologic conditions throughout all CPAs in consideration of management actions and climate change to support restoration project planning and the adaptive management of this Strategy.	Large	High
	Riverine Geomorphic Processes—Natural and Revetted Bank Locations. Inventory natural banks and revetment in the Upper and Lower San Joaquin River CPAs, and update the inventory of natural banks for the Lower Sacramento River CPA to support restoration project planning and the adaptive management of this Strategy.	Large	High
	Riverine Geomorphic Processes—Locations of Unnecessary Revetment (revetment that no longer serves its original purpose). Systematically identify and map unnecessary revetment in all CPAs to support restoration project planning.	Large	Moderate
	Riverine Geomorphic Processes—Meander Migration Potential. Update mapping of meander migration potential using new tools and anticipated hydrology resulting from climate change and future management throughout all CPAs to support restoration project planning and the adaptive management of this Strategy.	Large	Moderate
Habitat	SRA Cover—Location of Natural and Riparian-Lined Banks. Update and complete mapping of natural and riparian-lined banks in the Upper and Lower San Joaquin River CPAs, and update mapping of natural and riparian-lined banks in the Lower Sacramento River CPA, to support restoration project planning and the adaptive management of this Strategy.	Large	High



Type of Data Gap by Conservation Strategy Goal	Description of Data Gap	Size ^[a]	Significance ^[b]
Target Species - Plants	Slough Thistle—Confirm that species has been extirpated from the SPA by conducting surveys in the Lathrop area and south to the San Joaquin and Stanislaus County borders within the Lower San Joaquin River CPA (where the species was last documented) to support the adaptive management of this Strategy.	Small	Large
	Delta Button-celery—Distribution in Upper and Lower San Joaquin River CPAs: Survey known occurrences, most of which are historical (>20 years old), to determine current distribution to support restoration project planning.	Moderate	Moderate
Target Species - Fish	Delta Smelt—Model and map effects on delta smelt habitat resulting from climate change and changes to operations in the Yolo Bypass to support restoration planning.	Moderate	Moderate
	Salmonids—Update Rearing Habitat Modeling and Mapping. Use new analytical tools (e.g., the Salmonid Habitat Quantification Tool) to estimate the quantity and quality of salmonid rearing habitat on existing and potentially restored floodplains, to inform restoration project planning.	Large	Moderate
	Salmonids—SRA Cover Required for Recovery. Determine the quantity and distribution of SRA cover needed for recovery of target salmonid species through modeling or other methods to support the adaptive management of this Strategy.	Moderate	High
	Salmonids—Habitat Value of Revetted, Riparian-Lined Banks. Through field studies and modeling, determine the habitat value of woody vegetation planted in revetment, relative to SRA cover, to support the adaptive management of this Strategy.	Large	Moderate
	Green Sturgeon—Location of Deep Pool Habitats. Map the locations of important deep pool habitats in the Upper Sacramento River and Feather River CPAs, particularly adjacent to banks, to support restoration project planning.	Large	Moderate

Type of Data Gap by Conservation Strategy Goal	Description of Data Gap	Size ^[a]	Significance ^[b]
Target Species - Fish	Yellow-Breasted Chat—Breeding Territory Size Requirements. Conduct a field study in the Upper Sacramento River CPA to document the territory size of the breeding yellow-breasted chats, to inform restoration project development and vegetation management to benefit this species.	Moderate	Moderate
	Bank Swallow—Location of Sites for Restoration of Breeding Habitat. Identify revetment locations in the Upper Sacramento River, Lower Sacramento River, and Feather River CPAs that would be suitable as breeding habitat for bank swallows following removal.	Small	Moderate
Target Species – Birds and Mammals	Western Yellow-billed Cuckoo—Priority Locations for Habitat Restoration. Through an evaluation of recent cuckoo survey data, land cover mapping, and supplemental data collection, identify optimal locations for creation of >50 acres of continuous cuckoo habitat in the Feather River and Upper Sacramento CPAs to inform restoration project development and vegetation management to benefit this species.	Small	Moderate
	Tricolored Blackbird—Priority Locations for Breeding Habitat Restoration or Enhancement. Through an evaluation of colony records, land cover mapping, and supplemental data collection, identify optimal locations for restoration or enhancement (e.g., through restoring floodplain inundation) breeding habitat in all CPAs.	Moderate	Moderate
	Riparian Brush Rabbit and Riparian Wood Rat—Necessary Riparian Corridor Locations. Through evaluation of existing vegetation, inundation areas, and a synthesis of distribution and movement data, determine the location and extent of riparian corridors needed for riparian brush rabbit and riparian wood rat recovery in the Lower San Joaquin River CPA.	Moderate	Moderate



Type of Data Gap by Conservation Strategy Goal	Description of Data Gap	Size ^[a]	Significance ^[b]
Stressors	No data gaps of moderate to high significance for implementation of this Strategy have been identified for fish passage barriers or invasive plants.	Not Applicable	Not Applicable

^[a] Size is the relative level of effort and expenditure required to fill the data gap.

^[b] Significance is with regard to the effect on objectives and restoration actions: Lack of data for objective metrics was considered to have high significance, uncertainties with the potential to substantially affect the size of objectives were considered of moderate significance, and other data gaps were considered of moderate or low significance depending on their potential effect on conservation at a regional scale.

