Chapter 1
Introduction

Purpose, Scope, and Organization of Final Feasibility Report

The Shasta Lake Water Resources Investigation (SLWRI or Investigation) is a feasibility study being conducted by the U.S. Department of the Interior, Bureau of Reclamation (Reclamation), in coordination with cooperating agencies, other resource agencies, stakeholders, and the public. The SLWRI is being conducted consistent with the *Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies* (P&G) (WRC 1983), Reclamation directives and standards, the National Environmental Policy Act (NEPA), and other pertinent local, State of California (State), and Federal laws and policies. This Final Feasibility Report evaluates the potential effects of alternative plans to modify the existing Shasta Division of the Central Valley Project (CVP) by enlarging Shasta Dam and Reservoir; a related Final Environmental Impact Statement (EIS), published under separate cover, is incorporated by reference. The primary purpose of the feasibility study documented herein is to (1) determine the potential type and extent of Federal and non-Federal interest in alterative plans to meet identified objectives to improve anadromous fish survival in the upper Sacramento River (see Figure 1-1), increase water supply reliability in the Central Valley of California, and address related water resources needs and opportunities, (2) evaluate benefits and effects of alternative plans, and (3) determine the engineering, environmental, social, economic, and financial feasibility of the National Economic Development (NED) Plan.

Figure 1-1. Location of Shasta Dam and Reservoir

Study Overview and Status

The SLWRI is one of five surface water storage studies recommended in the CALFED Bay-Delta Program (CALFED) Programmatic Environmental Impact Statement/Report (PEIS/R) and Programmatic Record of Decision (ROD) of August 2000. Preliminary studies in support of the CALFED PEIS/R considered more than 50 surface water storage sites throughout California and recommended more detailed study of five sites identified in the CALFED Programmatic ROD (CALFED 2000a, 2000b, 2000c), including enlarging Shasta Lake. The Final EIS, accompanying this Final Feasibility Report, tiers to the CALFED PEIS/R.

Previous Reclamation studies and reports investigating potential enlargement of Shasta Dam and Reservoir include the *Enlarged Shasta Lake Investigation Preliminary Findings Report* (1983), *Shasta Dam and Reservoir Enlargement, Appraisal Assessment of the Potential for Enlarging Shasta Dam and Reservoir* (1999), *Strategic Agency and Public Involvement Plan* (2003a), *Mission Statement Milestone Report* (2003b), *Initial Alternatives Information Report* (2004a), *Environmental Scoping Report* (2006), *Plan Formulation Report* (2007a), *Draft Feasibility Report* (2011a), *Preliminary Draft Environmental Impact Statement* (2011b), and *Draft Environmental Impact Statement* (DEIS) (2013b).

Reclamation completed the Draft *SLWRI Feasibility Report* (Draft Feasibility Report), Preliminary Draft EIS (Preliminary DEIS), and related appendices in November 2011. These documents were subsequently released to the public in February 2012 to present the potential impacts, costs, and benefits of alternatives under evaluation at that time; to share information generated since the completion of the SLWRI *Plan Formulation Report* in December 2007; and to provide opportunity for public and stakeholder input. Comments received on the Draft Feasibility Report were considered in preparing this final report and supporting documents. Although Reclamation has not prepared or included herein formal responses to comments received on the Draft Feasibility Report, this final report does reflect changes resulting from public comments on both the Draft Feasibility Report and the DEIS, in compliance with the requirements of NEPA.

After the release of the Draft Feasibility Report and Preliminary DEIS, SLWRI alternatives (also referred to as comprehensive plans) were refined for evaluation in the DEIS based on several factors, including updates to CVP and State Water Project (SWP) water operations, and stakeholder input. Water operations modeling and related evaluations were updated for use in the DEIS, Final EIS, and this Final Feasibility Report to reflect the following:

- The 2008 *Biological Assessment on the Continued Long-Term Operations of the CVP and SWP* (2008 Long-Term Operation Biological Assessment (BA)) (Reclamation 2008a)

- The U.S. Department of Interior, Fish and Wildlife Service (USFWS) 2008 *Formal Endangered Species Act Consultation on the Proposed Coordinated Operations of the CVP and SWP* (2008 USFWS Biological Opinion (BO)) (USFWS 2008)

