

California's Flood Future

Recommendations for Managing
the State's Flood Risk

**Attachment H:
Practicing Flood Management Using
an Integrated Water Management
Approach**

Appendices A through F

FINAL November 2013

California's Flood Future is provided to help inform local, State, and Federal decisions about policies and financial investments to improve public safety, foster environmental stewardship, and support economic stability



PUBLIC SAFETY

ENVIRONMENTAL STEWARDSHIP

ECONOMIC STABILITY



US Army Corps
of Engineers

STATEWIDE FLOOD MANAGEMENT PLANNING PROGRAM



FINAL APPENDICES

Attachment H: Flood Management in the Context of Integrated Water Management

November 2013

This page intentionally left blank.

Table of Contents

Appendices

Appendix A: Flood Future Report Components

Appendix B: Management Action Descriptions

Appendix C: Local Planned IWM Projects in California

Appendix D: USACE Planned/Proposed IWM Projects in California

Appendix E: Detailed IWM Case Studies

Appendix F: Glossary

This page intentionally left blank.

Appendix A: Flood Future Report Components

This page intentionally left blank.

Appendix A: Flood Future Report Components

California’s Flood Future Report is composed of three layers of documents, which were developed with different audiences and purposes, as shown in Figure H-A-1. The three main layers are the Policy Brief, Highlights, and main report including the technical attachments (or technical memoranda).

The Policy Brief document provides a high-level summary of the key information contained in the Flood Future Report and its technical attachments. This document is meant to inform legislators, legislative staff, and agency executives about the report.

The Highlights document, which is an Executive Summary of the Flood Future Report, is more detailed than the Policy Brief slightly expanding the level of detail of the information provided in the Policy Brief. The Highlights document is intended for use by legislators, legislative staff, agency executives, and the public.

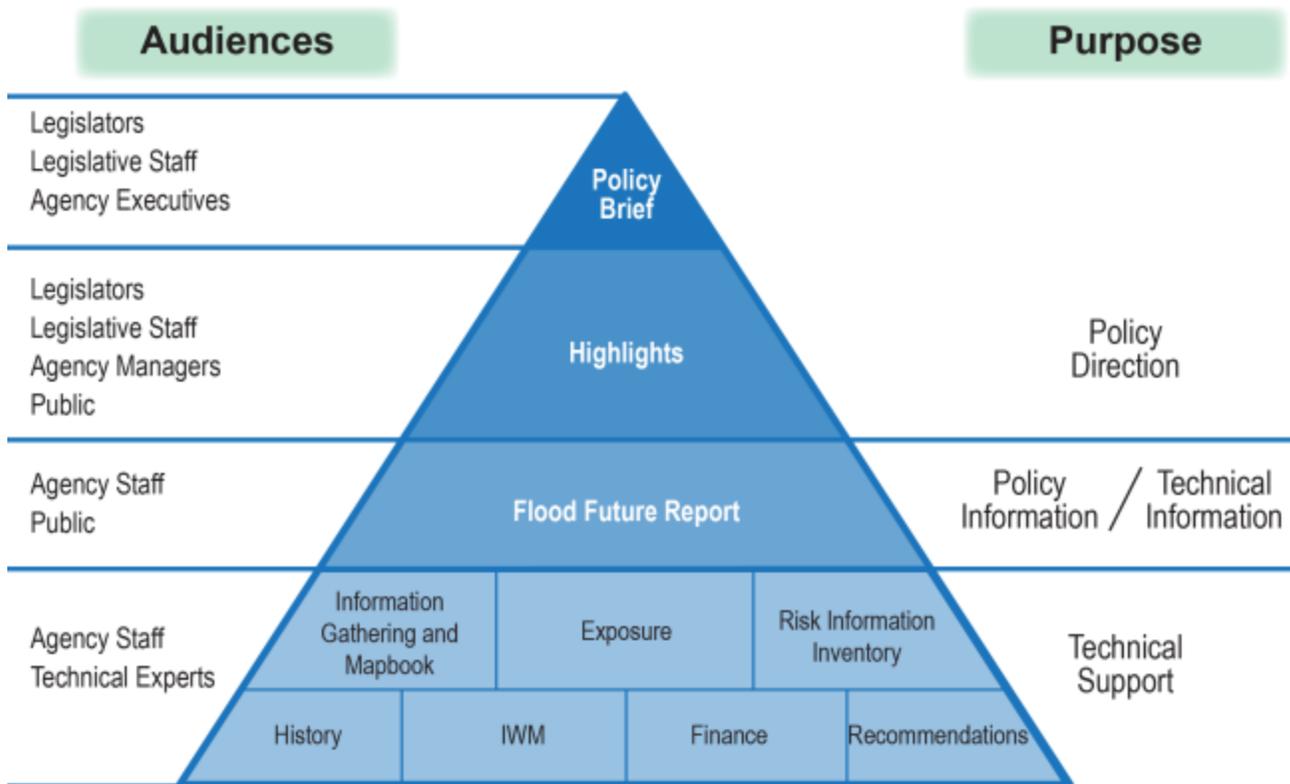


Figure H-A-1. Flood Future Report Components Diagram

The Flood Future Report provides a compilation of the information developed in the technical attachments. This document contains a comprehensive look at flooding throughout the state, and it describes the challenges and opportunities facing flood management. The Flood Future Report also provides information to make decisions about policies and financial investments to improve public safety, environmental stewardship, and economic stability.

This report is supported by eight technical attachments:

- **Attachment A: References**
- **Attachment B: Glossary**
- **Attachment C: History of Flood Management in California.** This attachment provides a detailed history of flooding in the 10 major California Water Plan hydrologic regions.
- **Attachment D: Summary of Exposure and Infrastructure Inventory by County (Mapbook).** This attachment is a mapbook organized by county providing information on exposure to flooding, flood infrastructure, flood types present, list of major floods, and information on the planned/proposed projects.
- **Attachment E: Existing Conditions of Flood Management in California (Information Gathering Findings).** This attachment provides an overview of the information gathering effort to collect flood management information from local, State, Tribal, and Federal agencies, as well as a detailed summary of the results of the information gathering effort. The purpose of this effort was to develop a better understanding of flood risk management in the State of California.
- **Attachment F: Flood Hazard Exposure Analysis.** This attachment describes the methodology used to identify flood hazard exposure statewide as well as the results of the flood hazard exposure analysis. This analysis was performed to provide insight into potential flood risks throughout the state.
- **Attachment G: Risk Information Inventory.** This attachment provides a better understanding of flood risk statewide, based on the best available information. To characterize flood risk in the California, the SFMP developed a risk exposure analysis used in conjunction with an inventory of risk-relevant information gathered from agency meetings.
- **Attachment H: Practicing Flood Management Using an Integrated Water Management Approach.** This attachment provides a description of the evolution of flood management practices toward and using an IWM approach, an overview of IWM, the benefits of using an IWM approach, and sample case studies of projects that have used an IWM approach.
- **Attachment I: Finance Strategies.** This attachment provides an understanding of the current status of flood management financing and the challenges that lie ahead as California develops recommendations to address flood management issues.
- **Attachment J: Recommendations to Improve Flood Management in California.** This attachment provides a detailed description of how the Flood Future Report recommendations were developed and outlines the recommendations along with other high-level challenges.

Each of the documents follows a color scheme that was developed for the Highlights document. The documents are formatted using different-colored headers to indicate the purpose of a given section. The color scheme follows the following coding format:

- Introduction (light blue)
- Understanding the Situation (brown)
- The Problem (goldenrod)
- The Solution (royal blue)
- Recommendations (green)
- The Path Forward (yellow)

Any and all appendices to an attachment were coded using a light blue to represent that this is background or supporting information.

This page intentionally left blank.

Appendix B: Management Action Descriptions

This page intentionally left blank.

Appendix B: Management Action Descriptions

Management actions were initially developed from the 93 management actions included in the Central Valley Flood Management Planning Program (CVFMP) *Management Actions Report* (DWR, 2010). Since the CVFMP was specific to flooding in the Central Valley, these management actions were revised and consolidated, and additional ones were identified to address other types of flooding, such as alluvial fan, coastal, tsunami, local stormwater, and engineered structure failure flooding. Input from USACE and DWR flood management experts was collected to identify additional management actions. The following references were reviewed:

- USACE Coastal Engineering Manual (EM) 1110-2-1100 (USACE, 2002)
- Final documents from the Alluvial Fan Task Force (AFTF, 2010a and 2010b)
- Local Hazard Mitigation Plans
- DWR Division of Dam Safety references
- Project information collected from the SFMP Information Gathering phase

A total of 103 structural and nonstructural management actions were identified through this process. For each management action, the problem addressed, methodology, and desired outcome were described, as well as the economic, environmental, and social considerations associated with implementation. A management action was then evaluated for the type(s) of flood hazard(s) it could address.

This page intentionally left blank.

Table H-B-1. Draft SFMP Management Action Descriptions

Index	Management Action	Problem Addressed	Desired Outcome	Methodology	Economic Considerations	Environmental Considerations	Social Considerations	Flood Hazard Types Addressed							Flood Risk Addressed			Integration Opportunities													
								Slow Rise	Flash	Debris Flow	Alluvial Fan	Coastal	Tsunami	Engineered Structure Failure	Stormwater Management	Hazard	Exposure	Vulnerability	Water Supply	Groundwater Recharge	Water Management Flexibility	Ecosystem Habitat	Invasive Species Management	Restore Natural Floodplain Processes	Erosion/Sediment Management	Fisheries	Recreation or Open Space	Hydropower	Navigation	Water Quality	Improve Agency Coordination
Flood Infrastructure																															
SM-1	Improve conveyance by addressing flow constrictions.	Constrictions and vegetation such as bridges, marinas, in-channel structures, and other obstructions can trap large debris during flood events causing floodwaters to back up. The backwater caused by the constrictions can increase pressure on the levees and increase sediment accumulation upstream of the restriction while incising the channel bed and/or eroding channel banks downstream. Flow constrictions could impact the channel's ability to accommodate reservoir's objective releases.	Increase channel or bypass flood conveyance capacity and efficiency by reducing impedances to flood flow, where feasible.	Removal, modification, or relocation of flow constrictions and hard points can increase overall channel capacity and/or reduce flooding upstream. This could improve operational flexibility of reservoirs. Specific actions or treatments would depend on the type of flow constriction or hard point.	Potentially high initial costs depending on number and type of flow constrictions to be removed, replaced, or modified. Impact on annual operation and maintenance (O&M) costs is variable.	Minor to moderate temporary impacts during construction, and potentially permanent impacts to aquatic and riparian habitats. Could contribute to rehabilitating physical processes and improving fish passage.	Highly dependent on site location and type of flow constriction. Institutional, funding, and public relations challenges exist.	X	X									X		X					X	X	X	X			
SM-2	Increase capacity of existing bypasses.	Due to changes in the channel morphology, some bypasses cannot convey flood flows at their designed flow rates and corresponding design stage. This lack of conveyance results in higher flood stages in the channel and increase the stresses on the levees; thereby increasing the risks of flooding.	Increase or restore the flood conveyance capacity of existing bypasses.	Could include widening or expanding the footprint of existing bypasses to increase capacity. It could include raising levees or berms along existing bypasses to create more flood-carrying capacity. It may require the reconstruction and/or re-operation of existing flow control weirs that direct flood flows into bypasses. This measure could include sediment removal or vegetation control.	Potentially high initial costs depending on number and type of modifications and real estate needs. Impact on annual O&M costs is variable. Potential for water supply impact if constructions serve as in-stream recharge purposes.	Could enhance key physical processes and ecological functions by restoring more natural flow regime to bypasses within historical overflow areas. Could result in substantial permanent impacts including loss of upland habitat. Could change sedimentation transport. Extensive, complex, and potentially costly permitting required.	Bypass modification likely to be more feasible/implementable than construction of new bypasses. May face opposition from some landowners because it would restrict land use within the bypass. Institutional, funding, and public relations challenges exist.	X	X									X						X	X	X	X				
SM-3	Modify existing weirs, overflows, or relief structures to improve flood system performance.	The performance and operation of weirs and flood overflows can be negatively affected by factors such as accumulation of sediment or debris, downstream flow restrictions, antiquated control systems, subsidence, erosion, structural deficiencies, and functional obsolescence. Their design parameters (how the flows are regulated), may be functionally obsolete due to changes in the flood flows caused by differing land use, climate, and weather patterns.	Improve flood system operations and performance by modifying existing weirs and overflows; provide or restore flood conveyance and storage; make water control structures that are robust and flexible to meet current and future flood management needs.	Weirs could be modified in several ways (raised, lowered, lengthened, or automated), changing the weir sill elevation depending upon the operation and desired effect.	Moderate to high initial costs to raise, lower, lengthen, or automate weirs depending on the type, operation, and desired effect. Potential to reduce annual O&M costs. Potential to impact water supply if existing weirs are used for groundwater recharge.	Varies by implementation. Could enhance key physical processes and could moderately alter physical processes downstream. Substantial permitting likely needed.	Institutional and funding challenges exist.	X	X										X	X			X	X	X						

Table H-B-1. Draft SFMP Management Action Descriptions

Index	Management Action	Problem Addressed	Desired Outcome	Methodology	Economic Considerations	Environmental Considerations	Social Considerations	Flood Hazard Types Addressed							Flood Risk Addressed			Integration Opportunities											
								Slow Rise	Flash	Debris Flow	Alluvial Fan	Coastal	Tsunami	Engineered Structure Failure	Stormwater Management	Hazard	Exposure	Vulnerability	Water Supply	Groundwater Recharge	Water Management Flexibility	Ecosystem Habitat	Invasive Species Management	Restore Natural Floodplain Processes	Erosion/Sediment Management	Fisheries	Recreation or Open Space	Hydropower	Navigation
Land Use Planning																													
LU-1	Reduce flood damages through acquisitions, easements, and private conservation programs.	In many areas, natural floodplains have been reduced, and floodplains are isolated from rivers and streams. This has led to constrictions to flow that create flood hazards, present maintenance problems, and result in loss of ecosystem quality and function.	Acquire or otherwise dedicate floodplain land that is now not subject to flooding to the flood management system in sufficient amounts and at appropriate locations so that the increased floodplain transient storage lowers flood peaks, restores river processes, enhances ecosystem value, and contributes to water supply management.	Lands adjacent to channels and coasts that have been flooded during periods of high flow would be inundated more frequently, at greater depths, or for longer periods of time. However, this must be balanced against the impact to existing land uses and critical infrastructure in floodplains. The use of voluntary flood easements could accommodate floodwaters, preserve agricultural land, and provide habitat. In addition, private land conservation programs could be expanded through developing partnerships and incentive programs.	Potentially high initial costs, depending on location and extent of floodplain acquisition. Could increase annual costs for floodplain maintenance.	Could rehabilitate key physical processes and ecosystem functions. Moderate to substantial permanent impacts to terrestrial, agricultural, and potentially to seasonal or freshwater marsh wetland habitats. Minor permitting required.	Implementation is highly variable due to location and geographical extent of land acquisition. Acquisition of some property, whether land or structures, may be necessary to ensure the effectiveness of the flood management system. Institutional, legal, funding, and community relations challenges exist.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
LU-2	Develop local flood management plan updates	The most recent and applicable data are not always available or used for updates to local flood management and land use planning documents, resulting in outdated planning strategy and reduced benefits. Many flood-related regulations and planning are associated with a defined level of protection or an event of certain return frequency, which is subject to change based on hydrological record. Some local agencies are limited in their capacity to update local flood management plans and might require institutional and technical support.	State and local agencies would manage floodplains more proactively and adaptively and would have access to the most recent hydrologic, climate, physical and biological conditions, policies, and land use data in order to adequately update planning documents for land use and flood management.	The approach would consist of General Plan updates, local flood management plan updates, regional general permitting, Natural Community Conservation Plans (NCCPs), Habitat Conservation Plans (HCPs), and other planning documents and enactment of local zoning amendments to increase level of protection. New data developed by local agencies for flood management planning purposes (i.e., new hydraulic models) would be integrated into planning documents when updated.	Low initial costs. Measures include policies, plans, improved tools, and do not involve physical construction. No impact on annual O&M costs in the short-term. Potential decrease in long-term annual O&M costs.	Dependent upon content of local plans.	Overall, improved land use management would be favorable to overall general public, government agencies, but some resistance by cities/counties that depend on tax base and development industry.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
LU-3	Provide information and data to assist local communities in planning and evaluating land use proposals on alluvial fan areas.	Practices utilized to address alluvial fan conditions generally lack consistency in California. Local governments that plan for and evaluate future development on alluvial fans sometimes have an insufficient understanding about alluvial fan flooding.	Increased awareness among local communities to plan and evaluate land use proposals in alluvial fan areas	The State, local agencies, and universities would identify a process to create and maintain a web-based portal that allows interested parties to access the pre-project screening and flood management tools and data for hazard and resource evaluation for special alluvial fan areas being planned or proposed for development.	Medium initial costs needed for coordination, data gathering, and outreach. Low annual costs.	None	Would require significant coordination across local agencies. Significant educational outreach would need to be conducted to promote the web-based portal.				X																		X

Table H-B-1. Draft SFMP Management Action Descriptions

Index	Management Action	Problem Addressed	Desired Outcome	Methodology	Economic Considerations	Environmental Considerations	Social Considerations	Flood Hazard Types Addressed							Flood Risk Addressed			Integration Opportunities														
								Slow Rise	Flash	Debris Flow	Alluvial Fan	Coastal	Tsunami	Engineered Structure Failure	Stormwater Management	Hazard	Exposure	Vulnerability	Water Supply	Groundwater Recharge	Water Management Flexibility	Ecosystem Habitat	Invasive Species Management	Restore Natural Floodplain Processes	Erosion/Sediment Management	Fisheries	Recreation or Open Space	Hydropower	Navigation	Water Quality	Improve Agency Coordination	
Natural Floodplain Function Restoration																																
E-1	Manage runoff through watershed management.	Runoff from watershed source areas increases, in varying extents, due to increases in impermeable surfaces in developed areas, soil compaction from agriculture, reductions in vegetative cover, incision of stream channels, and losses of wetlands. Runoff flood events will worsen in the next 50 to 100 years, as regional temperatures rise and as winter precipitation falls more frequently as rain, rather than snow. The increased intensity and frequency of winter flooding might overwhelm existing flood management systems on a more regular basis, unless other efforts are taken.	Improved watershed management to enhance ecosystem function and attenuate downstream runoff, reduce the rate and magnitude of runoff during precipitation events, and lessen the need to store runoff in large reservoirs. Other desired outcomes of upper watershed management include restoration of natural communities and wetlands, additional water storage, improved water quality, and increased flexibility for water management.	Update relevant land use plans in upper watersheds to protect and increase the area of wetlands; pass legislation governing standards for subdivisions. Plans should be updated to increase vegetative cover, expand wetland areas, restore meadows, install drywells to convert surface runoff to groundwater recharge, restore natural drainages, and minimize the area of compacted or impermeable surfaces. This will increase percolation and water retention rates across broader areas and reduce the need for more expensive downstream options.	Relatively high initial costs depending on the extent of physical construction. Costs for setback levees, groundwater recharge areas, drywells, wetland creation, and right-of-way easements can be high. Reduced annual costs for O&M, repair, mitigation and other permitting requirements in the long term.	Would rehabilitate key hydrologic processes in downstream areas. Physical construction of wetland areas, drywells, setback levees, and drainage conveyance could have some adverse environmental impacts too. Minor to substantial permitting required, depending on the project.	Local implementation might face challenges because implementation would restrict development. Institutional, legal, and funding challenges exist.	X	X								X	X			X	X	X	X								
E-2	Remove unnatural hard points within and along channels.	Unnatural hard points in or on the banks of streams (such as bridge abutments, rock revetment, dikes, limitations on channel boundaries, or other physical encroachments into a channel or waterway) can affect the hydraulics of river channels, constraining dynamic natural fluvial geomorphologic processes of erosion, deposition, and channel meander that contribute to healthy and sustainable ecosystems.	Promote natural physical processes that support essential ecosystem functions within the flood management system.	Changing the physical features of the conveyance system by removing hard points, such as rock revetment, dikes, or other structures in the stream, can improve ecosystem functions by promoting natural erosion and deposition processes, aquatic and terrestrial habitat heterogeneity, and successional habitat development. However, removing hard points should be commensurate with replacement of a feature that affords a similar function (e.g., level of protection, water management, vehicular passage), and must not restrict operability or maintainability of the flood protection works.	Medium to high initial costs, depending on number, location, and types of hard points and treatments implemented. Could potentially increase or decrease annual O&M costs.	Reducing flow constrictions and hard points would rehabilitate physical processes, including sediment transport and channel-forming processes. Potential construction impacts (temporary or permanent) would be associated with physical removal of hard points. Substantial permitting would be required.	Removal of hard points has been advocated by local governmental bodies and landowners who share in the cost and responsibility of maintaining revetment that does not reduce flood risk. Institutional and funding challenges exist.	X	X								X					X			X							

Table H-B-1. Draft SFMP Management Action Descriptions

Index	Management Action	Problem Addressed	Desired Outcome	Methodology	Economic Considerations	Environmental Considerations	Social Considerations	Flood Hazard Types Addressed							Flood Risk Addressed			Integration Opportunities												
								Slow Rise	Flash	Debris Flow	Alluvial Fan	Coastal	Tsunami	Engineered Structure Failure	Stormwater Management	Hazard	Exposure	Vulnerability	Water Supply	Groundwater Recharge	Water Management Flexibility	Ecosystem Habitat	Invasive Species Management	Restore Natural Floodplain Processes	Erosion/Sediment Management	Fisheries	Recreation or Open Space	Hydropower	Navigation	Water Quality
Permitting																														
P-1	Develop regional and corridor conservation plans, or expand existing regional conservation plans (such as regional HCPs and NCCPs) to provide a more efficient and effective regulatory approval process for flood projects.	Habitat and ecosystem planning currently is conducted in piecemeal, fragmented fashion in many areas. Multiple regulatory agencies are responsible for ensuring the protection or mitigation of environmental resources impacted by flood management activities. Limited coordination and shared vision result in a regulatory approval process that adds complexity and scheduling challenges to flood project approvals. It also results in fragmented conservation projects that might have limited viability in terms of long-term biological success.	High-quality regional and river-corridor conservation plans that both improve the success rate of flood project regulatory approval and provide improved multi-species habitat that is viable for the long term.	Develop plans such that they provide measurable biological objectives for targeted resources, incorporate adaptive management approaches, fund long-term habitat management and monitoring, and provide the public with the opportunity to assess, review, and critique plans as they are being developed.	Medium to high initial costs. Plans such as HCPs and NCCPs require adequate funding to develop. Implementation of the plans would have varying capital costs. Changes to annual costs.	Increased regional collaboration among habitat and ecosystem planning and mitigation would result in rehabilitation of ecosystem functions by concentrating mitigation in larger areas, and by selecting more suitable lands for mitigation than is possible with piecemeal mitigation. Would result in improved and streamlined permitting for future projects. Impacts associated with flood system O&M could be reduced because O&M would be better facilitated and mitigation better coordinated.	California currently already has more than 30 regional conservation plans in varying stages, with some plans in the implementation phase for more than 10 years. Corridor management plans are already under development, and they are being viewed as valuable approaches for meeting multiple flood management goals on specific reaches. Institutional, legal, and funding challenges exist.	X	X	X	X	X	X	X	X	X			X	X	X	X	X	X	X	X	X	X	X	
P-2	Develop regional advanced mitigation strategies and promote networks of both public and private mitigation banks to meet the needs of flood and other public infrastructure projects.	Some flood management projects require offsite mitigation to compensate for habitat losses. Identifying suitable offsite locations is often left to the last phase of flood projects, as the extent and nature of the expected impacts become more evident. Regulatory agencies need to approve these offsite locations, and negotiations can delay overall flood project approvals. Second, a temporal loss of habitat occurs between the time when the flood project removes habitat and when compensatory habitat is restored to pre-project levels. Third, offsite locations that are comparable in area to the impact are often too small and isolated to have long-term viability and often require high maintenance costs. Lastly, generating funding sources for mitigation early in the planning stages is an obstacle.	High-quality regional advance mitigation strategies and networks of mitigation banks that meet the needs of flood management and other public infrastructure projects.	Develop supporting policies, sustainable funding sources and partnerships with regulatory agencies for planning and implementation of comprehensive regional advance mitigation banks.	High initial cost. Establishment of mitigation banks requires acquisition of land, permitting, restoration, and funding for long-term management and monitoring. Regional collaboration for advance mitigation banks is likely to decrease overall costs of regulatory compliance and mitigation for O&M and repair activities. Potential exists to leverage private conservation funds.	Implementation and coordination on regional advance mitigation planning would result in rehabilitation of ecosystem functions by concentrating mitigation in larger areas, by implementing mitigation in advance of impacts, and by selecting more suitable lands for mitigation than is possible with piecemeal mitigation. Improved and streamlined permitting would be needed for future infrastructure projects. Banking has a complex set of permitting requirements, and it will take extensive work to create credits that can be used for flood projects.	There is high interest in developing regional advance mitigation banks from infrastructure agencies, resource agencies, and conservation organizations. Private mitigation banks already exist, and regulatory agencies have developed standard approval processes for establishing these banks. Institutional, legal, funding, and community relations challenges exist.	X	X	X	X	X	X	X	X	X			X			X	X	X	X	X	X	X	X	X

This page intentionally left blank.

Appendix C: Local Planned IWM Projects in California

This page intentionally left blank.

Table H-C-1. Local Planned IWM Projects in California

Hydrologic Region	County	Project Name	Estimated Cost	Project Description	IWM Project	Type of IWM Project
Central Coast	Monterey	Big Sur Land Trust Carmel River Floodplain Restoration and Environmental Enhancement Project		The initial Project action, commonly referred to as the Odello East Component in the following Initial Study, consists of (1) grading the existing farmland and access road to create an elevated agricultural preserve on approximately 40 acres on the southern edge of the Odello East site outside of the 100-year floodplain elevation; and (2) grading to restore the site's ecological function as a floodplain by creating the hydrological characteristics necessary to support floodplain restoration activities on approximately 55 acres of existing farmland. A portion of the agricultural preserve would be graded to accommodate future fill material as part of subsequent Project components/action. The second Project action, referred to as the Causeway Component, consists of replacing a portion of the SR 1 roadway embankment with a 520-foot-long causeway section. The third Project action, referred to as the Levee Component, consists of (1) removing approximately 2,400 linear feet of nonstructural earthen levees on the south side of the Carmel River channel, and (2) grading at the eastern boundary of the Project site on property owned by the Monterey Peninsula Regional Park District to encourage flood flows to enter into the south floodplain area at Odello East.	Yes	Agriculture
Central Coast	Monterey	Coastal Wetland Erosion Control and Dune Restoration	\$1,070,164	The proposed project will enhance and restore wetland and sand dune ecosystems in central Monterey Bay and control erosion in salt marshes directly behind the dunes around Moss Landing. These marshes are critical buffers to prevent salt water from entering surrounding farmland, especially the Salinas Valley, yet they are eroding at accelerating rates. Sand dunes help retain fresh water at the coast, recharge groundwater, retard saltwater intrusion, and minimize storm damage from the sea. Currently, much of the physical dune structure around Monterey Bay is fairly intact, but it is also highly degraded with invasive non-native plants, which continue to spread. Monterey Bay is the largest indentation widely open to the sea on the Pacific Coast of the U.S., with correspondingly large and ecologically important dune systems, and it is the core area of the Monterey Bay National Marine Sanctuary. The target area for this project, the central Monterey Bay, has the lowest and most degraded sand dunes in the region. They will be the first to fail as sea level rises from storms, El Nino cycles, and climate change. Should they fail, salt water will overflow into the Salinas Valley, compromising one of the nation's most productive agricultural centers.	Yes	Ecosystem
Central Coast	Monterey	Continued Enhancement of Groundwater/Surface Water Models			Yes	Water Supply
Central Coast	Monterey	Implementation of the Moro Cojo Slough Management and Enhancement Plan: Restoration of the Upper Slough	\$1,450,636	This project will involve the restoration of 120 acres of the Moro Cojo Slough containing tidal and brackish water marsh (a state marine reserve) that receive fresh water inputs from agricultural lands above. This project will restore the hydrologic connectivity of the upper, middle, and lower reaches of the Moro Cojo Slough by linking multiple marsh areas with new lands previously lost to agriculture. The project will reestablish an interconnected brackish water wetland ecosystem. The result of this project will be to reestablish hydrologic connectivity and ecosystem function, enhance wildlife habitat, reestablish wetland habitat that supports endangered species (brackish water snail and tidewater goby), and improve water quality flowing out of the watershed into several State marine reserves and the Monterey Bay National Marine Sanctuary. This will be a four-year project with three major outcomes: 1) protection of wetland marsh and adjacent upland habitats through easement or acquisition, 2) filtration of agricultural runoff with sediment basins and treatment wetlands prior to water entering the main slough 3) restoration of the main slough to increase open water habitat and overall system complexity, and 4) regain wetland habitat continuity between the three main sections of the Moro Cojo Slough.	Yes	Ecosystem
Central Coast	Monterey	Lower Carmel River and Lagoon Floodplain Restoration and Enhancement Project	\$18,310,032	This program consists of 3 projects: Carmel River Lagoon and Beach Studies, Lower Carmel River Floodplain Restoration and Enhancement, and Hacienda Carmel Flood Bypass. The Carmel River Floodplain Restoration and Environmental Enhancement Project proposes to restore and enhance the hydrologic function and connectivity of the Odello East property with the lower Carmel River region and southern floodplain. The Project would 1) restore approximately 90 acres of historic coastal wetlands, upland habitat, and/or riparian habitat on existing agricultural land to enhance the site's capacity to function as part of the historical Carmel River floodplain and to provide additional habitat to the lower Carmel River ecosystem; 2) create an approximately 40 acre agricultural preserve to achieve the goal of preserving the agricultural heritage of the Project area in a manner that is compatible with adjacent habitat; 3) replace a segment of State Route 1 with a 520-foot causeway to improve floodwater conveyance under the highway and reduce flood hazards to SR 1 and 4) remove 2,400 feet of the south bank levee and "Blister" to allow the lateral dispersal of floodwater onto the south overbank area and Project site.	Yes	Ecosystem
Central Coast	Monterey	Northern Gabilan Mountain Watershed Management Project	\$1,450,636	The project consists of three phases to restore a sub-watershed within the upper Gabilan watershed, and serve as a model for restoration of watersheds within the central coast. Phase I provides the foundational watershed characterization and process analysis necessary to develop meaningful and effective watershed management. It includes a review of previous relevant studies and preparation of original analysis along with a compilation of spatial data and key watershed processes. Analysis will be integrated with research and planning projects done by others. The synthesis of this information will be used to target planning and restoration for one sub-watershed. This will be accomplished by addressing the changes in the watershed functions and processes (physical, chemical and biological) that are caused by agriculture and urban activity that affect watershed health. Additionally, we will conduct a community-based engagement process to review Phase I information and watershed management options. Phase I will result in a management methodology and a master restoration plan for one of three sub-watersheds. Phase II will develop site design for prioritized restoration locations within the chosen sub-watershed and Phase III will implement those designs.	Yes	Ecosystem
Central Coast	Monterey	Pajaro River Parkway Plan		The Pajaro River Parkway Plan is a technical evaluation to identify public access and recreational opportunities that can be incorporated into the Levee Reconstruction Project. The plan will include an evaluation of expanding recreational opportunities within the Pajaro River levee reconstruction project area, engaging with the public, outreach and negotiation with landowners, development of alternatives, cost estimates, benefit analysis, environmental constraints analysis, and implementation plan.	Yes	Recreation
Central Coast	Monterey	Salinas Valley Water Project	\$2,390,000	The Salinas Valley Water Project has three components – (1) enlarging the spillway at Nacimiento Dam to handle a maximum probable flood, (2) prolonging releases of water to the Salinas River so that the basin's groundwater can be recharged; and (3) installing a diversion structure on the Salinas River near Marina to temporarily store and divert water during dry periods. That water, about 10,000 acre-feet per year, will be pumped to the Castroville Seawater Intrusion Project area, thus further reducing groundwater pumping and recharging the area's aquifers to hold off seawater intrusion. During winter months, the diversion structure will be lowered so that water can flow to Monterey Bay and endangered steelhead trout can migrate up river to spawn in Arroyo Seco River and other upstream waters. Flow rates will be maintained in the river and fish screens installed to support steelhead migration.	Yes	Water Supply

APPENDIX C: LOCAL PLANNED IWM PROJECTS IN CALIFORNIA

Table H-C-1. Local Planned IWM Projects in California

Hydrologic Region	County	Project Name	Estimated Cost	Project Description	IWM Project	Type of IWM Project
Central Coast	Monterey	Water Quality Enhancement of Tembladero Slough Phase II	\$609,525	This project is Phase II of Water quality enhancement of the Tembladero Slough and Coastal Access for the Community of Castroville, Phase I of which has been funded by the IRWM Plan Round 1. During Phase I, CCWG will work with County agencies, agricultural land owners and the community of Castroville for design and permitting of a select set of water quality/wetland management structures. These projects will utilize a variety of water quality management innovations, including the treatment train approach (i.e., detention/sedimentation features, pollutant filtration/ biological degradation of pollutants and water polishing areas). During Phase II of this project, 20 acres in total (approximately six projects) will be constructed based on the plans from Phase I that support and integrate the multiple objectives of the GMC IRWM Plan, emphasizing urban and agricultural water quality enhancement, flood management, habitat restoration and support of various watershed planning and permit processes. Features are selected based on available space, hydrologic requirements, and adjacent landowner concerns, but preferentially support projects that enhance habitat and open space features, as well as improve water quality.	Yes	Water Quality
Central Coast	Monterey	Watershed Approach to Water Quality Solutions	\$475,562	This project will improve water quality in multiple impaired bodies of water within the Lower Salinas River Watershed that are listed on the 303d list for pollutants such as nutrients, pesticides, sediment, and bacteria. These bodies of water include the Salinas Reclamation Canal, Santa Rita Creek, and Tembladero Slough; considered the most polluted bodies of water on the Central Coast with 37 TMDL listings. In agricultural areas, efforts will focus outreach and referrals for existing programs that will leverage funding for implementation of irrigation and nutrient management practices and Livestock and Lands program, while implementing much needed management measures such as erosion control for strawberry crops. Restoration projects along Santa Rita Creek will be installed to promote environmental stewardship, reduce illegal dumping, expand the floodplain, stabilize banks and increase biofiltration of pollutants through revegetation of native plants. Of utmost importance is the development of tracking tools for management measures and water quality monitoring to build a knowledge base. This project has been funded through Round 1 IRWM Implementation Grant funds.	Yes	Water Quality
Central Coast	San Luis Obispo	Flood Control Zone 1/1A Waterway Management Program		The program will increase the capacity of the lower 3 miles of Arroyo Grande Creek with levees while simultaneously enhancing water quality and sensitive species habitat within the managed channel.	Yes	Water Quality
Central Coast	San Luis Obispo	Morro Bay Harborwalk		The City of Morro Bay, in cooperation with the Morro Bay National Estuary Program and the County of San Luis Obispo, will be constructing multimodal transportation system improvements that include enhancement and rehabilitation of approximately 5 acres of coastal dune habitat. Of these, 1.75 acres will be treated with aggressive non-native species abatement followed by native revegetation using locally collected native seed; the remaining 2.99 acres will receive non-native species abatement with native species recruitment for restoration. Stormwater filtration and management measures will also be included in the construction.	Yes	Ecosystem
Central Coast	San Luis Obispo	San Luis Obispo Waterway Management Plan	\$36,620,000	Program will provide flood protection while simultaneously enhancing water quality and sensitive-species habitat in the San Luis Creek watershed from the City of San Luis Obispo to Avila Beach	Yes	Water Quality
Central Coast	Santa Barbara	Las Vegas/San Pedro Creek		The Santa Barbara County Flood Control District (CFCD) in partnership with Caltrans is proposing hydraulic capacity improvements along Las Vegas and San Pedro Creeks under Calle Real, Route 101, and the Union Pacific Railroad (UPRR). The proposed project would increase the hydraulic capacity of the two creeks from a 10-year to a 25-year stormwater event	Yes	Transportation
Central Coast	Santa Barbara	Lower Arroyo Burro Restoration Program		Design and implementation of creek bank stabilization and riparian habitat restoration projects on a reach-by-reach basis within the lower Arroyo Burro watershed. A collaborative project of the City, County and private landowners, restoration projects would include large scale modifications to the creek channel (widening, creation of floodplains, natural grade control structures, etc.), removal of key invasive plant species, installation of native plant species, and improvements to public access. The restoration efforts would be designed and implemented in order to reduce erosion, reduce flood risks, improve water quality, improve wildlife habitat and diversity, and improve educational and recreational opportunities.	Yes	Ecosystem
Central Coast	Santa Barbara	Upper Mission Creek Flood Management and Habitat Improvement Project		Removal of half of the concrete bottom slab for the entire mile of the channel, excavation of several feet into the underlying materials and construction of a natural-bottom creek channel with areas of lowered concrete embedded roughness. Results will include restoration of over 1 mile of creek channel and the creation of over 1 acre of wetland habitat, including removal of three fish passage barriers as well as removal and replacement of non-native plants with native plants.	Yes	Ecosystem
Central Coast	Santa Clara	Lower Llagas Creek Flood Protection Project and Creek Capacity Restoration Project	\$8,300,000	Restoration project to address reduced channel capacity in system with levees. May remove existing levees to widen floodplain. Project goals include: 1) Evaluate the current flood risk in the area surrounding the project versus the design level flood risk; 2) Develop options to provide flood protection for Lower Llagas Creek Reach 2 beyond the Soap Lake Floodplain in accordance with FEMA criteria; 3) Identify opportunities for environmental restoration and corridor preservation. The project will restore flood capacity in Lower Llagas Creek; coordinate with South County Wastewater Authority as a principal stakeholder and water resource co-planner; and integrate flood protection with habitat protection to satisfy California Endangered Species Act (California Fish and Game Code § 2050 <i>et seq.</i>) regulations.	Yes	Ecosystem
Central Coast	Santa Clara	San Juan Basin Surface Drainage		San Benito County Water District (SBCWD) has proposed surface water detention and drainage alternatives in the San Juan Basin area that can be integrated with an existing Caltrans reconstruction plan for Highway 156 between San Juan Bautista and Hollister. This plan will provide surface water detention and water quality benefits to a tributary of the Pajaro River, thereby assisting with stormwater runoff quality concerns and also reducing peak flows from the San Juan Basin into the Pajaro River.	Yes	Water Quality
Central Coast	Santa Clara	Soap Lake Floodplain Preservation Project (High Priority Project)	\$18,405,050	The Soap Lake Project, Phase 1 provides nonstructural flood protection through preservation of approximately 9,000 acres of agricultural lands. It is the first phase of the long-term recommended non-structural, 100-year flood protection project developed by the Pajaro River Watershed Flood Prevention Authority (FPA). The Project provides flood protection in the lower Pajaro River Watershed by preserving the Soap Lake floodplain. The floodplain provides natural flood storage and attenuation characteristics for the Pajaro River watershed and reduces the flow that needs to be conveyed through the downstream channel.	Yes	Ecosystem