Notes:

> = greater than

CPA = conservation planning area

SRA = shaded riverine aquatic

Strategy = Central Valley Flood Protection Plan Conservation Strategy

In addition to the specific data gaps described in Table 3-6, Appendix H, “Climate Change Adaptation for the CVFPP Conservation Strategy Update Memorandum” identifies the need for additional climate change modeling to better understand ecosystem-specific responses to climate change, based on changes to the frequency, magnitude, timing, and duration of regulated flows (in Section 4.2.3, “Adaptation Measure 3”).

Focused studies may be used to fill high-priority data gaps. Focused studies could also be conducted to confirm the benefits of restoration actions for targeted species (i.e., to monitor the effectiveness of restoration actions). Because most focused studies would address data gaps that affect other conservation programs as well, there are considerable opportunities for collaboration (e.g., with California EcoRestore or the SJRRP) or for data gaps to be filled by other programs. (Appendix C, “Updates to 2016 Conservation Strategy Appendix J, ‘Existing Conservation Objectives from Other Plans,’” summarizes related conservation efforts.)

3.4.5.3 Resource Inventories

Systemwide or regional resource inventories supported development of the 2012 CVFPP and its Program EIR, the 2016 Conservation Strategy, and the 2017 CVFPP Update and Supplemental Program EIR.

These inventories include GIS datasets that were developed to inform the CVFPP and the 2016 Strategy and its measurable objectives (e.g., floodplain inundation, vegetation types, and fish passage barriers). Table 3-7 lists these inventories, the date of their last update, and their anticipated frequency of updates. Updates to these inventories are anticipated to take place at intervals of five or 10 years, corresponding to the intervals between CVFPP updates. These updates support adaptive management by identifying the changes in ecosystem conditions to which CVFPP implementation contributes, and informing the development of future multi-benefit projects.



Table 3-7. Regional and Systemwide Inventories Related to the Conservation Strategy's Goals, Targets, and Metrics

Conservation Strategy Goal	Targeted Process, Habitat, or Stressor	Metric	Update Frequency (years)	Last Update
Ecosystem Processes	Floodplain inundation	Inundated Floodplain—total amount at selected frequency, timing, and duration of flows, including sustained flows (acres, expected annual habitat ^[a])	± 10	2012
	Riverine geomorphic processes	Natural Bank—total length (miles) ^[b]	± 5	2015, 2020
	Riverine geomorphic processes	River Meander Potential—total amount (acres) ^[b]	± 10	2015
Habitats	SRA cover	Riparian-Lined Bank—total length (miles) ^[b]	± 5	2015, 2020
	SRA cover	Natural Bank—total length (miles) ^[b]	± 5	2015, 2020
	Riparian	Habitat Amount—total amount on active floodplain (acres) ^[c]	± 5	2020
	Marsh (and other wetland)	Habitat Amount—total amount on active floodplain (acres) ^[c]	± 5	2020
Stressors	Fish passage barriers	Fish Passage Barriers—priority barriers rectified ^[c]	± 5	2014
	Invasive plants	Invasive Plant-dominated Vegetation—total area reduced (acres) on DWR-maintained land and facilities ^[c]	± 5	2020

^[a] Floodplain Restoration Opportunity Analysis maps (California Department of Water Resources 2012a); modeling of salmonid expected annual habitat (Appendix H of 2016 Strategy; San Joaquin River Restoration Program 2012).

^[b] Exists in part: Upper and Lower Sacramento River CPAs and Feather River CPA; Upper Sacramento River and Feather River CPAs updated in 2020.

^[c] Data developed by a collaborative group that includes DWR.

Notes:

CPA = conservation planning area

DWR = California Department of Water Resources

SRA = shaded riverine aquatic

Strategy = Central Valley Flood Protection Plan Conservation Strategy



3.4.5.4 Agency, Practitioner, and Other Stakeholder Input

DWR solicited input from federal, State, and local agencies; NGOs; and other stakeholders while developing the 2016 Conservation Strategy and 2022 Update (Section 2.3.4, “Implementation Guidance”) and will solicit such input during future updates. This input is necessary to ensure the Strategy is implementable, is consistent with existing laws and regulations, is based on the best available science, incorporates new learning over time, and is broadly supported.

While developing the 2016 Conservation Strategy and the 2022 Update, this input has been solicited through an interagency advisory committee, the CVFPB Advisory Committee, and surveys and interviews with DWR staff members and other project implementers. Input will be solicited from similar sources during future updates. DWR will also seek scientific advice from experts in conservation biology, the ecology of Sacramento and San Joaquin Valley Rivers and floodplains, and flood risk management policy and engineering, through a scientific advisory committee as described in the Conservation Strategy.

3.4.5.5 Reporting

In conjunction with the CVFPP update process, DWR produces five-year reports assessing implementation progress for the Conservation Strategy. The purpose of the five-year report is to demonstrate to the public how progress is being made toward the Strategy’s goals and measurable objectives. These reports summarize the activities of the previous five years. They describe implemented multi-benefit projects and O&M that benefit targeted processes, habitats, or species, and the resulting contributions to the Strategy’s measurable objectives.