- The National Marine Fisheries Service (NMFS) 2009 *Biological Opinion and Conference Opinion on the Long-Term Operations of the CVP and SWP* (2009 NMFS BO) (NMFS 2009a)

- Additional changes in CVP and SWP facilities and operations, such as implementation of the San Joaquin River Restoration Program

- Additional changes in non-CVP/SWP facilities and operations, such as the addition of the Freeport Regional Water Project

Reclamation released the related DEIS for the SLWRI for public review and comment in June 2013. During the process of addressing public comments on the DEIS, SLWRI comprehensive plans and related designs and evaluations were further refined for the Final EIS and this Final Feasibility Report. Refinements primarily include the following:

- Refinement of operational scenarios focused on anadromous fish survival, and the development, evaluation, and incorporation of Comprehensive Plan 4A (CP4A)

- Refinement of facility plans for recreation relocations, Shasta Dam modifications, Pit 7 Dam and Powerhouse modifications, and other reservoir area relocations (e.g., power transmission lines)

- Refinement of facility and construction footprints and characterization of most likely affected areas

- Refinement of mitigation measures

Organization of Final Feasibility Report

This Final Feasibility Report is organized as follows:

- Chapter 1 describes the study authorization; problems, needs, and opportunities; project background; study area; and prior studies, projects, and programs pertinent to the SLWRI.

- Chapter 2 describes the identified problems, needs, and opportunities, and existing and likely future resource conditions in the study area.

- Chapter 3 describes the plan formulation process, including planning objectives, management measures, and formulation and evaluation of concept plans and comprehensive plans.

- Chapter 4 describes the No-Action Alternative and Comprehensive Plans, including their potential benefits and costs, and the consistency of the comprehensive plans with other programs.

- Chapter 5 provides an evaluation and comparison of the comprehensive plans by P&G criteria, and presents the rationale for plan selection.

- Chapter 6 provides a description and determination of feasibility of the NED Plan, including discussion of considerations related to risk and uncertainty; unresolved issues; implementation requirements; roles and responsibilities; and implementation timeline.

- Chapter 7 provides an overview of the coordination and public involvement activities for the SLWRI, including agency coordination, stakeholder outreach, coordination with Tribal Governments and Native American tribal groups, and public and agency review and comment.

- Chapter 8 summarizes major findings and conclusions of this Final Feasibility Report.

- Chapter 9 provides recommendations and further considerations for the feasibility study.

- Chapter 10 contains the sources used to prepare this Final Feasibility Report.

Study Authorization and Guidance

Public Law 96-375 (1980) provides feasibility study authority for the SLWRI and allows the Secretary of the Interior to do the following:

> *(a)…engage in feasibility studies relating to enlarging Shasta Dam and Reservoir, Central Valley Project, California or to the construction of a larger dam on the Sacramento River, California, to replace the present structure.*
>
> *(b) The Secretary of the Interior is further authorized to engage in feasibility studies for the purpose of determining the potential costs, benefits, environmental impacts, and feasibility of using the Sacramento River for conveying water from the enlarged Shasta Dam and Reservoir or the larger dam to points of use downstream from the dam.*

The CALFED Bay-Delta Authorization Act (Public Law 108-361, October 25, 2004) Title I, Section 103, Subsection (c), "Authorizations for Federal

Activities Under Applicable Law," authorizes the Secretary of the Interior to carry out the activities described in paragraphs (1) through (10) of Subsection (d), which include the following:

> *...(1)(A)(i) planning and feasibility studies for projects to be pursued with project-specific study for enlargement of (1) the Shasta Dam in Shasta County.*

Public Law 108-361, Title I, Section 103, Subsection (a)(1) also states the following:

> *The Record of Decision is approved as a general framework for addressing the Calfed Bay-Delta Program, including its components relating to water storage, ecosystem restoration, water supply reliability (including new firm yield), conveyance, water use efficiency, water quality, water transfers, watersheds, the Environmental Water Account, levee stability, governance, and science.*