Table H-C-1. Local Planned IWM Projects in California

Hydrologic Region	County	Project Name	Estimated Cost	Project Description	IWM Project	Type of IWM Project
Central Coast	Santa Cruz	38th Avenue Detention Basin Retrofit	\$500,000	The proposed project is a retrofit of a County maintained detention basin to accommodate low flows. The detention basin is at the intersection of 38th Avenue and Brommer Street. It is an open-bottom basin that was designed to provide flood storage volume during large storms that exceeded the flow capacity of the downstream system. The basin is offline and water enters the basin only during high-flow events. All low flows currently bypass the basin through a pipe system. This project concept includes reconfiguring the inlet and outlet so that low flows can enter the basin and have the opportunity to be filtered through a vegetated path and infiltrated into the open channel. This project should help to reduce the volume and increase the quality of the urban runoff discharging to the channel downstream of the project site.	Yes	Water Quality
Central Coast	Santa Cruz	Gully G Drainage Improvement	\$1,771,000	Project includes structural BMPs to reduce flow rate, promote infiltration, and decrease sediment load in the Gully G drainage.	Yes	Water Quality
Central Coast	Santa Cruz	LID Demonstration Projects	\$750,000	The proposed project is the implementation of low-impact development (LID) measures that can be retrofitted into the existing County government facilities at 701 Ocean Street in Santa Cruz, California. Measures that will be considered for this project include: porous pavement, biofilters (e.g., swales, bioretention, buffer strips, landscape planter box), rainwater reuse, soil amendments, disconnected downspouts, drought tolerant planting in place of turf, green roofs, tree planting, solar panel installation and others. These facilities should serve to benefit stormwater quantity and quality leaving the site and entering the San Lorenzo River. This project will also provide highly visible demonstrations of how LID components can be incorporated into existing site design.	Yes	Water Quality
Central Coast	Santa Cruz	Lower Pajaro Valley and Watsonville Sloughs Conservation Planning and Funding Incentives Program	\$60,000	The purpose of this project is to identify and prioritize strategic land conservation opportunities in the lower Pajaro Valley and Watsonville Sloughs to achieve multiple resource benefits; develop specific funding and implementation strategies; and engage key landowners to help them understand the financial benefits associated with easements and other conservation funding. We hope to catalyze a pilot conservation project that adds to the network of protected lands, and demonstrates how easement funding can offset or incentivize land fallowing or other water conservation actions that reduce agricultural income.	Yes	Ecosystem
Central Coast	Santa Cruz	Pajaro River Watershed Study	\$1,000,000	The purpose of the Pajaro River Watershed Study would be to complement the ongoing development of the Pajaro River Flood Control Project by investigating management measures that are important to improving the overall public acceptability of the flood damage reduction project, but are outside of the scope of the project authorization. The Pajaro River Flood Control Project was authorized in 1966 as a single-purpose flood-damage-reduction project. As a single-purpose project, only flood-damage-reduction benefits can be used to justify Federal investment in the project; however, stakeholders have identified other outputs, such as geomorphic stability and steelhead habitat improvements, that are important for overall public acceptability of the project. The watershed study provides a means to investigate these other outputs. The watershed study would also provide information that will complement the ongoing Soap Lake Preservation Project and other proposed water resources projects in the Pajaro River Watershed.	Yes	Ecosystem
Central Coast	Santa Cruz	Soquel Creek Linear Park, Parking Improvements, Habitat Restoration, Flood Mitigation and Urban Greening Project	\$1,500,000	Park project is located in Santa Cruz County, California, within Soquel Village. The Agency's parcels (030-153-10 and 24) and others represent over 2 acres in Soquel Village along Soquel Creek. The project will implement the Soquel Village Plan; the proposed Soquel Creek linear park design will involve neighboring parcels and will provide economic vitality, improved vehicular and pedestrian circulation, parking and business waste infrastructure consolidation, water quality and quantity with stormwater BMPs and low-impact design, accessible recreational uses, including nature pathways, open and civic spaces, riparian habitat restoration partnerships among the community, private and public entities, including the Agency, the Soquel Village Parking and Business Association, County Parks, Santa Cruz County Resource Conservation District, Soquel History Association, and others.	Yes	Water Quality
Central Coast	Santa Cruz	Stormwater Allocation Program (SWAP) for Santa Cruz County	\$600,000	To meet State-mandated stormwater hydromodification requirements, new development and redevelopment is required to offset any increases in stormwater runoff. Normally, this is achieved using on-site controls. However, a significant number of projects do not have the space/capacity onsite to meet this requirement. The ability to utilize offsite facilities to meet the hydromodification requirement would benefit water quality, groundwater recharge, and development/redevelopment. The project will evaluate the potential for trading of stormwater capacity (volume) credits within the City of Watsonville. Trading would allow for hydromodification required projects within watershed boundaries instead of specific site boundaries to allow for a greater benefit to water quality, quantity, and overall watershed	Yes	Water Quality
Central Coast	Santa Cruz	Update of the Arana Gulch Watershed Assessment and Enhancement Plan (2002) Phase I and generated Phase II	\$160,000	Update the 2002 Arana Gulch Watershed Assessment and Enhancement Plan and to generate a Phase II Plan. Phase I Plan has been the guiding document for implementing identified restoration projects within Arana Gulch. Accomplishments to date include 10 of the highest priority Phase I restoration projects improving water quality and wildlife habitat throughout the watershed. Phase I plan calls for a review every 10 to 12 years to re-evaluate the Plan against current conditions, guidelines, and regulations (completed in 2000, thus revision is more than a year late). Phase II will address current conditions within the watershed and identify areas for reducing peak flows that are central to diminishing sediment-related issues. Additional opportunities for resource management will be evaluated such as revisitation of Phase I projects yet to be implemented, increased Arana Gulch watershed advocacy, flow gauge installation, annual stream-walk monitoring.	Yes	Water Quality
Central Coast	Santa Cruz	West Watsonville Slough Project	\$14,500,000	Purpose of protecting and enhancing freshwater coastal wetlands, improving floodplain function in Watsonville Slough, preserving agricultural lands and providing compatible public access.	Yes	Ecosystem
Colorado River	Riverside	San Jacinto River Gap Project	\$40,000,000	The project consists of a soft-bottom channel with levees from Sanderson Avenue to a point about 10,000 feet west and then northwest about 6,000 feet to Bridge Street. The channel will have capacity for about a 25-year storm event (31,000 cfs). There will be grade control structures in the channel. Enhanced habitat values will be provided along the channel alignment so it can be used as a corridor to connect the San Jacinto Wildlife Area (SJWA) between the Portrero and Davis Units of the SJWA. This project would prevent flows up to the 25-year storm from breaking out across agricultural land and thereby reduce nutrient loading to storm runoff; it would make an important contribution toward the delisting of Canyon Lake and Lake Elsinore as impaired water bodies; it would provide critical habitat corridor linkage for the Portrero and Davis Units of the SJWA (the SJWA is the No. 1 priority habitat area in Riverside County for the Multispecies Habitat Conservation Plan); it would provide managed habitat for the Los Angeles Pocket Mouse and San Bernardino Kangaroo Rat; and it would respect water rights in the region.	Yes	Ecosystem
Colorado River	Riverside	Cushenbury Flood Detention Basin	\$2,000,000	The project is proposed to capture runoff from the San Bernardino Mountains in the Lucerne Valley Sub-basin. Currently, large storm flows drain to dry lakebeds in the area that have low percolation rates. Consequently, the majority of water that drains to the lakebeds is lost to evaporation and never enters the basin. The project would divert storm flows to detention basins with high rates of percolation to decrease losses from evaporation.	Yes	Water Supply

Table H-C-1. Local Planned IWM Projects in California

Hydrologic Region	County	Project Name	Estimated Cost	Project Description	IWM Project	Type of IWM Project
North Coast	Del Norte	Klamath River Estuary Wetland Restoration Prioritization		The document develops guidance for prioritizing wetland restoration projects required through compensatory mitigation.	Yes	Ecosystem
North Coast	Del Norte	Requa Bridge Deck Raise			Yes	Transportation
North Coast	Humboldt	Mattole Integrated Watershed Management Initiative	\$4,459,000	The Mattole Integrated Watershed Management Initiative provides a comprehensive approach to watershed restoration in the Mattole through stream-flow enhancement, riparian restoration, coho salmon recovery rearing, stream flow and turbidity monitoring, sediment stabilization, and removal of invasive plants. Seven water storage tanks will be installed in the Mattole headwaters totaling 350,000 gallons to augment summer stream flows in critical reaches of coho salmon habitat. Residents agree to turn off in-stream pumps when directed and begin using water from storage tanks. Recovery rearing of coho salmon will be implemented as a temporary measure to avoid extirpation until stream flow and habitat issues are more fully addressed in the headwaters. Downstream work to control sediment will take place through the installation of bioengineered willow fences, as well as reduce active erosion and increase streamside shade through the planting of native riparian trees, shrubs, and grasses. Invasive plants will be removed on project sites prior to implementation, and turbidity and stream flow monitoring will ensure that project goals are met.	Yes	Ecosystem
North Coast	Humboldt	Rohner Creek Flood Control and Salmonid Habitat Improvement Project	\$5,000,000	The Rohner Creek Flood Control and Salmonid Habitat Improvement Project is a watershed-based, channel corridor-scale project with multiple objectives. The project is intended to provide immediate and substantial improvements to channel corridor function that will benefit aquatic organisms and reduce flood frequency within the City of Fortuna. Rohner Creek, at its confluence with Strongs Creek (located approximately 1,000 feet upstream from the Eel River), has a 4.5-square-mile watershed ranging in elevation from 25 to 1,600 feet. The upper portion of the watershed predominately consists of second- and third-growth redwood forest, whereas the mid-portion consists of rural residential areas. The lower portion of the watershed is comprised of residential, commercial, and industrial land uses and within the City limits of Fortuna. Through historic channelization and encroachments, Rohner Creek through the urbanized reach of Fortuna experiences overbank flows on a 1.5-year recurrence. Historic attempts to reduce flooding throughout the corridor have resulted in the absence of complex and diverse in-stream habitats suitable to support native stocks of salmonids including Chinook salmon, steelhead trout, and the State and Federally listed Coho salmon. The proposed project is taking a channel corridor approach in identifying opportunities to integrate habitat enhancement elements with flood-reduction improvements through the 1-mile project corridor within the City of Fortuna. Conceptual design-level hydrologic, hydraulic and geomorphic analyses are currently evaluating a suite of improvement opportunities throughout the project corridor. These improvements will address localized streambank mass wasting, channelization, and the absence of salmonid habitat elements throughout the corridor. These improvements will benefit ecological and hydraulic function of the corridor focusing on in-stream features and riparian plantings that will improve corridor habitats while reducing flood frequency. Once the improvements are identified and associated opinion of probable costs are developed, the City will prioritize the projects and commence final design, CEQA (California Public Resources Code § 21000 <i>et seq.</i>) documentation, and permitting to support the priority projects as available funding allows.	Yes	Ecosystem
North Coast	Humboldt	Salt River Restoration Project by Humboldt County Resource Conservation District, and California State Coastal Conservancy	\$5,950,000	Project will improve channel conditions in the Salt River by removing sediment from the channel. Nuisance in-stream vegetation will be removed and replaced with an appropriate composition of managed riparian vegetation. Setback levees will be used on the tributaries to promote natural sediment deposition trends on the alluvial fan. Sediment detention basins will be used to reduce suspended sediment levels. Erosion sources in the upper watershed will also be treated.	Yes	Water Quality
North Coast	Mendocino	Big River Main Haul Road Phase I Restoration	\$2,063,630	The Big River Main Haul Road Phase I Restoration project proposes to remove ecological obstructions (crossing fills, culverts, and stored sediment) at five locations that threaten water quality in the lower Big River watershed; restore sections of Class II tributary channels; construct bridges high above the restored channels to maintain access for ongoing restoration, compatible recreational use, and scientific study; remove invasive weeds that threaten wetland, riparian, and forest habitats in both the Big River and watershed. Four roadway watercourse crossings and one fill-slope failure along the main access road of the park are composed of significant volumes of fill, are actively eroding, and have trapped substantial volumes of sediment (approximately 14,000 cubic yards). Culverts conveying water through the fill prisms were constructed high above the natural stream channel and are too small to convey the 100-year floodwaters. The fill prisms and stored sediments exist in Class II watercourses and represent an ecological obstruction between forested uplands and the Big River estuary and floodplain, which occur 100 to 300 feet downstream of the crossings. Non-native plants have invaded sensitive habitats, impacting listed species such as coho salmon and steelhead trout.	Yes	Water Quality
North Coast	Sonoma	Copeland Creek Enhancement and Restoration Project	\$13,314,257	<ul style="list-style-type: none"> California Natural Resources Agency 2011 Environmental Enhancement and Mitigation Program Grant: \$345,480. Local Funds \$ 4,220,647 DWR IRWMP Proposition 84 (2006) Round 1 Grant Program: \$1,000,000. (Sub-agreement of grant award to County of Humboldt – North Coast IRWMP). 	Yes	Ecosystem
North Coast	Sonoma	Defining Summer Low Flow Channels in Engineered Streams	\$450,000	The overall goal of this project is to reduce sediment delivery and facilitate sediment movement in engineered stream reaches to be determined by this project. Possible candidates that have active watershed-based approaches and are familiar to IRWMP are Corte Madera Creek, Lagunitas Creek, Guadalupe River and Alameda Creek. Sediment management will be accomplished by improving and / or removing flood control structures, and stabilizing stream banks and creating / restoring thalwegs. These multiple efforts will improve summer habitat for the nationally threatened steelhead.	Yes	Water Quality
North Coast	Sonoma	Laguna de Santa Rosa Sedimentation Study and Projects	\$20,000,000	The Conservancy will assist the Sonoma County Water Agency (SCWA) with the proposed Phase II of the Laguna sedimentation study. Phase II will involve the assessment for and preparation of detailed designs for one or more projects on publicly owned land that will reduce effects of sedimentation for habitat restoration and flood control. Phase II will additionally include preparation of the environmental documentation for the chosen project(s). Phase II follows the nearly completed Phase I of this study, which was initiated because SCWA requested USACE to determine if siltation has impacted the ability of the Laguna to provide wildlife habitat and to act as a flood control basin. Phase I, therefore, evaluates the causes of sedimentation and assesses restoration needs.	Yes	Water Quality

Table H-C-1. Local Planned IWM Projects in California

Hydrologic Region	County	Project Name	Estimated Cost	Project Description	IWM Project	Type of IWM Project
North Coast	Sonoma	Multiple benefit Flood and Runoff Management for Sonoma Valley	\$10,000,000	This project addresses long-standing flooding, water supply, and water quality needs in the Sonoma Creek watershed, including the City of Sonoma, a Phase II stormwater municipality. The proposed activities continue many years of work toward achieving water management goals in the watershed. Aimed at reducing long-term environmental effects of ditching, draining, and paving, the project will reduce volume and velocity of storm runoff delivered to streams; enhance riparian corridors and increase canopy coverage; implement run-off BMPs on residential, vineyard, and horse properties, both in the upper watershed and along streams; reduce suspended sediment loads; and increase information sharing with our citizen and agency community.	Yes	Water Supply
North Coast	Sonoma	Multiple benefit Stormwater Management and Groundwater Recharge for Petaluma River Watershed	\$10,000,000	Provide 100-year flood protection and increase groundwater recharge potential.	Yes	Water Supply
North Coast	Sonoma	Multiple benefit Stormwater Management and Groundwater Recharge for the Santa Rosa Plain	\$10,000,000	Core Objectives: <ul style="list-style-type: none"> Flood Hazard Reduction – Improve management of stormwater that contributes, directly or indirectly to downstream flooding, thereby reducing flood hazards. Groundwater Recharge – Increase beneficial recharge of groundwater, whether or not that recharged groundwater is directly accessible as water supply 	Yes	Water Supply
North Coast	Sonoma	Russian River Groundwater Banking (Artificial Storage and Recovery) Study		Groundwater Banking Feasibility Study initiated in 2010 for banking excess winter water from the Russian River in the Sonoma Valley groundwater basin for storage and use in the summer or during drought period. Conceptually, a groundwater banking program would divert and transmit surplus Russian River water produced at the Agency’s existing production facilities and store that water in the Santa Rosa Plain Groundwater Basin and/or Sonoma Valley Groundwater Basin during wet weather conditions (i.e., the winter and spring seasons), for later recovery and use during dry weather conditions (i.e., the summer and fall seasons) or emergency situations.	Yes	Water supply
North Coast	Sonoma	Santa Rosa Creek Ecosystem Restoration Study	\$20,000,000	Ecosystem and flood management and detention basins	Yes	Ecosystem
North Coast	Trinity	Trinity River Restoration Program		Program activities include physical habitat modifications to the river, monitoring of river responses, and reviews and recommendations for future modifications or enhancements to current management actions (e.g., flow releases from dams, fishery harvests, hatchery practices).	Yes	Ecosystem
North Lahontan	Alpine	Markleeville Creek Restoration Project	\$220,700	The goal of the Markleeville Creek Floodplain Restoration Project is to reestablish the natural form and function of Markleeville Creek through the site of the former U.S. Forest Service Guard Station. The Alpine Watershed Group proposes to restore the streambed configuration to more closely resemble its natural state which will improve geomorphic function and restore the floodplain.	Yes	Ecosystem
North Lahontan	Lassen	Develop On-stream and Off-stream water storage to store floodwater and to store water for use during drought conditions			Yes	Water Supply
North Lahontan	Lassen	Susan River Parkway Project, inclusive of \$0.5 million of flood management components	\$3,500,000	This project is for bank stabilization and flood control, provide recreation, increase habitat, create river parkways and for conservation efforts.	Yes	Recreation
North Lahontan	Nevada	Trout Creek Restoration Project (Reaches 4 and 5) - Truckee	\$10,500,000	The grant funds requested would construct and restore two reaches Reach 4 and 5 of Trout Creek. Restoration of the two reaches would traverse lands owned by Holiday Development and would require infrastructure improvements to create the optimal stream restoration alignment. Infrastructure improvements include moving the balloon track adjusting the Glenshire Drive alignment and constructing two new bridges across Trout Creek to support the relocated balloon track.	Yes	Ecosystem
North Lahontan	Nevada	Trout Creek (Truckee) Flood Control and Restoration	\$2,743,000	Project includes bank stabilization, stream environment zone restoration, enhanced fish habitat, newly created riparian habitat, public outreach and education improved water quality of Truckee River, and flood protection for Truckee River corridor.	Yes	Ecosystem
South Lahontan	Inyo	Inyo/Mono Watersheds Invasive Weed Control Program	\$461,257	This project aims to control and eradicate invasive weeds that impact recreation, air quality, fire hazards, water issues including increased erosion leading to increased sedimentation, lowered quality, and decreased flood control capacity, and native habitat issues	Yes	Water Quality
South Lahontan	Inyo	Oak Creek Watershed Fire/Flood Restoration Phase I	\$355,760	This is a three-phase project design. Phase One is the study and engineering portion of the project, which has begun with a Bureau of Reclamation grant to assess watershed and Oak Creek irrigation system issues. The tribe is requesting IRWMP funding to be used for the vast engineering of up to three flood diversions, two reservoirs, 3 miles of creek restoration, and up to 500 acres of irrigation system as a portion of Phase One.	Yes	Water Supply
South Lahontan	Los Angeles	45th Street East Flood Control Basin	\$22,500,000	Construction of drainage basin (2,083 acre-feet) near 45th Street East and Avenue P-8 on Los Angeles City Department of Airports property. This project will integrate with the construction of the Avenue Q and 20th Street East detention basin for flood control, and it will provide possible groundwater recharge and natural habitat preservation.	Yes	Water Supply
South Lahontan	Los Angeles	Amargosa Creek Pathways Project (Lancaster)	\$1,300,000	The Amargosa Creek Pathways Project, proposed by the City of Lancaster, includes development of a top of bank trail or paseo along eastern side of Lake Lancaster, and construction of a foot-bridge structure crossing the lake and connecting under Highway 14 to link to the existing trailhead at the Antelope Valley Region Fairgrounds. The project integrates stormwater/flood control with natural riparian habitat enhancement and preservation, open/recreational space and land use management. The goal is to construct a pathway in harmony with established riparian habitat, within a flood control management basin which captures stormwater and nuisance water runoff that, in turn, sustains riparian habitat. This project will additionally increase the amount of protected natural habitat and provide improved flood control within the Amargosa Creek watershed.	Yes	Recreation

APPENDIX C: LOCAL PLANNED IWM PROJECTS IN CALIFORNIA

Table H-C-1. Local Planned IWM Projects in California

Hydrologic Region	County	Project Name	Estimated Cost	Project Description	IWM Project	Type of IWM Project
South Lahontan	Los Angeles	Amargosa Creek Recharge and Channelization Project	\$13,500,000	This project will increase the Antelope Valley's water supply, increase the amount of protected natural habitat and provide improved flood prevention within the Amargosa Creek watershed. Proposed improvements include expanding the size and capacity of the spreading ground of the natural recharge area; developing and preserving an ephemeral stream habitat; and channelizing Amargosa Creek (soft bottom); and providing a grade separation of 20th Street West over the Amargosa Creek. This project will integrate with the construction of the 20th Street West bridge over Amargosa Creek, the channelization of Amargosa Creek between 25th Street West and 20th Street West, and the natural habitat preservation, and with existing upstream and downstream Amargosa Creek improvements.	Yes	Water Supply
South Lahontan	Los Angeles	Anaverde Detention Basin, Dam & Spillway at Pelona Vista Park	\$10,000,000	Construct Pelona Vista Dam-grading, inlet/outlet structures, spillway, and storm drain piping. This project is a multipurpose flood control basin that has the ability to provide for wildlife habitat, conservation, and stormwater capture.	Yes	Ecosystem
South Lahontan	Los Angeles	Avenue Q and 20th Street East Basin (Q-west basin)	\$12,500,000	Acquisition and construction of a 1,612-acre-foot detention basin between Avenue P-12 and Avenue Q, from 20th Street East and 30 Street East or on LAWA's property from Avenue P-8 to Avenue P-12. This project will integrate with the construction of the 45th Street East and Avenue P-8 detention basin for flood control, and it will provide possible groundwater recharge and natural habitat preservation.	Yes	Water Supply
South Lahontan	Los Angeles	Barrel Springs Detention Basin and Wetlands (Palmdale)	\$10,000,000	Construction of an 878-acre-foot detention in the Barrel Springs area upstream of Old Harold Road and 25th Street East on a 40-acre, City-owned property. This project will provide flood control for the City of Palmdale, wetland enhancement, and habitat protection.	Yes	Ecosystem
South Lahontan	Los Angeles	Hunt Canyon Groundwater Recharge and Flood Control Basin (Palmdale)	\$10,000,000	Construction of detention/recharge basin, south of Pearblossom Highway, at 57th Street East. Basin is to have a 3,000-acre-foot capacity. The basin will also be used for storing aqueduct raw water to recharge into the aquifer and to control floodwaters. The proposed project would alleviate flooding and have the potential to provide a recharge area for raw aqueduct water.	Yes	Water Supply
South Lahontan	Inyo	West Walker River Channel Rationalization	\$225,000	This is an opportunity to merge holistic flood control planning along with riverine enhancement. Currently, the river on the site is flat and unbounded, washing away farm soil and offering little chance for recovery of what, before the 1997 flood, had been a rich fishery environment. By incorporating natural "breakout" levees, flood events could be cost-effectively controlled, while influencing the river course in directions where historic tree-canopy fishing "hole" refuges could be restored. Pilot area for planning is a 3-mile section of the river.	Yes	Ecosystem
South Lahontan	Mono	West Walker River Restoration Plan	\$80,000	The goal of this project is to develop a restoration plan via the completion of an assessment of the riverine and riparian conditions associated with approximately 3 miles of the West Walker River located within the Antelope Valley, which is designated as an economically disadvantaged community. The Antelope Valley in Northern Mono County is home to roughly 15,000 acres of actively farmed land contributing significantly to local livelihoods. The West Walker River is also ecologically important to imperiled, native trout. However, this same area has experienced significant damage from stormwater events that have in turn resulted in significant impacts, including loss of productive farmlands, from flooding of the Walker River. Most recently, in 1997, a 100-year flood event occurred resulting in extensive losses of productive farmland and deleterious impacts to the Walker River ecosystem. Today, threats from stormwater and flood events remain, and losses of active riparian farmlands occur annually. Better understanding of the historical and current geomorphological processes associated with the West Walker River along with assessing the current riparian habitat condition is the first step in developing a comprehensive stormwater/flood management that will provide the basis for long-term management of this economically and ecologically important portion of the Inyo-Mono IRWM region. This project will pay particular attention to assessing approximately three miles of the lower West Walker River system with the intent of developing management recommendation to ameliorate the threat to stream bank stabilization and in doing so, contribute positively to local livelihoods and local fisheries.	Yes	Ecosystem
South Lahontan	Los Angeles	Upper Amargosa Creek Flood Control, Recharge, and Habitat Restoration Project	\$6,983,322	This project will consist of a suite of activities designed to improve flood control, reduce dependence on imported water by stabilizing current groundwater levels (a source of local supply), and protect the environmental habitat.	Yes	Water Supply
South Lahontan	Mono	Mountain Gate Trail and Restoration Project		The site was previously frequently damaged by flooding. The project would establish recreation and habitat at the site.	Yes	Recreation
South Lahontan	Mono	Rush Creek Floodway Improvements		Increase the capacity of the Rush Creek floodway at Silver Lake to minimize flooding and maximize peak flow events up to 750 cfs that benefit the riparian ecosystem.	Yes	Ecosystem
South Lahontan	San Bernardino	Amethyst Detention Basin	\$12,100,000	The County proposes to construct Amethyst Basin (formerly known as Oro Grande Basin No.9), with combined detention and stormwater recharge capabilities. The basin will include the construction of associated inlet and outlet structures, channels and/or closed conduits, transition structures, wingwalls, headwalls, cutoff walls, basin embankments, emergency spillways, and access roadways along tops of the embankments and around the basins and access ramps to the basin floor.	Yes	Water Supply
South Lahontan	San Bernardino	Antelope Valley Wash Recharge Ponds	\$800,000	Antelope Valley Wash Recharge Ponds could provide groundwater recharge upgradient from City of Hesperia wells. The Hesperia Master Plan of Drainage identifies a 65-acre site for a stormwater detention basin in the Antelope Valley Wash south of Rancho Road. In addition to stormwater detention, the site might be able to accommodate groundwater recharge. The Morongo Basin Pipeline passes by this area and would be the source of recharge water.	Yes	Water Supply
South Lahontan	San Bernardino	Cedar Street Detention Basin	\$2,000,000	Cedar Street Detention Basin may provide the opportunity for recharge upgradient from the City of Hesperia wells. The Hesperia Master Plan of Drainage identifies a potential site for a stormwater detention basin at the east end of Cedar Street and southwesterly of the California Aqueduct. In addition to stormwater detention, the 120-acre site might be able to accommodate groundwater recharge. The California Aqueduct would be the source of recharge water.	Yes	Water Supply
South Lahontan	San Bernardino	Desert Knolls Wash, Phase 3	\$9,000,000	Construct the Desert Knolls Wash Reaches II and III flood protection, water quality and water conservation project. The project emphasizes the national goals of EPA to plan the development and use of land through preservation and enhancement of rivers, tributaries and streams, as well as the land drained thereby.	Yes	Water Quality
South Lahontan	San Bernardino	Mojave River I-15 Levee	\$1,360,000	Construct the Mojave Levee Phase II flood protection project in the amount of \$700,000. The project emphasizes the national goals of the EPA to plan the development and use of land through preservation and enhancement of rivers, tributaries, streams, as well as the land drained thereby.	Yes	Ecosystem

Table H-C-1. Local Planned IWM Projects in California

Hydrologic Region	County	Project Name	Estimated Cost	Project Description	IWM Project	Type of IWM Project
South Lahontan	San Bernardino	Mountain View Acres	\$7,065,000	Construct the Mountain View Acres flood protection, water quality and water conservation project in the amount of \$4 million. The project emphasizes the national goals of EPA to plan the development and use of land through preservation and enhancement of rivers, tributaries, streams, as well as the land drained thereby.	Yes	Water Quality
South Lahontan	San Bernardino	Ranchero Detention Basin	\$12,075,672	Construct the Ranchero Basin flood protection, water quality and water conservation project to help meet water demands and foster sustainable development in the rapidly developing communities, incorporating the latest science, engineering technology, climate models and dual-purpose basin innovation.	Yes	Water Supply
Tulare Lake	Fresno	Eastside Water Quality and Urban Reliability Project	\$20,000,000	The project includes both a direct groundwater recharge elements (Traver Groundwater Bank) and a surface water treatment plant that will provide a reliable supply of high-quality water to the current and future residents in the Cutler and Orosi Communities and surrounding unincorporated communities. All of the areas to be served are disadvantaged communities. The direct recharge elements of the project will also capture and recharge stormwater and integrate flood retention benefits; enhance environmental wildlife habitat; and provide flexibility in operation, water control, and utilization.	Yes	Water Supply
Tulare Lake	Fresno	Fancher Creek Flood Control Improvement Project - City of Fresno	\$4,462,173	The Fancher Creek Detention Basin removes 682 acres from the 100-year floodplain, redirects runoff that may contain pollutants into stormwater management basins, and result in approximately 740 acre feet of additional surface water recharge per year. Once complete, the basin will have sufficient capacity to provide the 100-year control of the Fancher Creek flows.	Yes	Water Quality
Tulare Lake	Fresno	Fresno Irrigation District Joint Conjunctive Use Project	\$10,000,000	The Fresno Irrigation District (FID) Joint Conjunctive Use Project is a cooperative effort of the Fresno Irrigation District, a second undisclosed district, and other local and State agencies. This project intends to utilize resources that are available to the District that may not currently be maximized and to supplement the FID water supplies. The project is an agricultural project that may ultimately provide water to urban and agricultural suppliers and facilitate the environmental benefits of improving the Kings River fishery. The project consists of expanding the recharge and banking facilities along the Kings River in Fresno and Kings Counties in the vicinity of the Peoples Weir for diversion of unregulated Kings River flood flows, Central Valley Project (CVP) contract water, 215 CVP floodwaters, and potentially other sources. Recovery wells will be installed to allow for a portion of the stored groundwater to be extracted. The project is a conjunctive use project, as the available water supply will be diverted to the expanded facilities for recharge and storage in the groundwater reservoir.	Yes	Water Supply
Tulare Lake	Fresno	Kings River North Fork Flood Protection and Wildlife Enhancement Project	\$3,274,512	The Kings River North Fork Flood Protection and Wildlife Enhancement Project is located on the Kings River in northern Kings County, an area historically prone to flooding prior to the development of the Kings River Channel Improvement Project by the U.S. Army Corps of Engineers and the Kings River Conservation District. The flood project was authorized by the U.S. Congress in 1944 and completed in 1972. Due to its character and age, the project does not comply with current design or levee constructions standards. The project utilized setback levees at many locations, incorporating existing conforming agricultural uses into the project. The agricultural uses provide benefit to the flood project in most locations; however, there is a flow constraint resulting from a large agricultural island at one location in the system. This location is immediately downstream from Island Weir and is upstream from State Highway 41.	Yes	Ecosystem
Tulare Lake	Fresno	McMullin On-Farm Flood Capture and Recharge Project	\$5,500,000	This project is Phase 1 in a multiple-phase project to capture Kings River flood flows and utilize those flows for on-farm conjunctive use activities (i.e., direct recharge, in lieu recharge, irrigation). These objectives will be achieved through a combination of flood easements on 250 acres; upgrade to structures (e.g., turnout along the Kings River, McMullin Grade Crossing, Terranova Canal); and implementation of Flood Flow Capture (FFC) Best Management Practices (BMPs) on 1,250 acres. On-farm FFC activities are economically motivated by chronic and severe groundwater overdraft in the Kings Basin threatening the viability of farming. Phase 1 will divert flood flows through a 500-cfs-capacity turnout onto farm fields for conjunctive use activities developed under a current NRCS pilot study. Phase 1 targets capturing (when available) 150 cfs of winter flood flows for direct recharge (9,375 acre-feet per month); 1,800 acre-feet for replenishing root zone moisture, and an average of 2,025 acre-feet per month for in lieu recharge. Under Phase 1, the legal entity McMullin Flood Flow Capture District, composed of supporting landowners and others involved in groundwater and flood flow, issues will be formed. These technical, organizational, and logistical efforts will be the foundation of subsequent phases increase the conjunctive use acreage to 5,000 acres to divert 500 cfs onto farms for recharge. At completion, this project will have the capacity to recharge 30,000 acre-feet per month for direct recharge in the winter, 4,800 acre-feet to replenish soil moisture, and an average 5,400 ac-ft/month for in lieu recharge during the spring. The Kings River is managed by KRWA in coordination with USACE and its management of the San Joaquin River. This project will have the capacity to divert up to 10% of Kings River flood flows (entering into the Mendota Pool through the James Bypass) and greatly ease flood-flow pressures at that location, as well as at areas upstream along the Kings River and downstream in the San Joaquin River.	Yes	Water Supply
Tulare Lake	Kern	Caliente Creek Habitat Restoration - Feasibility Study	\$500,000	The project consists of a study to determine the feasibility of acquiring land upstream of Highway 58 and restoring habitat in order to intercept floodwater and help mitigate routine flooding of Arvin and Lamont.	Yes	Ecosystem
Tulare Lake	Kern	Calloway Cross Valley Canal Intertie	\$13,700,000	Modify conveyance systems to enhance exchanges and delivery of supplies to in-lieu and direct absorptive capacity.	Yes	Water Supply
Tulare Lake	Kern	Cuddy Creek Restoration Project – Phase 1	\$1,000,000	Stabilization and restoration of approximately 3000 feet of Cuddy Creek to reduce watershed soil erosion and sedimentation of surface water to reduce the discharge of pollutants to State waters from storm or nonpoint sources.	Yes	Water Quality
Tulare Lake	Kern	Kern County's Southern San Joaquin Valley Flood Mitigation Plan	\$10,000,000	This plan consists of 40 coordinated projects that can be constructed to enhance groundwater recharge, preservation of habitat, and manage flood and debris flows from the various watersheds that drain into the Southern San Joaquin Valley portion of Kern County.	Yes	Water Supply
Tulare Lake	Kern	Kern River Shoreline 48 Acres	\$550,000	With the help of numerous volunteer groups, irrigation water mains and lateral lines will be installed as part of the restoration projects. The project will extend water lines and restore an additional 48 acres of Kern River shoreline and floodplain. The water will maintain native trees which will be planted along the highly visible Kern River floodplain. The project will include the replanting of riparian vegetation, approximately 500 trees/shrubs and installation of California native "golden" grass seed mix to enhance the natural Kern River habitat area. This project will implement a more environmentally sensitive flood management regime by relieving the tendencies for erosion of levees and riverbanks, thereby reducing the need to build levees higher or performing expensive rehabilitation of damaged levees. The addition of trees and native vegetation at the project site will resolve flood damage issues for floods up to the Standard Project Floods that exceed a 100-year storm.	Yes	Ecosystem

APPENDIX C: LOCAL PLANNED IWM PROJECTS IN CALIFORNIA

Table H-C-1. Local Planned IWM Projects in California

Hydrologic Region	County	Project Name	Estimated Cost	Project Description	IWM Project	Type of IWM Project
Tulare Lake	Kern	Pipeline Connecting Friant-Kern Canal in Support of Flood Storage Reservoir in Poso Creek Drainage	\$75,000,000	The proposed project is to connect the Friant-Kern Canal to a proposed 50,000-acre-foot flood storage reservoir in the Poso Creek drainage area east of State Highway 65. Stored floodwater would be delivered for irrigation.	Yes	Water Supply
Tulare Lake	Kern	Rock Meadow Riparian Vegetation Restoration (32 acres)	\$32,000	Fence off and restore approximately 32 acres of riparian vegetation along the Kern river. Replant native trees and bushes. Install an irrigation system.	Yes	Ecosystem
Tulare Lake	Kern	Storm Water Filtration and Retention Project	\$500,000	Installation of stormwater recapture and filtration units within the city limits and surrounding areas. Water will be placed in retention basins for use on irrigation projects.	Yes	Water Supply
Tulare Lake	Kings	Kings River Critical Levee Repairs	\$5,000,000	Restoration and protection for the Kings River Conservation Districts Kings River levees.	Yes	Recreation
Tulare Lake	Kings	North Fork Recharge Sites 11 and 16	\$750,000	Groundwater management construction project.	Yes	Water Supply
Tulare Lake	Kings	River Ranch Valley Oak Habitat Restoration & Groundwater Recharge Project, South Fork Kings River	\$7,000,000	Environmental and habitat protection and improvement conservation project.	Yes	Ecosystem
Tulare Lake	Tulare	Paregien Basin Project	\$2,150,000	This Project consists of a 78-acre groundwater recharge basin, associated structures and monitoring wells that would capture floodwaters for groundwater recharge. The basin is in an established riparian state which is to be preserved and enhanced.	Yes	Water Supply
Tulare Lake	Tulare/Kings	Upper San Joaquin River Basin Storage Investigation	\$62,251,000	DWR, U.S. Bureau of Reclamation, and their partners have developed a two-phase Plan of Study. Phase 1 will identify water resource opportunities and issues in the Upper San Joaquin River watershed. This phase will include an appraisal of opportunities to increase surface storage and conjunctive uses for groundwater. Phase 2 will be more detailed and will begin with public meetings to determine the scope of the study. Various dams on the Kings and San Joaquin Rivers and their tributaries. Or off-stream reservoirs within the Tulare Lake or San Joaquin Hydrologic Regions. The purpose of the Upper San Joaquin River Basin Storage Investigation is to determine the type and extent of Federal, State, and regional interests in a potential project in the upper San Joaquin River watershed to improve water supply reliability and flexibility of the water management system for agricultural, urban, and environmental uses; and enhance San Joaquin River water temperature and flow conditions to support anadromous fish restoration efforts.	Yes	Water Supply
Sacramento River	Butte	Murphy Slough Habitat Restoration		Modifications to existing flood relief structures and bank protection works.	Yes	Ecosystem
Sacramento River	Colusa	Colusa Sub Reach Wildlife Habitat Restoration Project		This project proposes the restoration of approximately 251 acres of wildlife habitat on portions of seven tracts within the levees of the Sacramento River between the community of Princeton and the City of Colusa.	Yes	Ecosystem
Sacramento River	Colusa	Cooperative Program for Groundwater Studies between the County of Glenn and the Colusa Basin Drainage District		This program includes investigating the potential for groundwater recharge in conjunction with the operation of flood detention facilities prior to design and construction as part of the Colusa Basin's Integrated Watershed Management Plan.	Yes	Water Supply
Sacramento River	Colusa	Integrated Resources Management for Flood Control		This project consists of three alternatives. Alternative 1: Construction of 14 detention basins and 10,000 acres of environmental restoration measure. Alternative 2: Construction of 8 detention basins and 10,000 acres of environmental restoration measure. Alternative 3: Construction of 5 detention basins and 10,000 acres of environmental restoration measure.	Yes	Ecosystem
Sacramento River	Colusa	Long-term flood management for Colusa Basin		A combination of strategically placed foothill reservoirs and up to 10,000 acres of multipurpose detention basins, catchment basins, and groundwater recharge facilities along the Colusa Drain and/or tributaries provide the most reasonable technical, environmental, and economical structural solution to significantly remedy the issues of flood control and groundwater recharge within the Colusa Basin.	Yes	Water Supply
Sacramento River	Colusa	Sites Reservoir		Provide water supplies in average and dry years for urban, agricultural, and environmental purposes. Sites Reservoir will add flexibility to the State's water management system and can provide unique benefits, which include: (1) enhanced water supply reliability for urban, agricultural, and environmental uses; (2) improved Delta water quality; (3) mitigation of snowpack storage losses due to climate change; (4) contribution to flood damage reduction in the Central Valley; (5) ecosystem restoration actions in the Sacramento River; (6) dedicated storage that can be adaptively managed to respond to Delta emergencies and help with restoration actions.	Yes	Water Supply/ Ecosystem
Sacramento River	Colusa	Upper Stony Creek Watershed Project		In addition to managing watershed resources, provide groundwater recharge and flood control by diverting and transporting peak flows through a series of man-made waterways or pipelines joining Walker and Wilson Creeks with the existing gravel sites.	Yes	Water Supply
Sacramento River	El Dorado	Finnon Lake Restoration and Habitat Improvement Project - Georgetown Divide Resource Conservation District	\$1,501,400	Restoring Finnion Lake back to its original operating capacity of 350 acre-feet while enhancing fishery and aquatic habitats, improving wetland habitat, improving upland forest habitats, and securing a sustainable water supply to combat wildfires.	Yes	Ecosystem/ Water Supply
Sacramento River	El Dorado	Hangtown Creek Restoration (South Fork American River Watershed)	\$24,046,050	Objectives include: (1) develop a comprehensive flood control plan for the City of Placerville; (2) complete the Hangtown Creek Master Plan; (3) relocate the trunk sewer lines out of the creek channel; (4) upgrade three sewer lift stations within the Hangtown Creek watershed; and (4) ongoing restoration of Hangtown Creek and its tributaries.	Yes	Water Quality
Sacramento River	El Dorado	Regional Water System Reliability and Conservation Project for American and Yuba river watersheds	\$18,000,000	Improve reliability of raw water conveyance and storage, and improve water conservation by eliminating seepage and minimizing evaporation, improve and protect raw water quality for downstream municipal and domestic water users; protect fisheries from a damming source of sediment and increase the capacity of raw water conveyance and storage to meet anticipated future demands.	Yes	Water Quality/ Water Supply
Sacramento River	Glenn	Colusa Subreach Wildlife Habitat Restoration Project		Develops a strategy for restoration of the ecosystem along the Sacramento River between the community of Princeton and the City of Colusa.	Yes	Ecosystem
Sacramento River	Glenn	Design of Recharge/Detention Basins		Continue investigation and design of recharge/detention basins on South Fork Willows Creek and Wilson Creek.	Yes	Water Supply

Table H-C-1. Local Planned IWM Projects in California

Hydrologic Region	County	Project Name	Estimated Cost	Project Description	IWM Project	Type of IWM Project
Sacramento River	Glenn	Hamilton City Flood Damage Reduction and Ecosystem Restoration		Construction of a setback levee to provide a more reliable form of flood protection to the community and agricultural areas. Degradation of the existing "J" levee to allow for reconnection of the river to the floodplain, and restoration of approximately 1,500 acres of native habitat between the new setback levee and the Sacramento River.	Yes	Ecosystem
Sacramento River	Glenn	Integrated Resources Management for Flood Control		This project has three alternatives. These alternatives include: construction of 14 detention basins and 10,000 acres of environmental restoration measure; construction of 8 detention basins and 10,000 acres of environmental restoration measure; construction of 5 detention basins and 10,000 acres of environmental restoration measure.	Yes	Ecosystem
Sacramento River	Glenn	Willows Area		Project is in development; alternatives include a nonstructural approach, a structural approach, and a combined approach. Goal is to reduce flood damages to the City of Willows and surrounding agricultural lands while increasing ecological value within the South Fork Willow Creek, North Fork Willow Creek, and Wilson Creek Sub-basins in Glenn County	Yes	Ecosystem
Sacramento River	Lake	Cache Creek Flow Enhancement Project		Determine mercury and nutrient inputs to Clear Lake to support the development and implementation of water quality protection measures	Yes	Water Quality
Sacramento River	Lake	Middle Creek Flood Damage Reduction and Ecosystem Restoration Project	\$ 48,000,000	This project eliminates flood risk to 18 residential structures, numerous outbuildings, and 1,650 acres of agricultural land while restoring damaged habitat and water quality of the Clear Lake watershed. In addition, this project includes restoration of wetlands, reconnection of floodplains, and relocation of 18 structures.	Yes	Ecosystem/ Water Quality
Sacramento River	Lassen	Ash Creek Wildlife Area Restoration Project	\$3,700,000	The project is a meadow restoration project (2,415 acres) on the lower section of the Ash Creek Wildlife Area. It will also protect 1,085 acres from further degradation. It will provide flood attenuation and shallow groundwater recharge.	Yes	Water Supply
Sacramento River	Lassen	Beaver Creek Meadow Restoration Project	\$800,000	The project is a meadow restoration project that will restore approximately 100 acres of a degraded meadow system and will also provide flood attenuation and shallow groundwater recharge.	Yes	Water Supply
Sacramento River	Lassen	Butte Creek Meadow Restoration Project	\$350,000	The project is a meadow restoration project that will restore approximately 150 acres and will provide flood attenuation and shallow groundwater recharge.	Yes	Water Supply
Sacramento River	Lassen	Floodplain Restoration at Egg Lake Slough-Lennon Ranch		The project will enhance and stabilize 0.5 miles of riverbank along Egg Lake Slough, improve habitat conditions, and keep the slough from further degradation and transport of high flows.	Yes	Ecosystem
Sacramento River	Lassen	Mountain Meadows Restoration Project	\$4,700	Three separate project reaches proposed for meadow restoration to reestablish floodplain function, reduce fine sediment, improve forage production, and enhance habitats for wildlife and aquatic species.	Yes	Water Quality/ Ecosystem
Sacramento River	Modoc	Alturas Area Levee and Enhancement Project		The project would redesign the levee system and channel through the city in a manner that is up to USACE standards, protects the infrastructure of the city, minimizes risk of debris accumulation and improves the aesthetics of the waterway to increase commercial activity in that part of town.	Yes	Recreation
Sacramento River	Modoc	Diamond Ranch/Canyon Creek Meadow Rehydration Project	\$110,000	The project will enhance a stream by placing grade control structures, which will be designed to stabilize banks and encourage flood flows to access the floodplain. The project will provide flood protection, groundwater recharge, and habitat enhancement.	Yes	Water Supply/ Ecosystem
Sacramento River	Modoc	Green Wing Properties River Bank and Wetlands Restoration Project		This project consists of riparian and wetland restoration along with watershed improvement in the surrounding upland areas. Beneficiaries of the project include landowners and general public.	Yes	Ecosystem
Sacramento River	Modoc	Haage Ranch Riverbank Stabilization Project and Riparian Enhancement Project	\$300,000	The project will enhance and stabilize 1.5 miles of riverbank along the Pit River, improve habitat conditions, and keep the river from further degradation and transport of high flows	Yes	Ecosystem
Sacramento River	Modoc	Hunsinger Draw Meadow Restoration Project	\$80,000	The project is a meadow restoration project (30 acres) along Hunsinger Creek that will provide flood attenuation, shallow groundwater recharge, and ecosystem restoration.	Yes	Water Supply/ Ecosystem
Sacramento River	Modoc	Parker Creek Restoration and Enhancement Project		This project proposes to conduct a variety of natural resource treatments including forest restoration, stream restoration, and habitat enhancement within the Parker Creek watershed.	Yes	Ecosystem
Sacramento River	Modoc	Proposed Willow Creek Ranch/LLL, Inc. Riparian and Wetland Enhancement Project		The project will consist of riparian and wetland enhancement along with watershed improvement in the surrounding upland areas.	Yes	Ecosystem
Sacramento River	Modoc	Rattlesnake Creek Riparian Enhancement	\$350,000	The project will enhance 3 miles of stream by placing grade control structures, which will be designed to stabilize banks and encourage flood flows to access the floodplain. The project will provide flood protection, groundwater recharge, and habitat enhancement.	Yes	Water Supply/ Ecosystem
Sacramento River	Modoc	Sponseller Ranch Riverbank Stabilization Project and Riparian Enhancement Project	\$210,000	The project will enhance and stabilize several miles of riverbank along the Pit River, improve habitat conditions, and keep the river from further degradation and transport of high flows	Yes	Ecosystem
Sacramento River	Placer	Dry Creek Watershed Flood Control and Environmental Enhancement Project - Dry Creek Parkway Reach	\$5,727,395	Project will reduce flood damages and enhance environmental quality of the Dry Creek Watershed by: purchase of easement and fee interests or real properties within the flood corridor, improving channel and floodplain connectivity by renovation of existing dam and removal of private non-engineered levees, establishing salmonid spawning habitat, and removal of 100 acres of red sesbania in lower watershed.	Yes	Ecosystem
Sacramento River	Placer	Dry Creek Watershed Flood Control and Environmental Enhancement Project – Miner’s Ravine	\$2,800,835	Reduce flood damages and enhance environmental quality of the Dry Creek Watershed by: constructing an off-channel detention basin in Placer County. Riparian and in-stream habitat improvements would benefit steelhead and many other wildlife species. Enhancements include removal of non-native plants, creating riparian habitat, enlarging stream channel and allowing for meander and restoration of natural processes including enhancement of seasonal wetlands.	Yes	Ecosystem