These reports also summarize cumulative progress toward the Conservation Strategy’s objectives, progress anticipated in the coming five years based on anticipated 2022 to 2027 projects, and issues that have arisen during implementation of the Strategy. Appendix F summarizes the 2016 to 2021 five-year report.

3.4.6 Prioritized Actions 2022 to 2027

As a key part of the development process for this Strategy Update, and to achieve the goals of advancing multi-benefit project implementation and the implementation of this Strategy and the CVFPP overall, DWR is collaborating with the CVFPB Advisory Committee and other stakeholders to develop a set of prioritized actions and recommendations for the 2022 to 2027 planning cycle. These prioritized actions have been developed from a variety of sources, including:

- Stakeholder surveys and interviews described in Section 2.3.4.
- CVFPB Advisory Committee recommendations provided in January and February 2021 from the three subgroups (Implementation of Multi-benefit Projects, Permitting, and Performance Tracking, also described in Section 2.3.4).
- DWR recommendations.
- Technical analyses, including the Climate Change Adaption study presented in Appendix H.



The CVFPB reconvened the Advisory Committee in the summer of 2020 to develop recommendations that would help inform the content of the Conservation Strategy Update. The Advisory Committee formed the following three subgroups to identify and address key issues:

1. Permitting.
2. Performance Tracking.
3. Implementation of Multi-benefit Projects.

Appendix G provides the CVFPB Advisory Committee's recommendations, along with a status of how their incorporation is intended to be addressed via the CVFPP planning process. The status for each recommendation is in one or more of the following categories:

1. Included in the Conservation Strategy Public Draft.
2. Considered for inclusion in the CVFPP Public Draft.
3. Considered for use as guidance or best management practices to inform other program or planning activities.
4. Already being implemented by other ongoing activities.
5. Considered for future CVFPP planning cycles.
6. Not considered for inclusion in this CVFPP planning cycle.

The CVFPB Advisory Committee submitted 79 recommendations to DWR, several of which contained various actions and were therefore placed in multiple categories. Some that were placed in several categories are also being considered (or are already being implemented) for various actions. Some of the recommendations are not within the scope of the CVFPP or not within the authorization of DWR.

Table 3-8 provides the recommendations and priority actions for this Strategy Update, including most of the CVFPB Advisory Committee recommendations categorized as Category 1. Some of the recommendations are incorporated into the content of this Update and thus are not included in Table 3-8. It is important to note that the implementation of any recommendations depend on the availability of sufficient staffing and funding resources.



Table 3-8. Recommendations and Priority Actions for 2022-2027 Included in this Conservation Strategy Update

Key Component of Strategy Implementation	Recommendations and Priority Actions
Coordination, Collaboration, and Alignment	<ul style="list-style-type: none"> • Use existing regional working groups (e.g., RFMP groups) to improve the integration of projects with one another and with ecosystem functions at a landscape scale. Where applicable, these working groups will be aligned with landscape-scale conservation and water resource planning efforts. • Coordinate with other government agencies, Tribes, and NGOs in the development of floodplain mitigation, habitat, and water management projects. • Identify potential opportunity zones and multi-benefit projects that meet the shared objectives of this Conservation Strategy, Flood-MAR, and SGMA, including strategically designed pilot studies to improve the understanding of potential for groundwater recharge on restored floodplains. • Seek partnerships and coordinate with other federal and State agencies to increase collaboration, support, and use of periodic updates to regional or systemwide inventories of vegetation, natural bank, riparian-lined bank, and salmonid rearing habitat.
Outreach and Engagement	<ul style="list-style-type: none"> • Identify opportunities, through established meetings and processes, for project proponents (including DWR) to engage with local agencies and potentially affected landowners, and for regulatory agencies to become engaged early in project development. • Increase the level of engagement and coordination with Federally Recognized Tribes, and include Tribal representation in the forums and venues that advise on Conservation Strategy development and implementation. • Continue to fund the Teacher Floodplain Institute and identify other opportunities to support and promote public education about floodplain management that includes environmental conservation information. • Better communicate climate change risks and adaptation opportunities to DWR partners and stakeholders.

Key Component of Strategy Implementation	Recommendations and Priority Actions
Funding	<ul style="list-style-type: none"> • Seek revisions to federal funding guidelines to fully account for the benefits provided by restored ecosystems, agricultural lands, and recreation, and thereby increase federal funding for multi-benefit flood projects. • Coordinate internally and with local agencies, private partners, and other entities to support and supplement funding for ecosystem improvements through multi-benefit projects. • Seek funding from the Greenhouse Gas Reduction Fund to implement the conservation components of multi-benefit flood projects. • Through RFMPs and funding requirements, identify “multi-benefit improvement zones” in which actions contributing to Conservation Strategy objectives could be coupled with other flood projects to satisfy grant funding requirements for multiple benefits. • Seek funding to continue the Small Communities Flood Risk Reduction grant program with a greater State share of project funding available for multi-benefit projects. • Participate in drafting bond language and implementing regulations to allow more comprehensive funding of projects and reduce conflicts with other requirements. • Seek funding to expand the Systemwide Flood Risk Reduction Program to increase State contributions in multi-benefit projects, and explore new multi-benefit project partnerships and implementation models to accelerate implementation. • Seek funding to support flood system O&M needs associated with multi-benefit projects where levees are being set back, channels widened, and new habitat areas being created.