Table H-C-1. Local Planned IWM Projects in California

Hydrologic Region	County	Project Name	Estimated Cost	Project Description	IWM Project	Type of IWM Project
Sacramento River	Placer	Lakeview Farms Conservation Project	\$495,527	This conservation project is being proposed as a collaborative effort with two partners: Lakeview Farms Inc. and Ducks Unlimited to acquire a conservation easement and improve the floodplain and wetland habitat resources on Lakeview Farms, a 138-acre property south and west of Sheridan along Coon Creek in western Placer County. The County's purchase of a conservation easement on this agricultural rice land is a part of a larger restoration effort at this site, through other funding sources, to restore the habitats that have been destroyed as a result of poor farm management. Wetlands habitat will be reconstructed to the primary benefit of the numerous waterfowl and migratory birds that are found in the area.	Yes	Ecosystem
Sacramento River	Placer	Proposed Antelope Creek Flood Control Project	\$5,839,747	This is a multiple objective water efficiency and regional flood control improvement project proposed within the Dry Creek Watershed area of the American River Basin. The project will meet multiple planning objectives by improving water supply, water quality, flood protection, ecosystem restoration and an existing public recreation corridor. Through the design and construction of several on-channel weirs along an existing open space protected reach of the creek, the project will provide flood control and flood damage reduction benefits to repeatedly damaged areas of downtown Roseville. Both ecosystem restoration and public recreational opportunities will be enhanced wherever possible within the floodplain of Antelope Creek, which currently includes a multiple purpose public trail system. In-stream improvements will include bank re-contouring to ensure overbank flows, specific habitat enhancements for fisheries, removal of invasive plant species and replanting with natives. An interpretive trail sign system is also proposed to help educate the public on the project as they utilize the existing multiple purpose trail system.	Yes	Water Supply/ Water Quality/ Ecosystem/ Recreation
Sacramento River	Placer	Proposed Regional Cross Canal Watershed Flood and Conservation Easement Project		In exchange for monetary payment, a qualifying property owner can continue agricultural activities while allowing rice lands to be periodically inundated with water during large winter storm events. This would include rice lands adjacent to Auburn Ravine, Markham Ravine, Pleasant Grove Creek, Coon Creek, Yankee Slough and their tributaries. The goal of the easement program is to conserve these rice lands and the riparian corridors along existing creeks to the mutual benefit of the Flood Control District and the property owner. Under this program, rice growing operations in new easement areas would not be altered but rather protected and conserved. Existing wetland and riparian areas adjacent to creeks would be improved and protected, any current waterfowl hunting operations could remain and the property owner would receive fair market value for the sale of an easement.	Yes	Ecosystem
Sacramento River	Plumas	Fitch Canyon Restoration Project		Restore meadow to reestablish floodplain function and improve habitats for wildlife and aquatic species.	Yes	Ecosystem
Sacramento River	Plumas	Integrated Greenhorn Creek Restoration Project	\$87,910	Treatment of six project reaches along Greenhorn Creek stabilizing eroding stream banks and the channel bed with boulder vanes, bank sloping and vegetation to reduce sediment and loss of property, and the construction of two fish passable riffle-pool structures to improve fish passage.	Yes	Ecosystem
Sacramento River	Plumas	Last Chance Creek Phase II Restoration Project	\$2,867,750	Restore the hydrologic function of 542 acres of meadow to reestablish floodplain, stabilize 7.8 miles of channel along Last Chance Creek to eliminate gullied channel as sediment source, and enhance meadow habitat.	Yes	Ecosystem
Sacramento River	Plumas	Red Clover Confluence Restoration Project	\$128,300	Restore the hydrologic function of approximately 2,100 acres of channel/floodplain system using pond and plug technique in Red Clover Valley. The primary project goal was to improve the water and sediment retention functions of the watershed, with objectives focusing on reduced bank erosion, improved water quality, improved fish and wildlife habitat, reduced flood flows, and increased base flows. Agencies participating or providing funding to this project include a consortium of 24 public and private sector groups.	Yes	Water Quality/ Ecosystem
Sacramento River	Plumas	Rowland-Meadowview Restoration Project	\$98,500	Restore the hydrologic function of 256 acres of meadow along Rowland Creek and Last Chance Creek to reestablish floodplain, eliminate gullied channel as sediment source, and enhance meadow habitat.	Yes	Ecosystem
Sacramento River	Plumas	Spanish Creek in American Valley Rehabilitation project	\$38,100	Treatment of three project reaches along Spanish Creek implementing gravel management through removal of gravel bars to expand floodplain capacity; stabilizing eroding stream banks with bank sloping, boulder vanes, and vegetation; and rehabilitating aquatic/riparian habitats.	Yes	Ecosystem
Sacramento River	Plumas	Spanish Creek in Meadow Valley Rehabilitation Project	\$531,050	Treatment of four project reaches along Spanish Creek, stabilizing eroding stream banks with bank sloping, boulder vanes, and planting vegetation. Also entails the implementation of gravel management through removal of gravel bars to expand floodplain capacity, reduce bedload sediment and bank erosion, and rehabilitate aquatic/ riparian habitats.	Yes	Ecosystem
Sacramento River	Plumas	Sulphur-Barry Creek Restoration Project	\$19,000	Reduce sediment and restore floodplain along Sulphur and Barry Creeks to reestablish hydrologic function, reduce bed load transport, and eliminate gullied channel as sediment source.	Yes	Ecosystem
Sacramento River	Plumas	Upper Dotta Canyon Restoration Project	\$549,914	Restoration of 253 acres of meadow floodplain and 2.9 miles of stream channel to reestablish hydrologic function, eliminate gullied channel as sediment source, and enhance meadow habitat potentially utilizing the pond and plug technique.	Yes	Ecosystem
Sacramento River	Plumas	Yellow Creek - Humbug Valley Restoration Project	\$388,400	Restoration of 109 acres of meadow floodplain to reestablish hydrologic function, eliminate gullied channel as sediment source, and enhance meadow habitat.	Yes	Ecosystem
Sacramento River	Sacramento	American River Basin IRWM Stormwater Flood Management Grant Proposal – Downtown Combined Sewer Upsizing Project	\$6,899,208	The Downtown Combined Sewer Upsizing Project will reduce flood damage in the economically vital downtown area of Sacramento; improve water quality in the Sacramento River through the reduction in raw sewage releases into the source of drinking water for millions of Californians; and protect public health by reducing the likelihood and volume of diluted sewage on public streets and properties.	Yes	Water Quality
Sacramento River	Sacramento	Arcade Creek Corridor Plan	\$1,000,000	This plan identifies numerous remedial and maintenance projects along Arcade Creek and Cripple Creek that will fulfill the goals of the Arcade Creek Watershed Group. The types of projects identified are as follows: remove debris jam and flow obstructions, remove invasive nonnative vegetation, stabilize banks, improve pipe outfalls, restore recreational trails, improve floodplain function, reconfigure the channel, control runoff from parking lots, stabilize swales, remove sediment and vegetation at creek crossings, remove concrete-lined channel. Identified projects are located within the City of Sacramento, Sacramento County, and the City of Citrus Heights.	Yes	Recreation

Table H-C-1. Local Planned IWM Projects in California

Hydrologic Region	County	Project Name	Estimated Cost	Project Description	IWM Project	Type of IWM Project
Sacramento River	Sacramento	Dry Creek Flood Hazard Mitigation Acquisitions with County Park Dept.		The Dry Creek Parkway project is a multi-agency project designed to return an area of Dry Creek floodway to a regional park site and open space. The floodway at this location is very broad compromising access during flood emergencies. The Parkway project goals and good floodplain management mandate the removal of the remaining residential structures located within the floodway. At this time, 21 residential structures are still remaining.	Yes	Recreation
Sacramento River	Sacramento	Elder and Gerber Creek	\$70,000,000	The North Vineyard Station Drainage Master Plan for Elder and Gerber Creek improvements has a Clean Water Act Section 404 Permit and will improve flood flow conveyance, store peak flow volume, and enhance habitat.	Yes	Ecosystem
Sacramento River	Sacramento	Gardenland Flood Management, Habitat Restoration, and Recreation Project	\$5,140,324	The Gardenland Sand and Gravel mine site is a 123-acre site on a floodplain terrace located within the designated boundaries of the American River Parkway. Sacramento Area Flood Control Agency proposes to acquire the site, restore it, and incorporate it into the publicly-owned American River Parkway. The site has been mined for decades and is now used for sorting, distributing, and recycling soil and construction debris. The dominant feature is a steep-sided, 62-acre mine pit that is now a lake, hydraulically linked to the American River through alluvial soil. It hosts non-native fish and vegetation, and the graded soils around the pit are either bare or host non-native vegetation and weeds. The site operators mow and disc much of the property to prevent the establishment of vegetation, particularly woody vegetation that would inhibit mining operations. Acquisition of the site would remove two occupied dwellings and various structures and equipment from the floodway. It would provide an opportunity to restore the site and eliminate the ongoing potential for sedimentation and water pollution from the on-site storage of piles of soil and debris of unknown origin.	Yes	Water Quality
Sacramento River	Sacramento	South Sacramento Habitat Conservation Plan		The South Sacramento Habitat Conservation Plan (SSHCP or Plan) provides a regional approach to balancing development against conservation and protection of habitat, open space, and agricultural lands. The SSHCP protects 30 species of plants and wildlife including 10 that are listed as threatened or endangered under the Federal Endangered Species Act (ESA), the California Endangered Species Act (CESA) (California Fish and Game Code § 2050 <i>et seq.</i>), or both. The SSHCP also protects vernal pool, wetland, and stream habitats that are subject to the Federal Clean Water Act (CWA) and California's Porter-Cologne Water Quality Control Act (California Water Code § 13000 <i>et seq.</i>). The SSHCP also seeks a programmatic Streambed Alteration Agreement under California Fish and Game Code section 1600 <i>et seq.</i> The primary mechanism for conservation established under the Plan is the SSHCP Reserve System, which will conserve habitat that will be managed and monitored to achieve the biological goals and objectives for the covered species.	Yes	Ecosystem
Sacramento River	Sacramento	Stormwater Source Control in the Cosumnes American Bear and Yuba Region - American Rivers	\$1,020,000	This project will construct green infrastructure stormwater facilities to reduce sediment, pollutants, and erosive peak flows, while increasing groundwater infiltration and storage in the Yuba River watershed. It will also provide a highly exportable, innovative solution for controlling downstream flood risk. The project will be constructed at two public sites in the disadvantaged communities of Nevada City and Grass Valley—the Nevada County Rood Administrative Center (Rood Center) and the Yuba River Charter School (YRCS). The proposed approaches mimic nature's way of dealing with stormwater and provide not only economic, water quality and hydrology benefits, but also aesthetic and habitat values. In addition, the project has an innovative and robust monitoring component to quantitatively measure benefits, incorporates education and outreach activities for a range of audiences, and coordinates with other such efforts throughout the state to promote early learning and replication throughout the Cosumnes, American, Bear and Yuba (CABY) watersheds and the greater Sierra Nevada region.	Yes	Water Quality
Sacramento River	Shasta	Burney Gardens Restoration Project	\$1,600,000	The project is a meadow restoration project of an open meadow area (estimated budget of \$75,000) and the restoration of an encroached lodgepole meadow area (\$1.5 million estimated budget). Removal of biomass and sale of this product is anticipated to pay for the restoration of the encroached meadow area. The project also provides flood attenuation and shallow groundwater recharge benefits.	Yes	Water Supply
Sacramento River	Shasta	Clover Creek Preserve	\$10,597,753	The Clover Creek Preserve project proposes to restore and conserve approximately 128 acres of land that had been slated for residential development. Specific components of the project include the creation of a 46+ acre detention basin/floodplain area (with 10 to 15 acres of associated seasonal wetland, marsh, perennial pond and riparian habitat); the enhancement or creation of 25 to 40 acres of oak woodland and 40 to 55 acres of grassland with scattered vernal pools; and the construction of bike paths, walking trails, a parking area, and habitat interpretive areas.	Yes	Ecosystem/ Recreation
Sacramento River	Shasta	McArthur Swamp Restoration and Management Planning Project	\$600,000	The project would develop a restoration design plan that would use surface flow water to restore seasonal wetlands and vernal pools in the project area.	Yes	Ecosystem
Sacramento River	Sutter	Lower Feather River Watershed Management Plan (WMP)		The Feather River Watershed Forum was established to implement watershed management and restoration activities in the Feather River watershed of northern California.	Yes	Ecosystem
Sacramento River	Sutter	Stream Systems Hillslope Processes Mining		One of the goals is to evaluate stream banks/levees and floodplain connectivity.	Yes	Ecosystem
Sacramento River	Sutter	Sutter Basin Feasibility Study		The project assesses flood risk, ecosystem restoration, and recreation issues.	Yes	Ecosystem
Sacramento River	Tehama	Deer Creek Levee widening (upstream of SR 99)		Redesign and widen of the Deer Creek levee to meet current needs due to capacity issues. Modeling results of existing conditions suggest that portions of the existing levee system are overtopped as low as 10,000 cfs. Reconstructing and setting back the levee on both sides of the stream would increase the floodplain and increase the transitory storage capacity, restore channel form and function to improve O&M and facilitate flood damage reduction, remove barriers to fish passage, set back levees to connect rivers to floodplains, restore channel alignment, encourage natural physical geomorphic processes including channel migration and sediment transport, protect critical infrastructure corridors from floodwaters (MA-069). This project is an effort to respond to the flooding and habitat problems in lower Deer Creek and explore the concept of deliberately using the floodplain of Deer Creek to accommodate part of the flood flows in a controlled fashion. With careful planning and adequate protections for vulnerable property and infrastructure, this project will seek to reduce flood flows and allow the channel to reestablish some of its irregular, hydraulically rough, and ecologically complete pre-levee condition.	Yes	Ecosystem
Sacramento River	Tehama	La Barranca and Blackberry Island	\$5,590,050	The proposed project is a comprehensive floodplain reconnection and restoration project (Phase III) within the Sacramento River National Wildlife Refuge. 450 acres on the La Barranca Unit and 50 acres on the Blackberry Island Unit will be restored, including: the removal of gravel pits, removal of a 900-foot private levee and roads to reconnect the river and its floodplain, control invasive weeds, and replanting with native riparian species. The reconnection will improve floodplain storage, reduce peak flood flows and protect property.	Yes	Ecosystem/ Water Supply

APPENDIX C: LOCAL PLANNED IWM PROJECTS IN CALIFORNIA

Table H-C-1. Local Planned IWM Projects in California

Hydrologic Region	County	Project Name	Estimated Cost	Project Description	IWM Project	Type of IWM Project
Sacramento River	Yolo	Bridge District Levee Access Road	\$4,500,000	Project would develop a levee maintenance and flood-fighting access road, spanning 3,250 linear feet (0.6 miles) on top of the levee crown, from the south side of the Tower Bridge to the future Mill Street, north of U.S. Highway 50. The proposed access road and off-road amenities would also serve as a recreational trail by allowing controlled use by bicyclists, pedestrians, and other recreationists. The proposed project is part of the Bridge District Specific Plan.	Yes	Transportation
Sacramento River	Yolo	Clear Lake Operations Evaluation Program		During the winter months Cache Creek Dam releases are dictated by the Gopcevic Decree. Yolo County Flood Control and Water Conservation District (FCWCD) and Lake County Watershed Protection District have discussed the possibility of modifying these operational rules under certain conditions to benefit both Yolo and Lake County interests. These changes could be coupled with some physical modifications at the Grigsby Riffle. These actions could potentially reduce peak flood flows in Cache Creek by about 4,000 cfs on the levees near Woodland, while also providing flood relief to Clear Lake residents. Additionally, reoperations of the Cache Creek Dam could provide a significant amount of water supply in certain hydrologic year types.	Yes	Water Supply
Sacramento River	Yolo	Deep Water Ship Channel Navigation Levee Repair		Correct deficiencies, protect against under seepage, and maintain the Deep Water Ship Canal Levees to current standards for FEMA 100-year and urban levee 200-year levels of flood protection. Physical improvements may include, but not be limited to, restoration and armoring of water-side levee slopes, increased levee height through crown raising or crown-top walls, slurry cutoff walls in the levee prism, seepage blankets on the levee land-side, levee setbacks, etc.	Yes	Transportation
Sacramento River	Yolo	Knaggs Ranch Acquisition	\$15,107,500	The project consists of the purchase of the 2,622-acre Knaggs Ranch property and its preservation for agricultural conservation, flood protection, and wildlife habitat. Project would prevent development on 30% of Elkhorn Basin adjacent to Central Valley Flood Control Project levees, which are part of an important floodwater retention and conveyance system. With land on the other side of the Sacramento River rapidly urbanizing, protection of this site provides an important relatively undeveloped area that might flood during extreme flood events releasing pressure on other parts of the flood control system possibly preventing the flooding of nearby urban areas such as the Natomas area. The site provides habitat of statewide importance for the Federal and State-listed giant garter snake (Threatened), the State-listed Swainson's hawk (Threatened), wintering waterfowl, Sacramento Splittail, and Chinook salmon. The site includes 850 acres within the Yolo Bypass.	Yes	Ecosystem
Sacramento River	Yolo	Yolo and Tisdale Bypasses Sediment Removal Program		Remove sediment that is restricting the capacity of the Yolo Bypass and the Tisdale Bypass.	Yes	Water Quality
San Francisco Bay	Alameda	Crow Creek Fish Habitat Restoration	\$1,000,000		Yes	Ecosystem
San Francisco Bay	Alameda	Flood Facilities - Chain of Lakes	\$23,350,000	The Chain of Lakes are located between the cities of Livermore and Pleasanton and, when complete, will consist of a series of abandoned gravel quarry pits converted into nine lakes, linked in a series, plus Cope Lake. Thus far the County owns two of these lakes, and will acquire one around 2014 and two more by 2030. The lakes are used for seasonal water storage and conveyance, and floodwater detention.	Yes	Water Supply
San Francisco Bay	Alameda	Major Fish Passage Barrier Removals: Don Castro, Foothill Fish Ladders, Resting Pools	\$7,000,000		Yes	Ecosystem
San Francisco Bay	Alameda	San Lorenzo Creek Parkways - Mission to Meek Demonstration Project with Fish Passage Enhancements	\$7,000,000	The San Lorenzo Creek Restoration Project is a pilot for a proposed pedestrian and bicycle trail along one of the largest creeks in the East Bay. A 40-foot-deep by 150-foot-wide stream gorge in downtown Hayward is the site of this successful creek restoration. The County's Flood Control District stabilized more than 400 feet of stream bank, constructed three trailheads with creek overlooks, installed ten interpretive panels and banners, and enhanced more than a thousand feet of creekside habitat. If the long-term vision of creating a 12-mile urban creek and trail system is realized, this project will be the centerpiece, providing a scenic rest stop and entry point. This trail system would connect the San Francisco Bay Trail on the western edge of San Lorenzo to the Bay Area Ridge Trail on the Eastern edge of Castro Valley and provide unique recreational opportunities for residents.	Yes	Recreation
San Francisco Bay	Alameda	Tidal Wetlands Restoration for Sediment Management	\$20,000,000		Yes	Ecosystem
San Francisco Bay	Alameda	Zone 2 Line B, Fish Ladder Construction at San Lorenzo Creek Dam in Unincorporated Hayward	\$660,000		Yes	Ecosystem
San Francisco Bay	Alameda	Zone 2 Line J, Creek Restoration Between Norbridge Avenue and East Castro Valley Boulevard in Castro Valley	\$265,000	The primary purpose of the project was to increase the creek's capacity to carry a 100-year flood. Project includes daylighting a stretch of Castro Valley Creek near Norbridge Avenue and Redwood Road, demolishing a 300-foot-long by 12-foot-wide by 6-foot-high concrete box culvert, widening creek banks, installing a creekside amphitheater, recreational trails, and a playground.	Yes	Recreation
San Francisco Bay	Alameda	Zone 3A, Line A between Confluence Union Pacific Railroad and Cabot Boulevard	\$1,400,000	This project will provide the best overall solution meeting District's design criteria including bank stabilization, reduction of flow velocities, and containment of the 100-year storm event. The project will restore the project site by planting native vegetation within the constraints of right of way and design parameters.	Yes	Ecosystem
San Francisco Bay	Alameda	Zone 5 Shoreline Levee Construct In-board Levee between Old and New Alameda Creeks, Union City	\$8,310,000	As part of the salt pond project coalition, the District is helping to restore approximately 5,500 acres of Eden Landing Ponds in Hayward, and has provided the design for restoration. Existing salt pond levees and dikes will be removed to allow water to flow naturally in and out of the low-lying wetlands. The District has also conducted studies to learn more about Bay tidal effects on the ponds, and how old Alameda Creek and the Alameda Creek Federal project will be integrated with the creation of new wetlands.	Yes	Ecosystem
San Francisco Bay	Contra Costa	Lower Walnut Creek Improvements	\$28,000,000	Master plan enhancement followed by restoration, levee setback, sediment removal to clear portion of channel, acquisition of adjacent wetland for salt marsh harvest mouse and trails adjacent to creek. Studies with the USACE are ongoing. Work has been completed on a \$260,000 CALFED grant - study grant. The Lower Walnut Creek Project incorporates a new way of approaching the traditional methods of operating and maintaining a flood control facility. The existing channel is a classic USACE trapezoidal earth channel that requires ongoing de-silting maintenance. The alternative approach will be to move the channel levees back in the lower reaches to provide additional capacity for floodwaters and to create floodplains. This approach will provide the necessary capacity to handle floodwaters while reducing de-silting costs and creating additional wetlands, riparian habitat and revegetation potential. Other project components include improving fish passage and habitat and increasing recreational opportunities.	Yes	Ecosystem

Table H-C-1. Local Planned IWM Projects in California

Hydrologic Region	County	Project Name	Estimated Cost	Project Description	IWM Project	Type of IWM Project
San Francisco Bay	Contra Costa	Pacheco Marsh Restoration	\$10,900,000		Yes	Ecosystem
San Francisco Bay	Contra Costa	Pinn Brothers Marsh Creek Riparian Restoration Project		Working in collaboration with the City of Brentwood, Contra Costa County FCWCD and NHI, the Pinn Brothers developers plan to restore a floodplain and riparian vegetation along 1,900 linear feet of Marsh Creek as part of a 579-unit subdivision development on 79 acres in downtown Brentwood. This project is the longest stretch of undeveloped land adjacent to Marsh Creek in the City of Brentwood. This project will expand the Marsh Creek channel, creating enough room to restore riparian vegetation while maintaining the 100-year flood conveyance capacity. Riparian vegetation will provide habitat for birds, shade for the residents who use the adjacent trail, and lower the temperature in the creek to improve habitat for aquatic species such as the endangered red-legged frog, western pond turtle and spawning fall-run Chinook salmon.	Yes	Ecosystem
San Francisco Bay	Marin	Bothin Marsh/Coyote Creek Restoration and Flood Control	\$3,000,000	The project will increase tidal prism by opening the levee between Coyote Creek and the Marsh and restore marsh habitat within the Bothin Marsh Open Space Preserve. It is also desired to increase the size of the Marsh area for stormwater absorption and increased tidal prism. The project will be designed to improve the value and quality of the habitats within Bothin Marsh. Fill will be excavated to restore marsh plain habitat; this will provide additional marsh habitat suitable for both the salt marsh harvest mouse and Point Reyes bird's beak. Also upland cover will be enhanced to provide upland refuge for clapper rails. The entire program would entail a joint planning, acquisition, construction and restoration project administered by the Marin County FCWCD in participation with County Parks and Open Space Department.	Yes	Ecosystem
San Francisco Bay	Marin	Channel Maintenance Dredging--Gallinas Creek		Maintenance dredging project of Las Gallinas Creek for recreational/boating use to minus 7 feet.	Yes	Recreation
San Francisco Bay	Marin	Community Service Area 29 Paradise Cay Maintenance Dredge	\$500,000	Maintenance dredging project that includes the north and south areas of Paradise Cay for recreational boating use to minus 7 feet within waterways and to minus 8 feet in the two entry channels.	Yes	Recreation
San Francisco Bay	Marin	Corte Madera Creek Unit 4 Zone 9	\$265,000	Replace the fish ladder and revet the banks of Unit 4 in Ross, dependent on Congressional funding	Yes	Ecosystem
San Francisco Bay	Marin	Corte Madera Creek/Ross Creek Critical Reach		This project will include, at a minimum, removal of the existing timber bulkhead/fish ladder at the concrete channel inlet, construction of a smooth transition from the natural channel to the narrow concrete channel inlet, and other measures to enlarge the channel. The USACE design is also anticipated to include top-of-bank floodwalls or landscape berms upstream and downstream of the fish ladder to contain floodwaters. This project will seek to accommodate a peak discharge up to 5,000 cfs at the lower Sir Francis Drake Boulevard Bridge and up to 6,000 cfs (but no less than 5,600 cfs) at the Ross Creek confluence. Measures that lower water levels under design discharge conditions by improving the hydraulic efficiency of the channel should be incorporated into the Unit 4 Project design. These measures, which are located upstream of the stream flow-gauge in Ross, also improve the natural and ecological functions of the creek (biotechnical bank stabilization, enlarging and restoring creek, restoring slope bank and bed).	Yes	Ecosystem
San Francisco Bay	Marin	Lower Las Gallinas and Miller Creek Restoration Proposal	\$52,000,000	The Las Gallinas-Miller Creek wetland complex (7 square miles) supports a significant area of mudflats in San Pablo Bay. These tidal marshes support the largest population of Clapper Rails in the North Bay region and Miller Creek supports a small but self-sustaining run of genetically unique steelhead trout. This proposal integrates wetland restoration with flood management benefits, including levee rehabilitation, local drainage improvements, and channel dredging.	Yes	Ecosystem
San Francisco Bay	Marin	Lower Novato Creek Restoration Proposal	\$12,200,000	The proposed tidal marsh restoration at Bel Marin Keys will affect the hydrology of several elements within the lower Novato Creek basin. Proposed modifications to Pacheco Pond and the proposed diversion of flow away from Novato Creek considered in the design alternatives will present the most substantial effects. The proposed modifications to Pacheco Pond consist of either expanding the existing pond, or creating a seasonal marsh adjacent to the pond. In addition, the diversion of water currently flowing into Novato Creek from Pacheco Pond, to the proposed tidal marsh will greatly affect existing conditions on the Bel Marin Keys tidal wetlands restoration site. These flows will provide fresh water for the proposed freshwater marsh portion of the project.	Yes	Ecosystem
San Francisco Bay	Marin	Phoenix Lake Detention Basin	\$3,700,000	Primarily for the purpose of water supply reserve for use during the dry season, particularly during shortages, but also serves as wildlife habitat and a public recreation and enjoyment area.	Yes	Ecosystem
San Francisco Bay	Marin	Phoenix Lake Integrated Regional Water Management Retrofit	\$7,661,000	The Phoenix Lake IRWM Retrofit is a multipurpose proposal composed of five component projects, all located at Phoenix Lake: Flood Damage Reduction; Water Supply; Water Quality; Ecosystem Restoration; and Recreation and Public Access. By seismically retrofitting the dam and constructing other improvements to the hydraulic and recreational infrastructures of the lake, thus can be operated to serve multiple purposes of flood control, drinking water supply, water quality, ecosystem restoration, and public recreation. Therefore, the Retrofit meets the 6 regional goals and 62 objectives of the Bay Area IRWM Plan.	Yes	Water Supply
San Francisco Bay	Marin	Regional Best Management Practices, Field Manual, and Training for Stream Maintenance Activities	\$130,000	The purpose of this project is to create an integrated set of regional BMPs, a standardized field manual, and consistent training for stream maintenance activities. Regionally consistent materials will help maintain flood capacity, while contributing to habitat protection and water quality.	Yes	Ecosystem
San Francisco Bay	Marin	Salt Marsh Enhancement and Tidal Prism Enlargement		Three measures to manage sedimentation and maintain 100-year capacity in the earthen channel: (1) raise levees along the 2,000-foot-long 100-year bankfull reach below the stilling basin; (2) scour the channel by enlarging the tidal prism; and (3) conduct periodic dredging. Five potential sites were preliminarily identified in the adjacent floodplain of the earthen channel for marsh enhancement and tidal prism enlargement	Yes	Water Quality
San Francisco Bay	Marin	Sleepy Hollow Creek Channel Improvements	\$9,100,000	For Sleepy Hollow Creek, the Capital Improvement Plan Study calls for 33 in-channel capacity measures. Key measures include: (1) replacing the Taylor, Mountain View, Morningside, and Broadmoor Avenue Bridges; and associated channel enlargement and creek restoration work, and (2) enlarging the channel and restoring the creek at two additional sites downstream of the Morningside Avenue Bridge and the Broadmoor Avenue Bridge.	Yes	Transportation
San Francisco Bay	Marin	Wetland and Creek Restoration at Big Lagoon, Muir Beach	\$2,500,000	The project involves three components: (1) ecological restoration, (2) public access upgrades, including a reconfiguration of the existing parking lot, and (3) replacement of the Pacific Way Bridge. All components are designed to improve ecological function.	Yes	Ecosystem

Table H-C-1. Local Planned IWM Projects in California

Hydrologic Region	County	Project Name	Estimated Cost	Project Description	IWM Project	Type of IWM Project
San Francisco Bay	Napa	Napa River - Rutherford Reach Restoration	\$17,800,000	Restoration objectives for the Rutherford Reach of the Napa River include the following: 1. Reduce bank erosion, loss of vineyard land, and flood damages by restoring stability to the Napa River 2. Reduce sediment loading into the river downstream and into San Pablo Bay (a Regional Water Quality Control Board TMDL objective) 3. Restore habitat for salmonids and other aquatic species including existing runs of steelhead trout and Chinook salmon, by creating more riffles, reducing sediment burial of spawning gravels, and increasing cover and shade 4. Restore a continuous corridor of riparian habitat for birds and wildlife 5. Replace invasive plants with native species and reduce risk of Pierce's disease 6. Engage landowners in the process and maintain regulatory compliance	Yes	Ecosystem
San Francisco Bay	San Mateo	Colma Creek Flood Control and Habitat Mitigation Improvements		The Colma Creek Flood Control Channel provides flood protection for residents of South San Francisco, Colma and Daly City. Loss of salt marsh wetland habitat caused by flood control channel improvements are being mitigated by restoring 1.5 acres of salt marsh wetlands and 2 acres of high-quality upland habitat located at the outlet of Colma Creek to San Francisco Bay. Funding is sought to complete three projects on the Colma Creek Flood Control Channel. One project would install a sheetpile wall on the south side of the Colma Creek Channel from Utah Avenue to Navigable Slough to provide enhanced flood protection at the lower reaches of the Channel. A second project would provide for continued maintenance and monitoring at the habitat mitigation site located along the creek banks near San Francisco Bay. A third project would develop and implement a trash management program aimed at reducing the amount of trash entering the flood control channel from adjacent and upstream communities.	Yes	Ecosystem
San Francisco Bay	San Mateo	Sanchez/Terrace Creek Restoration Project	\$10,000,000	Repair eroded channel, stabilize banks and levees, remove sedimentation, improve catch basins and storm drain pipes in the Laguna Avenue residential area. Improve channel conveyance capacity by increasing the size of the Terrace Creek box culvert from Laguna Avenue to California Drive, by installing a new pump station and force main in the vicinity of Carolan Avenue, and by installing a debris basin upstream from Carolan Avenue. Improve the benefits to the creek eco system	Yes	Water Quality
San Francisco Bay	San Mateo	Streambank Stabilization Using Bio-engineering		Project will demonstrate and improve use of bio-engineering techniques on eroding sections of Pescadero Creek, Tunitas Creek, Purisima Creek, and Lobitos Creek, located in unincorporated San Mateo County. The targeted eroding creek banks are located adjacent to county-maintained roads and within county rights-of-way. These creeks are designated as critical habitat for steelhead trout by the National Marine Fisheries Service. Grant funds will be used to train engineering staff and road crews, design site-specific bioengineered projects, permitting, construction, and monitoring.	Yes	Ecosystem
San Francisco Bay	Santa Clara	Alviso Slough Restoration Project	\$16,500,000	Objectives include: (1) restore Alviso Slough's channel width and habitat to prior to 1983 conditions; (2) improve the community's ability to pursue navigation, public access, and aesthetics to allow for the expansion of boating and other recreational and/or tourism opportunities; (3) maintain 1 percent flood protection in Alviso Slough; (4) reduce mosquito nuisance; and (5) promote the integration of the Alviso Slough Restoration Project with the South Bay Salt Pond (SBSP) Restoration Project (including the SBSP Phase 1 Action at Pond A8) to reestablish the saltwater connection to the Lower Guadalupe River.	Yes	Ecosystem
San Francisco Bay	Santa Clara	Guadalupe River Downtown Flood Protection (from Interstate 880 to Interstate 280)		The Guadalupe River Flood Protection Project extends from Interstate 880 to Interstate 280 in the City of San Jose. The project will provide flood protection to the city's technology and commercial industries and established residential neighborhoods, protect and improve the water quality of the river, preserve and enhance the river's habitat, fish, and wildlife, and provide recreational and open space benefits.	Yes	Ecosystem
San Francisco Bay	Santa Clara	Lower Silver Creek Flood Protection Project	\$50,000,000	The project will enlarge the creek channel and requires the replacement or enlargement of existing bridges crossing the creek. Project will protect nearly 3,800 homes and businesses from a 100-year flood event. Project objectives include: (1) provide flood protection from a 100-year flood event from Coyote Creek to Cunningham Avenue; (2) protect 3,800 homes and businesses from a 100-year flood event; (3) prevent potential future flooding damages from a 100-year flood event; (4) enhance native riparian and environmental habitat; (5) improve creek maintenance; (6) improve water quality; (7) provide increased opportunities for recreation in cooperation with the city and county.	Yes	Ecosystem
San Francisco Bay	Santa Clara	Lower Silver Creek, I-680 to Cunningham (Reach 4-6)	\$65,334,000	This project is part of a flood control project that partners with the Natural Resource Conservation Service (NRCS) to plan, design and construct improvements along approximately 2.3 miles of Lower Silver Creek, from Interstate 680 to Lake Cunningham. This project includes elements that are eligible for reimbursement from the State and Federal governments to accomplish the following objectives: Increase flood protection to 5,400 properties in the surrounding area. Improve vehicle and pedestrian bridges crossing Lower Silver Creek. Allow for onsite mitigation of project impacts, and in some cases enhancement of existing habitat values by increased wetlands and riparian habitat.	Yes	Ecosystem
San Francisco Bay	Santa Clara	Mid-Coyote Project	\$32,000,000	The Mid Coyote Project is located in the central portion of the Coyote Watershed. Its limits extend approximately 6.1 miles between Montague Expressway and I-280, all in the City of San Jose. The project's primary objective is to enhance the creek's conveyance. Additionally, the project will improve fisheries and habitat values and provide appropriate public access opportunities in cooperation with the City of San Jose. This multi-year study will necessitate preparation of a detailed Engineer's Report and an Environmental Impact Report to comply with CEQA (California Public Resources Code § 21000 <i>et seq.</i>).	Yes	Ecosystem
San Francisco Bay	Santa Clara	Open Space Authority Acquisitions		Preservation of wetlands and riparian corridors will also help reduce flood peaks	Yes	Ecosystem
Central Coast	Santa Clara	Restoration of the Upper Pajaro River Floodplain		Develop a plan for restoration of a wildlife corridor that will also preserve undeveloped land valuable for flood attenuation.	Yes	Ecosystem
San Francisco Bay	Santa Clara	San Francisco Bay Shoreline	\$500,000,000	San Francisco Bay Shoreline is a partially-funded (planning phase only) project that provides district coordination with the California Coastal Conservancy, USACE, and other project partners to plan, design, and construct improvements to accomplish the following objectives: provide integrated fluvial and tidal flood protection; restore and/or enhance tidal marsh and related habitats; provide recreational and public access opportunities throughout the tidal floodplain of Santa Clara County; and pursue continued Federal funding.	Yes	Ecosystem
San Francisco Bay	Santa Clara	San Tomas Creek, Quito Road Bridges Replacement	\$558,000	This project funds the town's portion of the replacement cost for two bridges on Quito Road to improve roadway safety and provide adequate stormwater flow capacity in the creek under the bridge.	Yes	Transportation