Key Component of Strategy Implementation	Recommendations and Priority Actions
Regulatory Compliance	<ul style="list-style-type: none"> • Seek a memorandum of agreement or memorandum of understanding between DWR, LMAs, and regulatory agencies that establishes standard avoidance and minimization measures for multi-benefit projects and O&M. • Continue to advance MOOM pilot studies in the SPFC, and work with other LMAs and agencies to develop other approaches to manage natural resources as part of the routine O&M approach. • Secure funding for advance mitigation projects. Numerous multi-benefit flood, O&M, and single-purpose projects will require mitigation for impacts on multiple resources; funding advance mitigation increases the availability of compensatory mitigation and could provide conservation benefits over time. • Consider developing of a regional permitting approach to facilitate the implementation of multi-benefit projects. Using established permitting mechanisms such as HCPs, RCISs/MCAs, and others can facilitate the coordinated planning of multi-benefit projects throughout a region or corridor, potentially expediting permitting and providing a mechanism to secure advance mitigation. • Promote early engagement and coordination with regulatory agencies to improve the permitting process and conservation outcomes. DWR, project proponents, and RFMPs may benefit by convening workshops and meetings with the regulatory agencies when developing project priority lists and during project design. • Develop guidance to help project proponents identify components in their projects that meet multi-benefit and Conservation Strategy measurable objectives. This can be used by project proponents beginning in the early design phase and through project permitting to optimize ecological features and potentially expedite the regulatory process. • Encourage and assist implementers of multi-benefit projects to develop O&M plans and incorporate these into their overall project description and regulatory applications. • Develop guidance with standardized avoidance and minimization measures that can be incorporated into O&M plans for multi-benefit projects to maintain and optimize habitat quality while providing assurances and standardized methods for completing O&M. • Develop landscape-scale permitting mechanisms that apply or complement existing means of expediting the permitting of multi-benefit projects. • Consider reconvening the IAC workgroup to collaborate on effectively permitting multi-benefit projects and develop protocols to find efficiencies amongst agencies as appropriate.



Key Component of Strategy Implementation	Recommendations and Priority Actions
Adaptive Management	<ul style="list-style-type: none"> • Create and maintain a central repository of project information that is accessible and regularly updated by project managers. • Create clear reporting guidance for managers on documenting ecosystem improvements, and their use as compensatory mitigation. • Seek the establishment of an online, publicly accessible clearinghouse of as-built, and annual and final post-construction monitoring reports for projects and O&M covered by incidental take permits or biological opinions, and for habitat management lands provided as compensatory mitigation. • Re-inventory vegetation, natural bank, and riparian-lined bank throughout all CPAs and continue to make this data publicly available. • Model the distribution of salmonid rearing habitat using current modeling tools for existing and planned changes in facilities and operations, and anticipated changes in hydrology.
Climate Adaptation	<ul style="list-style-type: none"> • Build ecosystem resilience to reduce or mitigate the risks of climate change to the ecological processes, habitats, and species identified in the Conservation Strategy by implementing projects and management actions that restore ecosystem functions, increase the quantity and quality of essential habitats, and improve conditions for specific species (refer to Appendix H, Section 4.2.1, for specific adaptation measures and actions). • Increase the pace, scale, and geographic extent of multi-benefit project implementation, given the likely impending impacts of climate change and the escalating need to build ecological resilience at a rate that can mitigate those impacts (refer to Appendix H, Section 4.2.2, for specific adaptation measures and actions). • Perform more detailed analyses of climate change impacts to Conservation Strategy processes, habitats, and species to better understand risks and adaptation opportunities (refer to Appendix H, Section 4.2.3, for specific adaptation measures and actions). • Develop more effective tools and processes to evaluate climate change impacts at a regional or project-specific level, and assist with multi-benefit project design and implementation (refer to Appendix H, Section 4.2.4, for specific adaptation measures and actions)



Glossary

Term	Definition
adaptation	“The process of adjustment to actual or expected climate and its effects. In human systems, adaptation seeks to moderate or avoid harm or exploit beneficial opportunities. In some natural systems, human intervention may facilitate adjustment to expected climate and its effects.” (International Panel on Climate Change 2014).
adaptive management	<p>“(1) a framework and flexible decision-making process for ongoing knowledge acquisition, monitoring, and evaluation leading to continuous improvement in management planning and implementation of a project to achieve specified objectives” (California Water Code Section 8502).</p> <p>“(2) management that improves the management of biological resources over time by using new information gathered through monitoring, evaluation, and other credible sources as they become available, and adjusts management strategies and practices to assist in meeting conservation and management goals. Under adaptive management, program actions are viewed as tools for learning to inform future actions” (California Fish and Game Code Section 13.5).</p>
advance mitigation	Temporary uplift that will be used as mitigation for future project- or activity-specific impacts.
anadromous fish	Fish that spend a part of their life cycle in the sea and return to freshwater to spawn.
avoidance	Measures taken to avoid creating impacts from the outset, such as a change in a project’s footprint to avoid affecting a resource. (Definition adapted from International Union for Conservation of Nature 2014.)