Table H-C-1. Local Planned IWM Projects in California

Hydrologic Region	County	Project Name	Estimated Cost	Project Description	IWM Project	Type of IWM Project
San Francisco Bay	Santa Clara	South Bay Salt Pond Restoration Project		The goals of the project are to restore and enhance a mix of wetland habitats, provide wildlife-oriented public access and recreation, and provide for flood management in the South Bay.	Yes	Ecosystem
San Francisco Bay	Santa Clara	Sunnyvale and East and West Channels	\$50,300,000	Sunnyvale East and West Channels Improvement project plans, designs, and constructs improvements to approximately 6.4 miles of the Sunnyvale East Channel, from Guadalupe Slough to Interstate 280, and 2.3 miles of the Sunnyvale West Channel, from Guadalupe Slough to Highway 101. This project will provide flood protection to 1,629 parcels; provide environmental enhancement benefits where opportunities exist; provide recreation enhancements where opportunities exist; reduce erosion, sedimentation, and maintenance costs; and protect fish and wildlife habitat.	Yes	Water Quality
San Francisco Bay	Santa Clara	Thompson Creek Stream Stabilization	\$2,500,000	Work along the riparian corridor will enhance habitat by rehabilitating potentially thousands of feet of currently concrete channels back to partial riparian channels.	Yes	Ecosystem
San Francisco Bay	Solano	Alamo Creek Detention Basin	\$5,920,000	This project would include the establishment of a 1,000-acre-foot detention basin upstream from the City of Vacaville. The detention basin would hold 1,000 acre-feet of floodwater when flows exceed 500 cfs. Water would flow in and out of the basin by gravity (i.e., no pumps will be required). The frequency of flooding along Alamo Creek will be reduced from 1 in 3 to 5 years to about 1 in 28 years. Within the detention basin 1 acre of wetland habitat would be created. There would be a reduction in sediment loads and downstream erosion.	Yes	Ecosystem
San Francisco Bay	Solano	Cache Slough/Yolo Bypass Mitigation Area, Solano County, California, Office Report, Sacramento River Bank Protection Project		The Sacramento River Bank Protection Project (SRBPP) is a continuing construction project, authorized by the Flood Control Act of 1960, to provide protection for the existing levees and flood control facilities of the Sacramento River Flood Control Project. The Cache Slough/Yolo Bypass mitigation site is very similar to the Prospect Island study. For this site, a cross levee was constructed to isolate the southern tip of Liberty Island from the northern portion of the island. Two mounds were created in the interior of the island, and then the levees of the isolated tip were breached in two places to restore tidal action to the site. This report evaluated different combinations of the habitat variables (such as topography, planting, and type of levee breach) of the mitigation site to determine the habitat value that could be realized by each combination.	Yes	Ecosystem
San Francisco Bay	Sonoma	Baylands		The project site offers a unique opportunity to restore nearly 1,000 acres of historic tidal marsh habitat that will benefit the Baylands ecosystem and endangered species, and provide Bay Area communities with improved water quality, flood protection and recreation. The Sonoma Land Trust has acquired the property	Yes	Ecosystem
San Joaquin River	Amador	Off-Stream Storage on Consumes River	\$40,000,000	A combination flood control and surface water supply project will provide both a reliable water supply and some flood control for these areas. Rather than on-stream storage and a dam, this project will focus on off-stream storage. High river flows will be reduced as surplus water is diverted and stored for use during dry periods.	Yes	Water Supply
San Joaquin River	Amador	Bear River Reservoir Expansion Project	\$44,000,000	There are three alternatives for this project that are being considered. The alternatives are: (1) raise the Lower Bear Dam by 32 feet, increasing storage capacity by 26,407 acre-feet; (2) replace the Upper Bear Dam with a new dam; or (3) construct a new dam on Cole Creek. While the primary benefit is additional water supply for Amador and Calaveras Counties through increased storage of winter flows, other benefits include flood control, power generation, improved water quality, and cold water releases to improve fisheries.	Yes	Water Supply
San Joaquin River	Calaveras	Off-Stream Storage on Mokelumne and Calaveras Rivers Project Summary	\$155,276	The Off-Stream Storage on Mokelumne River is Phase I and Off-Stream Storage on Calaveras River is Phase II of the project. Phase II may begin upon completion of Phase I or occur simultaneously. This project proposes to store surplus winter flows in the Mokelumne River. High flow discharges will be captured for distribution during the peak water use season. A study will be performed to identify and evaluate site-specific characteristics for potential off-stream storage reservoir locations. The Calaveras River flow is derived from rainfall with almost no contribution from snowmelt. A study will be performed to identify and evaluate locations for off-stream storage reservoirs to take advantage of surplus flows.	Yes	Water Supply
San Joaquin River	Calaveras	Calaveras River Watershed Implementation Plan	\$325,000	Continual overdraft and contamination of this critically overdrafted groundwater basin has created a need to identify new surface water sources. The Watershed Implementation Plan will include a list of management strategies that will address multiple issues in the watershed, including, but not limited to, the need for water quality improvements for drinking water and other beneficial uses, water supply reliability, pollution prevention, and aquatic and terrestrial habitat restoration; and the steps necessary to implement each management strategy.	Yes	Water Supply
San Joaquin River	Calaveras	Cosgrove Creek Project	\$5,000,000	To provide flood control protection along Cosgrove Creek in these areas as well as surface water storage, recreation, environmental restoration, and wastewater recycling, a series of facilities will be constructed. A weir to attenuate the flashy Cosgrove Creek flood flows. The weir will be built across the creek with off-stream storage on New Hogan Dam Road, just south of Valley Springs, putting diverted water to beneficial use. It will reduce peak flows from 3,800 cfs to 3,000 cfs that currently impact over 400 people and over 100 structures, in this 100-year floodplain. A pedestrian/bike path along Cosgrove Creek will also be included with the project to connect the La Contenta area to the Valley Springs area. Recreational fields, including soccer and baseball fields, will also be constructed in the inundation area. The fields will be irrigated with recycled tertiary treated wastewater from CCWD's La Cantata WTP. Vernal pools will be implemented along the creek, contributing to riparian restoration in the area. The addition of vernal pools will diversify the surrounding habitat and species, moderate seasonal flooding during storm events, and like wetlands, remove contaminants from agricultural and urban runoff. Trails coupled with tours and pamphlets will also be implemented as an opportunity to contribute to public education.	Yes	Water Supply
San Joaquin	Calaveras	Upper Mokelumne River Watershed Management Plan	\$1,250,000	A complete watershed management plan is needed that will integrate much of the water quality management plan information into a comprehensive watershed management plan for the Upper Mokelumne River watershed. This document will help direct future watershed restoration and land use policies within the region by prioritizing restoration needs, resource conservation strategies and projects, and adoption of local and regional land use policies designed to provide a comprehensive management plan for the Upper Mokelumne River watershed resources.	Yes	Water Quality

APPENDIX C: LOCAL PLANNED IWM PROJECTS IN CALIFORNIA

Table H-C-1. Local Planned IWM Projects in California

Hydrologic Region	County	Project Name	Estimated Cost	Project Description	IWM Project	Type of IWM Project
San Joaquin River	Contra Costa	Dutch Slough Tidal Marsh Restoration		The Dutch Slough Tidal Marsh restoration project is located at the mouth of Marsh Creek in northeast Contra Costa County. The project will restore 1,266 acres of wetland and upland habitats including tidal marsh, oak woodland, Antioch dune scrub, and shaded riverine riparian. Phase 1 entails excavating approximately 750,000 cubic yards of material on Ironhouse Sanitary District lands immediately west of the Marsh Creek flood control channel to create 100 acres of tidal marsh and riparian habitat at the mouth of Marsh Creek while cost-effectively providing fill material necessary to prepare the 1,166 Dutch Slough site east of Marsh Creek for tidal marsh restoration. Fill material from the Iron House Sanitary District (IHSD) lands will be used to bolster interior levees and elevate subsided areas in preparation for tidal marsh restoration at DWR's Dutch Slough project site. After excavation, the 100-acre IHSD site west of Marsh Creek will be restored to a tidal marsh and riparian habitat zone especially designed to enhance the functionality of the Marsh Creek flood control channel and to biofilter polluted water emanating from the Marsh Creek watershed. The biofiltration wetland will reduce pollutants entering the Dutch Slough site and the Delta and thereby help protect the region's water quality source from degradation by nonpoint run-off.	Yes	Ecosystem
San Joaquin River	Contra Costa	East Antioch Creek Marsh Restoration Project		This project is located in the lower reach of East Antioch Creek between the San Joaquin River and Lake Alhambra. The reservoir rehabilitation will be conducted in two phases and has three identified goals: enhanced marsh expansion and restoration, increased tidal and storm flow capacity, and establishment of community-based conservation through public education and outreach programs.	Yes	Ecosystem
San Joaquin River	Contra Costa	Knightsen Wetland Biofilter	\$2,815,000		Yes	Water Quality
San Joaquin River	Contra Costa	Marsh Creek Drop Fish Passage Improvement	\$146,000		Yes	Ecosystem
San Joaquin River	Fresno	Temperance Flat Dam	\$33,000,000	Increase storage capacity, It would provide 1,200,000 acre-feet of storage and an additional 160,000 acre-feet of usable annual water	Yes	Ecosystem, Water Quality, Water Supply
San Joaquin River	Madera	Ash Slough Arundo Eradication and Sand Removal Project	\$1,922,810	This project involves the eradication of <i>Arundo donax</i> , a non-native invasive bamboo, from critical portions of Ash Slough. Arundo blocks flood flows in the Slough and causes flood hazards, as well as fire hazards, habitat deterioration and excessive evapotranspiration of water that could be used to recharge the overdrafted groundwater. The targeted area has been selected to prevent levee failure and flooding of the City of Chowchilla. As part of this project, the County will also obtain the required permits for sediment removal from the channel. This will provide additional increased flood flow capacity. Arundo utilizes up-to 20 times more water as the native grasses which will be used to re-vegetate the cleared areas. This is water that would otherwise either percolate through the sandy soils to recharge the groundwater, be used for agricultural purposes, or flow down the Eastside Bypass into the San Joaquin River delta.	Yes	Ecosystem
San Joaquin River	Madera	Cottonwood, Dry and Berenda Creek Arundo Eradication and Sand Removal Project	\$2,184,531	There is potential for flooding on Cottonwood Creek, Dry Creek, and Berenda Creek due to invasive plant species, particularly Arundo, overgrown vegetation, and sedimentation which lead to a lack of channel capacity. Without proper capacity, these channels are unable to carry the design flows or flood flows. Objectives of the project include: (1) to improve flood flows in Madera County, specifically on property, both industrial and agricultural, along Cottonwood Creek, Dry Creek and Berenda Creek; (2) to improve Madera County's economic viability by reducing the potential for flood flows; (3) to increase water availability in Madera County by reducing unnecessary evapotranspiration from <i>Arundo Donax</i> infestation; (4) to improve wildlife habitat in Madera County along Cottonwood Creek, Dry Creek and Berenda Creek by eradicating <i>Arundo Donax</i> , an invasive exotic plant, and by removing excess sedimentation; (5) to improve Madera Irrigation District's ability to deliver water to its users without capacity constraints; (6) to provide Madera Irrigation District's growers greater flexibility in managing their water, thus improving overall irrigation efficiency and use; (7) eradicate <i>Arundo Donax</i> from 32 miles of creeks and an area of approximately 300 acres; (8) remove 25,000 tons of sand from 32 miles of creek bottom.	Yes	Ecosystem
San Joaquin River	Madera	Madera Rancho Flood Control and Water Recharge Ponding Basin	\$2,233,950	The project is a ponding basin to be located adjacent to the Madera Canal at the Southeast corner of Avenue 12 and Road 38, east of the Madera Rancho community. The ponding basin will be a large pond which can be used for overflow of floodwaters to prevent the flooding of the Madera Rancho community. Floodwaters will be held in the pond until they percolate into the ground, recharging the overdrafted groundwater in that area. Project Goals are (1) develop a project that will prevent flooding of the Madera Rancho community from 100-year flood events; (2) increase groundwater recharge in the area; and (3) create a 120-acre-foot detention basin for flood control and groundwater recharge.	Yes	Water Supply
San Joaquin River	San Joaquin	Budlisilich Fish Passage Improvements	\$350,000	Flashboard dam which was barrier for fish. SEWD agreed to make improvements as part of Anadromous Fish Program from the Department of Fish and Wildlife. Project is more than 50% complete.	Yes	Ecosystem
San Joaquin River	San Joaquin	Farmington Groundwater Recharge and Seasonal Habitat Program	\$33,500,000	The objective of the Farmington Groundwater Recharge Program is to recharge an average of 35,000 acre-feet of water annually into the Eastern San Joaquin Basin. The recharge method of choice is field-flooding, a practice where a small perimeter levee is built at the parcel, then flooded to a depth of up to 18 inches.	Yes	Water Supply
San Joaquin River	San Joaquin	Gill Creek and Woodbridge Road Flood Control Improvements	\$25,000,000	In 2004, the San Joaquin County Department of Public Works Stormwater Management Division completed the Gill Creek and Woodbridge Road Watersheds Reconnaissance Study (Gill Creek Study) to identify and recommend a project that would provide a 100-year level of protection to structures and a 25-year level of protection to agriculture in the study area. The Gill Creek Study explored three alternatives with the following focuses: channel enlargement, detention, and diversion into the Lower Mokelumne River. The Gill Creek Study identified detention as the preferred alternative, which includes minor channel improvements and the construction of up to 15 detention basins covering a total area of 65 acres spread throughout the watersheds. The preferred alternative also has the potential to provide additional benefits because the channels and detention basins could be used to convey Mokelumne River Water for irrigation and direct recharge. The North San Joaquin Water Conservation District (NSJWCD) owns an existing 30 cfs irrigation system near Tretheway Road extending west along Acampo Road. Improvements to the NSJWCD North Irrigation System or an additional system could serve the conjunctive water management needs of the area. The next step is to perform a feasibility study where the conjunctive use and flood control operation can be explored further and the benefits quantified.	Yes	Water Supply
San Joaquin River	San Joaquin	Lower San Joaquin River Flood Bypass	\$6,125,000	Increase flood conveyance capacity through a constrained reach of the San Joaquin River floodway by acquiring easements and fee title to expand Paradise Cut Bypass. The project will also provide floodplain and riparian habitat for sensitive species including riparian brush rabbit, giant garter snake, Sacramento splittail and juvenile Chinook salmon. The project would reduce flood stage in mainstem San Joaquin River between Vernalis and Stockton and reduce the likelihood of levee failure on the San Joaquin River in Lathrop, Manteca and Stockton areas.	Yes	Water Supply

Table H-C-1. Local Planned IWM Projects in California

Hydrologic Region	County	Project Name	Estimated Cost	Project Description	IWM Project	Type of IWM Project
San Joaquin River	San Joaquin	MORE Water Project	\$412,000,000	The MORE WATER Project could potentially bring 60,000 to 100,000 acre-feet per year to the Basin. The MORE WATER Project is planned to consist of three infrastructure projects: the MORE WATER Duck Creek Reservoir, the MORE WATER Lower Mokelumne Diversions, and the MORE WATER Storage Plus Direct Diversions Project. Lower Mokelumne Diversions: The MORE WATER Project and water right application is also seeking one or more diversions from the lower Mokelumne River. The diversions would be located along the Mokelumne River between Camanche Reservoir and Interstate 5. Herein, up to 620 cfs would be diverted from the river at structural or nonstructural intakes. Diverted water would include only surplus spills from Camanche Reservoir, including flood flows. Under either alternative, water would be transported to the Stockton area via pipeline and Watershed Improvement District canals. Water would then be utilized during the December through June period for direct or in-lieu groundwater recharge. This project would supply an average of up to approximately 43,000 AF/yr during December through June. Water Storage Plus Direct Diversions: Water would be diverted from the southern end of Pardee Reservoir, which is located on the Mokelumne River. Diverted water would be routed into a gravity-feed tunnel/pipeline that would discharge into Duck Creek, which is a tributary to the Calaveras River. In the event that Duck Creek Reservoir is not built, water would be diverted from the Calaveras River downstream of its confluence with Duck Creek. If Duck Creek Reservoir is approved and completed, water diverted from Pardee Reservoir would instead flow into the Duck Creek Reservoir. From that point it would be transported, via pipeline, to agricultural users, groundwater recharge facilities, or other users, or routed into spreading and recharge basins. The project would supply up to an average 67,000 acre-feet per year at a maximum diversion rate of 1,000 cfs. Diversion would occur only during flooding and other high-flow periods, or in anticipation of flooding event. Duck Creek Reservoir: The proposed Duck Creek Reservoir is an approximately 150,000 af capacity off-stream reservoir located in eastern San Joaquin County. The Duck Creek watershed drains into the Calaveras River at the divergence of the Calaveras River and Mormon Slough at Bellota. The Duck Creek dam system would consist of a 6000' earthen main dam at the south end and a series of smaller saddle dams to the west. Water would be diverted at either Pardee Reservoir or Camanche Reservoir for storage in Duck Creek Reservoir. The water right application seeks to divert up to 1,000 cfs to storage and 620 cfs by direct diversion. The total maximum diversion capacity is 1,620 cfs from either Pardee or Camanche Reservoirs. Water diverted from Pardee Reservoir at a rate of 1,620 cfs would require a diversion structure and tunnel. Regulated releases from Bellota would be rediverted to the SEWD water Treatment Plant, Mormon Slough, Potter Creek, Mosher Slough, the Lower Calaveras River, and potentially the proposed Alliance Canal for beneficial use or direct groundwater recharge.	Yes	Water Supply
San Joaquin River	San Joaquin	Re-Operation of New Hogan Reservoir for Flood Control		This combination of options suggests that average annual deliveries to SEWD could be increased by about 25,000 acre-feet by maximizing the available supplies from New Hogan Reservoir. The reservoir is currently operated to save a certain amount of carryover storage each year; however, the carryover requirement limits the amount of storage available in wet years. All of the carryover storage water can be used in each year by farmers who currently use groundwater for irrigation. This in-lieu recharge would result in an increase of groundwater storage that could be used during dry years. Thus, this option effectively moves carryover storage from the reservoir into the groundwater basin. If the reservoir is fully emptied before the rainy season begins, then the reservoir could capture additional flows during wet years.	Yes	Water Supply
San Joaquin River	Stanislaus	Big Bend Floodplain Protection and Restoration Project (Formerly Todd-Venn)	\$2,605,619	The project is located in eastern Stanislaus County approximately 5.5 miles west of the City of Modesto. The project proposes to acquire fee title to and perpetual conservation easements on approximately 167 acres and restore approximately 223 acres of the Tuolumne River floodplain. The enhanced area provides for flood damage reduction by facilitating, enlarging, and returning natural fluvial processes to the floodplain. In addition, the restored riparian corridor and its associated shaded riverine aquatic habitat that extends approximately 2 miles on the south side of the river and 1 mile on the north side of the river will provide enhanced habitat for a variety of fish and wildlife species.	Yes	Ecosystem
San Joaquin River	Stanislaus	Ecosystem Restoration & Floodwater Attenuation Project, San Joaquin River.	\$3,565,496	This project will benefit the State of California by reducing flood risk liability, enhancing the ecosystem and reducing operation and maintenance costs for flood control facilities on the San Joaquin River. The project improve the connection of 1,535 acres of floodplain to the River by breaching existing levees to reduce fish entrapment and improve transient floodwater storage benefits, and reduce ecosystem damage from water standing for excessive periods.	Yes	Ecosystem
San Joaquin River	Stanislaus	Riddle Surface Mine		Calaveras Materials Inc. (CMI) proposes developing and reclaiming an aggregate (sand and gravel) surface mine and materials processing Plant Complex on two discontinuous sites totaling 436 acres in western Stanislaus County. CMI is proposing to reclaim the site to an agricultural reservoir (as a source of irrigation water to surrounding agricultural uses) and/or a flood detention component of the County's flood control system.	Yes	Water Supply
San Joaquin River	Stanislaus	Vierra Unit Restoration	\$1,755,542	The proposed project will involve 511 acres. Levee breaches will be engineered and constructed to minimize erosion, allow water circulation, and minimize fish stranding; wetlands will be restored including grading, water control structures, and a pump and fish screen; riparian woodland will be restored by planting and three years of irrigation and weed control. Federal levee breaching may not occur and USFWS may repair local levees to deal with fish stranding. Project would eliminate the need to repair the local levees and allow area to be opened for flood storage. Wildlife benefit includes conversion of abandoned agricultural fields, now growing exotic weeds, to 200 acres of wetlands and 311 acres of riparian forest.	Yes	Ecosystem
San Joaquin River	Tuolumne	Tuolumne Ditch System Sustainability Project		Development of a Ditch System Sustainability Project (DSSP). The DSSP shall identify the system's values and develop management objectives, tools and maintenance strategies that protect, manage, and enhance the multiple values of the system while improving water delivery. The goal of the project is to sustain the values of the ditch system by developing a comprehensive plan for the management of the system.	Yes	Water Supply
South Coast	Los Angeles	Acquisition of River Channel and Major Tributaries for watershed protection		Acquisition of riparian and floodplain parcels to limit development and preserve habitat function and other watershed benefits.	Yes	Ecosystem
South Coast	Los Angeles	Acton Master Drainage Plan		Phased development of flood control facilities to mitigate flooding in the Acton community. Proposed improvements include four debris basins, five multiple use retention facilities, and low impact water quality enhancement flood control facilities.	Yes	Water Quality
South Coast	Los Angeles	Big Tujunga Wash Mitigation Bank Management	\$2,500,000	Big Tujunga Wash Mitigation Bank project encompassed 100-acre site of willow riparian, oak/sycamore woodland and coastal sage scrub terrain overrun with <i>Arundo</i> and other non-native plant species. Los Angeles County Department of Public Works, through Chambers Group, engaged Natures Image as landscape construction specialists for this restoration project. This public works project demanded economical use of public funds and a light footprint that would preserve thriving native species while eliminating exotic species that interlaced it.	Yes	Ecosystem
South Coast	Los Angeles	JWPCP Marshland Enhancement Project	\$2,637,065	Restoration of vegetation and wildlife habitat value of the 1-acre freshwater Joint Water Pollution Control Plant (JWPCP) marshland that provides stormwater treatment, flood control; project includes educational and recreational facilities.	Yes	Ecosystem

APPENDIX C: LOCAL PLANNED IWM PROJECTS IN CALIFORNIA

Table H-C-1. Local Planned IWM Projects in California

Hydrologic Region	County	Project Name	Estimated Cost	Project Description	IWM Project	Type of IWM Project
South Coast	Los Angeles	Marina Del Rey and Ballona Creek Feasibility Study Sediment Control Management Plan		This study analyzes the area's hydrology, oceanographic processes, water quality, sediments, biological resources, and economics under existing and future conditions with- and without-project implementation.	Yes	Water Quality
South Coast	Los Angeles	Morris Dam Water Supply Enhancement Project	\$13,258,175	Lower the operational pool behind Morris Dam by upgrading the dam's control structures to allow more stormwater to be captured for recharge at downstream spreading grounds	Yes	Water Supply
South Coast	Los Angeles	North Atwater Creek Restoration Project	\$5,600,000	This project will construct water quality physical and structural improvements to an area along the Los Angeles River. The project will restore the creek at the North Atwater Park for stormwater runoff capture and treatment and provide wetlands habitat linkage to the Los Angeles River. Two acres of wetland habitat will be created.	Yes	Ecosystem
South Coast	Los Angeles	San Gabriel Dam Browns Gulch Access Bridge	\$1,900,000	Project will replace the existing bridge across Browns Gulch on the San Gabriel Dam access road. The existing bridge does not meet current standards.	Yes	Transportation
South Coast	Los Angeles	Tujunga Spreading Grounds Enhancement Project	\$24,000,000	Tujunga Spreading Grounds Enhancement Project will improve water supply, water quality, flood control, and open space enhancements, native habitat, and wetlands with passive recreational and educational opportunities.	Yes	Water Supply
South Coast	Los Angeles	Upper Santa Clara River San Francisquito Creek Arundo and Tamarisk Removal Project	\$726,500	Restoration of riparian habitat, increased water quantity, improvement of water quality, and reduction of flood and wildfire hazard through the removal of invasive plant species in the Upper Santa Clara River watershed.	Yes	Ecosystem
South Coast	Orange	Aliso Creek Mainstream Restoration Project	\$25,000,000	Restoration of a rare coastal stream in Orange County that has been subjected to a variety of degradations. This project will recontour, establish better channel gradient (pools and riffles) by stair-step benching, eliminate non-native vegetation, plant natives, and repair an oxbow meander. Would effectively reestablish riparian wildlife corridor in area of concern. Restoration of corridor on larger scale being envisioned. Also, small coastal zone freshwater wetland would be reestablished.	Yes	Ecosystem
South Coast	Orange	Borrego Canyon Wash Stabilization and Restoration Project	\$3,232,000	Borrego Canyon Wash, a tributary of San Diego Creek, drains an area about 5.2 square miles in the upper Newport Bay watershed. It has experienced severe destabilization, including accelerated streambed and bank erosion in recent times. Studies have identified Borrego Wash as the source of approximately half of the sediment discharged to Newport Bay during very wet years. Stream erosion and sedimentation adversely impact water quality beneficial uses of San Diego Creek and Newport Bay, for which a sediment TMDL was adopted in 1998 to address impairment due to excessive sedimentation. To prevent degradation and loss of property and to comply with the sediment TMDL, the County with the aid of the State Water Resources Control Board, completed a feasibility study that provided fluvial modeling and recommended stabilization control measures with conceptual designs. This project will implement the bank stabilization and restoration measures identified in the study.	Yes	Water Quality
South Coast	Orange	Brookhurst Widening Bio-Swale and Synthetic Turf Installation	\$1,600,000	This project will use remnant parcels left over from "full takes" of residential properties to create several linear bioswales, which will collect rain and dry weather flows from the curb line via reverse curb drains and will treat and infiltrate these flows, with overflow being released to the storm drain system following treatment. Additionally, drought-tolerant plants along with one-third acre of synthetic turf will be installed to reduce landscape water use.	Yes	Water Quality
South Coast	Orange	Fletcher Basin Rehabilitation	\$5,000,000	Fletcher Basin is owned by Orange County Flood Control Division (OCFCD) and was formerly used to impede stormwater flow prior to discharge into the Santa Ana River. Currently, the site is used to dispose of excess soils. This project would convert Fletcher Basin into a recharge basin and make improvements to enhance flood control. This project would include: excavating the basin of excess soils; Cleaning, hauling and disposing of soils; Construction of an influent pipeline and inlet/outlet structure into the basin; Construction of a low-flow channel to route nuisance water directly to the Fletcher Channel; Installation of a pump to evacuate the water into Fletcher Channel in the event of a forecasted storm or for cleaning; construction of improvements to Fletcher Channel (concrete vertical walls) downstream from Fletcher Basin.	Yes	Water Supply
South Coast	Orange	Gobernadora Multi-Use Flood Control Detention Basin Facility	\$14,009,085	Proposing to construct the Gobernadora Multipurpose Basin Project (Project) in the South Orange County Watershed Management Area (WMA). The Project will consist of an urban runoff and storm/flood detention basin that will be established as a wetland and riparian habitat, a collection system to capture and divert flows from the constructed wetlands, a pump station and pipeline to connect to the existing Portola Reservoir system. The Basin will be utilized to reduce storm peak flows by flood storage, divert and naturally treat urban runoff and storm flows to 1) reduce downstream erosion and sedimentation, 2) address excessive surface water and groundwater, and 3) improve the water quality in the Gobernadora Creek and San Juan Creek, including the downstream Gobernadora Ecological Restoration Area (GERA).	Yes	Ecosystem
South Coast	Orange	Haster Retarding Basin and Pump Station	\$15,677,100	Haster Retarding Basin and Pump Station (C05B02/C05PS1) has over the years experienced flooding in surrounding areas due to flooding of the existing basin and its inability to handle the 100-year peak storm flow. Analysis of the current basin has shown that the basin can only handle the equivalent of a 5-year storm event and needs to be upgraded. Presently, Haster Retarding Basin serves a dual role as a flood control facility and as a community park (Twin Lakes Freedom Park). Regrading the basin and installation of a new pump station is proposed at the Haster Retarding Basin to eliminate flooding of adjacent areas and provide 100-year flood protection. The proposed pump station is intended to be built at the southwest corner of the basin that will also allow existing park uses to continue. The improvements are intended to eliminate basin flooding while maintaining the existing discharge at the downstream outlet to avoid flooding at the Aspenwood	Yes	Recreation
South Coast	Orange	Miraloma Recharge Basin	\$6,100,000	The project will consist of a recharge basin, which will be excavated over most of the 13-acre site to a depth of roughly 10 feet below existing ground level. Excavation will require removal and disposal of roughly 177,000 cubic yards of soil. The wetted area of the basin will be approximately 11 acres. At an average water depth of 10 feet, the basin will retain roughly 110 acre-feet of water. Given similar geology and close proximity, it is estimated that the percolation capability of the proposed Miraloma Basin will be similar to that of Kraemer Basin. The average annual Kraemer Basin recharge rate of 2.7 feet per day can be used to estimate the recharge rate of the Miraloma Basin. Assuming that the Miraloma Basin is 11 acres, the recharge capacity is estimated to be 11 acres times 2.7 feet per day, or 30 acre-feet/day. On an annual basis, this corresponds to approximately 10,000 acre-feet per year.	Yes	Water Supply

Table H-C-1. Local Planned IWM Projects in California

Hydrologic Region	County	Project Name	Estimated Cost	Project Description	IWM Project	Type of IWM Project
South Coast	Orange	Modjeska Park Parking Detention/Infiltration Facility	\$250,000	The project utilizes an existing 37,000-square-foot parking lot (at Modjeska Park) footprint to install an underground detention/infiltration facility. It consists of the removal of the existing paving surface, excavation, and construction of inlet and outlet Reinforced Concrete structures; the installation of detention/infiltration reinforced-concrete box to capture the stormwater flows from the existing 48-inch reinforced-concrete pipe storm drain flowing southerly along Nutwood Avenue. Stormwater captured will percolate through the basin invert and replenish the groundwater table. It also includes back filling, paving of the existing parking lot, striping, and all work shown on the construction documents.	Yes	Water Supply
South Coast	Orange	Orange County Regional Stormwater Infiltration Program	\$2,000,000	The Project will create a program to develop new regional infiltration facilities and expand existing facilities to capture stormwater runoff from new development and significant redevelopment at various sites throughout Orange County in cases where on-site capture and infiltration is feasible due to site constraints, such as soil conditions, groundwater levels, and soil or groundwater contamination, or has potential to cause or contribute to degradation of groundwater quality	Yes	Water Quality
South Coast	Orange	Santa Margarita Water District Gobernadora Multipurpose Basin Project	\$9,009,085	(1) Urban runoff water quality basin to improve water quality for downstream riparian and wetlands areas; (2) stormwater detention basin to protect downstream wetlands and riparian habitat from erosion and deposition damage; (3) collection system to capture and harvest drainage flows for recycled water use in the existing Portola Reservoir; and (4) regional trail link for overall trail connection from Thomas F. Riley Park to Caspers Wilderness Regional Park.	Yes	Water Quality
South Coast	Orange	Serrano Creek Restoration Plan	\$3,345,212	Serrano Creek, a tributary of San Diego Creek, drains an area of about 2,590 acres in the upper watershed for the Newport Bay. Serrano Creek is in the Newport Bay Watershed. The Newport Bay currently has a sediment TMDL, which is linked in part to the severely eroding banks in Serrano Creek. The banks of Serrano Creek have undergone substantial erosion due to upstream development in recent years. As a result, private property and public trails are at risk, riparian habitat is degraded and open space has been lost. In general, sediment supply to the unimproved stream has been reduced and local runoff has increased both in peak flow and duration. This project will implement bank stabilization and restoration measures for portions of Serrano Creek Reach 2, between Trabuco Road and Portola Parkway, in the City of Lake Forest	Yes	Water Quality
South Coast	Orange	Wood Canyon Emergent Wetland Project	\$204,000	Construction of emergent wetland to enhance habitat, support functions/values, improve water quality, and mitigate channel incision, degradation, and flooding.	Yes	Ecosystem
South Coast	Riverside	Bedford Wash and Temescal Wash Flood Protection Corridor Project	\$6,435,000	The proposed project, in conjunction with surrounding projects, which includes the Dos Lagos Redevelopment Area, represents a model mixed land use approach designed to reclaim a 600-acre area damaged by more than 70 years of silica mining extraction and processing, and general manufacturing activity. The restoration of Bedford Wash and Temescal Wash in combination with the balanced and sustainable approach to the redevelopment of the larger and surrounding area, make this a unique and important project. The remediation, restoration, and preservation of Bedford and Temescal Washes will integrate with surrounding development and ongoing land use planning efforts such as the preservation of 135 acres of open space, linking the 13,000 acre Lake Matthews-Estelle Reserve with restoration activities to Temescal Wash.	Yes	Ecosystem
South Coast	Riverside	Lake Mathews Watershed Master Water Quality Improvement Project Phase II	\$8,000,000	The Drinking Water Quality Management Plan (DWQMP) was completed in the early 1990s through an active partnership between Metropolitan Water District of Southern California, Riverside County FCWCD, and the County of Riverside. The DWQMP investigated the effects that development may have on lake water quality and recommended steps to reduce nonpoint source pollution into Lake Mathews. The Cajalco Creek Dam and Detention Basin were constructed as Phase I of that plan. The Project partners are updating the watershed study based on updated development projections, changing regulatory environment, and state-of-the-art stormwater treatment options. Phase II of the Project will implement the updated recommendations and consist of infiltration basins, extended detention basins, constructed wetlands, and/or other BMPs located strategically along Cajalco Creek and other watershed tributary drainages. The Phase II project components will coordinate with site-specific BMPs to be implemented by new development in the watershed.	Yes	Water Quality
South Coast	Riverside	Master Drainage Plan Enhancement and Implementation in Riverside County	\$205,000,000	This project proposes updates to the District's Master Drainage Plans (MDPs) to reflect current environmental constraints. An update will result in plans that make environmental benefits a priority, identify retrofit opportunities, and utilize regional opportunities for environmental mitigation (such as for TMDLs and Municipal Separate Storm Sewer System permit compliance). This project would construct un-built MDP facilities and retrofit existing flood control facilities in the Anza, Murrieta, and Wildomar Master Plans.	Yes	Ecosystem
South Coast	Riverside	Mockingbird Canyon Restoration	\$4,250,690	Upon further investigation, the best long-term solution appears to be the restoration and stream bank stabilization of Mockingbird Canyon wash. Rather than collecting the debris from these areas every year, this approach focuses on improving reaches of the wash so that they become stable and vegetated over time, hence, transporting less sediment. A field investigation showed that some reaches of the wash are healthy, with good habitat, and with only a few invasive plants. However, some portions of the wash have no vegetation and erode quite heavily. Typically this erosion occurs downstream of private driveway culverts and road crossings. To address this issue, it would be best to work toward restoring the natural wash, which would involve studying the wash as a whole, acquiring right of way, and stabilizing the wash over time.	Yes	Ecosystem
South Coast	Riverside	Phases 2-4 of the Homeland/Romoland Line A Master Drainage Plan	\$16,181,233	Storm drain improvements to (1) provide protection from historic flooding and remove impacted properties from the 100-year floodplain; (2) improve water quality by reducing top soil erosion and pollutants and implementing water quality BMPs; (3) construct drainage basins and remove 500,000 tons of silt and debris that currently flow to the San Jacinto River, thereby assuring higher quality water supply to both Canyon Lake and Lake Elsinore; (4) provide flood control protection for the recently flooded Heritage High School, the fire station, existing Edison substation, businesses and homes (5) recharge the local groundwater basin and create an infiltration area for recharge during low level storm events; (6) create community parks, trails and recreation facilities with drought-resistant landscaping for use by local residents; and (7) facilitate new development and provide permanent jobs in an existing community with high unemployment rates.	Yes	Water Quality
South Coast	Riverside	San Jacinto River Gap Project	\$40,000,000	The project consists of a soft-bottom channel with levees from Sanderson Avenue to a point about 10,000 feet west and then northwest about 6,000 feet to Bridge Street. The channel will have capacity for about a 25-year storm event (31,000 cfs). There will be grade control structures in the channel. Enhanced habitat values will be provided along the channel alignment so it can be used as a corridor to connect the San Jacinto Wildlife Area (SJWA) between the Portrero and Davis Units of the SJWA. This project would prevent flows up to the 25-year storm from breaking out across agricultural land and thereby reduce nutrient loading to storm runoff; it would make an important contribution toward the delisting of Canyon Lake and Lake Elsinore as impaired water bodies; it would provide critical habitat corridor linkage for the Portrero and Davis Units of the SJWA (the SJWA is the No. 1 priority habitat area in Riverside County for the Multispecies Habitat Conservation Plan); it would provide managed habitat for the Los Angeles Pocket Mouse and San Bernardino Kangaroo Rat; and it would respect water rights in the region.	Yes	Ecosystem

Table H-C-1. Local Planned IWM Projects in California

Hydrologic Region	County	Project Name	Estimated Cost	Project Description	IWM Project	Type of IWM Project
South Coast	Riverside	Santa Margarita Region Retrofit Opportunities Study and Program Framework	\$70,495	Study to identify and prioritize existing areas of development that have the potential to cause water quality impairments as a result of urbanization, as well as the development of a program framework to be used to further refine prioritizations based on water quality data analysis. The study would develop a retrofit program that can be implemented through the Upper Santa Margarita Watershed IRWM Region to holistically address water quality issues associated with urban development. This study would support the project (Water Quality Enhancements in Riverside County) to reduce impacts from hydromodification, promote low-impact development, support riparian and aquatic habitat restoration, reduce the discharges of stormwater pollutants, and improve water quality. A focus for candidates will include areas where receiving waters are channelized, hardened, and/or eroded. Candidates will also include the development tributary to these receiving waters and developed areas generating pollutants to environmentally sensitive areas. The retrofit program framework will become part of ongoing stormwater management programs and will serve as a guidance for City and County agencies to effectively implement retrofit projects. The framework will include a menu of project types and establish incentives and partnership programs. Also included will be a tracking mechanism for completed projects and guidance for ongoing evaluation for additional retrofit program candidates.	Yes	Water Quality
South Coast	Riverside	Temescal Creek Floodplain Acquisition	\$10,089,280	Acquisition of floodplain area for flood protection, water conservation, and habitat mitigation banking. Scope of acquisition not fully defined.	Yes	Ecosystem
South Coast	Riverside	Water Quality Enhancements in Riverside County	\$36,500,000	The project aims to reduce impacts from hydromodification, promote low-impact development, support riparian and aquatic habitat restoration, reduce the discharges of stormwater pollutants, and improve water quality. The project builds on the Santa Margarita Region Retrofit Opportunities Study and Program Framework, which involves identification of retrofit opportunities in the Santa Margarita Watershed, including researching, inventorying, and prioritizing areas of existing development (i.e., municipal, industrial, commercial, residential) as candidates for targeted retrofit projects that would reduce the impacts of existing development on the watershed. Specific outreach will occur through the education of homeowners associations (HOAs) that will serve to identify the need and benefits to retrofit existing common landscaped areas. The project also involves hydromodification management, which will guide and support the planning, design, and construction of priority new and significant redevelopment projects (PDPs) within the Upper Santa Margarita Watershed to manage increases in runoff discharge rates and durations.	Yes	Ecosystem
South Coast	San Bernardino	14th Street Storm Water Collection/Integration Project - Upland	\$5,000,000	The project that will provide flood protection by capturing and conveying storm flows to Upland Basin. The additional benefits such as water quality and groundwater recharge through the construction of a detention/retention basin will allow recharge of storm flows into multiple aquifer basins and the decrease of pollutants and silt transportation into downstream sensitive habitat/species areas such as Santa Ana River and Prado Dam. In addition, the proposed project will be capable of mitigating flood damage and loss of life from a potential catastrophic San Antonio Dam failure.	Yes	Water Supply
South Coast	San Bernardino	Antelope Valley Wash Recharge Ponds	\$800,000	Antelope Valley Wash Recharge Ponds could provide groundwater recharge upgradient from City of Hesperia wells. The Hesperia Master Plan of Drainage identifies a 65-acre site for a stormwater detention basin in the Antelope Valley Wash south of Rancho Road. In addition to stormwater detention, the site might be able to accommodate groundwater recharge. The Morongo Basin Pipeline passes by this area and would be the source of recharge water.	Yes	Water Supply
South Coast	San Bernardino	Cactus Basins Number 3 and 3A	\$10,000,000	As part of the proposed I-210 freeway construction project, Caltrans reconstructed Cactus Channel, which intercepts flows to the north of the proposed freeway and discharges into the Cactus Basins, south of the freeway. As a result of the new construction, additional flows will be collected in Cactus Channel and discharged into the Cactus Basins. Cactus Basins, therefore, will need to be enlarged to mitigate the increased flow. The Cactus Basin improvements will consist of three in-series detention basins upstream of Baseline Road. The first phase of construction will consist of improvements to Basins 3 and 3A. Surface water in the area will flow southward from the existing Cactus Channel into Basin No. 3 and from there into Basin No. 3A. Surface water will then flow from Basin No. 3A through an existing reinforced concrete box and pipe structure (located in the southwest corner of Basin No. 3A) under Baseline Road into the existing Rialto Channel and Basins 1 and 2.		
South Coast	San Bernardino	Cactus Basins Number 4 and 5	\$21,600,000	As part of the proposed I-210 freeway construction project, Caltrans reconstructed Cactus Channel, which intercepts flows to the north of the proposed freeway and discharges into the Cactus Basins, south of the freeway. As a result of the new construction, additional flows will be collected in Cactus Channel and discharged into the Cactus Basins. Cactus Basins, therefore, will need to be enlarged to mitigate the increased flow. The Cactus Basin improvements will consist of a series of detention basins upstream of Baseline Road.		
South Coast	San Bernardino	Chino Creek Multipurpose Corridor	\$13,900,000	Creation of a multipurpose green corridor along Chino Creek, including reconfiguring the channel cross section and creating floodplain terraces that will allow flood flows to dissipate energy and decrease velocities. Grade control structures will stop channel bed erosion. Bioengineering methods will be used to stabilize bank. Will revegetate and create 51 acres of new native vegetation, create 3.2 miles of trails, and 2.1 miles of riparian corridor. Subproject areas include: (1) channel restoration/grade control near Central Avenue Bridge; (2) bank stabilization near Kimball Avenue; (3) storm drainage confluence improvement near Chino Creek Park; (4) floodplain park near Magnolia Channel confluence and Chino Hills soccer complex; (5) stream restoration through El Prado Golf Course.	Yes	Ecosystem
South Coast	San Bernardino	Cushenbury Flood Detention Basin	\$2,000,000	The project is proposed to capture runoff from the San Bernardino Mountains in the Lucerne Valley Sub-basin. Currently, large storm flows drain to dry lakebeds in the area that have low percolation rates. Consequently, the majority of water that drains to the lakebeds is lost to evaporation and never enters the basin. The project would divert storm flows to detention basins with high rates of percolation to decrease losses from evaporation.	Yes	Water Supply
South Coast	San Bernardino	Enhanced Stormwater Capture and Recharge along the Santa Ana River Phase I	\$8,000,000	The Enhanced Stormwater Capture and Recharge along the Santa Ana River project consists of enhancing the Cuttle weir diversion structure, improvements to the existing San Bernardino Valley Water Conservation District Canal, construction of Valley District's Plunge Pool Pipeline Phase I, construction of pretreatment facilities, improvements to the existing spreading grounds and construction of new spreading grounds. The project will achieve: (1) increased utilization of stormwater as a water supply, (2) increased storage of imported water during wet years for use during droughts, (3) increased water supply reliability, and (4) improved water quality. The design objectives for these facilities are 80,000 acre-feet in a single year at a maximum instantaneous flow rate of 500 cfs.	Yes	Water Supply

Table H-C-1. Local Planned IWM Projects in California

Hydrologic Region	County	Project Name	Estimated Cost	Project Description	IWM Project	Type of IWM Project
South Coast	San Bernardino	Enhanced Stormwater Capture and Recharge along the Santa Ana River Phase II	\$22,000,000	This portion of the Enhanced Stormwater Capture along the Santa Ana River project involves the construction of Plunge Pool Pipeline Phase II. This section of pipe would be approximately 2 miles long and 8 feet in diameter. The completion of Phase II would enable Valley District/western to convey up to 500 cfs from the Santa Ana River to the Metropolitan Water District of Southern California inland feeder for delivery to Western Municipal Water District and Riverside. This project will provide an average additional yield of 2,700 acre-feet a year (104,000 acre-feet over 39 years).	Yes	Water Supply
South Coast	San Bernardino	Etiwanda/San Sevaine Basins 1 through 4	\$4,000,000	The proposed debris and sedimentation basins will capture runoff from the mountains and foothills north of the City of Rancho Cucamonga, namely from the East Etiwanda Creek and San Sevaine Creek. The proposed study will be performed such that Basins 1 through 4 may be designed and constructed to be permanent flood control facilities and perform in concert with the recently improved Etiwanda Basin 5 to provide 100-year flood protection. Also to be taken into consideration for the calculation of ultimate basin capacities will be burn events. Even though the basin's primary function will be to provide increased flood protection, it also will provide a reliable water supply, preserve and enhance the environment, ensure high-quality water, use rainfall as a resource, and maintain quality of life.	Yes	Water Supply
South Coast	San Bernardino	Inland Empire Utility Agency Basin Recharge Project	\$38,000,000	Inland Empire Utilities Agency is lead agency for a proposal to use 19 existing basins within the Chino Basin to recharge stormwater and imported water.	Yes	Water Supply
South Coast	San Bernardino	Lytle Cajon Basin	\$1,000,000	The debris and sedimentation basin currently captures runoff from the mountains and foothills north of the City of San Bernardino, namely from Lytle Creek. The purpose of this proposed study is to determine the characteristics and extent of the drainage area as sediments are washed toward the basins downstream gatehouse and to explore methods of operation or construction concepts that would more fully utilize the East Branch Lytle Creek Channel, as by design, it could certainly take more frequent flows and relieve the pressure from Lytle-Cajon Channel. For the past several years, the invert of Lytle-Cajon Channel has received all of the debris from the watershed drainage areas as it travels down this channel to its confluence with Warm Creek. This debris received by the Lytle-Cajon Channel has caused severe erosion and damage to the channel invert, with many areas exposed to the second layer of reinforcement bar. Even though the basins primary function will in fact be to provide increased flood protection, it will also provide a reliable water supply, preserve and enhance the environment, ensure high water quality, use rainfall as a resource, and maintain quality of life.	Yes	Water Supply
South Coast	San Bernardino	Mission Zanja Creek Feasibility Study	\$1,000,000	The objective of the study will be to build upon the previous watershed planning efforts and provide viable alternatives, implement water quality, and water supply aspects on a regional scale for the next generation. In addition, the study will provide avenues for responsible preservation and enhancement of the practical and sentimental values of the Zanja to the Native Gauchama Indians and its place in the National Register of Historical Places through potential partnerships in recreational and educational uses. The goals of the study focus on solving the flooding issues, implementing economic and environmentally viable alternatives for the long term vision.	Yes	Water Quality
South Coast	San Bernardino	Turner Basin Improvements	\$13,453,000	The project area includes flood control channels, water conservation basins and regional park facilities. The property is located between I-10 Freeway and 4th Street and it is bifurcated by Archibald Avenue. Archibald Avenue, a major collector street, is one of the main transportation corridors into Rancho Cucamonga from I-10 and Ontario and is essentially a "Gateway" into Rancho Cucamonga. In 2003 Inland Empire Utilities Agency with Chino Basin Watermaster constructed water conservation facility improvements including expansion of the stormwater retention basins to capture and conserve additional stormwater including improvements on the western area of the Turner basin site. The Turner Basins Improvements will be a multiple beneficial use project that maximized the use of the Turner basin site by constructing stormwater capture basins, groundwater recharge basins, wetlands, native landscaping, road way improvements, recreation open spaces, educational trails about conservation and local history, and flood control improvements.	Yes	Water Supply
South Coast	San Bernardino	West Fontana Basin	\$10,000,000	The proposed project is the basin portion of an overall project that will include the expansion and lining of the existing West Fontana channel and construction of a flow-by basin along the alignment and at an existing quarry pit (near Tokay Avenue). The existing channel is currently 12 feet wide and unlined. The design of the channel improvements, including the flow-by basin has been selected from eight alternatives submitted by the County to the Regional Water Quality Control Board. The alternative selected would convey the 100-year flow of 3,515 cfs safely to Banana Basin and provide the adequate freeboard using the San Bernardino County Flood Control District (FCD) right-of-way. Even though the basins primary function will in fact be to provide increased flood protection, it will also provide a reliable water supply, preserve and enhance the environment, ensure high water quality, use rainfall as a resource, and maintain quality of life.	Yes	Water Supply
South Coast	San Diego	Campo Creek Watershed Groundwater management Plan	\$1,000,000	This project would design and install an approved streambed, bank and habitat stabilization and enhancement in a section of the valley and creekbed where extreme erosion has occurred. This would enhance groundwater recharge; greatly reduce downstream erosion and sediment transport, revitalize the local valley, creekbed and habitat.	Yes	Ecosystem

Table H-C-1. Local Planned IWM Projects in California

Hydrologic Region	County	Project Name	Estimated Cost	Project Description	IWM Project	Type of IWM Project
South Coast	San Diego	County of San Diego Chollas Creek Runoff Reduction and Groundwater Recharge Project	\$1,600,000	The Chollas Creek Runoff Reduction and Groundwater Recharge Project is a project to reduce runoff from five County of San Diego facilities in the Chollas Creek subwatershed of the Pueblo San Diego hydrological unit. These facilities occupy sites that are highly impervious and could be retrofitted with low-impact development (LID) components to reduce runoff and promote infiltration. Since each of the properties has been developed to facilitate public access, and each site consists, in part, of significantly sized impervious parking lots, one component of this project will be to use what has been learned to date about porous pavements in the Porous Pavement and Model Municipal Operations Demonstration Project as the basis for retrofitting portions of the parking lots with porous pavement over stone reservoirs to capture runoff from the parking lots, and, where feasible, to also capture runoff from roof drains. The second major component of the project includes the application of other stormwater BMPs at the five County facilities that demonstrate vegetated roof systems and capture/reuse technologies, as well as landscape elements such as rain gardens. With an average annual rainfall of only about 10 inches per year, greater attention must be given capturing and reusing as much rainfall as possible. This project will demonstrate techniques to capture rainfall and to infiltrate or return to the atmosphere rainwater that cannot be captured and reused. The purpose of this retrofitting is to prevent runoff from these impervious surfaces from transporting pollutants -- particularly copper, lead, and zinc that have been directly deposited on the properties through atmospheric deposition and through the storm drain system -- to Chollas Creek, which has been listed as impaired by copper, lead, and zinc and is the subject of a total maximum daily load (TMDL) currently proposed for approval by the San Diego Regional Water Quality Control Board.	Yes	Water Supply
South Coast	San Diego	De Luz Road and Channel Repairs	\$975,000	The proposed project entails roadway and embankment repair, fence replacement, traffic striping, and restoration of two spillways. A temporary asphalt concrete patch will be removed and replaced with an asphalt concrete pavement section covering approximately 1,500 square feet of existing roadbed near the Santa Margarita River Bridge for De Luz Road. Damaged asphalt concrete dikes will be removed and replaced over a distance of approximately 450 feet. The road fill prism on the south bridge approach will be armored with installation of a riprap slope on the upstream and downstream faces. To protect the road from future runoff damage, this riprap slope will extend 12 feet underground or to the bedrock in the area, whichever is reached first.	Yes	Transportation
South Coast	San Diego	Foothill/Bobier upscale - Vista	\$2,127,587	This project has been separated from the annual Street Rehabilitation and Maintenance (CIP #8037) due to the scope of the work. The project will reconstruct the portion of Foothill Drive between Beverly Drive and Vale Terrace. Four segments, which include Beverly Drive to Warmlands Avenue (3), Warmlands Avenue to north of Troy Place (4), north of Troy Place to south of Vine Circle (5), and south of Vine Circle to Vale Terrace (6), will be reconstructed to 24 feet wide with an asphalt concrete dike on each side to control drainage. Segment No. 5 (north of Troy Place to south of Vine Circle) will be reconstructed as a semi-rural arterial and will be 28 feet wide with a concrete curb and gutter. A graded disintegrated granite walkway for pedestrians will be installed on the east side of Foothill Drive between Vale Terrace Drive and north of Troy Place to serve the new Rancho Minerva Middle School.	Yes	Transportation
South Coast	San Diego	Forester Creek Improvement Project		This funding is being requested to widen the Forester Creek channel and to restore ecosystem function to the last viable stretch of Forester Creek before it enters the San Diego River. In its current condition the creek in Santee has a channel width of 75 to 100 feet and can carry only a 10-year flow between its banks. The newly widened channel is designed to achieve 100-year flood capacity and will have a top width varying from 181 feet to 358 feet. Exotic plant species will be removed from the project area. Approximately 17 acres of native riparian vegetation will be created through a planting and plant establishment program.	Yes	Ecosystem
South Coast	San Diego	Implementing Improvements to the Rose Creek Watershed: Controlling Invasive Exotic Species	\$742,500	This IRWMP proposal will support the removal and subsequent restoration of approximately 68 acres of invasive exotic plants in the Rose Creek Watershed in a manner to maximize improvements in water quality, biological diversity, enhanced public safety, reduced fire risk and enhanced community connections. The final acres of removal/restoration area will depend on the amount of funds awarded as removal costs vary depending on the species and difficulty of terrain which varies throughout the watershed.	Yes	Ecosystem
South Coast	San Diego	La Jolla Shores Ocean Protection Project	\$2,192,000	(1) Irrigation Runoff Reduction - Irrigation runoff from the western portion of the University of California, San Diego (UCSD) and Scripps Institution of Oceanography (SIO) campus drains directly into Area of Special Biological Significance (ASBS) No. 31. Portions of the irrigation water distribution system will be improved to reduce water use and prevent irrigation water from discharging into the stormwater conveyance system. Improvements will include installing system controllers to automatically adjust irrigation times in response to changing daily evapotranspiration values and optimize the watering of poor drainage sites, slopes, and heavy soil areas. (2) Pollutant Source Reduction - UCSD and the Urban Corps of San Diego (Urban Corps) will partner to implement BMPs throughout the La Jolla Shores watershed to reduce or eliminate the discharge of pollutants into the ocean including non-stormwater discharges. (3) Kellogg Park Green Lot LID - This low-impact development component will remove the western half of the asphalt paving of the Kellogg Park parking lot in the Peñasquitos Hydrologic Unit and replace it with porous concrete. The porous paving will allow urban runoff to infiltrate into the ground instead of discharging directly to the storm drain system and adjacent La Jolla Shores beach and ASBS. Educational outreach to the surrounding community will also be conducted regarding the benefits of the project in preserving and improving the quality of urban runoff and ultimately the nearby La Jolla Shores Beach.	Yes	Water Quality
South Coast	San Diego	Loma Alta Lagoon Acquisition and Restoration		A restoration plan will be developed to provide guidance and designs for restoration of the five parcels. By enlarging the lagoon in the area of these five parcels, a bottleneck would be removed allowing water to fan out and reduce flooding upstream from the lagoon. Implementation of the restoration plan will include acquiring all necessary permits and installation of native plants. Public access to the restored area would be allowed, but in a confined area of the project. A kiosk and parking area would be designed into the plan, allowing access to residents and visitors. This would provide an opportunity for students to tour the site and possibly be involved in the actual project restoration.	Yes	Ecosystem
South Coast	San Diego	Olive/Maryland Upsize - Vista	\$935,912	This project provides for design and construction to widen pavement, install sidewalks and storm drain improvements, acquire right-of-way, Class III bike lane, and parking. This project includes sidewalks on the east side of the street. Tasks to complete the project include: detailed design and construct the project. Phase I was completed in September 2006, which constructed improvements from Olive Avenue to Rose Drive. Phase II will construct improvements from Rose Drive to Highland Drive including Maryland Court, Rose Court, and a portion of Olive Avenue.	Yes	Transportation
South Coast	San Diego	San Marcos Creek Floodway Improvement Project	\$12,158,258	The objective of this project is to contain the 100-year storm flows within the channelized area of San Marcos Creek so that disadvantaged areas adjacent to the creek are removed from the floodplain. The project would restore native riparian vegetation within the regraded channel to increase nutrient uptake and reduce sediment flowing downstream into Lake San Marcos.	Yes	Ecosystem

Table H-C-1. Local Planned IWM Projects in California

Hydrologic Region	County	Project Name	Estimated Cost	Project Description	IWM Project	Type of IWM Project
South Coast	San Diego	Santa Maria Creek Flood Protection Corridor	\$65,000,000	A significant, far-reaching plan to preserve and protect from development a number of 1,000-acre plus ranches around the town site. There is pressure to develop in this rare coastal upland grassland, much of which constitutes a riparian/seasonal wetland area. This project promises to set aside a large area, and then rebuild the creek and the native habitat to slow the waters, slow the erosion, and restore the riparian zones on Santa Maria Creek.	Yes	Ecosystem
South Coast	San Diego	Stabilization and Restoration of Bonita Canyon Creek - a Tributary of the Sweetwater River		The project will accomplish slope stabilization, channel restoration, and revegetation of degraded earthen channel with native riparian species.	Yes	Ecosystem
South Coast	San Diego	Stabilization and Restoration of Long Canyon Creek - a Tributary of the Sweetwater River		The project will accomplish stabilization of eroded slopes, channel restoration, and revegetation of the degraded earthen channel with native riparian species.	Yes	Ecosystem
South Coast	San Diego	Tijuana River Valley Invasive Plant Control Program - Phase 4	\$2,978,000	The proposed project will control exotic plants (particularly giant reed (<i>Arundo donax</i>), tamarisk (<i>Tamarix</i> spp.) and castor bean (<i>Ricinus communis</i>) on 1,100 acres of prime estuarine and riparian habitats in the Tijuana River Valley.	Yes	Ecosystem
South Coast	Ventura	Lower Ventura River Habitat Restoration and Enhancement	\$5,000,000	The Lower Ventura River Habitat Restoration project involves acquiring land and conservation easements in the 100-year floodplain along lower reaches of the river. This project will also include habitat restoration and enhancement along the lower 5 miles of the Ventura River up to and including the estuary.	Yes	Ecosystem
South Coast	Ventura	Lower Calleguas Creek - Integrated Watershed Protection - Projects	\$345,000,000	Provide a sound framework and guidelines for flood control, life/property protection, sediment management, and a holistic approach in integrated watershed planning and environmental resources management within the watershed. The multiple purpose study encompassed issues related to habitat preservation, land development, erosion/sedimentation, BMPs, flood control, groundwater protection and recharge enhancement, water supply, water quality, and potential sources of funding for recommended projects, among others.	Yes	Ecosystem
South Coast	Ventura	Natural Floodplain Protection Program/Santa Clara Floodplain Conservation Project	\$5,000,000	Implementation of the Natural Floodplain Protection Program will preserve a critical section of the remaining undeveloped 500-year floodplain in the Santa Clara River Watershed by acquiring property easements to preclude development. Acquisition of these easements will provide downstream flood benefits by allowing flooding to occur upstream in the watershed.	Yes	Ecosystem
South Coast	Ventura	Ojai Meadows preserve Habitat Restoration and Flood Control Plan	\$500,000	At its Ojai Meadows Preserve, the Ojai Valley Land Conservancy seeks \$500,000 to complete the final phase of an ecological restoration project to relieve flooding on the adjacent highway and high school, to filter runoff and recharge groundwater, and to restore wetland, riparian, and upland habitat for returning wildlife and the use and enjoyment of visitors.	Yes	Water Supply
South Coast	Ventura	Rice Creek Realignment and Enhancement	\$500,000	This project on the Ventura River Preserve of the Ojai Valley Land Conservancy would return Rice Creek to its approximate historical location from its current channelized location. The project will add more than 1,500 feet of new riparian habitat on the site and reestablish floodplain connections and buffer habitats. This project will help shade the water to keep it cool and reduce algal blooms, reduce sedimentation in Rice Creek and the Ventura River via erosion control, increase the numbers and variety of wildlife, and act as infiltration areas to support water storage for the Ventura River.	Yes	Ecosystem
South Coast	Ventura	Virginia Colony Flood Storage and Habitat Enhancement Project	\$6,015,015	Project would acquire easements on seven properties, to construct a detention basin on the north side of the railroad tracks, to do mitigation planning, and to cover part of the mitigation costs. Future phases include a detention basin on the south side of the railroad tracks, channel widening, and overflow channel. These facilities would be located on, adjacent to, or downstream from the parcels that could be acquired. Water quality would be improved by trapping sediments. Water storage will add to recharge of the groundwater aquifer. The project will provide passive public recreation.	Yes	Water Quality

This page intentionally left blank.

Appendix D: USACE Planned/Proposed IWM Projects in California

APPENDIX D: USACE PLANNED/PROPOSED IWM PROJECTS IN CALIFORNIA

This page intentionally left blank.

Table H-D-1. USACE Planned/Proposed IWM Projects in California

Hydrologic Region	USACE District	Counties	USACE Project Name	USACE Project Cost Share (Federal Cost Share)	Project Description	IWM Project	Type of IWM	Project Funded in FY 2012	Funding Appropriated in FY 2012 (\$ millions)
San Francisco Bay	San Francisco	Alameda	Estudillo Canal, California	\$38,000,000	The study area is located within the city of San Leandro, California, about 15 miles southeast of San Francisco. The watershed drains into San Francisco Bay, with a drainage area of approximately 10 square miles. A substantial number of properties within this densely populated area are designated as being in a Federal Emergency Management Agency (FEMA) Floodplain. The study will evaluate potential flood damage reduction alternatives in a highly developed area.	Yes	Ecosystem, Recreation, Flood Risk Management	No	
San Francisco Bay	Sacramento	Contra Costa	Grayson and Murderer's Creeks, Walnut Creek Basin, California	\$2,452,000	The Grayson and Murderer's creeks feasibility study is investigating flood damage reduction, ecosystem restoration and recreation in the Grayson Creek sub-watershed of the Walnut Creek watershed. The study is considering detention basins, channel modifications, levee and floodwall improvements, and other structural and nonstructural measures for flood damage reduction on Grayson Creek and its tributaries. The ecosystem restoration and recreation measures that are being considered would be secondary to the flood damage reduction objective.	Yes	Ecosystem, Recreation, Flood Risk Management	No	
San Francisco Bay	Sacramento	Contra Costa	Lower Walnut Creek General Reevaluation	\$3,360,000	The lower Walnut Creek General Reevaluation is a multi-objective project to create a more sustainable facility that maintains or improves the level of flood protection while preserving sensitive habitat for rare and endangered species.	Yes	Flood Risk Management, Ecosystem Restoration	No	
San Francisco Bay	Sacramento	Sacramento, Yolo, Solano, Contra Costa, San Joaquin	Sac-San Joaquin Delta Islands and Levees, California	\$6,000,000	Develop a road map to identify water and related land resources problems and opportunities; utilize a watershed approach for the majority of the study area (740,000 acres), possibly incorporating a feasibility level of study for the sponsor's greatest area of concern.	Yes	Ecosystem Restoration, Flood Risk Management	Yes	\$971,000
San Francisco Bay	San Francisco	Contra Costa	Wildcat and San Pablo Creeks, California	\$5,000,000	The study area is located in the cities of Richmond and San Pablo, California. Reach 1 of the authorized flood risk management project was completed by USACE in 1995, and is located in the city of Richmond. Reach 2, within the city of San Pablo, was not constructed at the time because of concerns about economic justification, and it was subsequently placed in the deferred status. Recent flow/frequency projections, and new FEMA floodplains, as well as a 905b reconnaissance report show that Reach 2 may be economically justified at this time.	Yes	Ecosystem, Water Quality	No	
North Coast	San Francisco	Del Norte	Crescent City Harbor		Ongoing repair and dredging of Crescent City Harbor facilities.	Yes	Recreation	No	
Sacramento River	Sacramento	Glenn	Sacramento River, Glenn-Colusa Irrigation District, California	\$23,380,000	Stabilizing the river level on the Sacramento River near Hamilton City is an essential component of the Glenn-Colusa Irrigation District Fish Screen Improvement Project. Stabilization will preserve the agricultural irrigation supplies to roughly 1,200 farm families, while complying with the Federal Endangered Species Act and contributing to the restoration of anadromous fish species in the Sacramento River. Improvement will ensure the continued operation of the pumping facility.	Yes	Agriculture, Water Quality, Water Supply	No	
South Coast	Los Angeles	Los Angeles	Los Angeles County Drainage Area Whittier Narrows Water Conservation, California	\$1,200,000	Whittier Narrows Water Conservation project will expand water conservation pool behind Whittier Narrows Dam from 2,500 acre-feet to 3,500 acre-feet. Projected partners are Los Angeles County Department of Public Works, Water Replenishment District of Southern California, and USACE. The \$1.2 million USACE cost share total figure reflects Federal appropriations to date (over several years, the last one being in 2010).	Yes	Water Supply	No	ZERO in construction, but LACDA did receive funding as an overall line item of \$4,933,170 in O&M
North Coast	San Francisco	Mendocino	Coyote Valley Dam, California	\$150,000,000	The study area is located in northern California on the east fork of the Russian River at Coyote Valley, near the city of Ukiah. The Russian River drains an area of 1,485 square miles. Approximately two-thirds of this area is in Sonoma County, with the remainder in Mendocino County. The existing USACE project, Coyote Valley Dam, which was completed in 1957, consists of an earth-filled dam 160 feet high and 3,560 feet long, with a reservoir storage capacity of 122,000 acre-feet. The authorized project included sediment, flood risk management, and domestic and agricultural water supply pools with a total storage capacity of 199,000 acre-feet. An additional water supply portion, which included additional storage for about 77,000 acre feet, was placed in the deferred category as local interest considered it unnecessary at that time. Since then, increased development has created a need for additional water supplies.	Yes	Agriculture, Water Quality, Water Supply	No	

APPENDIX D: USACE PLANNED/PROPOSED IWM PROJECTS IN CALIFORNIA

Table H-D-1. USACE Planned/Proposed IWM Projects in California

Hydrologic Region	USACE District	Counties	USACE Project Name	USACE Project Cost Share (Federal Cost Share)	Project Description	IWM Project	Type of IWM	Project Funded in FY 2012	Funding Appropriated in FY 2012 (\$ millions)
San Francisco Bay	Sacramento	Napa	Napa River, California	\$283,093,000	The Napa River Flood Protection Project will provide 100-year flood protection to the City of Napa, protecting business and residences, and improving water quality, creating urban wetlands, enhancing wildlife habitats, and creating over 730 acres of tidal wetlands.	Yes	Flood Risk Management, Recreation	Yes	\$1,300,000
San Francisco Bay	San Francisco	Napa	St. Helena Comprehensive Flood Protection Project, California	\$30,000,000	The project is located within the city of St. Helena along the Napa River. Major floods have occurred on the Napa River in this area in 1986, 1995, 1997, and 2006. Combined, these floods cost the community over \$95.6 million in property damages. The project will restore habitat of the natural floodplain terraces, including riparian and aquatic habitat. Also, the project will restore native plant and tree communities through revegetation efforts and is needed to provide 100-year flood protection to the area. The Water Resources Development Act (WRDA) of 2007 authorized the construction of the project substantially in accordance with the California State Environmental Impact Report, as opposed to a Chief's Report.	Yes	Ecosystem, Water Quality	No	
South Coast	Los Angeles	Orange	San Juan Creek, South Orange County, California	\$3,265,000	The feasibility study will investigate flood risk management alternatives and other related purposes along the lower portions of San Juan, Trabuco, and Oso creeks.	Yes	Ecosystem	No	
South Coast	Los Angeles	Orange	Santa Ana River Basin, California	\$2,102,400,000	The Santa Ana River Mainstem Project is designed to provide flood protection to the growing urban communities in Orange, Riverside, and San Bernardino counties. The proposed improvements to the system cover 75 miles, from the headwater of Santa Ana River east of the city of San Bernardino to the mouth of the river at the Pacific Ocean, between the cities of Newport Beach and Huntington Beach.	Yes	Ecosystem, Recreation, Water Quality	Yes	\$3,425,400 in O&M; the MAINSTEM project received \$23,093,000 in Construction
South Coast	Los Angeles	Orange	Surfside - Sunset - Newport Beach, California	\$75,100,000	This project supports periodic beach nourishment in Surfside, Sunset, and Newport Beach.	Yes	Recreation	No	
South Coast	Los Angeles	Orange	Westminster (East Garden Grove) Watershed, California	\$6,260,000	A comprehensive study of the Westminster Watershed, including the East Garden Grove-Wintersburg Channel and the Bolsa Chica Flood Control Channel to develop a rehabilitation plan that will consider flood risk management, ecosystem restoration, recreation, and water quality solutions. This project is consistent with the USACE flood risk management and environmental restoration missions in Southern California.	Yes	Ecosystem, Recreation, Water Quality	No	
South Coast	Los Angeles	Orange, San Diego	California Coastal Sediment Master Plan, California	\$7,100,000	This project will develop a comprehensive master plan for the conservation, restoration, and preservation of the valuable sediment resources along the coast of California to reduce shoreline erosion and coastal storm damages, provide for environmental restoration and protection, increase natural sediment supply to the coast, restore and preserve beaches, improve water quality along coastal beaches, and optimize the beneficial use of material dredged from ports, harbors, and other opportunistic sediment sources.	Yes	Ecosystem, Water Quality	Yes	\$861,000
South Coast	Los Angeles	Riverside	Murrieta Creek, California	\$122,200,000	The project is a multi-purpose flood risk management, environmental restoration and recreation project along 7.5 miles of Murrieta Creek. The major project features include: <ul style="list-style-type: none"> • Channel widening and deepening • Environmental corridor along the length of the project • Multipurpose detention basin • Wetland restoration area • Recreation park • Three bridge replacements 	Yes	Ecosystem, Recreation, Water Quality	No	
South Coast	Los Angeles	Riverside	Prado Basin Water Supply, California	\$1,465,000	Feasibility Report for the Proposed Prado Basin Water Supply. The project will result in increasing the water storage pool during the flood season from an elevation of 494 feet to an elevation of 498 feet within Prado Basin. This will enable increased water recharge at the Orange County Water District's recharge facilities downstream of Prado Dam.	Yes	Water Quality, Water Supply	No	

Table H-D-1. USACE Planned/Proposed IWM Projects in California

Hydrologic Region	USACE District	Counties	USACE Project Name	USACE Project Cost Share (Federal Cost Share)	Project Description	IWM Project	Type of IWM	Project Funded in FY 2012	Funding Appropriated in FY 2012 (\$ millions)
Sacramento River	Sacramento	Sacramento, Yolo, Solano, Contra Costa, San Joaquin	CALFED Levee Stability Program, California	\$196,000,000	A report that identified and prioritized potential levee stability projects in the Delta. Through the CALFED Levee Stability Program, the USACE is authorized to participate in flood risk improvements to Delta and Suisun Marsh levees with the potential for incorporation of ecosystem restoration elements. Additionally, the authorization has provided the opportunity to develop Emergency Response Planning tools in partnership with the California DWR.	Yes	Ecosystem Restoration, Flood Risk Management	No	
South Coast	Los Angeles	San Diego	Imperial Beach, Silver Strand Shoreline, California	\$84,410,000	The Imperial Beach shoreline has been heavily impacted by erosion, which is caused by a lack of sediment transfer from the Tijuana River and San Diego Harbor due to dam and jetty impediments. The sources of this erosion are a Federal jetty protecting the San Diego Harbor and three dams on the Tijuana River, two of which are Federal. Funding would provide the Federal portion for the placement of beach sand to protect private and public property and preserve recreational opportunities.	Yes	Recreation, Water Quality	No	
South Coast	Los Angeles	San Diego	San Luis Rey River, California	\$76,900,000	The Project includes the following: <ul style="list-style-type: none"> • Double levee, 5.4 miles long • Stone protected channel with a soft bottom • 1,330 feet of parapet walls at the ocean on the north and south levees • Six interior drainage ponds • 5-mile bike trail • 247 acres of conservation lands 	Yes	Recreation, Water Quality	Yes	\$1,300,000
South Coast	Los Angeles	San Diego	Solana Beach, California	\$10,096,000	A study of shoreline erosion along 8 miles of San Diego County coastline. Bluff erosion is extremely dangerous to the public, considering that portions of the bluffs have collapsed and threaten private property.	Yes	Recreation	Yes	\$300,000
San Francisco Bay	San Francisco	San Mateo, Santa Clara	San Francisquito Creek, California	\$53,000,000	The study area is located in the northern portion of Santa Clara County, and in southern San Mateo County, in northern California, about 22 miles south of San Francisco. San Francisquito Creek has an inadequate carrying capacity due to vegetation, sedimentation, land subsidence, levee settlement, and erosion. Flooding from the creek affects the cities of Menlo Park and East Palo Alto in San Mateo County, and Palo Alto in Santa Clara County. San Francisquito Creek starts at the base of Searsville Dam at Stanford University and flows into the San Francisco Bay about 2.5 miles south of the Dumbarton Bridge. As a result of record rainfall in February 1998, San Francisquito Creek overtopped its banks, affecting approximately 1,700 residential and commercial structures and causing more than \$26.6 million in property damages. The study will evaluate potential improvement plans to help alleviate flooding problems, as well as address environmental degradation of the watershed.	Yes	Ecosystem	No	
Central Coast	Los Angeles	Santa Barbara	Lower Mission Creek Flood Control and Restoration Project	\$90,229,000	The purpose of this project is to improve the flood flow conveyance and habitat for aquatic species of Mission Creek through the downtown area of the City of Santa Barbara.	Yes	Ecosystem	No	
San Francisco Bay	San Francisco (Design and Construct), Sacramento (Investigation)	Santa Clara	Coyote and Berryessa Creeks, California	\$18,000,000	The purpose of this project is to provide flood protection for Silicon Valley's high-tech, commercial industries, and residential areas with potential damages from a 1 percent flood exceeding \$202 million. Alternatives will be selected in an environmentally sensitive way that is acceptable to the local community and that addresses sedimentation and water quality issues.	Yes	Flood Risk Management, Water Quality	Yes	\$276,000

APPENDIX D: USACE PLANNED/PROPOSED IWM PROJECTS IN CALIFORNIA

Table H-D-1. USACE Planned/Proposed IWM Projects in California

Hydrologic Region	USACE District	Counties	USACE Project Name	USACE Project Cost Share (Federal Cost Share)	Project Description	IWM Project	Type of IWM	Project Funded in FY 2012	Funding Appropriated in FY 2012 (\$ millions)
San Francisco Bay	San Francisco	Santa Clara	South San Francisco Shoreline, California	\$500,000,000	The study area is located along the shoreline of South San Francisco Bay, California, extending from the city of Palo Alto to city of San Leandro. A substantial portion of the Bay shoreline consists of levees that provide protection from tidal flooding for an extensive residential, commercial, and industrial area. These levees are part of an extensive system of former salt manufacturing ponds, which can be restored to vital wetland habitat that would support multiple threatened and endangered species. The last estimated value of the urban development in low-lying areas along the Bay shoreline is approximately \$5.5 billion (at September 1998 price levels). The study will reexamine tidal and fluvial flooding problems, and restoration opportunities, and potential alternative solutions.	Yes	Ecosystem, Recreation, Water Quality	Yes	\$353,000
Central Coast	San Francisco	Santa Cruz	Pajaro River at Watsonville, California	\$220,000,000	This originally authorized flood control project will address flooding from the existing Pajaro River and Salsipuedes Creek project (1949) and from Corralitos Creek. The study objective is to develop a plan that provides a 100-year level of protection on both the mainstem and tributaries. This project is limited to benefits based on the Net Economic Development, although environmental sustainability will be considered because the Pajaro River contains endangered fish species.	Yes	Ecosystem	No	
Tulare Lake	Sacramento	Tulare	San Joaquin River Basin, Frazier Creek, California	\$1,500,000	The purpose of this study is to determine Federal interest in providing flood risk management, environmental restoration, recreation, and water quality improvements on Frazier and Strathmore creeks.	Yes	Ecosystem, Water Quality, Flood Risk Management, Recreation	No	
Tulare Lake	Sacramento	Tulare	Success Dam, Tule River, California (Dam Safety)	\$500,000,000	Success Dam is an earthen flood risk management dam on the Tule River in the southern San Joaquin Valley. USACE has downgraded its risk potential associated with dam and remediation alternatives to be determined.	Yes	Dam Safety, Irrigation, Water Supply	Yes	\$12,600,000
Tulare Lake	Sacramento	Tulare	Tule River, California	\$18,200,000	Success Dam is an earthen flood risk management dam on the Tule River in the southern San Joaquin Valley. USACE has downgraded its risk potential associated with dam and remediation alternatives to be determined.	Yes	Water Supply, Irrigation	No	
Tulare Lake	Sacramento	Tulare	San Joaquin River Basin, White River and Deer Creek, California	\$1,500,000	The purpose of this study is to determine Federal interest in providing flood risk management and environmental restoration on White River, Dear Creek, and adjacent streams in the vicinity of the town Earlimart California.	Yes	Ecosystem, Flood Risk Management	No	
South Coast	Los Angeles	Santa Barbara	Matilija Dam Ecosystem Restoration	\$140,000,000	The purpose of this project is to remove Matilija Dam and to identify mitigation.	Yes	Ecosystem	No	
South Coast	Los Angeles	Santa Barbara	Ventura and Santa Barbara County Shoreline, California	\$2,930,000	The purpose of the project is to identify and quantify the pathways for near-shore sediment transport in Santa Barbara and Ventura counties, with emphasis on critical regions of shoreline erosion.	Yes	Ecosystem	No	

Appendix E: Detailed IWM Case Studies

This page intentionally left blank.

Appendix E: Detailed Descriptions of Case Studies

Detailed case studies from across the state were developed. The following case studies demonstrate how an IWM approach is used to address various flood hazard types and provide multiple benefits. Each case study provides a summary of regional and agency information, project need, solution describing the IWM approach components of the project, financial information, and project status. The information presented in these case studies is based upon existing and readily available information, as well as additional information collected from project agency partners.

The case studies include:

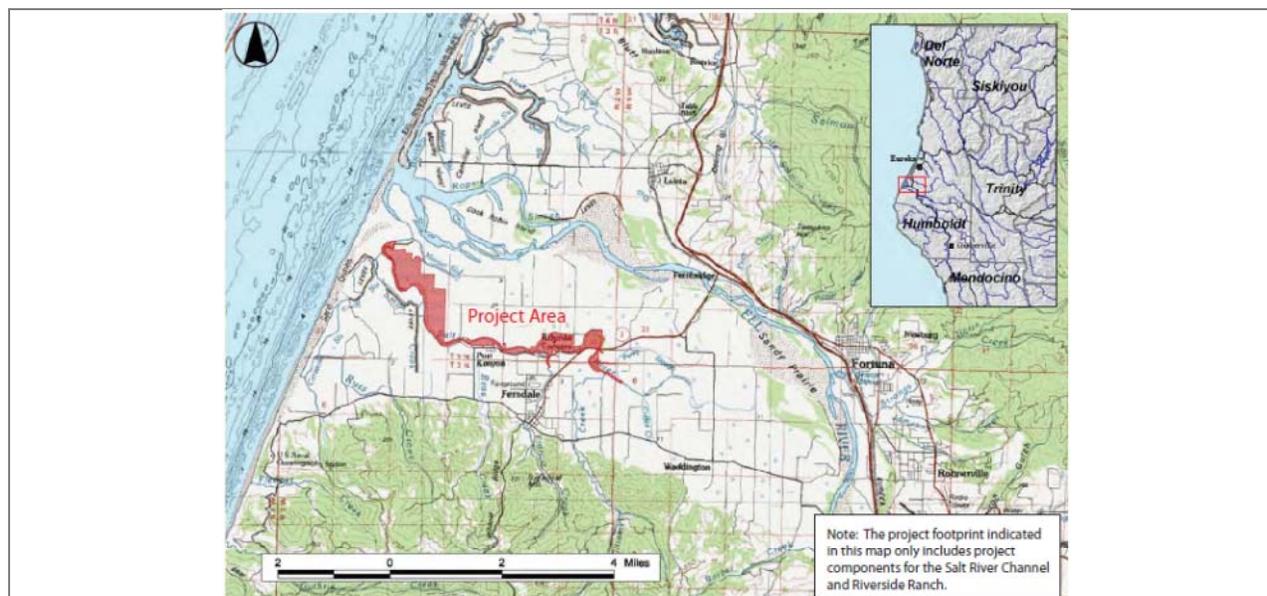
- Salt River Ecosystem Restoration Project
- Middle Creek Flood Damage Reduction and Ecosystem Restoration Project
- Red Clover Creek Restoration Project
- South San Francisco Bay Shoreline Study
- Lower Carmel River Floodplain Protection and Enhancement Project
- San Bernardino County Flood Control District Groundwater Recharge Program – Cactus Basins 3, 4 and 5
- Sun Valley Watershed Management Plan
- Flood Management, Habitat Restoration, and Recharge on the San Diego River



This page intentionally left blank.

Project Name: Salt River Ecosystem Restoration Project

Responsible Agency	Humboldt County Resource Conservation District (HCRCD)
Partners	<p>The Salt River Ecosystem Restoration Project is being developed through collaboration between private landowners and multiple public agencies, including:</p> <ul style="list-style-type: none"> • HCRCD • County of Humboldt • City of Ferndale • California Department of Fish and Wildlife (CDFW) • USACE • National Oceanic and Atmospheric Administration (NOAA) National Marine Fisheries Service • U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) • Salt River Advisory Group (SRAG) • Salt River Watershed Council • U.S. Fish and Wildlife Service • State Coastal Conservancy • State Water Resources Control Board • California Wildlife Conservation Board • Caltrans <p>Project partners also include the Wildlands Conservancy, the Western Rivers Conservancy, and Ducks Unlimited.</p> <p>HCRCD has had a long-standing relationship with USACE as partners on the Salt River Restoration Project Continuing Authority Program, Section 206. The USACE has dedicated significant resources and oversight for specific studies, design, and technical assistance. Currently, Ducks Unlimited is negotiating a contract with the USACE for Estuary Restoration Act funds that were recently awarded to the project.</p>
Region/County	North Coast/Humboldt County
Project Area	
<p>The Salt River Ecosystem Restoration Project Area lies within the floodplain of the Eel River Estuary. The estuary is located along the northern California coast, approximately 13 miles south of the City of Eureka, California. The estuary is recognized as one of the most ecologically important tidal marsh habitats in California. The Salt River estuary is part of the Humboldt Bay/Eel River estuary complex which encompasses the second and fourth largest estuaries on the California coast. Together, this estuary complex is the only substantial tidal marsh habitat between San Francisco and Coos Bay, Oregon. The project area includes three valuable habitat linkages or corridors— (1) designated critical habitat for salmon and steelhead under the California Endangered Species Act (California Fish and Game Code § 2050 <i>et seq.</i>), (2) estuarine wetlands critical to one of the most significant shorebird wintering and migration staging areas along the Pacific Flyway, and (3) riparian forest and scrub corridor providing habitat for riparian birds linked to riparian habitat. Currently, most of the lands on or near the project area are in agricultural (mostly dairy) uses. The Salt River watershed ranges in elevation from sea level at the river mouth to approximately 700 feet in upland areas. The steep slopes in the upland tributary areas are sharply contrasted with their flat alluvial valley floors.</p>	



Salt River Ecosystem Restoration Project

Problems and Need

Sedimentation and loss of natural hydraulic function: Historically, the Salt River was largely influenced by the tide up to 5 miles of its nearly 14-mile length. The tidal exchange of salt water upriver was crucial for maintaining the Salt River channel by flushing sediment from the river and limiting the growth of sediment-trapping aquatic vegetation. Over the years the watershed ecosystem and hydrology were significantly impacted by changes in land use, which accelerated in the late nineteenth century. Now, only a small fraction of the original Salt River Estuary complex is subject to tidal influence due to land reclamation activities, levee and tide gate construction, and channel aggradation. The main channel of the Salt River and the lower reaches of its tributaries have become choked with sediment and willows, and the reaches have lost nearly all natural hydraulic function. Wherever flow is concentrated in remnant riparian areas, the water flows into thick vegetation, slows, and then deposits additional large quantities of sediment throughout the reach, further filling any remaining channel. One foot of sediment deposition per year in any given reach of the project area is commonplace.

Flooding: During the wet season, even small rain events cause the Salt River and the lower reaches of its tributaries to overflow their banks, resulting in almost perpetual flood conditions. The overflow spreads out across the relatively flat landscape, flooding agricultural and residential properties, and threatening public infrastructure. Hundreds of acres of dairy and grazing land are taken out of production for almost 8 months each year due to chronic flooding. Production losses and additional expenses for supplemental feed, pumping out floodwater, and farming and reseeding flooded areas are borne by agricultural producers.

Water quality and drainage: In addition to flooding, the hydraulic dysfunction of the Salt River causes significant problems related to discharge of wastewater treatment plant effluent and overall water quality. Historically, water flows within the Salt River were sufficient to provide the required dilution for discharge from the City of Ferndale wastewater treatment plant. However, sedimentation has reduced channel capacity and the receiving water flows to the point that the effluent violates water quality standards, for which the North Coast Regional Water Quality Control Board has issued a Cease and Desist Order. Treated effluent often flows undiluted into residential areas and agricultural lands, and sediment deposition puts the entire wastewater treatment plant at increasing risk of being flooded. Impaired channel conditions contribute to other water quality problems by limiting drainage of adjacent agricultural lands. These problems increase each winter as the sediment continues to fill drainages.

Loss of habitat: The absence of a clearly defined channel also results in the absence of either freshwater or estuarine aquatic habitat. The Salt River historically functioned as a migration corridor for adult salmonids reaching spawning habitat in tributaries within the Wildcat Mountains, and it provided rearing habitat for juveniles migrating downstream to the Eel River Estuary. However, the current poor fish passage conditions have resulted in drastic population declines of all species of salmonids that formerly used the Salt River and its tributaries. In addition, there has been a substantial loss of wetlands and habitat diversity.

Flood Hazard Type

Types: Debris Flow, Coastal Flooding, Slow Rise, Tsunami Flooding

Flood hazards along the Salt River are related to both overbank flows from the Eel River and storm runoff from its tributaries. This overbank flooding has an estimated recurrence interval of 12 years. Annual flooding of lowland areas is now commonly triggered by relatively minor precipitation events, and areas along the Salt River that formerly drained relatively quickly now remain ponded well into the summer. Tectonic subsidence and sea level rise both work to counteract the impacts of sediment accumulation in the Salt River, but at a much slower or less frequent rate than overbank flooding and associated sediment deposition. Portions of the project area lie inside the county's tsunami wave run-up boundary and are subject to moderate tsunami hazards.