Term	Definition
baseline	The current condition of a natural resource, or its condition at a time of assessment—used as a starting point against which future conditions can be measured or compared.
Basin-Wide Feasibility Studies (BWFs)	The Sacramento and San Joaquin BWFs focused on refining the improvements of the 2012 CVFPP through technical analyses and evaluations. These analyses and evaluations were done in two phases: Phase 1 focused on developing specific planning objectives and exploring different physical features for system improvements; Phase 2 evaluated and compared the physical improvement components of the CVFPP on a systemwide scale, considering their costs, effects, and benefits.
biotic community diversity	The taxonomic or functional richness (number) and equitability of abundance of species in and among communities (co-occurring assemblages of species).
bypass	An engineered wide and shallow channel or confined floodplain, usually flanked by levees, that periodically receives floodwaters to reduce the amount of flow in a river or stream.
capacity	Defined under <i>conveyance capacity</i> .
Central Valley Flood Protection Board (CVFPB)	An agency (formerly known as the State of California Reclamation Board) created by the California Legislature in 1911 to carry out a comprehensive flood control plan for the Sacramento and San Joaquin Rivers. The CVFPB has jurisdiction throughout the Sacramento–San Joaquin Valley, which is synonymous with the drainage basins of the Central Valley and includes the Sacramento–San Joaquin Drainage District.
Central Valley Flood Protection Plan (CVFPP)	A State plan that describes the challenges, opportunities, and vision for improving integrated flood management in the Central Valley. The CVFPP documents current and future risks associated with flooding and recommends improvements to the State-federal flood protection system to reduce the occurrence of major flooding and the consequences of flood damage that could result. The initial plan was submitted to the CVFPB on December 30, 2011, and adopted June 29, 2012. It is updated every five years.



Term	Definition
compensatory mitigation	<p>The restoration (re-establishment or rehabilitation), establishment (creation), enhancement, or, in certain circumstances, preservation of a resource as required by a permit or approval for the purpose of reducing or offsetting unavoidable adverse impacts which remain after all appropriate and practicable avoidance and minimization has been achieved. (Definition adapted from “Compensatory Mitigation for Losses of Aquatic Resources; Final Rule,” 33 CFR Parts 325 and 332, 40 CFR Part 230; 73 <i>Federal Register</i> 19594–19705.)</p>
conservation	<p>“(1) In the context of natural resource management: Active management of the biosphere to protect the survival of the maximum diversity of species and the maintenance of genetic variability within species.” (United Nations Environment Programme 2019)</p> <p>“(2) In the context of this Conservation Strategy: activities contributing to the environmental objectives of the Central Valley Flood Protection Act: (1) Promote natural dynamic hydrologic and geomorphic processes; (2) increase and improve the quantity, diversity, and connectivity of riparian, wetland, floodplain, and SRA habitats, including the agricultural and ecological values of these lands; and (3) promote the recovery and stability of native species populations and overall biotic community diversity” (California Water Code, Section 9616[a]).</p> <p>“(3) In the context of the ESA: all methods and procedures necessary to bring any endangered species or threatened species to the point at which the measures provided pursuant to [the Endangered Species] Act are no longer necessary” (ESA Section 3[3]).</p> <p>“(4) In the context of CESA: the use of all methods and procedures which are necessary to bring any endangered species or threatened species to the point at which the measures provided pursuant to this chapter [i.e., CESA] are no longer necessary. These methods and procedures include, but are not limited to, all activities associated with scientific resources management, such as research, census, law enforcement, habitat acquisition, restoration and maintenance, propagation, live trapping, and transplantation, and in the extraordinary case where population pressures within a given ecosystem cannot be otherwise relieved, may include regulated taking” (California Fish and Game Code Section 2061).</p>



Term	Definition
conservation bank	A publicly or privately owned and operated site that is to be conserved and managed in accordance with a written agreement with CDFW, NMFS, or USFWS that includes provisions for the issuance of credits created to: compensate for take of species listed under ESA or CESA, impacts on fish and wildlife resources, or significant effects on the environment. (Definition adapted from California Fish and Game Code Section 1797.5.)
conservation planning area	One of five subdivisions of the SPA that differs from other CPAs in regard to natural resources and CVFPP activities. Each CPA consists of one or more regional flood management plan regions and the adjoining upstream portions of the SPA.
conveyance capacity	The maximum rate of flowing water, usually expressed in cubic feet per second, that a river, canal, or bypass can carry without exceeding a threshold value such as flood discharge, or without using the freeboard distance from the top of a levee. Freeboard is a factor of safety, usually expressed in feet above a flood level, used for purposes of floodplain management.
developed land cover and land use	Developed lands with more than one unit (or structure) per acre, and containing infrastructure and landscaping.
distributary	A river branch flowing away from the mainstem.
dynamic hydrologic and geomorphic processes	In the context of river systems, the dynamic processes of water flow subsurface, overland, and in rivers and the resulting entrainment, transport, and storage of sediment in river channels and on floodplains.
ecosystem	A natural unit consisting of all the plants, fungi, animals, and microorganisms (the biotic community) together with the abiotic environment in a given area. (Definition adapted from Begon et al. 2006 and Levin 2009.) The biotic community and abiotic environment in an ecosystem are interdependent, frequently with complex feedback loops. The abiotic environment that sustains the biota of an ecosystem includes the soil or substrate, topographic relief and aspect, atmosphere, weather and climate, hydrology, geomorphic processes, nutrient regime, and salinity regime.