Salt River Flooding near Ferndale

Solution

The Salt River Ecosystem Restoration Project was developed to respond to the problems described above. It is a multi-year, multi-agency, large public-private partnership endeavor that takes a holistic, watershed-wide approach to address sediment, fish passage, flooding, and drainage issues in the Salt River watershed of Ferndale. The restoration will alleviate the chronic and economically damaging flooding while restoring and enhancing fish and wildlife habitat that have been lost due to the ongoing aggradation of the historic Salt River channel. The project consists of the following four major components:

- **Salt River Channel and Riparian Floodplain Restoration** – Restoration of hydraulic capacity, in-stream fish habitat, riparian vegetation, and improved water quality in the entire Salt River and its tributaries. The channel design for this option optimizes fish passage, riparian habitat, and sediment transport.
- **Tidal Wetland and Upland Restoration** – Restoration of the Riverside Ranch property located near the confluence of the Salt River and the Eel River. Portions of the property would be restored to open water, salt marsh, and other wetland types. Some acreage would continue to be agriculturally managed to create suitable habitat for Aleutian geese.
- **Upslope Sediment Reduction** – Sediment reduction/erosion control actions in the sub-watersheds, including upslope channel restoration, riparian planting, bank stabilization, livestock fencing, and road drainage upgrades. Projects may also include engineered natural features to capture and trap sediment in off-channel areas that would gradually be restored to wetland areas. These efforts would improve the quality of Salt River water and hydrologic function by reducing turbidity, sediment load, and sediment deposition.
- **Adaptive Management Plan** – Project performance thresholds and acceptable practices would be developed for future adaptive management measures to maintain performance of the overall Salt River Ecosystem Restoration Project.

Through these actions, the project will reconnect the Eel River Estuary with the Salt River channel and its upslope watersheds. In total, 7.7 river/riparian corridor miles and 444 acres of tidal wetland habitat will be restored.

Success Factors:

Many factors have contributed to the success of this FM/IWM project. Several unique factors are discussed here.

Transparency: Project proponents attribute the sustained success of this project to the open and transparent process. This approach contributed to common understanding of the problems being addressed, identification of an integrated solution, and understanding of the associated benefits and costs of that integrated solution. This transparency also contributed to the support and participation of interested parties and stakeholders that grew over the course of the project.

Permitting Approach: One of the biggest challenges faced by project proponents was working through the permitting process. The SRAG employed a work group approach for coordinating permit requirements of the individual components of the FM/IWM project. The work group approach enabled the project proponents to describe the integrated solution, providing better context for the regulatory permitting agencies. Through this coordinated approach conflicts and opportunities were identified and a resolution to a majority of the permitting questions was reached in a timely and effective manner.

Role of the responsible agency, HCRCD: HCRCD recognized early on that this was a community project and that it required the involvement and commitment of all interests affected by, and beneficiaries to, the solution. HCRCD defined its role as an advocate and resource for these project interests and has consistently served in that capacity for the duration of the project development.

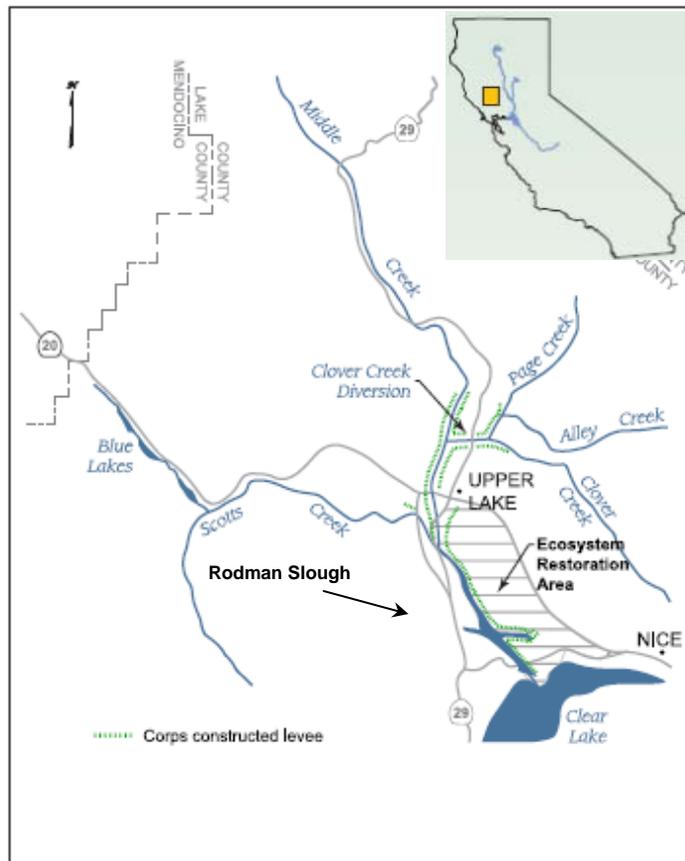
APPENDIX E: DETAILED DESCRIPTIONS OF CASE STUDIES

Integrated Management Actions
Anticipated project activities include channel dredging and/or excavation, establishment of active and passive sediment management areas along the channel, extensive revegetation throughout the project footprint, tide gate modification and/or removal, channel realignment, wetland restoration, construction of setback berms and regrading of existing levees on Riverside Ranch, spoils transport, staging, placement, and reuse as an agricultural amendment, erosion control projects in the upper watershed, and future adaptive management projects for project maintenance.
Integrated Benefits
The Salt River Ecosystem Restoration Project is a watershed-based, ecosystem-scale project with multiple objectives and benefits. The project's primary benefits are for reduction of chronic flooding and ponding for long durations, fish and wildlife habitat restoration and enhancement, water quality improvement, and carbon sequestration. The project will provide immediate and substantial improvements to the watershed, facilitate improved agricultural production, and restore natural hydrologic and ecological processes.
Financial Information and Project Status
Construction of the Salt River Ecosystem Restoration Project is proceeding in two major phases. Phase 1 consists of wetland and upland restoration of the Riverside Ranch property and excavation and reconfiguration of approximately 1.5 miles of Salt River channel. Plans and specifications are 95 percent complete and construction is expected to start in the summer of 2012. Phase 2 consists of excavation and reconfiguration of an additional 5.5 miles of Salt River channel. Plans and specifications for this phase are 50 percent complete, and construction will follow completion of Phase 1 construction. The project also includes an adaptive management plan for the long-term maintenance of the Salt River channel and Riverside Ranch restorations. The estimated total project construction cost (Phases 1 and 2) is \$17,101,000.
The Salt River Ecosystem Restoration Project and its project components have received funding from various sources, including:
<ul style="list-style-type: none">• DWR Flood Corridor Grant Program: \$3,000,000 (draft recommendation)• DWR IRWMP Grant Program: \$1,169,000 (sub-agreement of grant award to County of Humboldt – North Coast Integrated Regional Water Management Plan)• State Water Resources Control Board Proposition 50 (2004) Grant Program: \$5,000,000• CDFW Fisheries Restoration Grant Program: \$551,551• California Department of Transportation (Caltrans) Environmental Enhancement and Mitigation Program: \$350,000• NRCS Wetland Reserve Program: \$1,700,000• USFWS National Coastal Wetlands Conservation: \$1,000,000.• USFWS North American Wetlands Conservation Act: \$400,000.• Wildlife Conservation Board: \$1,000,000.• NOAA: \$760,343.• Estuary Restoration Act via U.S. Army Corps of Engineers: \$800,000
This totals approximately \$15.7 million (current and pending) in funding.
Primary Information Sources
Humboldt County Resource Conservation District. <i>Final Environmental Impact Report: Salt River Ecosystem Restoration Project</i> . February 2011.
Humboldt County Resource Conservation District. <i>Project Summary</i> (unpublished). January 2012.
Humboldt County Resource Conservation District. <i>Salt River Ecosystem Restoration Project Adaptive Management Plan</i> . January 2011.

Project Name: Middle Creek Flood Damage Reduction and Ecosystem Restoration Project

Responsible Agency	Lake County Watershed Protection District
Partners	<p>The Middle Creek Flood Damage Reduction and Ecosystem Restoration Project (Middle Creek Restoration Project) was developed through collaboration between the District and multiple agencies. The District is developing partnerships to assist in completion of the Project. Current and potential partners include:</p> <ul style="list-style-type: none"> • U.S. Army Corps of Engineers (USACE) • Central Valley Flood Protection Board • California Department of Fish and Wildlife (CDFW)/Wildlife Conservation Board • California State Water Resources Control Board • Central Valley Regional Water Quality Control Board • California Bay-Delta Authority • California Department of Water Resources (DWR) • Local Native American Tribes • Lake County Special Districts • Nonprofit organizations <p>The District is also cooperating with the U.S. Department of Agriculture (USDA) Forest Service, USDA NRCS, the U.S. Department of Interior Bureau of Land Management, East Lake and West Lake Resource Conservation Districts, and local watershed groups in support of the Middle Creek Project and to improve management of Clear Lake watershed.</p>
Region/County	Sacramento River Region/Lake County

Project Area



Middle Creek (Flood Damage Reduction and Ecosystem Restoration Project)

APPENDIX E: DETAILED DESCRIPTIONS OF CASE STUDIES

The Middle Creek Restoration Project is located at the north end of Clear Lake, Lake County, California (about 90 miles north of San Francisco), in the area bounded by State Highway 20 and Rodman Slough. Clear Lake is a large, natural, shallow, eutrophic lake and is the headwaters of Cache Creek (a tributary of the Sacramento-San Joaquin Delta). The Scotts Creek and Middle Creek watersheds, which comprise approximately one half of the Clear Lake watershed, drain through Rodman Slough adjacent to the Middle Creek Restoration Project area. These two watersheds provide 57 percent of the inflow and 71 percent of the phosphorus loading to Clear Lake. Fourteen hundred acres of reclaimed¹ wetlands are located in the Middle Creek Restoration Project area. Areas adjacent to the project are a mixture of agricultural lands, rural residences, and small communities (Upper Lake and Nice).

Problems and Need

The Clear Lake watershed has faced numerous problems over the last 20 to 30 years. The most significant issues include flooding, water quality, and habitat degradation.

Flooding: As was the custom of the era, the Middle Creek Restoration Project area was reclaimed between 1900 and 1940 by constructing levees, creating a slough and reclaiming approximately 1,200 acres of lake bottom and shoreline wetlands for agricultural purposes. In 1958, USACE added to the levee system, reclaiming an additional 200 acres of shoreline wetlands. Completed in 1966, the original Middle Creek project added 14.4 miles of levees on Middle Creek and Scotts Creek.

Having settled up to 3 feet below design grade, the levees in the Middle Creek Restoration Project area are particularly prone to failure during a major flood event. Key levee hazard factors include slope stability and inadequate cross-section geometry. The pump station is 49 years old and in need of major repairs, primarily due to age and levee settlement. USACE has determined that the levees provide a 4-year level of protection (the levees were originally designed to provide a 50-year level of protection) and will overtop during a 35-year flood event without emergency floodfight measures.² The area was evacuated in 1983, 1986, and 1998, with evacuation imminent in 1995. Reconstruction of the levees is estimated to require in excess of \$64 million. Since the reconstruction costs would exceed the estimated flood damage reduction benefits received, neither the State nor Federal government is authorized to participate in the repair of the levees.



View from degraded levee looking northeast past pumping plant. Area beyond pump house proposed to be flooded.

Water quality and habitat degradation:

Reclamation of wetland areas to support development in the Clear Lake watershed significantly impaired water quality, and freshwater marsh and riparian habitat. Significant decline in Lake water quality has resulted in increased biological productivity in the lake with frequent blue-green algal blooms in the late summer months. The U.S. Environmental Protection Agency (EPA) Clean Lakes Diagnostic/Feasibility Study completed in 1994 for Clear Lake concluded that sediment nutrients are primarily responsible. The study recommends numerous actions to reduce the frequency and magnitude of the blue-green algal blooms, including erosion control and wetland and riparian restoration.

Flood Hazard Type

Type(s): Slow Rise Flood

Clear Lake and its tributaries have a long history of flooding. Flooding along Clear Lake's shoreline (including the historic floodplain of Middle Creek) is primarily caused by high lake inflows in conjunction with limited outflow. As a consequence, excess runoff must be stored in the lake causing lake levels to rise. Because of the discharge capacity, lake stages can remain above flood level for many days, sometimes months.

¹ Reclamation is the process of creating and protecting lands susceptible to overflow from ocean and bodies of fresh water, such as seas, lakes, rivers, and their tributaries.

² U.S. Army Corps of Engineers, Office of the Chief of Engineers. Middle Creek, Lake County, California, Flood Damage Reduction and Ecosystem Restoration, Final Chief of Engineers' Report. November 29, 2004.

Solution

The Middle Creek Restoration Project would restore the largest damaged wetland located at the base of the largest sediment source within the watershed. This would require restoration of 1,650 acres of wetlands and floodplain that were previously isolated from Clear Lake. Flooding, water quality, and habitat issues discussed above were first addressed with an integrated, watershed approach in the 1990s with the formation of the Clear Lake Basin Resource Management Committee (renamed the Lake County Coordinating Resource Management Committee). Efforts by the committee include developing a Clear Lake watershed management plan and support for the Middle Creek Restoration Project.

The Middle Creek Restoration Project will reconnect Scotts and Middle Creek to historical floodplains by acquiring previously reclaimed land, and breaching the existing levee system along Rodman Slough to create inlets that direct flows into the historical floodplain.

Significant land acquisition will be required, including relocation of up to 18 residential structures. The CDFW prepared a Draft Clear Lake Wildlife Area Conceptual Area Protection Plan, which included acquisition of all of the property required for the Middle Creek Restoration Project. If the CDFW proceeds with the Conceptual Area Protection Plan, the District will work closely with CDFW to meet the mutual goals of each agency.



View looking downstream Rodman Slough. Photographer standing on the substandard levee proposed to be breached.

The entire Middle Creek Restoration Project area will be restored to a natural habitat consisting of open water, freshwater emergent wetlands, riparian zones and upland habitat (oak woodland). The historical floodplain at the mouth of Scotts Creek and Middle Creek will be restored. Because Clear Lake will inundate the Middle Creek Restoration Project area, the natural hydrology of a lacustrine, freshwater wetland will be restored. In addition to restoration of fish and wildlife habitat values, the wetland area will provide water quality benefits of sediment, phosphorus and nitrogen removal from the water column. Channels will be excavated to direct the flow of water from Middle Creek and Scotts Creek through the Middle Creek Restoration Project area, thereby improving the quality of water (sediment and phosphorus removal) that enters Clear Lake from their watersheds. In addition, the denitrification (the conversion of nitrogen to nitrogen gas) of lake water during the summer may provide some additional water quality benefits.

Success Factors:

Multiple, watershed-wide benefits: This project is anticipated to have multiple benefits not only onsite but also for the entire Clear Lake watershed. While the project could have potential negative effects for a range of watershed stakeholders, the integrated approach provides an opportunity to mitigate most, if not all, of these effects.

Collaboration: Many factors are required for this project to be successful. One important factor is the high degree of collaboration among multiple landowners, public and private entities, as well as funding partners. The Lake County Watershed Protection District is forming partnerships with various interested parties to meet the cost-share conditions for implementing the project.

Integrated Management Actions

The Middle Creek Restoration Project will encompass integrated structural and nonstructural actions to achieve multiple benefits. The primary actions are summarized below.

Flood damage protection measures include:

- All property within the 100-year floodplain will be acquired in fee, structures will be demolished and/or relocated, infrastructure will be removed or floodproofed, and the existing substandard levees will be breached to allow the area to reflow in a passive manner.
- Rock slope protection and native vegetation will be used to minimize erosion in the Middle Creek Restoration Project area. Small areas at the levee breaches have been proposed to be lined with riprap to prevent erosion.

APPENDIX E: DETAILED DESCRIPTIONS OF CASE STUDIES

Restoration measures include:

- The levees will be breached to allow water to automatically flow in and out of the Middle Creek Restoration Project area. The breaches will also serve as fish and wildlife passage areas.
- Native wetland, riparian, and brush/woody vegetation will be planted in the Middle Creek Restoration Project area.
- Floodplain habitat will be enhanced by creating islands using material excavated from the levee breaches and created channels. The island habitats will provide refuge for small mammals during the winter and breeding sites for birds. Also, the remaining unused levees will be restored as islands.
- Channels, sloughs, and ponds similar to those that existed prior to 1920 will be created. They will be excavated prior to flooding of the Middle Creek Restoration Project site, which will enable the use of conventional construction equipment.

Integrated Benefits

The Middle Creek Restoration Project will decrease flood damages, provide open water and riparian habitat for fish and wildlife, including special-status species, and improve water quality. Specific integrated benefits of the project are discussed below.

Flood damage reduction benefits:

- Reduce flood risk by removing structures and property at risk of severe flooding as a result of levee failure. There are 18 homes and numerous outbuildings subject to flooding should the levees fail. Approximately 1,650 acres of agricultural land would be flooded. Because flood depths are large (more than 5 feet in most locations) and would occur for extended periods, potential flood damages are high.
- Protect more than 3 miles of public roads and a major high-voltage Pacific Gas and Electric transmission line that cross the Middle Creek Restoration Project area, all of which are currently vulnerable to flood damage, by elevating or retrofitting the existing structures.
- Remove approximately 3 miles of substandard levees, one pumping station and one weir structure associated with these existing facilities. DWR, the agency that maintains the Middle Creek flood management facilities, would experience a reduction in operation and maintenance (O&M) costs (\$110,000 to \$160,000 per year) and emergency response costs (estimated in excess of \$300,000 per major flood event for DWR and cooperating State and Federal agencies).

Water quality benefits:

- Sediment is the primary nutrient source (97 percent of Clear Lake's total phosphorus load is sediment bound) contributing to eutrophication of Clear Lake that produces algae bloom. It has been estimated that the current sediment and phosphorus load is twice the pre-European settlement sediment load. Approximately 71 percent of the sediment and phosphorus entering Clear Lake is from Scotts and Middle Creek watersheds. The Middle Creek Restoration Project is estimated to remove up to 40 percent of phosphorus entering Clear Lake from these two creeks. Reduced phosphorus concentrations in Clear Lake would potentially reduce the chlorophyll concentrations by 33 percent. A corresponding reduction in total organic carbon would also be realized.
- Wetlands are known to efficiently remove nitrogen from the water column. Because the Middle Creek Restoration Project area is hydraulically connected to Clear Lake, it would provide some nitrogen removal benefits to Clear Lake. The extent of these benefits is unknown and has not been quantified.
- Improved water quality in Clear Lake will reduce the cost of treating lake water to drinking water standards.
- Recreation and tourism will be enhanced by improving the water quality in Clear Lake. In 1994, the USDA Soil Conservation Service estimated that \$7 million in tourism is lost annually due to water quality issues in Clear Lake.

Habitat benefits:

- Restore up to 1,400 acres of the 7,520 acres of historical wetlands in the Clear Lake Basin that have either been lost or severely impacted. This is a 79 percent increase in the Basin's existing wetland habitat. Of the historical 9,300 acres of freshwater wetlands that existed in the Clear Lake Basin, approximately 7,520 acres (80 percent) have been lost or severely impacted. Restored habitat includes open water, seasonal wetlands, in-stream aquatic habitat, shaded aquatic habitat, and perennial wetlands. Additional upland habitat will be protected adjacent to the wetland and stream areas.
- Provide a significant increase in habitat for fish and wildlife. The Middle Creek Restoration Project would greatly improve the bird-nesting habitat and increase the available spawning habitat for native and non-native fish. The area is currently used extensively by migratory waterfowl.

- Preserve the fish and wildlife resources and the cultural resources in the project area.
- Several special-status wildlife species could benefit from the creation of wetland, open water, and riparian habitats in the expanded floodplain. Some species include the northwestern pond turtle, American white pelican, double-crested cormorant, western least bittern, osprey, white-tailed kite, bald eagle, northern harrier, Cooper's hawk, American peregrine falcon, California yellow warbler, yellow-breasted chat, tricolored blackbird, fringed myotis, long-eared myotis, long-legged myotis, pallid bat, and Townsend's western big-eared bat.

Other potential benefits:

- Improve vector control in the area. The Middle Creek Restoration Project would introduce a diverse wetland and riparian community in place of several hundred acres of rice fields and flood-irrigated pasture. The presence of natural predators may result in lower insect populations in the area.
- Potential conservation of water supply. Initial estimates by Lake County Watershed Protection District indicate the Middle Creek Restoration Project could increase Clear Lake storage by 5,900 acre-feet. The restoration of the Middle Creek floodplain is expected to have positive effects upon water supplies, including increased surface water storage and groundwater recharge. However, restoration might negatively affect water supplies by increased evaporation from surface water surfaces and likely greater consumptive use (wetlands compared to existing agricultural uses). Further hydrologic studies are planned to better assess how the Middle Creek Restoration Project affects water supply.

Financial Information and Project Status

In 1995, Lake County requested USACE to assist in evaluating the Middle Creek Restoration Project to reduce flood risk and to improve water quality. USACE undertook the Middle Creek Restoration Project under the Environmental Restoration Authority, where it is authorized to provide up to 65 percent of the construction cost. In May 1997, the USACE completed a Reconnaissance Study that concluded that the Middle Creek Restoration Project was practical and that a Federal interest existed to pursue it further. In June 1999, the USACE began a Feasibility Study concurrent with an environmental impact statement (for Federal compliance) and environmental impact report (for State compliance). These documents were completed in 2003 and 2004, respectively. Six alternatives were evaluated. A singular flood damage reduction project was not cost effective. The most beneficial project was determined to be an integrated approach addressing flood risks, habitat improvements, and other benefits. The Middle Creek Restoration Project was authorized by the Water Resources Development Act in November 2007. After review of the Federal document for compliance with the National Environmental Policy Act, the U.S. Fish and Wildlife Service (USFWS) requested a survey of the red-legged frog and an evaluation of potential methyl mercury impacts. USFWS approved the completed studies in September 2012. Design work, originally scheduled for completion in 2010, has been postponed pending this approval. In addition, limited Federal funds have been appropriated, and additional funds are needed to complete the design. Construction of the Middle Creek Restoration Project, originally planned for 2012 through 2015, has similarly been delayed.

In August 2003, the Lake County Watershed Protection District was awarded a \$5.214 million grant by DWR to begin acquiring residential properties within the Middle Creek Restoration Project area. In December 2006, the grant amount was increased to \$5.714 million. The appraisal process began in September 2004, with property acquisitions ongoing. It is anticipated that eight or nine of the most flood-prone residential properties can be acquired with these funds, once funds are released. As of November 2008, seven parcels have been acquired. In December 2008, the funds were frozen by the State, with no estimate of when the funds will be made available. The Lake County Watershed Protection District purchased and demolished one additional residential parcel using District funds in 2009-2010. Five additional parcels are currently being appraised for purchase, with additional parcels soon to enter the appraisal process. A grant amendment for an additional \$7 million dollars to acquire homes was approved in 2011. Four parcels were acquired in 2012, and 17 additional parcels are in the acquisition process in 2013.

Under current funding guidelines, approximately 35 percent of the costs for future phases of the project are the responsibility of Lake County Watershed Protection District. These costs are beyond the District's ability to pay, and the District is currently developing partnerships (see Partners section above) to assist in completion of the Middle Creek Restoration Project.

The most recent project costs, including engineering, design, and construction, is estimated by the USACE based on October 2006 price levels, as follows:

- Federal Share \$31,300,000
- Non-Federal Share \$16,700,000
- Total Cost \$48,000,000

APPENDIX E: DETAILED DESCRIPTIONS OF CASE STUDIES

Primary Information Sources

- California Department of Water Resources. *Middle Creek (Flood Damage Reduction and Ecosystem Restoration Project) Fact Sheet*. October 2011.
- California Department of Water Resources. *Middle Creek Ecosystem Restoration Project Case Study: Benefit and Cost Analysis, EPA Wetlands Protection Development Grant for Multi-Objective Approaches to Floodplain Management on a Watershed Basis*. 2005.
- Lake County Watershed Protection District. *Overview Middle Creek Flood Damage Reduction and Ecosystem Restoration Project*. October 14, 2010.
- Lake County Watershed Protection District. *Middle Creek Flood Damage Reduction and Ecosystem Restoration Project, Construction Phase, Flood Protection Corridor Program Grant Application*. 2003.
- Lake County Watershed Protection District. *Middle Creek Flood Damage Reduction and Ecosystem Restoration Project, Phase II, Flood Protection Corridor Program Grant Application*. 2008.
- U.S. Army Corps of Engineers, Office of the Chief of Engineers. *Middle Creek, Lake County, California, Flood Damage Reduction and Ecosystem Restoration, Final Chief of Engineers' Report*. November 29, 2004.
- U.S. Army Corps of Engineers, Sacramento District. *Middle Creek, Lake County, California, Flood Damage Reduction and Ecosystem Restoration, Final Integrated Feasibility Report and Environmental Impact Statement/Environmental Impact Report*. September 2002, revised October 2003.

Project Name: Red Clover Creek Restoration Projects

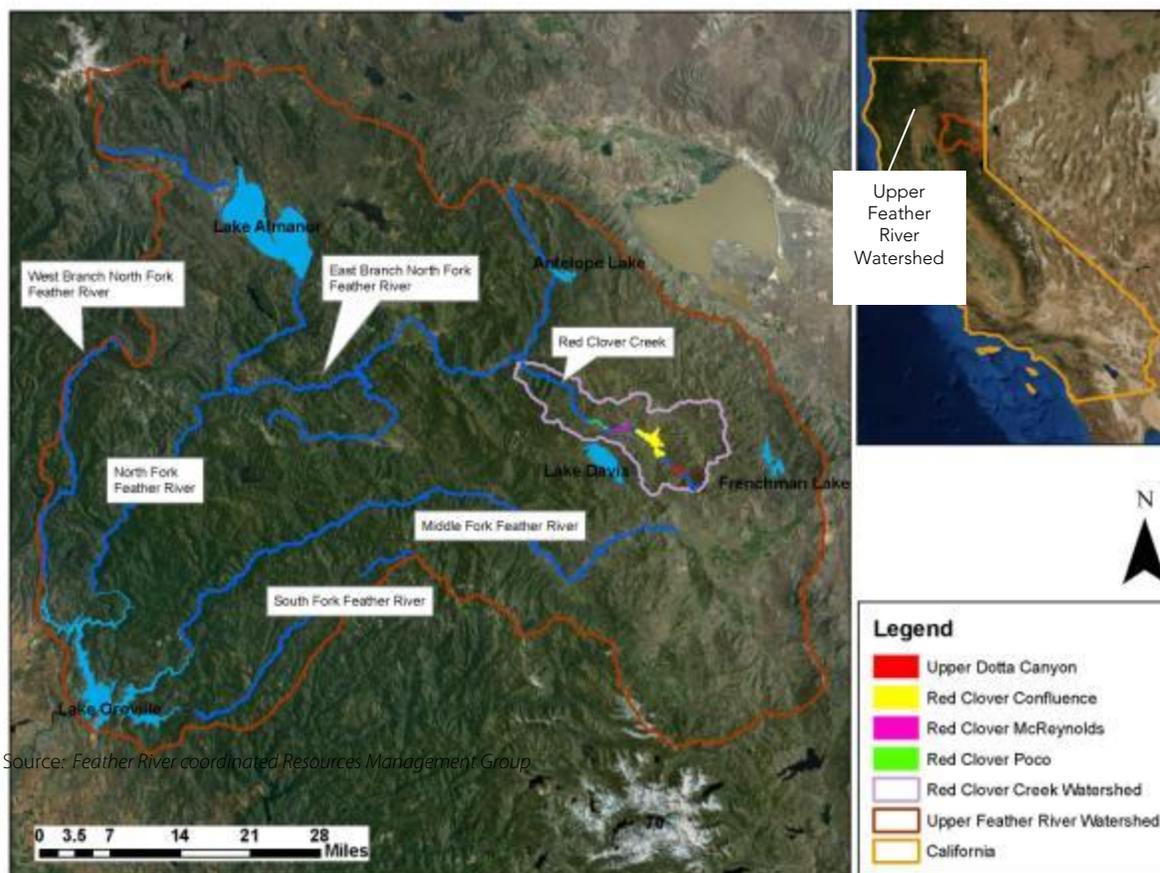
Responsible Agency	Plumas Corporation and the Feather River Coordinated Resource Management (FRCRM) Group
Partners	<p>Red Clover Creek restoration efforts are being directed by the FRCRM group. This group, formed as an alliance in 1985 to work on watershed restoration, is a consortium of the following 24 public and private sector groups:</p> <ul style="list-style-type: none"> • California Department of Forestry and Fire Protection • California Department of Fish and Wildlife • California Department of Water Resources (DWR) • California Regional Water Quality Control Board • California Department of Conservation • Feather River College • North Cal-Neva Resource Conservation and Development District • Pacific Gas and Electric Company • Feather River Resource Conservation District • Plumas Unified School District • Plumas Corporation • U.S. Forest Service, Plumas National Forest • Trout Unlimited • U.S. Department of Agriculture (USDA), Natural Resource Conservation Service (NRCS) • U.S. Army Corps of Engineers (USACE) • U.S. Fish and Wildlife Service (USFWS) • California Department of Transportation (Caltrans) • California Department of Parks and Recreation • Plumas County Community Development Commission • University of California Cooperative Extension • Salmonid Restoration Federation • USDA Farm Services Agency • Plumas County • Sierra Valley Resource Conservation District <p>The primary partnership mechanism is the Memorandum of Understanding for Coordinated Resource Management executed for the upper Feather River watershed. Enabled by Federal statute, this collaborative, consensus-based process has allowed for effective collaboration and support from numerous public and private entities within the watershed. Additionally, each project has a project agreement, typically for 10 years, that outlines the roles and responsibilities for management, monitoring, and maintenance for the various project partners.</p> <p>USACE was a founding signatory member of the FRCRM group. Originally, USACE participated in FRCRM meetings to provide technical and regulatory input. Currently, USACE is inactive as a direct participant, but it still has regulatory jurisdiction over all projects through the permitting process.</p>
Region/County	Sacramento River/Plumas County
Project Area	
<p>The upper Feather River watershed straddles the northern Sierra Nevada Range between the Great Basin Desert and the Central Valley of California. This watershed has long been recognized for its recreational and aesthetic value. Water originating from its drainages represents a significant component of the State Water Project and provides high-quality water for hydropower generation, agriculture, industry, and cities.</p> <p>Since the inception of the FRCRM group, more than 50 watershed projects have been completed, including studies and assessments, stream restoration, monitoring, resource management plans, strategic planning,</p>	

APPENDIX E: DETAILED DESCRIPTIONS OF CASE STUDIES

community outreach, and educational activities. This case study describes four ongoing and proposed projects within the Red Clover Creek watershed as a group, since they address the common problem in the upper Feather River watershed of channel erosion and incision, resulting in disconnection of the channel from its floodplain and dewatering of the adjacent meadow. These featured projects are:

- Red Clover/McReynolds Creek Restoration Project (completed 2006)
- Red Clover POCO Restoration Project (completed 2010)
- Red Clover Confluence Project (proposed)
- Upper Dotta Canyon Restoration Project (proposed)

The projects are located in Red Clover Valley, approximately 60 miles north of Truckee and 30 miles east of Quincy in Plumas County. Red Clover Valley is 13 miles long, up to 2 miles wide, and has a drainage area of 75 square miles. The McReynolds Creek portion of the project extends north from its confluence with Red Clover Creek approximately 5,000 linear feet upstream. The cumulative watershed area is 82 square miles from the confluence of the two creeks. The Dotta Canyon project is located in the upper reaches of Red Clover Valley.



Problems and Need

Watershed degradation and erosion: The Feather River watershed has been impacted by more than 140 years of intense human use. Past mining, grazing, and timber harvesting practices; wildfire; and railroad and road construction, along with several damaging floods (in 1955, 1986, and 1997), have contributed to the degradation of over 60 percent of the watershed, resulting in accelerated erosion, degraded water quality, decreased vegetation and soil productivity, and reduction in the productivity and diversity of fish and wildlife populations in the Feather River and tributary streams.

Water quality and ecosystem impacts: The Red Clover Creek watershed historically has been used for grazing and logging, with an extensive road and historical logging railroad grade system. This stream system also had a reputation as an outstanding trout fishery. Continuing disturbance over time initiated moderate to severe incision (downcutting) of the stream channels throughout Red Clover Valley, resulting in extensive gully networks that have lowered the shallow groundwater tables in the valley meadow, concurrently changing the plant communities, and increasing the sediment supply. In turn, this has resulted in a loss of meadow productivity, diminished summer flows, and severe bank erosion. This erosion contributed large amounts of sediment to the

North Fork Feather River system via Indian Creek. Due to severe channel incision and bank erosion, the Red Clover Creek watershed channel system was determined to be the third highest sediment-producing subwatershed in the East Branch North Fork Feather River watershed (*East Branch North Fork Feather River Erosion Inventory Report*, USDA - Soil Conservation Service, 1989). Annually, 1.1 million tons of sediment are delivered to Rock Creek Dam at the downstream end of the East Branch North Fork Feather River, of which 80 percent is attributable to human activities.

Flooding: Upper watershed degradation resulted in local and regional flood management issues. The stream channels have become disconnected from the floodplains, eliminating the buffering capacity of the floodplain. This results in flooding of lands at downstream locations where hydraulic capacities are limiting. Furthermore, bank erosion results in heavy sediment loading downstream and impacts flood management operations in downstream reservoirs, such as Oroville reservoir, which provides water supply, recreation, hydropower, and flood protection for downstream areas.

Flood Hazard Type

Types: Debris Flow and Alluvial Flooding

Solution

Since inception, the FRCRM has known that mountain meadows play a key role in affecting watershed condition and water flow in the northern Sierra Nevada. Restoration of degraded meadows is the first step in improving overall watershed function and could have major effects on surface and subsurface flow regimes, which influence water delivery downstream.

The FRCRM restoration efforts evolved from a project-level scale to a systematized, coordinated, long-range resource restoration and management system conducted on sub-watershed, watershed, and landscape scales. The four Red Clover Creek projects share the same watershed restoration goal of stabilizing stream channels to address erosion, improve water quality, increase summer base flows for priority species and beneficial uses, restore floodplain habitat, and reduce impacts to downstream water supply and flood management.

The four restoration projects in Red Clover Valley were implemented in a step-wise approach for practical reasons, such as locations within the watershed with the most pressing issues, lands with willing land owner participants, and funding limitations. By taking this step-wise approach, the FRCRM group can monitor and quantify benefits, educate the public, provide technology transfer, and over time, tackle the issues within the entire valley.

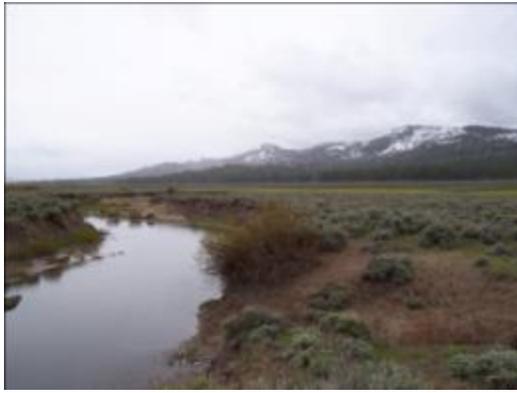
The scope of the Red Clover Creek restoration projects include eliminating the existing gullies within the project area, restoring bank-full flows to the historical remnant channel(s) on the surface of the meadow, restoring floodplain function, decreasing water temperatures, reducing sedimentation, improving forage production for cattle, improving fish and wildlife habitat, and improving long-term stability of the channel/floodplain system.

The pond-and-plug technique is used to address floodplain function as the fundamental precursor to all other project objectives. This technique replaces miles of entrenched, gullied channels on both private and public lands with a series of plugs that effectively eliminate the gully as a drainage feature on the landscape. The plug material comes from the edges of the gully, in between plugs. The pond-and-plug technique is an economically feasible and proven technique to restore a channel to the meadow floodplain elevation. The specific actions include:

- Excavation of fill material from the gully to build plugs, resulting in creation of ponds that fill with groundwater
- Rock fill for grade control structure (if necessary)
- Redirection of flows from the gully into an existing remnant channel on the meadow
- Installation of new pasture fencing and offsite water supply on private land
- Cattle guard installation on local roads
- Monitoring and management

Overall, restoration activities play an important role in accelerating improvement in watershed function, the local economy, and downstream uses. Public education is also an essential element to the success of FRCRM programs. Plumas County's watershed management initiatives, such as the Upper Feather River Watershed Integrated Regional Water Management Plan (2005), provide the foundation for larger-scale water management and planning.

APPENDIX E: DETAILED DESCRIPTIONS OF CASE STUDIES



Red Clover Creek – Before Restoration



Red Clover Creek – Restored

Success Factors:

Many factors have contributed to the success of this FM/IWM project. Several unique factors are discussed here. After 25 years and completion of 60 restoration projects, the FRCRM has experienced that the once-full floodplain function has been restored, other project objectives are more effectively achieved because in a riparian ecosystem, they are inextricably linked.

The suite of projects undertaken or planned for Red Clover Valley have required a high degree of collaboration among multiple landowners, public and private, as well as funding partners. The FRCRM group has also formed partnerships with academia to improve the science of restoration projects and better understand watershed processes.

Scaling the pond-and-plug technology to the landscape scale has required continuous adaptive management to address highly variable landscape settings/conditions. Historical and current watershed effects are taken into consideration in the design and implementation process via watershed analysis. In addition, emphasis has shifted from a “project-of-opportunity” approach to a strategic approach that provides for long-term watershed maintenance in the highest priority areas at the right time.

The challenges of working at the landscape scale are numerous. Agencies and watershed stakeholders, particularly downstream water right holders, have expressed reservations/concerns over the scale and pace of project implementation relative to ability of the research and monitoring to effectively determine change, if any. Multiple funding opportunities exist; however, grant caps, match requirements, and differing grant program objectives make securing funding a relatively onerous process.

Integrated Management Actions

The main actions implemented for the Red Clover Creek restoration projects include the following:

- Floodplain reconnection
- Pond-and-plug
- Redirect flow into remnant channel
- Riparian revegetation

Integrated Benefits

Stabilized stream channels to address erosion, improved stream conditions, increased summer base flows for priority species and beneficial uses, restored floodplain function and habitat, waterfowl and wetland enhancement, reduced turbidity, reduced impacts to downstream water supply and flood management.

Financial Information and Project Status

The Advanced Project Planning List by the FRCM Group, Plumas Corporation includes potential projects that are currently in some phase of analysis. Of the projects in Red Clover Valley discussed in this FM/IWM case study, the Red Clover/McReynolds Creek Restoration Project and the Red Clover Poco Restoration Project are complete and are currently being managed and monitored. The Dotta Canyon Project is scheduled for implementation in July or August 2012. The Red Clover Confluence Project is in the project development and design phase and is on hold until additional funding is secured.

The Red Clover Valley projects discussed here are in various stages of receiving and securing funding. The funding status for each project is described below:

- The Red Clover/McReynolds Creek Restoration Project primary funding (\$1,101,000) was provided through the State Water Resources Control Board (SWRCB) Proposition 13 (2000) CALFED Watershed

APPENDIX E: DETAILED DESCRIPTIONS OF CASE STUDIES

Program, with contributions from DWR, Natural Resources Conservation Service, U.S. Forest Service-Plumas National Forest, the landowner, and volunteers.

- The Red Clover Poco Restoration Project primary funding (\$1,169,650) was provided through the SWRCB Proposition 13 (2000) and Proposition 50 (2004) Watershed Protection Grant Program, with contributions from DWR, Point Reyes Bird Observatory Conservation Science, Plumas Audubon, Herger-Feinstein Quincy Library Group, U.S. Forest Service-Plumas National Forest, and volunteers.
- The Upper Dotta Canyon Restoration Project is to be funded by USACE Sacramento District Wetland Conservation fund, Natural Resources Conservation Service Environmental Quality Incentives Program, and California Proposition 13 (2000) and 50 (2004) water bond funds.
- Initial project development funding support for the Red Clover Confluence Project was from Plumas County Resource Advisory Committee Secure Rural Schools Act Public Law 110-343 and the landowner. Further funding is under development.

Primary Information Sources

Department of Water Resources. *Upper Feather River Watershed IRWMP, Volume 1*. June 30, 2005.

Feather River Coordinated Resource Management Group, Plumas Corporation. *Red Clover/McReynolds Creek Restoration Project, Final Report*. January 28, 2008.

Feather River Coordinated Resource Management Group, Plumas Corporation. Summary of Red Clover/McReynolds Creek Restoration Project (2006). Provided on FRCRM Web site: www.feather-river-crm.org. Accessed on February 23, 2012.

Feather River Coordinated Resource Management Group, Plumas Corporation. *Red Clover Poco Restoration Project Baseline Report*. August 31, 2010.

Feather River Coordinated Resource Management Group, Plumas Corporation. *Red Clover Poco Restoration Post-Project Monitoring Report*. February 12, 2012.

Feather River Coordinated Resource Management Group, Plumas Corporation. *Red Clover Poco Restoration Project Environmental Permitting, Full Project Proposal*. March 30, 2009.

Feather River Coordinated Resource Management Group, Plumas Corporation. *Summary of Red Clover Poco Restoration Project (2010)*. Provided on FRCRM Web site: www.feather-river-crm.org. Accessed on February 23, 2012.

Feather River Coordinated Resource Management Group, Plumas Corporation. *Upper Dotta Canyon Restoration Scoping Report*. January 2012.

Feather River Coordinated Resource Management Group, Plumas Corporation. *Upper Dotta Canyon Restoration Environmental Assessment*. January 12, 2012.

Feather River Coordinated Resource Management Group, Plumas Corporation. *Advanced Project Planning List*. January 15, 2012.

Feather River Coordinated Resource Management Group, Plumas Corporation. Personal communications with Gia Martynn, Watershed Coordinator. February 2012.

Feather River Coordinated Resource Management Group. Project Locations Map, showing projects that provide flood management benefits. Undated.

Feather River Coordinated Resource Management Group. Completed Projects and Costs List. Undated.

This page intentionally left blank.

Project Name: South San Francisco Bay Shoreline Project

Responsible Agency	U.S. Army Corps of Engineers (USACE)
Partners	California State Coastal Conservancy (Conservancy) Santa Clara Valley Water District (SCVWD) U.S. Fish and Wildlife Service
Region/County	San Francisco Bay/Santa Clara, San Mateo, and Alameda counties

Project Area

The South San Francisco Bay Shoreline Study (Shoreline Study) is located in the southern part of the San Francisco Bay Area (South Bay) and encompasses three former salt production pond complexes and adjacent shoreline areas. The entire South Bay salt pond complex is spread over an area of approximately 26,000 acres and surrounds nearly the entire San Francisco Bay south of the San Mateo Bridge on lands that were formerly tidal marsh. Current planning efforts are focused on a subset of ponds within the Alviso Pond Complex in Santa Clara County and the community of Alviso.