Term	Definition
ecosystem benefits	The goods and services that people derive directly or indirectly from ecosystem functions.
ecosystem functions	“Intrinsic ecosystem characteristics related to the set of conditions and processes (such as primary productivity, food chain, and biogeochemical cycles) whereby an ecosystem maintains its integrity. Ecosystem functions include such processes as decomposition, production, nutrient cycling, and fluxes of nutrients and energy.” (Millennium Ecosystem Assessment 2005.)
enhancement	The manipulation of the physical, chemical, or biological characteristics of an ecosystem to heighten, intensify, or improve one or more ecosystem functions or properties. Enhancement results in the gain of selected ecosystem functions or properties, but may also lead to a decline in other ecosystem functions or properties. Enhancement does not result in a gain in ecosystem area (i.e., one type of ecosystem is not converted to another type of ecosystem). (Definition adapted from U.S. Army Corps of Engineers and U.S. Environmental Protection Agency 2008.)
environmental stewardship	The concept of responsibly managing and protecting natural resources (water, air, land, plants, and animals) and ecosystems in a sustainable manner so that they are available for future generations.
expected annual habitat	Expressed in units, the annual average of the area expected to be inundated in general or by flows meeting defined criteria for timing and duration (e.g., sustained spring flows) so as to provide habitat for a species (e.g., Chinook salmon).
feasible	“Capable of being accomplished in a successful manner within a reasonable period of time, taking into account economic, environmental, legal, social, and technological factors.” (California Water Code Section 8307.)



Term	Definition
fish passage barrier	A water management structure, such as a dam, weir, control structure, or water diversion, that blocks, delays, strands, or adversely influences anadromous fish as they migrate upstream or downstream. These structures can be total, temporal, or partial barriers, depending on physical characteristics (e.g., height, hydraulic conditions affecting water depth and velocity, attraction flow, and physical deterioration); operation (e.g., diversion rate and timing and flashboard or gate operations); and relation to species' biological characteristics (e.g., mode of locomotion, species type, size, physical abilities, and fish condition).
flood	<p>“A general and temporary condition of partial or complete inundation of 2 or more acres of normally dry land area or of two or more properties (at least one of which is the policyholder’s property) from any of the following:</p> <ul style="list-style-type: none"> • Overflow of inland or tidal waters. • Unusual and rapid accumulation or runoff of surface waters from any source. • Mudflow. • Collapse or subsidence of land along the shore of a lake or similar body of water as a result of erosion or undermining caused by waves or currents of water exceeding anticipated cyclical levels that result in a flood as defined.” <p>(Federal Emergency Management Agency 2020)</p>
flood risk	The combined effect of the chance of flooding and the property that would be damaged if flooded.
flood system flexibility	The ability of a flood management system to adapt to changing conditions, such as hydrologic, social, political, regulatory, or ecological conditions. A more flexible flood system can provide adaptive capacity in the face of climate change and help make investments in regional and local flood protection more enduring in the face of future hydrological uncertainties.



Term	Definition
flood system resiliency	The ability of the flood management system to continue to function and recover quickly after damaging floods. Increased flood system resiliency can be achieved by increasing the robustness of flood management improvements; adapting measures that reduce the time and cost of flood recovery; improving emergency preparedness, emergency response, and flood recovery planning; and improving system redundancy, particularly in high-risk areas.
floodplain	<i>Active (or “connected”) floodplain:</i> The geomorphic surface adjacent to the stream channel that is typically inundated on a regular basis (i.e., with a recurrence interval of about 2 to 10 years or less). It is the most extensive low-depositional surface, typically covered with fine overbank deposits, although gravel bar deposits may occur along some streams.
<i>“Inactive” (or “disconnected”) floodplain</i>	Historical floodplains that are no longer inundated because of channel incision, flow regime changes, or intervening levees. The floodplain surface often contains abandoned channels or secondary channels (i.e., chutes).
floodway	The channel of a stream and the portion of the adjoining floodplain required to reasonably provide for passage of the design flood (the selected flood against which protection is provided, or eventually will be provided, by means of flood protective or control works).
geomorphology	The study of the characteristics, origins, and development of landforms.
in-kind mitigation	“Compensatory mitigation involving a resource of a similar structural and functional type to the affected resource.” (U.S. Army Corps of Engineers and U.S. Environmental Protection Agency 2008.)



Term	Definition
in-lieu fee program	A program involving the restoration, establishment, enhancement, or preservation of a resource through funds paid to a governmental or non-profit natural resources management entity to satisfy compensatory mitigation requirements of permits or approvals. Similar to a mitigation bank, an in-lieu fee program sells compensatory mitigation credits to permittees whose obligation to provide compensatory mitigation is then transferred to the in-lieu program sponsor. (Definition adapted from U.S. Army Corps of Engineers and U.S. Environmental Protection Agency 2008.)
integrated water management	An approach to water management that combines flood risk management, water supply management, and ecosystem-oriented actions to deliver multiple benefits.
invasive plants	Non-native plants that could adversely affect this Conservation Strategy’s objectives or public safety through the compromised O&M of the SPFC.
large woody material	Logs, typically more than 4 inches in diameter and more than 6 feet long, lying in river or stream channels. This material provides valuable cover and resting habitat for fish.
local maintaining agency	Any city, county, district, or other political subdivision of the State that is authorized to maintain levees. DWR maintains levees pursuant to California Water Code Sections 8361 and 12878, but is not considered an LMA.
loss	Measurable reduction or decline in habitat extent or condition relative to a baseline
metric	The attribute used for measuring the extent to which outcomes are (or can be) achieved.
measurable objective	The definition of what an action or plan will accomplish, which includes components for quantity and proportion (how much) and time (when the objective should be accomplished).
minimization	Measures taken to reduce the duration, intensity, or extent of impacts that cannot be completely avoided. (Definition adapted from International Union for Conservation of Nature 2014.)