Problems and Need

Flooding: The study area has a history of fluvial flooding and is at risk of tidal flooding due to projected sea level rise and historic subsidence, which has resulted in portions of the study areas being 13 feet below sea level. In addition, tidal flood risk will increase if the levees surrounding the former salt production ponds are breached to restore tidal marsh.

Flood damage to communities in the area has occurred from streams tributary to the shoreline, but has been addressed by other projects. The city of Alviso was flooded by Guadalupe River in this way in 1983. Similar flood events also occurred in Alviso in 1982, 1986, and 1995.

Habitat degradation: An estimated 85 percent of the historical tidal marshes in the San Francisco Bay-Delta Estuary have been filled or significantly altered during the past two centuries for urban development, agriculture, and salt production. Habitat conditions within the estuarine ecosystem have been in a state of decline. Although dramatically different from 150 years ago, the South Bay’s wetland habitats, including the salt ponds, tidal marshes, sloughs, mudflats, and open bay, are used by large populations of waterfowl and shorebirds, harbor seals, and a number of threatened and endangered species, including the California clapper rail, California black rail, California brown pelican, California least tern, western snowy plover, salt marsh harvest mouse, and steelhead trout.

APPENDIX E: DETAILED DESCRIPTIONS OF CASE STUDIES

Flood Hazard Type(s)

Slow rise flooding, coastal flooding, and engineered structure failure flooding.

Solution

The Shoreline Study is investigating the feasibility of a combined flood risk management and ecosystem restoration project that also provides additional public access opportunities.



Typical natural tidal marshland in San Francisco Bay near the Shoreline project area.

Originally, the study encompassed all the ponds in within the study area. However, during the “without-project conditions” phase of the study, the cost and time required to model, plan, and analyze this large-sized project area proved to be much more than anticipated. To reduce costs and finish the study before the targeted implementation date of 2017, the USACE, SCVWD, and the Conservancy decided to focus on the portion of the study area that had some of the highest estimated damages from tidal flooding – the Alviso area between Alviso Slough and Coyote Creek, which includes Alviso Ponds 9 through 18.

At this time, the proposed project elements are generally:

- Tidal restoration of Alviso Ponds A9 through A15 to be phased in through adaptive management
- Tidal restoration of Alviso Pond A18 with possible creation of large upland areas and brackish marshes using treated wastewater effluent or stormwater
- Flood protection through an engineered levee system that would connect the existing high ground between Alviso Slough and Coyote Creek
- Public trails on levees and connections to the existing trail network

Various flood protection strategies will be examined, such as engineered levees, ring levees around key infrastructure, and relocation of structures within the floodplain. Proposed ecosystem restoration management actions would include breaching historical channels, lowering outboard levees, placing fill along levees to enhance upland transition zones and sea level rise resilience, placing fill as islands and deltas, and designing terraced levees to promote habitat transition zones conducive to sea level changes.

Success Factors:

- Multiple sources of funding and widespread support for the project.
- A phased project approach with an adaptive management plan integrated into the project.

Integrated Management Actions

The San Francisco Bay Shoreline Project integrates management actions to address reduction of flood risk and other resource management needs, including ecosystem restoration and enhanced recreation. Multiple benefits are achieved through this integration.

Potential management actions include: flood protection system modifications such as replacement of non-engineered levees, sloughs realignment, and stream stability improvements; levee erosion control using natural materials; improved ecosystem functions through channel breaching, lowering outboard levees, enhancing bay transition zone, and designing terraced levees and islands; floodplain management actions such as raising structures and floodproofing; targeted outreach in areas protected by levees to promote risk-reduction activities; and defining roles and responsibilities for floodplain management and emergency management.

Integrated Benefits
<p>The future project would:</p> <ol style="list-style-type: none"> 1. Reduce potential economic damages due to tidal flooding 2. Reduce the risk to public health, human safety, and the environment due to tidal flooding 3. Increase contiguous marsh to restore ecological function and habitat quantity, quality, and connectivity (including upland transition zones) 4. Provide opportunities for public access, education, and recreation
Financial Information and Project Status
<p>The total cost of the study is approximately \$19 million, and the estimated project cost is on the order of \$100 - \$200 million.</p> <p>Feasibility studies and early implementation stages are funded and underway, although design and construction phases are presently unfunded. When viewed over the long term, the inclusion of project features beyond flood protection is likely to yield a far better return on investment.</p> <p>USACE is currently working on developing restoration and flood protection alternatives for the Alviso area with an estimated implementation date of 2017. Flood risk management features will complete constructions within a few years, and implementation of the restoration activities will take several decades due to the phased nature of the restoration, reliance on natural processes to create tidal marsh, and potential need to adjust timing to reflect monitoring results and adaptive management.</p>
Primary Information Sources
<p>Santa Clara Valley Water District. <i>2012-2016, 5-Year Capital Improvement Program</i>, 2011.</p> <p>Study partnership website: http://www.southbayshoreline.org/</p>

This page intentionally left blank.

Project Name: Lower Carmel River Floodplain Restoration and Flood Control Project

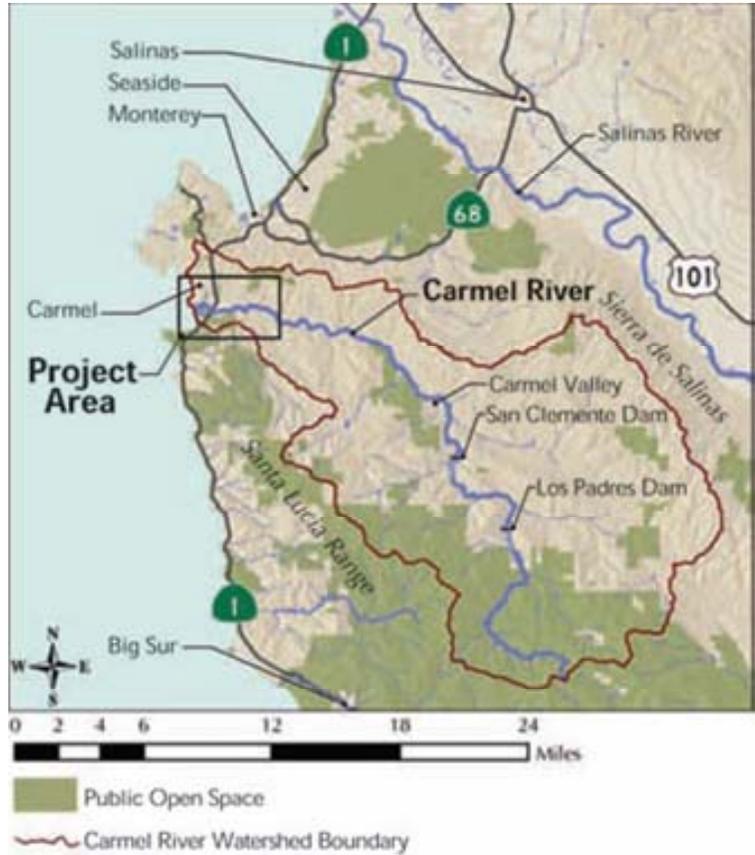
Responsible Agency	The Big Sur Land Trust (BSLT) Monterey County Water Resources Agency (MCWRA) Monterey County Public Works Department (MCPWD) California Department of Parks and Recreation (California State Parks)
Partners	<p>The Lower Carmel River Floodplain Restoration and Flood Control Project (Carmel River Project) focuses on environmental enhancement and flood control improvements for the lower Carmel River and lagoon. These critical needs are being addressed by local agency managers, nonprofit partners, and private entities that have come together and identified several key interrelated projects, forming a comprehensive solution. These parties recognized an integrated approach was needed to effectively address flooding issues and unfavorable habitat conditions.</p> <p>This multiple-agency effort is taking place in three unique, but connected, areas within the lower Carmel River -- O'dello East area, Carmel River Lagoon area, and County Service Area 50 (CSA-50). These areas are described in detail in the Solutions section below. The responsible agency for each area is BSLT, MCWRA and California State Parks, and MCPWD, respectively. Other entities and interests involved with these efforts include the following:</p> <ul style="list-style-type: none"> • California Coastal Conservancy (Conservancy) • National Oceanic and Atmospheric Administration Fisheries Service • Transportation Agency of Monterey County • California Department of Transportation • Carmel River Steelhead Association • Carmel River Watershed Conservancy • Monterey Peninsula Regional Park District • Carmel Development Corporation • California American Water Company • California State University at Monterey Bay • Carmel Area Wastewater District • Carmel River Lagoon Coalition • California Coastal Commission • California Department of Fish and Wildlife (CDFW) • U.S. Army Corps of Engineers (USACE) • U.S. Fish and Wildlife Service (USFWS)
Region/County	Central Coast Region/Monterey County

Project Area

The Carmel River Project is located within the lower reaches of the Carmel River watershed; the project extends from the Carmel River lagoon and river mouth to about two miles inland (see Project Area Map).

The project area includes the Carmel River State Beach and adjacent lagoon area, wetlands, and floodplain area, which together, serve as an important refuge for sensitive aquatic species and migratory birds. The project area is a dynamic interface between marine and freshwater systems.

This project area is characterized by white sand beaches, natural habitats, and agriculture, as well as residential neighborhoods, golf courses, and commercial centers.



Project Area Map

Problems and Need



Lower Carmel River and Lagoon

Human activities and infrastructure – water diversions, gravel mining, agricultural and urban development, roads, levees, bridges, and buildings– have altered the lower end of the Carmel River and impacted the watershed by redirecting flood flows, reducing floodplain acreage, and degrading wildlife habitat.

Diminished Hydrologic and Ecologic Function: The construction of State Route 1 (Highway 1) isolated floodplain areas along the lower reach of the Carmel River, diminishing the hydrologic connectivity between the river channel and adjacent floodplain. This hydrologic connectivity between the river channel and adjacent floodplain was further diminished by earthen levees constructed on the southern bank of the river that reduce flooding of adjacent

farmlands. These changes contributed to repetitive flooding problems along the northern bank of the river, resulting in tens of millions of dollars in damages to residential and commercial buildings. Additionally, the isolation of floodplains from the river channel and associated expansion of agricultural land uses significantly compromised riparian and wetland habitat in the area.

Flooding and Erosion Impacts: The confinement of the main channel, as described above, redirected flood flows downstream to the Carmel River Lagoon area and river mouth, increasing the frequency and severity of

downstream flooding. Sediments that would normally be deposited when flood flows move laterally into floodplains are now carried downstream and contribute to the buildup of a natural flow barrier at the river mouth. The flow barrier causes the northward migration of the river mouth. These conditions increased water levels several feet in the adjacent lagoon and increased erosion of adjacent scenic coastal roadways (Scenic Road) during flood events. Sandbar management activities historically partially mitigated impacts to low-lying structures and public infrastructure. However, these activities have been found to cause loss of aquatic habitat in the lagoon area.

Past flooding events have caused expensive and severe damage to the areas around the lower reach of the Carmel River. The most noted events include the March 1995 flood and February 1998 flood. The 1995 flood, considered a 20- to 30-year flood event, destroyed the Highway 1 Bridge and flooded development on both sides of the highway. During the 1995 and 1998 events, sewage treatment was disrupted in the lower Carmel River residential and commercial areas. A state of emergency was declared during both of these events.



Highway 1 Bridge over the Carmel River during the March 1995 Flood

The lower reaches of the river and lagoon areas are rated as the highest on the list of repetitive loss areas in Monterey County, coupled with damage to coastal scenic roadways from associated channel erosion. Furthermore, portions of the project area lie inside the county's tsunami wave run-up boundary and are subject to moderate tsunami hazards. Projected rising sea levels resulting from global climate change could further exacerbate this flooding problem.

Flood Hazard Type(s)

Type(s): Failure of Engineered Structures, Coastal Flooding, Tsunami Flooding

Solution

Several interrelated projects have been proposed to improve hydrologic functions, restore habitat, and reduce flooding hazards along the lower Carmel River. These projects are multiple objective and provide opportunities for other benefits, including water quality, water supply, cultural practices, and recreation. The integration of management actions forms the basis for specific projects being planned and implemented. Some examples of key management actions include:

- Increasing accuracy and completeness of map information through topographic surveys to clearly define elevations pertinent to flood control planning
- Conducting geotechnical engineering analysis and hydraulic modeling needed to support design of flood control improvements
- Modifying placement and/or size of existing levees and/or floodwalls, and adding new levees or floodwalls to improve flood protection
- Improving hydrologic functions by reconnecting floodplains through land restoration. This is accomplished with actions such as regrading lands, modifying or removing nonstructural levees, re-vegetating with native species, and reestablishing riparian and wetland habitat in the floodplain and off-channel wetland habitat
- Integrating storage and filtration basins into restored floodplains to increase flood flow retention, promote sediment and nutrient removal, and increase groundwater recharge
- Establishing and preserving agricultural operations adjacent to, but hydrologically disconnected from, the floodplains

Provided below is a summary of the interrelated projects. The relative location of these projects is shown in the accompanying map placed at the end of this section.

O'dello East Area: Projects for this area, which is south of CSA-50, will enhance native riparian and wetland habitat while restoring hydrologic function. This will be accomplished through the following projects:

- Big Sur Land Trust Floodplain Restoration Project. This project is in the design phase and involves floodplain restoration efforts to reshape lands to create the hydrologic characteristics necessary to

support natural hydrologic processes and ecosystem functions. This includes modifications of nonstructural earthen levees and adjustment of topography to direct flood flows to restored floodplains, and introduction of various habitat types, including shallow seasonal habitat areas along the river and within the floodplain.

- Highway 1 Causeway Project. This project is in the design phase and consists of constructing a causeway to facilitate conveyance of flood flows under Highway 1. This would reconnect the floodplain area east of the highway (O'dello East Area) with the floodplain and lagoon west of the highway (Carmel River Lagoon Area). The causeway will also address existing deficiencies with this segment of the highway and reduce flood hazards to the route.

Carmel River Lagoon Area: In recent years, fish and wildlife habitat improvements have been made in the Carmel River Lagoon area. Flood flow conveyance and floodplain connectivity improvements are proposed between this area and the adjacent upstream floodplain area east of Highway 1 (O'dello East Area). This improved hydrologic function would increase the flood flow capacity and enhance floodplain habitat conditions. Completed and additional planned improvements include:

- California Department of Parks and Recreation (California State Parks) – Carmel River Lagoon Restoration. This completed project expanded the lagoon by restoring adjacent agricultural lands. The project included excavation of a remnant southern arm of the lagoon on the western side of Highway 1 to expand aquatic habitat for steelhead and riparian wildlife.
- Carmel River Lagoon Ecosystem Protective Barrier (EPB) Project and Scenic Road Preservation and Protection Project. These two projects are in the planning stages and will protect adjacent low-lying residential structures, adjacent park facilities, and Scenic Road. They will also provide habitat for fish and wildlife and reduce or eliminate sandbar management activities.

CSA-50: Originally completed in 2002, an updated flood control project report is planned for CSA-50. This effort is in the planning stages and specific actions have not been identified. When the report update is completed, the preferred project will identify specific actions that address flood control needs, and that further enhance hydrologic connectivity with the O'dello East area (south of CSA-50) and improve water quality of stormwater runoff from CSA-50. Following completion of this updated report, the next phase of work will involve completing environmental documentation and permitting necessary to implement the preferred project, and also recommendations from the Carmel River Lagoon EPB and Scenic Road Preservation and Protection Project feasibility analyses (discussed above).



Project Components

Success Factors:

Many factors have contributed, and continue to contribute, to the success of ongoing and planned efforts related to the Carmel River Project. Through creative partnerships, solutions associated with and planned for this project are being developed in coordination with other ongoing but related efforts in the area, increasing the opportunity for multiple benefits. For example, BSLT, one of the Carmel River Project responsible agencies,

is also working on creating an extensive network of open space and trails along the lower Carmel River. This has been made possible through teaming with agencies that are partners in and supporters of this project.

Integrated Management Actions

The Carmel River Project encompasses structural and nonstructural actions integrated to achieve multiple benefits. Primary actions are summarized below:

- Set back or remove levees to connect rivers to floodplains
- Restore lands to a more naturally functioning floodplain
- Restore channel form and function to improve operation and maintenance and facilitate flood damage reduction
- Construct new bypasses to improve flood system performance
- Construct new levees or floodwalls to provide flood protection to additional areas potentially affected by flooding
- Improve structural performance and resilience of existing flood facilities
- Develop local flood management plan updates

Integrated Benefits

The Carmel River Project proposes to restore and enhance the lowest reach of the Carmel River to increase native habitats and provide flood reduction benefits to areas prone to flood hazards.

Flood protection benefits include the following:

- Reducing damages to residences, commercial businesses, and local and State of California infrastructure
- Improving connectivity between the main channel and overbank areas to reduce flooding hazards
- Providing a protective buffer against sea level changes

Ecosystem benefits include the following:

- Recovering natural functions and values that were present historically
- Restoring riparian and wetland habitat within the historical floodplain
- Increasing habitat connectivity between the main channel, floodplain habitat, and lagoon habitat

Other benefits include the following:

- Increasing recharge and storage of groundwater
- Improving the quality of water entering the Carmel River lagoon
- Maintaining historically important agricultural operations
- Improving recreation and associated public access

Financial Information and Project Status

O'dello East Area: Currently, BSLT has secured approximately \$17 million in grant funding necessary for project implementation, and they continue to pursue additional grant funding for contingencies, including the State's Integrated Regional Water Management Grant Program. Additional grant funding, however, is not currently available for the Highway 1 Causeway Project. California Department of Water Resources (DWR) recently published draft funding recommendations for the Flood Protection Corridor Program 2010-2011 Competitive Grant funding. BSLT requested \$5 million in grant funds, which would help provide partial funding for the Highway 1 Causeway Project.

Carmel River Lagoon Area: The California State Parks implemented the Carmel River Lagoon Enhancement Project to expand the lagoon west of Highway 1. The Conservancy funded \$4 million to the California State Parks to lead this effort. The MCWRA received a \$145,000 Wildlife Conservation Board grant to complete a feasibility analysis for the Carmel River Lagoon EPB Project, and the MCDPW received a \$54,200 DWR grant to complete a feasibility analysis for the Scenic Road Protection and Preservation Project. These feasibility analyses will identify a preferred project for each area.

CSA-50: MCWRA received a \$500,000 EPA special appropriation for the lower Carmel River. A work plan is currently being developed to utilize the funds. Phase I of the draft work plan is focused on developing a preferred project within CSA-50. Phase II is anticipated to involve completing environmental documentation and permitting necessary to implement recommendations of the Phase I report, and also recommendations from the Carmel River Lagoon EPB and Scenic Road Preservation and Protection Project feasibility analyses.

APPENDIX E: DETAILED DESCRIPTIONS OF CASE STUDIES

Primary Information Sources

Big Sur Land Trust. *Lower Carmel River and Lagoon Floodplain Restoration and Enhancement Project Fact Sheet*. January 2008.

Big Sur Land Trust and Monterey County Water Resources Association. *Draft Initial Study for the Big Sur Land Trust Carmel River Floodplain Restoration and Environmental Enhancement Project*. February 2011.

California State Department of Fish and Wildlife, Wildlife Conservation Board. Wildlife Conservation Board Meeting, Final Agenda Items. June 2, 2011.

Monterey County Resource Management Agency. "Carmel River Floodplain Restoration – Board Approves Grant Application." *RMA News*, Volume 5, Issue 4. April 2012.

Monterey County Water Resources Agency. *Monterey County Floodplain Management Plan Update*. 2008.

Monterey County Water Resources Agency. *Draft Work Plan - Lower Carmel River Floodplain Restoration and Flood Control Project (R9 06-211 2011 Special Appropriation)*. March 2012.

Monterey Peninsula Water Management District. *Monterey Peninsula, Carmel Bay, and South Monterey Bay Integrated Regional Water Management Plan*. November 2007.

Project Name: San Bernardino County Flood Control District Groundwater Recharge Program – Cactus Basins 3, 4, and 5

Responsible Agency	San Bernardino County Flood Control District
Partners	San Bernardino Valley Municipal Water District City of Rialto Public Works Department California Department of Water Resources
Region/County	South Coast/San Bernardino County
Project Area	
<p>The project is situated in a developed, highly urbanized area in the north-central portion of the City of Rialto. The project site is an undeveloped field owned by San Bernardino County that is approximately 140 acres in size. The Cactus Basins (Basins 3, 4, and 5) are unlined retention basins located between U.S. Highway 210 and Baseline Road, west of Cactus Avenue, and east of Ayala Drive.</p> <p>The project site is primarily a gently sloping (less than 2 percent) alluvial fan. Several small shallow drainage channels cross the site, and a significant portion of the land is being used for gravel pit operations. Cactus Basins 3, 4, and 5 are a part of the Rialto Channel system. Cactus Basin 3 has acted as a flood management facility from the time it was used as a borrow pit in 1976.</p>	
Problems and Need	
<p>Flooding along the Rialto Channel (located immediately downstream from the Cactus Basin channels) occurs on a regular basis. Even during moderate storms, flooded roadways adjacent to the Rialto Channel become a public hazard for both pedestrian and vehicular traffic. During these moderate events, the City of Rialto has to expend resources to both manage the flooding for public safety during the event, and to clean up afterwards. In the winter 2004/2005, severe flooding along the channel damaged several property walls of residences immediately adjacent to the channel. The cost to replace the block walls was approximately \$1.2 million, which was shared by both the San Bernardino County Flood Control District and the City of Rialto. Estimated 50-year and 100-year flood damages under without-project conditions are approximately \$27.3 and \$30.5 million, respectively.</p> <p>Inadequate water supply: Planned development in the City of Rialto will increase the amount of impervious area, which will increase both the magnitude of peak flows and the volume of storm runoff. Also, additional development will interrupt natural groundwater recharge processes and increase water usage.</p>	
Flood Hazard Type	
Types: Alluvial Flooding. Flash Flooding. Debris Flow Flooding.	
Solution	
<p>The project includes enlargement of three existing unlined retention basins and construction of a habitat restoration area. The main objective of the proposed project is to eliminate any potential increase in flood hazard due to extensive development in the northern portion of the watershed. Cactus Basins 3, 4, and 5 are essential to adequately protect the City of Rialto's primary commercial/industrial area. The project is intended to attenuate upstream flows for stormwater facilities located downstream from the project area, thereby allowing the regional flood management system to function more efficiently. Once the Cactus Basins are completed, they will provide 100-year flood protection for residents and businesses within the Rialto Storm Drain system by reducing peak flows. Under current conditions, Cactus Basins 3, 4, and 5 have a total capacity of 447 acre-feet and 100-year storm peak outflows of 8,215 cubic feet per second. Cactus Basin 3 is currently the only functioning basin. Once the proposed improvements are constructed, total capacity will increase nearly five times, to approximately 2,039 acre-feet. Peak flows will thus be reduced to 1,244 cubic feet per second. The 80 percent reduction in peak outflow will provide flood protection to the immediate vicinity and allow downstream facilities to be designed with smaller capacities.</p> <p>The proposed project will entail grading the three unlined retention basins and constructing a system of basin inlets and outlets to route storm runoff in a controlled manner. The three existing basins will be excavated (following previous sand and gravel removal activities) to increase the depths to permit storage of increased stormwater runoff. Slopes will measure between 20 feet and 46 feet in height from the bottom of the basins to the top of the slope. The inlets to Basins 3, 4 and 5 will be constructed using concrete and a half-ton of ungrouted rock. Width will range between 210 feet and 300 feet. The rock used at the inlets will reach from the top of the embankment to the toe at the basin bottom, and will include a 25-foot-wide splash pad. Surface water in the area will flow southward from Basin 5 to Basin 4 and from Basin 4 to Basin 3. Surface water will then flow from Basin 3 through an existing reinforced concrete box and pipe structure (located in the southwest corner of Basin 3) under Baseline Road into the Rialto Channel and the existing Basins 2 and 1. The outlet of existing Basin 1 connects to Rialto Channel, which flows approximately 5.4 miles southward to the Santa Ana River.</p>	

APPENDIX E: DETAILED DESCRIPTIONS OF CASE STUDIES

Water that exceeds the capacity of the culvert will overtop and use the emergency spillway from Basin 5 to Basin 4. The spillway will be constructed of reinforced concrete, 120 feet wide with a quarter ton of rocks added to the sides and concrete for protection. The outlet of Basins 3 through 5 will all incorporate a reinforced concrete box culvert.

The project can logically be subdivided into three main aspects:

- Construction of basins
- Operation of the facility for flood management purposes
- Operation of the facility for artificial recharge of retained stormwater runoff

The project's primary function will be to enhance flood protection, and it will increase the local water supply by acting as a groundwater recharge facility. In their current condition, Cactus Basins 3, 4, and 5 do not have groundwater recharge capabilities. Total annual recharge capacity for the improved Cactus Basins 3, 4 and 5 was estimated in the 1988 Environmental Impact Report to be 35,000 acre-feet per year, with an average of 15,000 acre-feet per year. The percolation rate of the basins was determined in the Santa Ana River Water Rights Application for Supplemental Water Supply. Because of the project's groundwater recharge potential, local water purveyors will be able to use the facility to increase their water supply and incorporate that increase into their water management programs.

Portions of the basins will be used for ecosystem restoration as part of environmental permitting requirements. San Bernardino County Flood Control District will hydroseed the project site with an alluvial fan sage scrub seed mix. A 2.67-acre area immediately east of Basin 3 will be reserved as a riparian habitat revegetation area in which cuttings will be installed and seeded over in accordance with the Cactus Basin 3 revegetation plan. The loss of alluvial fan sage scrub will be mitigated offsite by preserving 45 acres of reserve mitigation land within the Santa Ana River basin in perpetuity. Potential mitigation sites include Lytle Creek, San Sevaine Creek, and Cucamonga Creek.

Success Factors:

The project and affected watershed are located within the City of Rialto. The city has a relatively large population of low- to moderate-income families, as defined by thresholds developed under the U.S. Department of Housing and Urban Development Community Development Block Grant Program. This population has been historically underserved in infrastructure and public works improvements. The project will provide improvements to the community in flood risk reduction, water supply, and habitat restoration from previous gravel pit operations.

Integrated Management Actions

Main actions implemented for Cactus Basins 3, 4, and 5 include the following:

- Increase on-stream flood storage capacity by building new storage facilities or updating, modifying, or replacing existing flood storage facilities.
- Improve conveyance by addressing flow constrictions.
- Improve water supply by using flood basins for groundwater recharge.
- Improve the quality, quantity, and connectivity of wetland, riparian, woodland, grassland, and other native habitat communities.

Integrated Benefits

The proposed improvements will provide multiple benefits to the communities in the watershed, such as flood management, an increased water supply through groundwater recharge, and ecosystem restoration.

Financial Information and Project Status

In 2011, various technical studies have been performed regarding hydrology and hydraulics related to this project and Rialto Channel downstream from the basins. The required environmental documents (CEQA, under California Public Resources Code § 21000 *et seq.*) were prepared and approved by the City of Rialto in 1988. Because of the time lapse since approval of the original document and the need to comply with current standards, the district completed a CEQA document for the Supplemental Environmental Impact Report in December 2008 for Cactus Basin 3. CEQA documentation for Cactus Basins 4 and 5 will be completed before construction. Design is approximately 98 percent complete for Cactus Basin 3 and 30 percent complete for Cactus Basins 4 and 5. For Cactus Basin 3, plans are in the final stages of review and environmental clearance. Construction of the entire project is expected in 2015.

Total project cost is expected to be approximately \$35,346,985. The project was awarded \$1,000,000 in Proposition 84 (2006) Stormwater Grant funds from the California DWR through the Santa Ana Watershed Project Authority.

Primary Information Sources

San Bernardino County. 2011 Federal Legislative Platform. 2011.

San Bernardino County Flood Control District. Proposition 1E (2006) Stormwater Flood Management Application. October 3, 2011.

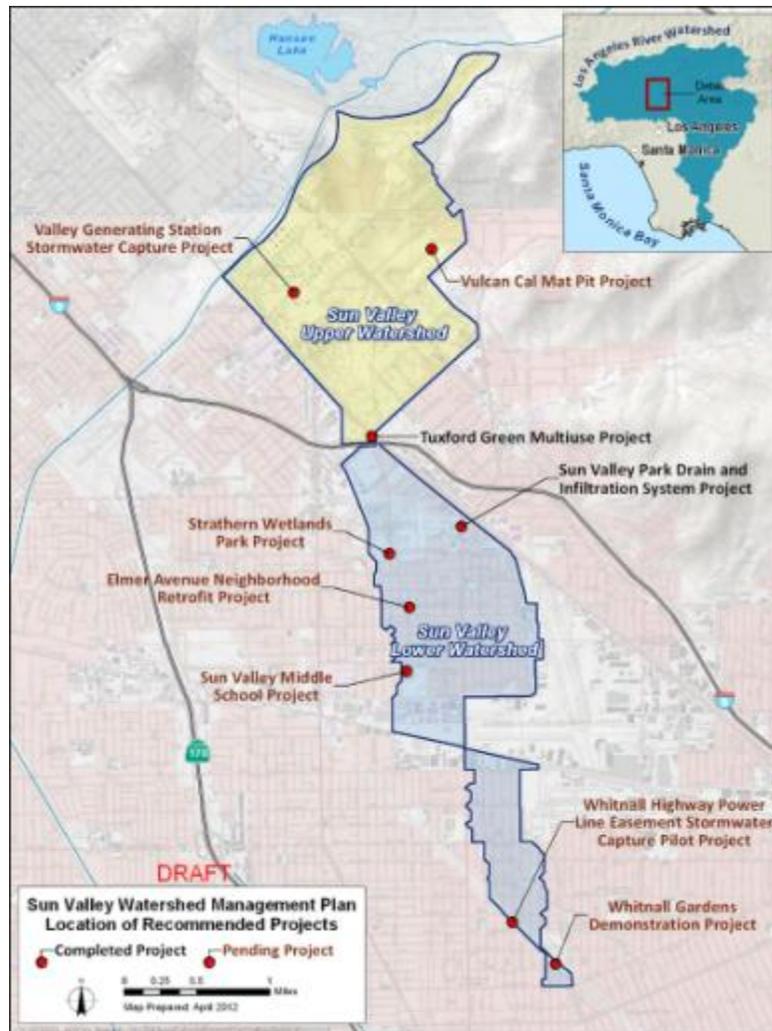
Santa Ana Watershed Project Authority. *One Water One Watershed Project Information, Cactus Basins 3 and 3A, Project Number 1190*. 2010.

Santa Ana Watershed Project Authority. *One Water One Watershed Project Information, Cactus Basins 4 and 5, Project Number 1180*. 2010.

This page intentionally left blank.

Project Name: Sun Valley Watershed Management Plan

Responsible Agency	Los Angeles County Department of Public Works (LACDPW)
Partners	The Sun Valley Watershed Management Plan (Watershed Management Plan) is an integrated watershed management effort focused on solving chronic stormwater flooding within a subwatershed of the Los Angeles River. The Watershed Management Plan is directed by the LACDPW, with extensive input from the Sun Valley Watershed Stakeholders Group (Stakeholder Group). Organizations involved in the diverse stakeholder group include 20 city agencies, 3 county agencies, 12 State agencies, and 10 environmental agencies. Other key stakeholders include the U.S. Department of the Interior, Southern California Association of Governments, Los Angeles Trails Project, Los Angeles Unified School District, Upper Los Angeles River Area Watermaster Services, and dozens of local businesses, industries, and area residents.
Region/County	South Coast/Los Angeles County
Project Area	
<p>The Sun Valley watershed is located in the San Fernando Valley in the city of Los Angeles, approximately 14 miles northwest of downtown Los Angeles. The watershed is a 2,800-acre (4.4-square mile) sub-basin of the Los Angeles River watershed. It is densely urbanized with approximately 60 percent of the area dedicated to industrial and commercial use.</p> <p>The Watershed Management Plan project area is coincident with the Sun Valley watershed shown on the accompanying map. Also shown on the map are projects recommended by the plan. The plan and associated projects are discussed in the Solutions section below.</p>	



APPENDIX E: DETAILED DESCRIPTIONS OF CASE STUDIES

Problems and Need

The Sun Valley watershed has experienced numerous flooding and related problems during the last 40 years. The most significant issues include flood damage, water quality, and habitat degradation.

Limited Flood Management Facilities: As in most heavily urbanized area, about two-thirds of the ground in Sun Valley is covered by hard or impervious surfaces. Underground storm drain systems are used to carry stormwater away from urbanized areas. However, the Sun Valley watershed is not served by a comprehensive underground storm drain system; instead, stormwater is primarily conveyed on street surfaces with relatively flat slopes. As a result, light rainfall leads to moderate to severe flooding of city streets.

Another problem is the location of existing flood management structures. Flood management structures that convey stormwater from the Sun Valley watershed to the Los Angeles River are located on the southern end of the watershed and are too far from the northern part of the watershed to provide flood management for that area. As a result, the runoff from the upper watershed discharges directly onto city streets into the lower, southern end of the watershed.



Chronic Street Flooding – Sun Valley Watershed

Water Quality and Ecosystem Impacts: Development of the Sun Valley watershed has resulted in significant water quality impacts to the Los Angeles River, and has reduced and fragmented native habitat. Development has decreased vegetation and open space, which has reduced the natural retention of rainfall and has impacted the productivity and diversity of wildlife in the watershed. Approximately 66 percent of rainfall within the watershed flows untreated to the Los Angeles River. Runoff from the watershed often includes elevated contaminants typical of urban stormwater, such as nitrogen, ammonia, pH, algae, scum, odors, coliform, trash, and heavy metals (SWRCB, 2003). Heavy metals are noticeably higher in flows originating in the lower watershed because of the higher concentration of industrial and automotive land uses in this area.

Flood Hazard Type

Types: Local Stormwater Flooding and Debris-Flow Flooding

Flooding is primarily caused by urban development and inadequate flood management facilities. Uncontrolled runoff flows through developed areas within the watershed, hindering transportation, damaging property, and carrying debris and contaminants into the downstream Los Angeles River.

Solution

Numerous projects have been proposed to relieve flooding in the Sun Valley watershed. A traditional, single-purpose regional relief drain was proposed in 1989 but was never implemented. During the 1990s, Sun Valley stakeholders and the LACDPW began to explore an innovative, integrated approach to solving flooding and related problems using more sustainable practices. These efforts resulted in the Watershed Management Plan, which was completed by the stakeholders and adopted by the Los Angeles County Board of Supervisors in 2004. The primary objective of the Watershed Management Plan is to reduce existing and future flooding to levels consistent with LACDPW standards, using a wide range of multiple objective projects that collectively also increase water conservation, increase recreational opportunities, increase wildlife habitat, improve water quality, provide additional environmental benefit, and increase multiple agency participation. Extensive stakeholder input helped identify potential projects based on their ability to meet these objectives in a cost-effective manner. As a group, the planned projects are designed to control runoff from a 50-year frequency design storm, a LACDPW stormwater management standard.

Specific management actions supported by the Watershed Management Plan include retention basins, underground storage, infiltration basins, and large-scale stormwater separation devices to remove trash and suspended pollutants. These are integrated with actions to increase open space and connect fragmented habitats through restoration of commercial and industrial gravel pits, improvements along easements and rights-of-way utility corridors, incorporation of trails along these corridors, and improvement of public access to

restored areas. The integration of various combinations of these, and other similar management actions form the basis for the projects recommended by the Watershed Management Plan. These recommended projects are summarized below.

Sun Valley Park Drain and Infiltration System Project: Completed in 2006, this project converted an existing municipal park into a multiple use site incorporating stormwater management, water quality treatment, and water conservation. The project alleviates localized flooding through a new storm drain. The storm drain routes runoff through a water quality treatment system to remove suspended solids and heavy metals. Treated runoff is then routed to infiltration basins to recharge groundwater. Because the system is underground, the park's recreational elements are undisturbed. The project also includes the addition of new soccer and baseball fields, refurbished recreational amenities, and vegetative swales that both improve natural beauty and treat runoff.

Tuxford Green Multiple Use Project: Completed in 2007, this multiple objective project uses a series of catch basins and storm drains to collect runoff from a 2.2-square-mile urbanized area. Stormwater is treated and conveyed under an existing intersection and hydraulic pressure "pushes" flows up to an existing culvert, where they continue to the southern end of the watershed. The project includes landscaping of a previously barren corner of the intersection with native plants that are irrigated with stormwater stored in a 45,000-gallon underground cistern.

Strathern Wetlands Park Project: This project will convert a 46-acre, engineered, inert landfill into a multiple purpose wetlands park. A storm drain system, detention ponds, and wetlands will be constructed to capture and treat stormwater runoff. Treated flows will be pumped to the adjacent Sun Valley Park groundwater infiltration basins providing recharge into the local groundwater system. In addition to water quality improvements, the constructed wetlands will also enhance native vegetation, and create opportunities for wildlife habitat and recreation.

Valley Generating Station Stormwater Capture Project: The Valley Generating Station is a power-generating facility owned and operated by Los Angeles Department of Water and Power (LADWP) and located within the upper Sun Valley watershed. For this project, stormwater runoff from the area will be captured, treated, and directed through a series of recharge basins, swales, and overflow culverts. The project may also consider upgrades to the existing gravel pit for use as possible storage and stormwater infiltration and construction of a large infiltration swale to provide offsite stormwater capture.

Whitnall Gardens Demonstration Project: This project will feature a conservation garden, including drought-tolerant planting, a walking path, and stormwater capture. A storm drain system will direct stormwater runoff into a 32,000-cubic-foot infiltration basin. This small-scale demonstration project is intended to inform the development of other San Fernando Valley projects that share similar soil characteristics. An infiltration test was conducted at this site in March 2009, which proved the soils in this area to be excellent for infiltration at a rate of 8.2 feet per day.

Elmer Avenue Neighborhood Retrofit Project: This project was led by the Council for Watershed Health and TreePeople and was completed in 2010. Project features capture and treat runoff from 40 acres of residential land-use, provide 16 acre-feet of groundwater recharge annually, and reduce peak flows and pollutant loads to the Los Angeles River.

Other Planned Projects: Other potential projects included in the Watershed Management Plan are in the early stages of discussion and, because they are associated with private land holdings, may be several years away from implementation. These projects include:

- Vulcan Cal Mat Pit Project
- Whitnall Highway Power Line Easement Stormwater Capture Pilot Project
- Sun Valley Middle School Project

The Vulcan Cal Mat Pit Project would place a berm around an existing landfill that currently stores inert debris to create a retention basin that would store and promote infiltration of runoff from adjacent residential areas. The Whitnall Highway Power Line Easement Stormwater Capture Pilot Project would capture stormwater runoff at several locations along the easement and direct stormwater into a network of swales, culverts, hydrodynamic separators, and infiltration basins for pretreatment and infiltration. The Sun Valley Middle School Project would incorporate a new storm drain to collect runoff and alleviate flooding from adjacent residential areas, an underground infiltration basin, and bioswales for groundwater recharge. The project will also be featured as part of an environmental education program.

Success Factors:

The projects for the Sun Valley watershed have required a high degree of collaboration among multiple stakeholders, including government officials, civic organizations, local businesses, and area residents. LACDPW hosts a quarterly meeting with a Sun Valley Watershed Stakeholder Group, which provides a key venue to receive stakeholder input, inform stakeholders of watershed issues, and update stakeholders on the status of ongoing projects.

Interagency cooperation has been critical to the success of the Watershed Management Plan. Using the integrated water resources approach promotes creativity in project design and encourages participation from

APPENDIX E: DETAILED DESCRIPTIONS OF CASE STUDIES

multiple agencies in the watershed. All parties are encouraged to recognize the legitimacy of each other's organizational goals and seek to maximize all the goals of all parties as much as possible. This helps each agency accomplish their own organizational goals cooperatively while also making the best use of human and financial resources in implementing the Watershed Management Plan.

Integrated Management Actions

The main actions implemented for the Watershed Management Plan projects include the following:

- Construct debris basins (use of large-scale stormwater separation devices to remove trash and suspended pollutants).
- Improve interior drainage (use of storm drain systems).
- Manage runoff through watershed management (increased vegetative cover, infiltration basins, minimizing impermeable surfaces).
- Improve the quality, quantity, and connectivity of wetland, riparian, woodland, grassland, and other native habitat communities.
- Manage municipal stormwater to provide regional or system-wide flood benefits.
- Increase local agency awareness of flood mitigation compliance and grant application assistance (through the Stakeholder Group).
- Improve awareness of floodplain function through outreach and education (through the Stakeholder Group).
- Encourage multi-jurisdictional and regional partnerships on flood planning and improve agency coordination on flood management activities, including operation and maintenance, repair, and restoration (through the Stakeholder Group).

Integrated Benefits

Projects to address stormwater issues in the Sun Valley watershed will provide multiple benefits to water supply, recreation, wildlife habitat, and water quality. Specific integrated benefits of the projects are discussed below.

- **Increase Water Supply:** Increase local water supplies by capturing runoff and recharging groundwater. Use captured runoff for non-potable purposes to reduce the demand for potable water.
- **Increase Recreational Opportunities:** Increase recreational opportunities in the watershed by increasing the acreage of parks and the number of sports fields, adding equestrian and bike trails, and increasing public access.
- **Increase Wildlife Habitat:** Improve wildlife conditions by restoring and connecting existing flood easement and right-of-way corridors within the Sun Valley watershed.
- **Improve Water Quality:** Improve the water quality of the Los Angeles River by removing the pollutant load generated from stormwater in the Sun Valley watershed.
- **Provide Additional Environmental Benefit:** Provide additional environmental benefits as a result of implementing management actions that help reduce flooding or accomplish other objectives described above. For example, tree planting may help reduce urban runoff and provide shade to buildings, resulting in reduced energy costs for air-conditioning. Trees also cleanse air, thereby improving air quality.
- **Increase Multiple Agency Participation:** Increase multiple agency participation in local flooding and related water resource management challenges. Benefits of this include, but are not limited to, additional funding sources; a more involved government and community; increased literacy and awareness on watershed, water supply, and water quality issues; more effective use of resources; and increased opportunities to improve the economic climate for Sun Valley residents.

Financial Information and Project Status

Watershed Management Plan projects are being implemented in phases, and are in various stages of securing funding. Project status, cost, and funding are described below:

Sun Valley Park Drain and Infiltration System Project: This project was completed in 2006 with a total project cost of approximately \$7 million. The project was funded by a California Department of Water Resources (DWR) (Local Groundwater Assistance) grant, a Proposition 12 (2000), the Safe Neighborhood Parks, Clean Water, Clean Air and Coastal Protection Bond Act of 2000 (Murray-Hayden) grant received by TreePeople, and the Los Angeles County Flood Control District.

Tuxford Green Multiuse Project: This project was completed in 2007 with a total project cost of approximately \$3.7 million. The project was funded by the Los Angeles County Flood Control District.

Strathern Wetlands Park Project: This project is currently in the design phase and construction is scheduled for the fall of 2013. The total cost for design and construction is estimated at \$50 million and will be funded by the

APPENDIX E: DETAILED DESCRIPTIONS OF CASE STUDIES

Los Angeles County Flood Control District, the LADWP, and Proposition O (2004) grant funds.

Valley Generating Station Stormwater Capture Project: This project is currently in the planning and design phase. There is no specific schedule for project design and construction. The estimated construction cost is \$9.7 million.

Whitnall Gardens Demonstration Project: This project is currently in the design phase. There is no specific schedule for project construction. The estimated construction cost is \$1.3 million.

Whitnall Highway Power Line Easement Stormwater Capture Pilot Project: This project is currently in the planning and design phase. Design is expected to be completed the end of the 2014 fiscal year, followed by construction, which is to be completed by 2015. The land is already secured and the estimated construction cost is \$7.3 million.

Elmer Avenue Neighborhood Retrofit Project: This project was completed in 2010 with a total project cost of approximately \$2.7 million. This cost covered all project stages, including monitoring, data gathering, design, construction, and outreach. This project was funded by the U.S. Department of the Interior, Bureau of Reclamation; DWR; LACDPW; Metropolitan Water District of Southern California; Water Replenishment District of Southern California; LADWP; and the City of Santa Monica.

Cost estimates have not been developed for the Vulcan Cal Mat Pit Project or the Sun Valley Middle School Project.

By filing grant applications, the Stakeholder Group has been able to help contribute to financing the above projects.

A U.S. Army Corps of Engineers feasibility study is also currently being completed to determine whether there is a Federal interest in the Water Management Plan projects.

Primary Information Sources

Los Angeles County Department of Public Works. *Final – Sun Valley Watershed Management Plan*. May 2004.

Los Angeles County Department of Public Works. *Sun Valley Watershed Management Plan – Overview Fact Sheet*. October 2011.

Los Angeles County Department of Public Works. *Sun Valley Watershed Management Plan – Strathern Wetlands Park Fact Sheet*. March 2012.

Los Angeles County Department of Public Works. *Sun Valley Watershed Management Plan – Sun Valley Park Drain and Infiltration System Fact Sheet*. March 2012.

Los Angeles County Department of Public Works. *Sun Valley Watershed Management Plan – Tuxford Green Multiuse Project Fact Sheet*. March 2012.

Los Angeles County Department of Public Works. *Sun Valley Watershed Management Plan – Valley Generating Station Stormwater Capture Project Fact Sheet*. November 2011.

Los Angeles County Department of Public Works. *Sun Valley Watershed Management Plan – Whitnall Gardens Demonstration Project Fact Sheet*. September 2011.

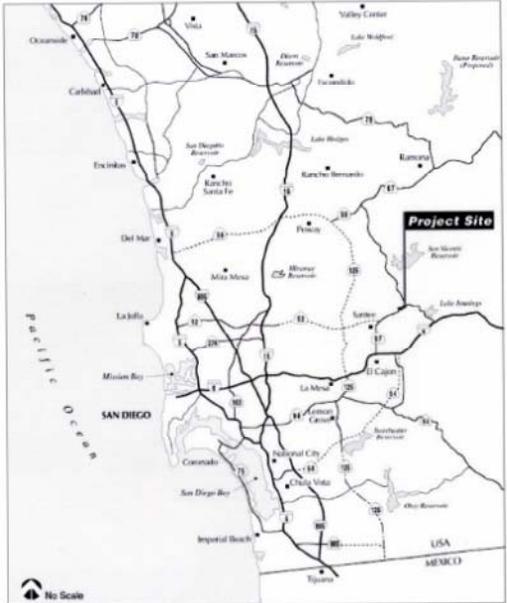
Los Angeles County Department of Public Works. *Sun Valley Watershed Management Plan – Whitnall Highway Power Line Easement Stormwater Capture Pilot Project Fact Sheet*. January 2012.

State Water Resources Control Board (SWRCB). *2002 CWA Section 303(d) List of Water Quality Limited Segments, Draft Version*. January 13, 2003.

Council for Watershed Health, *Elmer Avenue Neighborhood Retrofit Project Fact Sheet*. June 2, 2010.

This page intentionally left blank.

Project Name: Flood Management, Habitat Restoration and Recharge on the San Diego River

Responsible Agency	Lakeside’s River Park Conservancy (LRPC)
Partners	<p>The Lakeside’s River Park Conservancy’s project, Flood management, Habitat, Restoration and Recharge San Diego River (LRPC Project), was developed through collaboration among multiple agencies, including:</p> <ul style="list-style-type: none"> • San Diego River Park Foundation • Wildlife Conservation Board • San Diego River Conservancy • Riverview Water District • California State Coastal Conservancy (Conservancy) • California State Water Resources Control Board (SWRCB) • California Department of Transportation (Caltrans) • The Resources Agency
Region/County	South Coast/San Diego County
Project Area	
<p>The project is located in the community of Lakeside in San Diego County and is within a 580-acre area known as the Upper San Diego River Improvement Project (USD RIP). The area surrounding USD RIP is urban in nature, with industrial, commercial, and residential uses. USD RIP was established in the 1980s for the purpose of channeling the San Diego River to prevent future floods following two disastrous floods during the winters of 1978-79 and 1981-82.</p> <p>Incorporated in 2001, LRPC’s main area of concern is the Lakeside community located along a 2.5-mile stretch of the San Diego River. The project area is located along the northeastern edge of San Diego’s urbanized zone, approximately 21 miles northeast of downtown San Diego (see figure). Lakeside is surrounded by a rural setting. As the population of this community steadily grew during the mid- to late 20th century, the community faced various challenges, including flood hazards and environmental degradation. This segment of the San Diego River valley is now within a rapidly growing part of San Diego County. Improvements to the San Diego River and adjacent lands continue to be discussed, with continued emphasis on flood management, environmental habitat restoration, recreation, and water supply.</p>	 <p>The map shows the San Diego River flowing from the northeast towards the Pacific Ocean. Key locations marked include San Marcos, Escondido, Encinitas, Del Mar, La Jolla, Mission Bay, San Diego, Coronado, San Diego Bay, Imperial Beach, and National City. The project site is highlighted in a red box near Lakeside. The map also shows major roads like I-15 and I-805, and the border between the USA and Mexico.</p>

Upper San Diego River Improvement Project

Problems and Need

Flooding has created numerous problems for Lakeside, including the loss of roads and bridges that linked the northern and southern halves of the community and the rupture of sewer lines that crossed the river. The western half of USDRIP, including the project site, has been dominated by sand mining since the 1930s. Two sand mining ponds existed on the project site. The ponds created deep, open water in the river channel that acts as a sediment trap during a flood. This causes a buildup of sediment in the channel, decreasing the channel's capacity to convey floodwaters. Flooding was further aggravated by a constriction in the river north of the project site, thereby causing floodwaters to move at a much faster rate than would have been with a wider floodway.



Riverford washout, 1930.

Pre-project Development Sediment Flows

Lakeside experienced catastrophic damages from floods in the 1978-79 and 1980-81 flood seasons. The flooding damaged homes, transportation corridors, commercial and public facilities, and pipelines. These two flood events were the first floods to occur since the community began its transformation from a rural, farming community to a suburban bedroom community. Until recent flood management improvements were completed, damaging flood events of this type were expected to occur about every 17 years.

The County of San Diego responded to flooding in the Lakeside area with an ambitious plan to reduce flooding by sand mining the alluvium from the river, reclaiming and raising riverbanks with imported fill, and creating a channelized floodway. Although this process had some success in reducing flooding during 10-year events (3,500 cubic feet per second), it has never been tested in a flood event anywhere near the anticipated 100-year flood flows (35,000 cubic feet per second).

Loss of habitat, recharge, and recreation: Many of the natural functions of the river, including habitat, water quality, and recharge, have been lost in the process of channelizing portions of the river. The river has also lost its place as a source of recreation in the community. Up until recently, the sand mining operations along the river limited the public from accessing and enjoying walking, biking, or riding along the river for many years.

Flood Hazard Type

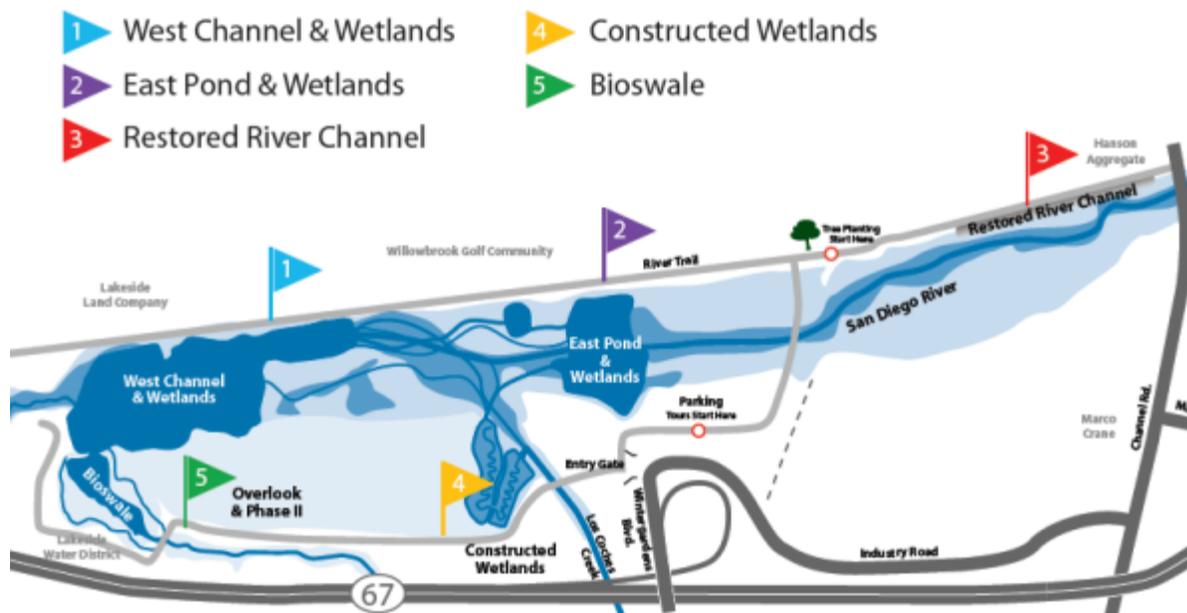
Type(s): Slow Rise Flood

Solution

The focus of this project is the restoration of the natural functions of the San Diego River corridor. The 100-acre area was formerly a sand and gravel mine. This project was approached in two phases.

Phase I consisted of five major elements: (1) West Channel and Wetlands, (2) East Pond and Wetland, (3) Restored River Channel, (4) Constructed Wetlands, and (5) Bioswale. These elements performed specific functions in the manner described below.

Phase I Restoration



Flood Control, Habitat, Restoration, and Recharge on the San Diego River

- Improving filtration and circulation:** The West Channel and Wetlands were originally excavated as a sand and gravel mining pond. The restoration focus here was to increase the wetlands, improve circulation in the pond, and improve sediment transport. The pond was made shallower with fill to create a defined channel and to improve circulation. To achieve this, a subterranean concrete wall was constructed along the southern edge of the pond and fill was placed behind it. A new wetland was formed south of the fill area through which water circulates. Coast live oak and sycamore were introduced, along with cottonwood and willow. This wetland vegetation cleans the water of pollution and supports nesting and spawning.
- Flood management and water quality:** The East Pond and Wetlands were originally formed by sand and gravel mining that left a pit 30 feet deep in the center. This was a trap for sediments. Also, invasive species dominated the upper slopes and algae blooms were significant. The pond receives tributary flows from the west, which, during rain events, includes urban stormwater flows. The restoration focus here was to improve sediment transport and provide additional wetland area for filtration and habitat. Approximately 80 percent of the East Pond was filled. Recycled riprap from excavated concrete was placed on the face of the soil fills to hold the soil in place during storm events. Wetland plantings were also completed in this step to help filter pollutants.
- Channel restoration:** A constriction in the river channel constructed after the floods of the 1970s and 1980s to protect a sand mining operation was aggravated by sediment deposits over time. The river channel was only 30 feet wide. The work was to improve flood management and lower the 100-year flood levels by widening the floodway to at least 100 feet. The County required the new cut slope to have riprap to the 100-year flood level to stabilize the slope under the velocities of a major flood event. All the riprap on the slope was recycled from the excavation, and included rock and large concrete slabs that were broken up onsite. More than 500 native shrubs and trees were planted every 10 feet throughout the riprap. These plantings provide green cover over the slope.
- Constructed wetlands:** The constructed wetland was designed to further cleanse the pollutants from tributary flows from the west that carry stormwater and urban runoff. About 65,000 cubic yards were excavated to form two treatment cells. The water must travel through treatment systems in both cells before it can recharge the groundwater or discharge back into the river below the channel mouth. In the first cell, wetland vegetation provides natural filtration. The second cell is designed to encourage groundwater infiltration and to direct the flow of stormwater into the channel.
- Bioswale:** The southwestern corner of the project area, adjacent to State Highway 67, receives urban runoff from a watershed south of Highway 67. Bioswales are used to treat the runoff before it flows into the southwestern corner of the West Pond. Retention time is the key to effective natural treatment in

the bioswale. Several pond areas receive and retain flows before the water flows to the next level. On the east, a narrow mature line of cottonwood, willow, and mulefat scrub treats the water. To the west, a new connection retains water briefly before it flows into the shallow thicket of young cottonwoods and willows. These trees treat the water before it slowly flows through the newly excavated treatment area. The two streams join again just before entering the western channel wetlands.

Phase II consisted of removing approximately 400,000 cubic yards of fill to create an area designed to slow floodwaters and provide additional habitat; this area is called the West Meadow. In Phase II, Caltrans excavated and removed fill west of the constructed wetland to construct the extension of State Route 52 to Highway 67. Approximately 400,000 cubic yards of fill were removed from the project area. This created new transitory storage and decreased flood levels in the 100-year event. It also increased riparian habitat.

Success Factors:

In January 2008, the project was recognized by the SWRCB as a success story in treating urban runoff and restoring the integrity of the river.

There are many factors that contributed to the success of this FM/IWM project. Unique factors are discussed here.

Tenacity for the Project: Project proponents attribute the sustained success of this project to the tenacity and commitment of those involved in the work. Passionate advocates for the project persevered through various challenges, such as funding delays and complex permitting processes. Volunteer support and community service work programs also played an integral role in the success of the project. In total, 23,600 volunteer and work program hours have been logged, engaging in invasive species eradication, planting native species, weeding, patrolling, and general support in a number of administrative areas.

Role of Project Partners: Phase II of the project was made possible when Caltrans became a partner and performed fill removal necessary for the project, and used this fill to meet their own construction needs. This collaborative element resulted in a net savings for both parties.

Phased Project Approach: Splitting the project into phases had several benefits. To be successful, the revegetation program required a phased, multi-year approach to prepare the earth for a healthy native species population that could withstand significant quantities of invasive species. Dewatering the project site during Phase I enabled accurate excavation elevations to be determined for the Phase II transitory storage element. Phased project efforts could be aligned with the grant funding that tended to fluctuate. Several project adjustments occurred in response to observations of actual field conditions and agency input. This resulted in project performance improvements and increased project benefits.

Compatibility with Regional Efforts: Efforts to restore the San Diego River are not exclusive to Lakeside. The San Diego River Park concept is an ambitious undertaking that will establish a linear River Park along the urban and rural sections of the San Diego River from the Pacific Ocean to the river's headwaters near Julian, California. The management organizational structure for the river park includes a coalition of 50 community-based land conservancies and friends groups that will manage river restoration and park activities in partnership with the San Diego River Park Foundation and the San Diego River Conservancy.

Integrated Management Actions

The project encompassed structural and nonstructural flood management and restoration actions that were integrated to achieve multiple benefits. The primary actions include:

- Acquiring ownership or land tenure on property for preservation or restoration as protected habitat. LRPC has acquired land through purchases from willing sellers and through land donations.
- Widening of the river (from 30 feet to 100 feet) into a portion of its historical floodplain.
- Restoring the natural meanders of the river channel.
- Reconfiguring tributary discharge points through the use of passive engineering techniques, which will slow flood velocities and divert those flows into a restored meander system.
- Restoring riparian habitat types for several threatened and endangered species.
- Capturing transient flood flows for habitat (wetland) enhancement and for groundwater recharge enhancement. The amount of recharge is increased to local aquifers that feed water supply to municipal wells. Recharge is accomplished through the use of former gravel mining pits for floodwater detention and groundwater recharge.
- Lowering the stream channel to its normal flood management level. This required removal of 400,000 cubic yards of sediment and debris.
- Adding approximately 1 mile of publicly accessible new river trails along the banks of the newly restored river channel. The success of the trail system was largely a result of generous property donations and extensive volunteer work.

Integrated Benefits

The LRPC project is a multifaceted, multiple objective effort. The project provides flood protection, habitat, recreation, water quality, and supply benefits.

Flood benefit: Primary flood benefits include reduced flood levels, prevention of urban development in a floodplain that is subject to development pressure, improved sediment balance, and protection of downstream bridges and water pipeline.

Environmental benefits: Environmental benefits include restoring and preserving habitat, and preventing use of the land for ranchette development or other use that would be incompatible with the floodplain and habitat value of the site. The project created, restored, and enhanced more than 90 acres of habitat for threatened and endangered species, and it improved downstream water quality with the creation of the constructed wetlands and the bioswale.

Water supply benefits: The constructed wetlands treats urban runoff and allows it to recharge into the aquifer, increasing groundwater storage, which supports municipal wells important to the local community.

Recreation benefits: The project includes camping areas, trails, and a boardwalk in the pond with access for the disabled and interpretive educational information.

Other benefits: Fill material from channel excavation was used for transportation needs (Highway 52 project). Volunteer involvement in the project increased community awareness of the importance of a natural river system that can function in a safe and beneficial way. The project also affords educational opportunities for students and community members.

Financial Information and Project Status

The project was initiated in 2004 and completed in 2010. LRPC received funding from various sources for the project, including:

- Private parties, foundations, nongovernmental organizations, and business partnerships: \$473,000
- California Coastal Conservancy: \$800,000
- Wildlife Conservation Board: \$4,800,000
- California Resources River Parkways Program (Proposition 40 [2002]): \$4,200,000
- California DWR Flood Protection Corridor Program (Proposition 13 [2000]): \$4,139,000
- California DWR Flood Protection Corridor Program (Proposition 84 [2006]): \$3,229,000
- State Water Resources Control Board (Proposition 13 [2000]): \$1,105,700
- Regional Water Quality Control Board (Proposition 13 [2000]): \$1,291,000
- California Natural Resources Agency and Caltrans Environmental Enhancement and Mitigation Program: \$250,000
- California River Parkways Grant Program: \$200,000

This totals approximately \$20.5 million in funding. The grants LRPC obtained supported the following actions:

- Property acquisition was made possible in 2004 using California State Coastal Conservancy, Wildlife Conservation Board, Proposition 40 (2002), and DWR Flood Protection Corridor funding.
- Restoration to reclaim river functions and further the San Diego River Watershed Management Plan objectives was funded by two Proposition 13 (2000) grants from the SWRCB and a restoration portion incorporated into the DWR Flood Protection Corridor Grant.
- A Constructed Wetland Grant and an Excavation and Water Quality Grant from the SWRCB, in combination with a second DWR Flood Corridor Protection Grant, funded project elements that addressed flood management, habitat restoration, and water quality.

APPENDIX E: DETAILED DESCRIPTIONS OF CASE STUDIES

Primary Information Sources

County of San Diego. *Final Environmental Impact Report: Upper San Diego River Improvement Project*. August 2000.

Lakeside's River Park Conservancy. *Flood Management, Habitat, Restoration, and Recharge on the San Diego River, Final Report*. April 28, 2010.

Lakeside's River Park Conservancy. *Project Summary, Proposition 84 Flood Protection Corridor Program*. 2008.

Lakeside's River Park Conservancy. "Background of the Project." Available on Web site: www.lakesideriverpark.org/About/background.htm. Accessed on February 23, 2012.

San Diego River Park Conservancy/Lakeside's River Park Conservancy. *Project Application for the Proposition 13 Flood Protection Corridor Program*. 2003.

Appendix F: Glossary

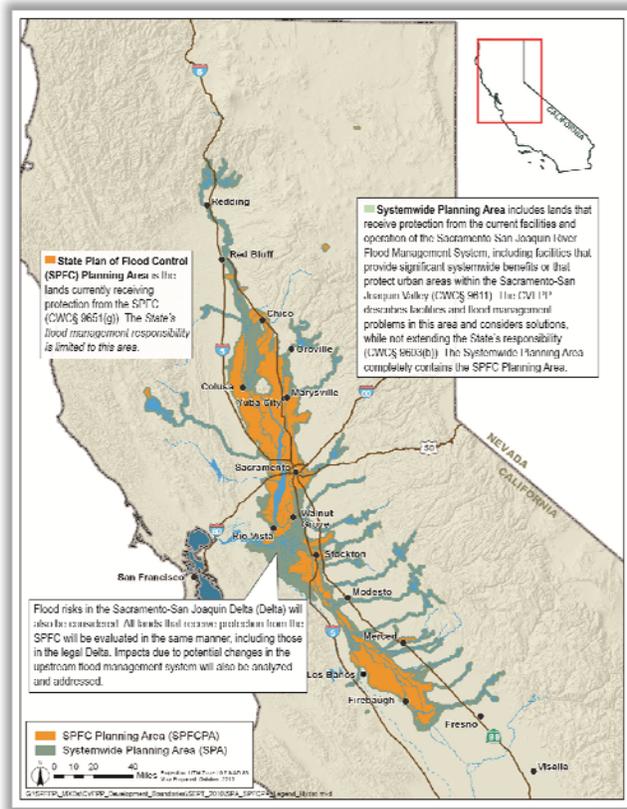
This page intentionally left blank.

Appendix F: Glossary

2-year event	50 percent chance of exceedance in a given year
20-year event	5 percent chance of exceedance in a given year
50-year event	2 percent chance of exceedance in a given year
100-year event	(also known as a base flood) 1 percent chance of exceedance in a given year
200-year event	0.5 percent chance of exceedance in a given year
500-year event	0.2 percent chance of exceedance in a given year
A-Zone	The A-zone is an area of special flood hazard without water surface elevations determined. Flood insurance is mandatory in areas with a 1 percent annual chance of flooding.
Actions	Informed by tools and guided by plans, actions include activities that fund, manage, and oversee implementation of the projects. Actions also include fostering innovation and developing agency alignment to improve flood management policies, planning, governance, and investments. Actions based on IWM principles and thorough planning efforts will provide the most benefit to Californians.
Alluvial Fan Flooding	Flows of shallow depth and high velocity, with sediment transport, along uncertain flow paths on the surface and at the toe of alluvial fans. Typically caused by localized rainstorms, often with snowmelt.
Atmospheric River	A weather pattern that forms a narrow corridor of concentrated moisture in the atmosphere that drops torrential rains as it passes over land.
Base Flood Elevation	The elevation of surface water resulting from a flood that has a 1 percent chance of equaling or exceeding that level in any given year. The base flood elevation is shown on Flood Insurance Rate Maps for zones AE, AH, A1-A30, AR, AR/A, AR/AE, AR/A1–A30, AR/AH, AR/AO, V1–V30, and VE.
Benefit-to-Cost (B/C) Analysis	The B/C analysis is a formalized procedure for estimating the benefits that a project is expected to generate and the costs necessary to produce the project, and then comparing project alternatives. When planning for flood protection, there will be construction and implementation costs, as well as flood risk reduction benefits.
California Data Exchange Center (CDEC)	The CDEC provides a centralized location to store and process real-time hydrologic information gathered from different contributors statewide.
California Water Plan (CWP)	The CWP provides a collaborative planning framework for elected officials, agencies, tribes, water and resource managers, businesses, academia, stakeholders, and the public to develop findings and recommendations and make informed decisions for California's water future. The plan, updated every 5 years, presents the status and trends of California's water-dependent natural resources; water supplies; and agricultural, urban, and environmental water demands for a range of plausible future scenarios. The CWP also evaluates different combinations of regional and statewide resource management strategies to reduce water demand, increase water supply, reduce flood risk, improve water quality, and enhance environmental and resource stewardship.

APPENDIX F: GLOSSARY

Capacity Exceedance	Capacity exceedance implies exceedance of the capacity of a water conveyance, storage facility, or damage-reduction measure. This includes levee or reservoir capacity exceeded before overtopping, channel capacity exceedance, or rise of water above the level of raised structures.
Central Valley Flood Management Planning (CVFMP) Program	CVFMP is one program within FloodSAFE California, a multi-year initiative led and managed by the California Department of Water Resources. Primary products of the CVFMP Program are the State Plan of Flood Control Descriptive Document, the State Plan of Flood Control History Document, the Flood Control System Status Report, and the Central Valley Flood Protection Plan.
Central Valley Flood Protection Plan (CVFPP)	The CVFPP is a State plan that will describe the challenges, opportunities, and a vision for improving flood management in the context of Integrated Water Management in the Central Valley. The CVFPP will document the current and future risks associated with flooding and recommend improvements to the Federal-State flood protection system to reduce the occurrence of major flooding and the consequence of flood damage that could result. The plan was submitted to the Central Valley Flood Protection Board in January 2012 for adoption by July and will be updated every 5 years. The planning area for the CVFPP is shown below.



Central Valley Flood Protection Plan (CVFPP) Floodplain	The floodplains used for the SFMP risk characterization within portions the Central Valley are the CVFPP No Action depth grid floodplains with the addition of the flood bypasses. SFMP received the draft CVFPP floodplains on October 4, 2011. The CVFPP floodplains were based on the floodplains of the <i>Sacramento and San Joaquin River Basins Comprehensive Study</i> (USACE, 2002) and modified by the CVFPP to reflect current hydrologic, hydraulic, and geotechnical information. For the SFMP analysis, the Yolo, East Side, Upper Sacramento, Mariposa, Sutter, and Tisdale bypasses were added to the CVFPP floodplains.
Coastal Flooding	Inundation at locations normally above the level of high tide. Often caused by storm surges occurring with high tides. Impacts include property damage and beach erosion.
Community	A political entity that has the authority to adopt and enforce floodplain ordinances for the area under its jurisdiction.
Consequences	Consequences are the quantitative measures of loss, such as direct tangible monetary loss or number of lives lost, when water inundates the people and property exposed.
Critical Facilities	Essential, high potential loss, lifeline, and transportation facilities, as defined by HAZUS-point shapefiles
Debris Flow Flooding	Flows made up of water, liquefied mud, and debris. Can form and accelerate quickly, reach high velocities, and travel great distances. Commonly caused by heavy localized rainfall on hillsides denuded of vegetation.
Economic Risk	Economic risk is the likelihood of flood damage to an identified area under a given climate and land use condition.
Engineered Structure Failure Flooding	Flooding as a result of dam failure or levee failure presents the potential of catastrophic impact, depending on amount of water impounded and location of populated areas downstream.
Essential Facilities	Care facilities, emergency centers, fire stations, police stations, and schools, as defined by HAZUS-point shapefiles.
Expected Annual Damage (EAD)	EAD is the value that measures the severity of flood loss in any given year. EAD does not mean that this amount of damage will occur in any particular year, but rather that over a long period, the average damages will tend to approach that amount.
Exposure	Exposure is a description of who or what is in harm's way.
Fetch	The distance along open water or land over which the wind blows, or the distance waves can traverse unobstructed.
Flash Flooding	Quickly forming floods with high-velocity flows. Often caused by stationary or slow-moving storms. Typically occurs on steep slopes and impermeable surfaces, and in areas adjacent to local streams and creeks.

Flood Emergency Response Information System (FERIS)	FERIS is a geospatial information system that allows for integration of existing California Data Exchange Center (CDEC) systems with real-time data collection and data exchange.
Flood Hazard	The Federal Emergency Management Agency defines a flood hazard as any flood event or condition with the potential to cause fatalities, injuries, property damage, infrastructure damage, agricultural loss, environmental damage, business interruption, or other loss.
Flood Insurance Rate Map (FIRM)	A FIRM is the official map of a community on which the Federal Emergency Management Agency has delineated the Special Flood Hazard Areas, the Base Flood Elevations, and the risk premium zones applicable to the community.
Flood Management	See <i>flood risk management</i> . Generally, the terms <i>flood management</i> and <i>flood risk management</i> are used interchangeably throughout the Flood Future Report.
Flood Risk	<p>Flood risk is the likelihood of consequence of inundation within an identified area, given a specified climate condition, land use condition, and flood management system (existing or planned) in place. The consequence may be direct or indirect economic cost, loss of life, environmental impact, or other specified measure of flood effect. Flood risk is a function of the following components:</p> <ul style="list-style-type: none"> • Loading, which is the frequency and magnitude of flooding • Performance of flood management measures • Exposure and vulnerability, which are the relationship between the flood hazard (rising or flowing water) and its effect on life loss, property, and/or environmental resources • Consequence <p>Therefore, flood management actions may reduce risk by changing loading, performance, exposure, vulnerability, or consequence.</p>
Flood Risk Management	<p>Flood risk management seeks to reduce flood risks by managing the floodwaters to reduce the probability of flooding (including by levees and dams) and by managing the floodplains to reduce the consequences of flooding. Flood risk management requires integrating and synchronizing programs at various levels of government designed to reduce flood risk.</p> <p>Source: USACE, Institute for Water Resources, a dynamic resource at http://nfrmp.us/frm_terminology.cfm#def17 (accessed March 11, 2013).</p>
Floodplain	The extent of the flood hazard for a 100-year (1 percent chance of exceedance in a given year) or 500-year (0.2 percent chance of exceedance in a given year) event, as determined by the Central Valley Flood Protection Plan, Federal Emergency Management Agency, or U.S. Army Corps of Engineers.

FloodSAFE California	FloodSAFE California refers to the California Department of Water Resources multi-faceted initiative launched in 2006 to improve public safety through flood management in the context of Integrated Water Management and to reduce potential flood damages in areas of the state with the highest risk. Although led at the State level and initially funded by bond money from Propositions 1E (2006) and 84 (2006), FloodSAFE implementation relies on the cooperation and assistance of Federal partners, Tribal entities, local sponsors, and other stakeholders. The FloodSAFE vision is a sustainable system of flood management with an IWM approach and emergency response throughout California that improves public safety, protects and enhances environmental and cultural resources, and supports economic growth by reducing the probability of destructive floods, promoting beneficial floodplain processes, and lowering the damages caused by flooding.
Hazard Mitigation Plan (HMP)	A community's long-term strategy to reduce disaster losses and break the cycle of disaster damage, reconstruction, and repeated damage is described in an HMP. Results are accomplished through hazard mitigation, which is any sustained action taken to reduce or eliminate the long-term risk to human life and property from hazards.
Hazards United States (HAZUS) – Federal Emergency Management Agency (FEMA)	FEMA has developed a Geographic Information System-based U.S. multihazard assessment software, which contains a Flood Loss Estimation Model with flood hazard analysis and flood loss estimation modules for riverine and coastal analyses. The flood hazard analysis module (HAZUS) uses characteristics such as frequency, discharge, and ground elevation to estimate flood depth, flood elevation, and flow velocity.
High Potential-Loss Facility	Facilities such as dams and hazardous material sites, as defined by HAZUS-point shapefiles.
Hydrologic Engineering Center-Flood Damage Analysis (HEC-FDA)	The U.S. Army Corps of Engineers, Hydrologic Engineering Center (HEC) Flood Damage Analysis (FDA) model is designed to perform risk analysis as part of a flood risk study. The approach explicitly incorporates descriptions of uncertainty of key parameters and functions into project benefit and performance analyses.
Hydrologic Unit Code 8 (HUC8)	A Hydrologic Unit Code 8 is a watershed address consisting of a name and a number (for example, Lower James watershed, 02080206). The 8-digit number is a Hydrologic Unit Code or HUC. The Hydrologic Unit system is a standardized watershed classification system developed by the U.S. Geological Survey in the mid-1970s. Hydrologic units are watershed boundaries organized in a nested hierarchy by size. They range in size from regions to the smaller cataloging units, which are roughly equivalent to local watersheds.
Impact Area	Impact area is a term used for convenience to describe a geographic area for which risk is assessed.
Improvement Project	A project that will improve or add facilities to the State Plan of Flood Control to increase levels of flood protection for urban areas. Funding for improvement projects is authorized by California Public Resources Code section 5096.821(b).

APPENDIX F: GLOSSARY

Integrated Regional Water Management (IRWM)	IRWM promotes the coordinated development and management of water, land, and related resources to maximize the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems.
Integrated Water Management (IWM)	IWM is a strategic approach to planning and implementation that combines specific flood management, water supply, and ecosystem actions to deliver multiple benefits. IWM relies on blending knowledge from a variety of disciplines, including engineering, economics, environmental sciences, public policy, and public information. This approach also promotes system flexibility and resiliency to accommodate changing conditions such as regional preferences, ecosystem needs, climate change, flood or drought events, and financing capabilities.
Life-Safety Risk	Life-safety risk represents the number of lives in jeopardy in an identified portion of the state, considering a given climate and land use condition, with a specified plan of flood management in place.
Loading	In the context of flood risk, loading describes the likelihood of occurrence of conditions that lead to loss of life or damage to property if the conditions are not controlled or the consequence is not managed. Loading commonly is described with a discharge-frequency function, which identifies the probability that discharge at a specified location will exceed a specified value.
Local Maintaining Agency (LMA)	LMAs include reclamation districts, State maintaining agencies, improvement districts, and individual districts like American River Flood Control District or Lower San Joaquin Levee District.
Long-Term Average (or Expected) Annual Inundation Damage	See Expected Annual Damage (EAD).
Maintenance and Inspection	Actions required for the proper care and efficient operation of various project elements. These actions may be combined or separated, as best suits the particular project. The guidance for proper maintenance and inspection are contained in ER 1130-2-303. Adaptations needed to satisfy conditions not covered in the ER are encouraged. Outlines of the maintenance and inspection records are to be maintained and available for Government inspection. Government inspections will be performed in consultation with the project's sponsor. (Source: ER 1110-2-401)
Management Action	A management action is a specific structural or nonstructural strategy, action, or tactic that contributes to stated goals and addresses identified problems. Management actions could range from potential policy or institutional changes to operational and physical changes to the flood management system. Management actions are broad (not location-specific), and they vary in their level of detail.

Modification	Project modifications include changes in project operation, changes in real estate interests, the physical change of a project feature, addition of project features, or changes in the purposes of a project. (Source: ER 1165-2-119)
National Flood Insurance Program (NFIP)	The NFIP is a Federal program created by the U.S. Congress to mitigate future flood losses nationwide. The NFIP requires local communities to enforce building and zoning ordinances in exchange for access to affordable, Federally backed, flood insurance protection for property owners.
Operation	Actions that are necessary for the safe and efficient functioning of a project to produce the benefits set forth in the project authorization. The operational requirements for nonreservoir projects are to be presented as operation plans covering essentially the who, what, where, when, and how of the various project operations. An outline of operation records is to be maintained and available for inspection. The operation of reservoirs, covered in water control manuals shall be separate from this operation and maintenance manual. (Source: ER 1110-2-401)
Operation, Maintenance, Repair, Rehabilitation, and Replacement (OMRR&R)	For Federally funded projects the definition of operation and maintenance (O&M) includes the local entity's financial obligation to operate, maintain, repair, rehabilitate, and replace (OMRR&R) the implemented project. OMRR&R is a non-Federal responsibility when local, regional and/or State entities partner on a Federal project. References to O&M provided in the Flood Future Report include OMRR&R responsibilities when the project is a Federal/non-Federal partnership.
Performance	Performance refers to the effectiveness of flood or floodplain management measures.
Plans	Plans utilize information provided by tools, as well as input from stakeholders to guide the development of the flood management strategies. Plans take into account near- and long-term actions, as well as any additional considerations, such as multiple benefits, environmental concerns, overall water management, and climate change, to formulate long-lasting resilient strategies. Plans include identifying and evaluating possible multibenefit projects and the most effective means of implementing projects using an integrated, collaborative approach.
Project Management Plan	A project management plan defines how a project is executed, monitored, and controlled. It is used to define the approach, scope, and delivery of a project.

APPENDIX F: GLOSSARY

Public Law 84-99 (33 U.S.C. 701n) USACE has authority under Public Law (PL) 84-99, Flood Control and Coastal Emergencies (33 U.S.C. 701n) (69 Stat. 186) for emergency management activities to protect human life and improved property, reduce human suffering, help communities recover from the effects of disasters, and mitigate damage and future threats. Under PL 84-99, the Chief of Engineers, acting for the Secretary of the Army, is authorized to undertake activities, including disaster preparedness, advance measures, emergency operations (flood response and post-flood response), rehabilitation of flood control works threatened or destroyed by flood, protection or repair of Federally authorized shore-protective works threatened or damaged by coastal storm, and provisions of emergency water due to drought or contaminated source.

California Public Resources Code section 75003.5 The people of California further find and declare that the growth in population of the State and the impacts of climate change pose significant challenges. These challenges must be addressed through careful planning and through improvements in land use and water management that both reduce contributions to global warming and improve the adaptability of our water and flood control systems. Improvements include better integration of water supply, water quality, flood control and ecosystem protection, as well greater water use efficiency and conservation to reduce energy consumption.

California Public Resources Code section 75032(a) California Public Resources Code section 75032(a) provides funds for: The inspection and evaluation of the integrity and capability of existing flood control project facilities and the development of an economically viable flood control rehabilitation plan.

Reconstruction Reconstruction consists of addressing the major performance deficiencies caused by a long-term degradation of the foundation, construction materials, and engineering systems that have exceeded their expected service lives and the resulting inability of the project to perform its authorized project functions. (Source: USACE, Program Guidance Letter on Reconstruction, August 16, 2005, <http://planning.usace.army.mil/toolbox/library/MemosandLetters/reconstruction.pdf>)

Rehabilitation Rehabilitation refers to a set of activities necessary to bring a deteriorated project back to its original condition. (Source: ER 1110-2-401)

Repair Repair refers to those activities of a routine nature that maintain the project in a well kept condition. (Source: ER 1110-2-401)

Replacement Replacement covers those activities taken when a worn-out element or portion of a project is replaced. (Source: ER 1110-2-401)

Residual Risk Residual risk is the likelihood of damage or other adverse consequence remaining after flood management actions are taken.

Results Robust tools, thorough planning, and integrated actions deliver results that provide value to California's residents, environment, and economy. Results are tracked using performance measures and sustainability indicators that help improve investment performance and increase flood management benefits.

Severe Repetitive Loss (SRL)	<p>Any NFIP-insured residential property that has met at least one of the following paid flood loss criteria since 1978, regardless of ownership:</p> <ul style="list-style-type: none"> • Four or more separate claim payments of more than \$5,000 each (including building and contents payments) • Two or more separate claim payments (building payments only) where the total of the payments exceeds the current value of the property <p>In either case, two of the claim payments must have occurred within 10 years of each other. Multiple losses at the same location within 10 days of each other are counted as one loss, with the payment amounts added together. The loss history includes all ownership of the property since 1978 or since the building's construction if built after 1978.</p>
Slow Rise Flooding	<p>Slow rise flooding occurs as a gradual inundation as waterways or lakes overflow their banks. Most often caused by heavy precipitation, especially with heavy snowmelt. Includes riverine flooding in deep floodplains and ponding of water in low-lying urban areas, as well as gradual flooding in areas adjacent to local streams and creeks.</p>
Special Flood Hazard Area (SFHA)	<p>SFHAs are areas subject to inundation from a flood that has a 1 percent chance of being equaled or exceeded in a given year.</p>
State Plan of Flood Control (SPFC)	<p>Collectively, the facilities, lands, programs, conditions, and mode of operation and maintenance for the State-Federal flood protection system in the Central Valley. This area is shown in the figure provided under CVFPP definition.</p>
Tools	<p>Tools include data, models, and assessments needed for decision making in all aspects of flood management. DWR continues enhancing and sharing technical resources (tools) across all programs and projects. This includes flood, environmental, and water management data gathering, modeling, and the technical aspects of flood readiness and emergency response. Technical and modeling information help inform thorough and thoughtful planning, along with accurate design of flood management facilities.</p>
Transportation Facility	<p>Runways, railway bridges, rail facilities, port facilities, light-rail facilities, highway bridges, ferry facilities, bus facilities, and airport facilities, as defined by HAZUS-point shapefiles.</p>
Tsunami Flooding	<p>Tsunami flooding occurs as a result of high-speed ocean waves triggered by mass movement that displaces a large volume of water. Causes include earthquakes and underwater landslides. Impact on land depends on wave height and inundation area.</p>
Utilities	<p>Wastewater, potable water, oil, natural gas, electric power, and communications facilities, as defined by HAZUS-point shapefiles.</p>
V-Zone	<p>The V-zone is an area inundated by 1 percent annual chance (100-year) flooding with velocity hazard (wave action); no base flood elevations have been determined.</p>

APPENDIX F: GLOSSARY

Vulnerability	Vulnerability is the susceptibility to loss or damage of people and property exposed to the flood hazard.
Water Data Library (WDL)	The WDL is a searchable Geographic Information System (GIS) interface on the Internet. WDL allows users to access information about monitoring gauges, groundwater data, and water quality.

STATE OF CALIFORNIA
THE NATURAL RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES

UNITED STATES ARMY CORPS OF ENGINEERS
FLOOD PLAIN MANAGEMENT SERVICES PROGRAM



US Army Corps
of Engineers ®

The complete report, *California's Flood Future: Recommendations for Managing the State's Flood Risk*, including technical attachments and other supporting information is available for review at:

<http://www.water.ca.gov/SFMP>