Term	Definition
mitigation	The actions intended to avoid, minimize, and offset a project’s impact to the extent necessary to meet requirements of applicable regulations and authorizations.
mitigation bank	A site, or suite of sites, where an aquatic ecosystem (e.g., freshwater wetland) is restored, established, enhanced, or preserved for the purpose of providing compensatory mitigation for impacts authorized by permits or approvals. In general, a mitigation bank sells compensatory mitigation credits to permittees whose obligation to provide compensatory mitigation is then transferred to the mitigation bank sponsor. The operation and use of a mitigation bank are governed by a mitigation banking instrument. (Definition adapted from U.S. Army Corps of Engineers and U.S. Environmental Protection Agency 2008.)
multi-benefit project	“In the context of the CVFPP, multi-benefit projects are projects designed to reduce flood risk and enhance fish and wildlife habitat. Multi-benefit projects may also create additional public benefits such as sustaining agricultural production, improving water quality and water supply reliability, increasing groundwater recharge, supporting commercial fisheries, and providing public recreation and educational opportunities, or any combination thereof.” (California Department of Water Resources 2017.)
nonproject levee	Any levee that is not part of the SPFC (California Water Code, Section 9602[c]) or other State-federal or local-federal flood protection facilities. Nonproject levees are typically privately owned or under the authority of a local levee district.
non-SPFC levee	Any levee that is not part of the SPFC (California Water Code, Section 9602[c]). This includes State-federal levees outside the Sacramento and San Joaquin River watersheds and levees within the Sacramento and San Joaquin River watersheds that do not have (1) documented State assurances of nonfederal cooperation with the federal government or (2) State responsibility identified in California Water Code Section 8361.



Term	Definition
objectives	“Collectively, measures intended to define the overall accomplishments of the CVFPP. The objectives are not specific actions to achieve the goals, but rather, quantitative overall measures of success of the plan.” (California Department of Water Resources 2010.)
operations and maintenance (O&M)	The effort that must be expended to keep project facilities in good working condition so they continue to operate as designed—wear and tear on facilities that are not adequately maintained can reduce their capacity or make them more vulnerable to failure. O&M also refers to the management of adjustable features (e.g., flow rate, stage, reservoir storage) to achieve the desired conditions.
out-of-kind mitigation	“Compensatory mitigation for a resource of a different structural and functional type from the affected resource.” (U.S. Army Corps of Engineers and U.S. Environmental Protection Agency 2008.)
partners	Individuals, organizations, or agencies with direct responsibilities for activities and actions anticipated by the CVFPP.
permittee-responsible mitigation	“A resource restoration, establishment, enhancement, or preservation activity undertaken by the permittee (or an authorized agent or contractor) to provide compensatory mitigation for which the permittee retains full responsibility.” (U.S. Army Corps of Engineers and U.S. Environmental Protection Agency 2008.)
preservation	The removal of a threat to, or preventing the decline of, ecosystems and resources by an action in or near their location. This term includes activities associated with the protection and maintenance of existing resources through the implementation of appropriate legal, financial, and physical mechanisms (e.g., acquisition of fee title to property and fencing, respectively). Preservation does not result in a gain of resource area or functions. (Definition adapted from U.S. Army Corps of Engineers and U.S. Environmental Protection Agency 2008.)
project levee	Any levee that is a facility of the SPFC (California Water Code, Section 9602[c]).



Term	Definition
public agency	Any city, city and county, county, or district organized, existing, and acting pursuant to the laws of this State (California Water Code, Section 8402([d])).
public safety	The prevention of, and protection of the general public from, events (such as natural and human-made disasters) that could significantly endanger, injure, or harm people, or cause damage.
rearing habitat	Instream habitat with food, shelter, and water velocity, depth, and quality conditions adequate for juvenile salmonids to survive, avoid predators, and grow.
recovery	“In the context of the Endangered Species Act, improvement in the status of listed species to the point at which listing is no longer appropriate under the criteria set out in Section 4(a)(1) of the ESA (50 CFR 402.02). More generally, a recovered species is demographically and ecologically self-sustaining, genetically robust, with healthy populations, and resilient across its range.” (Redford et al. 2011.)
resilience	“The capacity of a resource and natural or constructed system to adapt to and recover from changed conditions after a disturbance.” (California Department of Water Resources 2018.)
restoration	The manipulation of the physical, chemical, or biological characteristics of a site to assist the recovery of a historical or degraded resource.
revetment	Erosion-resistant materials that reinforce and protect streambanks and levees.
riparian area	A transitional area between terrestrial and aquatic ecosystems, distinguished by gradients in biophysical conditions, ecological processes, and biota. These are areas through which surface and subsurface hydrology connect water bodies with their adjacent uplands. Riparian areas include portions of terrestrial ecosystems that significantly influence exchanges of energy and matter with aquatic ecosystems (i.e., they are zones of influence). Riparian areas are found adjacent to perennial, intermittent, and ephemeral streams, lakes, and estuarine-marine shorelines.



Term	Definition
riparian habitat	As used in this Conservation Strategy, the forest, woodland, and scrub vegetation characteristic of riparian areas in the Sacramento and San Joaquin Valleys (as described in Sawyer et al. 2009 and Vaghti and Greco 2007).
Sacramento River Flood Control Project	“The core of the flood protection system along the Sacramento River and tributaries. The Sacramento River Flood Control Project includes most of the levees, weirs, control structures, bypass channels, and river channels that make up the SPFC. Approximately 980 miles of levees were involved in the project. Portions of these levees were originally constructed by local interests and were either included directly in the project without modification or modified to meet USACE project standards. The project was originally authorized by the Flood Control Act of 1917 and subsequently modified and extended by the Flood Control Acts of 1928, 1937, and 1941. The State of California adopted and authorized the Sacramento River Flood Control Project in 1953.” (California Department of Water Resources 2010.)
Sacramento–San Joaquin River Flood Management System	A flood management system that comprises all of the following: (a) the facilities of the SPFC as the plan may be amended by the CVFPB and (b) any existing dam, levee, or other flood management facility that is not part of the SPFC if the CVFPB determines, upon recommendation by DWR, that the facility does one or both of the following: (1) Provides significant systemwide benefits for managing flood risks within the Sacramento–San Joaquin Valley or (2) includes project levees that protect a contiguous urban area of 10,000 or more residents within the Sacramento–San Joaquin Valley (California Water Code, Sections 9602 and 9611).
sensitive species	Species assigned a special status in local or regional plans, policies, or regulations, or by CDFW, NMFS, or USFWS, because they are at risk of extinction or extirpation, or species that meet the criteria for such special status (used synonymously with “at-risk species”).



Term	Definition
shaded riverine aquatic cover	“The unique, nearshore aquatic area occurring at the interface between a river (or stream) and adjacent woody riparian habitat. Key attributes of this aquatic area are as follows: (1) The adjacent bank is composed of natural, eroding substrates supporting riparian vegetation that either overhangs or protrudes into the water, and (2) the water contains variable amounts of woody debris, such as leaves, logs, branches, and roots; often has substantial detritus; and has variable velocities, depths, and flows.” (U.S. Fish and Wildlife Service 1992.) SRA cover provides structural and functional integrity for several regionally important fish and wildlife species. It has drastically declined in area and become increasingly fragmented in the Central Valley.
State Plan of Flood Control	The State and federal flood control works, lands, programs, plans, policies, conditions, and mode of O&M of the Sacramento River Flood Control Project, described in California Water Code Section 8350, and of flood control projects in the Sacramento River and San Joaquin River watersheds, authorized pursuant to Article 2 (commencing with Section 12648) of Division 6, Part 6, Chapter 2, for which the CVFPB or DWR has provided the assurances of nonfederal cooperation to the United States, and those facilities identified in California Water Code Section 8361 (California Water Code, Section 9110[f]).
surplus value	Uplift created secondarily or unintentionally. Includes (a) additional benefits to species that were not intended; and (b) other secondary benefits such as providing greater habitat connectivity.
sustainable	Socially, environmentally, and financially feasible for an enduring period. In the context of the CVFPP, a sustainable project has the flexibility to adapt to potential future changes, such as climate change.
system	The Sacramento–San Joaquin River Flood Management System, as described in California Water Code Section 9611.
systemwide	At the scale of an entire system (e.g., the flood management system within the Sacramento–San Joaquin River Flood Management System).



Term	Definition
Systemwide Planning Area	The geographic area that encompasses lands receiving flood damage reduction benefits from the existing SPFC facilities and operation of the Sacramento–San Joaquin River Flood Management System.
target	The specific entities with which goals are concerned and for which objectives have been developed.
temporal loss	The time lag between the loss of a resource caused by an impact and the replacement of the resource by compensatory mitigation. (Definition adapted from U.S. Army Corps of Engineers and U.S. Environmental Protection Agency 2008.)
transitory storage	The temporary and periodic storage of peak flood flows from adjacent rivers or waterways. Storage occurs in modified floodplain areas acquired through easement or fee title.
uplift	Measurable improvement to habitat extent or condition above a baseline
vulnerability	“The propensity or predisposition to be adversely affected. Vulnerability encompasses a variety of concepts and elements including sensitivity or susceptibility to harm and lack of capacity to cope and adapt.” (International Panel on Climate Change 2018.)
watershed	“The land area from which water drains into a stream, river, or reservoir. The watershed for a major river may encompass a number of smaller watersheds that ultimately combine at a common point.” (California Department of Water Resources 2018.)



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Target Species List Review and Update

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Climate Change Adaptation for the
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Cover Image: California Department of Water Resources 2007.
General description: An aerial view of the Sacramento River, the largest river in California, near Gerber at Oat Creek and Deer Creek. Photo taken May 25, 2007 by Dale Kolke.



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