At the conclusion of the SLWRI, the Secretary may submit the Feasibility Report to Congress with a recommendation to construct with Federal funding, according to Public Law 108-361, Title I, Section 103, Subsection (d)(1)(B)(i):

> *If on completion of the feasibility study for a project described in clause (i) or (ii) of subparagraph (A), the Secretary, in consultation with the Governor, determines that the project should be constructed in whole or in part with Federal funds, the Secretary shall submit the feasibility study to Congress.*

Other Federal legislation also influences the SLWRI. Two laws of special note include the 1965 Public Law 89-336 and 1992 Public Law 102-575. Public Law 89-336 created the Whiskeytown-Shasta-Trinity National Recreation Area (NRA) and directed that the area be administered by the U.S. Department of Agriculture, Forest Service (USFS). Public Law 102-575, the Central Valley Project Improvement Act (CVPIA), directed numerous changes to the operation of the CVP. Among these changes was adding protection, restoration, and enhancement of fish and wildlife and associated habitats as project purposes, resulting in significant changes to water supply deliveries, river flows, and related environmental conditions in the study area. To minimize impacts to CVP water contractors, the CVPIA also directed the Secretary of the Interior to develop a least-cost plan to increase the yield of the CVP by the amount dedicated to fish and wildlife purposes.

Guidance in the CALFED Programmatic Record of Decision

The principal objective of CALFED was to develop a comprehensive, long-term strategy to provide reliable water supplies to cities, agriculture, and the environment while restoring the overall health of the San Francisco Bay/Sacramento-San Joaquin Delta (Bay-Delta). The NEPA and California

Environmental Quality Act (CEQA) lead agencies for the CALFED PEIS/R were Reclamation and DWR, respectively.

Several program elements were defined that, in combination, would help attain the overall goals of CALFED. The CALFED Programmatic ROD recommended numerous projects and actions to increase water supply reliability, improve ecosystem health, increase water quality, and improve Sacramento-San Joaquin Delta (Delta) levee stability (CALFED 2000a). Preliminary studies in support of the CALFED PEIS/R considered more than 50 surface water storage sites throughout California and recommended more detailed study of five sites in the Central Valley, including Shasta Lake. As part of the Storage Program element, the CALFED Programmatic ROD called for the Secretary of the Interior to conduct feasibility studies of expanding CVP storage in Shasta Lake by up to 300,000 acre-feet to:

> *…increase the pool of cold water available to maintain lower Sacramento River temperatures needed by certain fish and provide other water management benefits, such as water supply reliability.*

CALFED Tiering

The 2000 CALFED PEIS/R Preferred Program Alternative and associated CALFED Programmatic ROD recommended project specific studies of the potential enlargement of Shasta Lake. As described in the CALFED Programmatic ROD:

> *For actions contained within the Preferred Program Alternative that are undertaken by a CALFED Agency or funded with money designated for meeting CALFED purposes, environmental review will tier from the [CALFED] Final Programmatic EIS/R.*

Accordingly, since the SLWRI is an action contained within the CALFED Preferred Program Alternative, the accompanying EIS to this Feasibility Report tiers to the CALFED PEIS/R. The CALFED Programmatic ROD describes tiering as follows:

> *Whenever a broad environmental impact analysis has been prepared and a subsequent narrower analysis is then prepared on an action included within the entire program or policy, the subsequent analysis need only summarize the issues discussed in the broader analysis and incorporate discussions from the*

The 2000 CALFED Programmatic ROD identified a 300,000 acre-foot expansion (approximately a 6.5-foot dam raise) as the most economical enlargement of Shasta Dam and Reservoir. This is primarily because at the time a 6.5-foot raise was believed to be the largest expansion that would not require relocation of the Pit River Bridge, including Highway 5 and the Union Pacific Railroad, as indicated below (CALFED 2000b):

Preliminary water yield and economic evaluations shows that an option with a 6.5 foot raise of the existing Shasta Dam to produce the most economical water of any site investigated. This option maximizes storage without relocating Interstate Highway 5 and the Union Pacific Railroad…

However, through more detailed evaluations during the SLWRI plan formulation process, it was determined that Shasta Dam could be raised by up to 18.5 feet without relocating the Pit River Bridge. Accordingly, SLWRI comprehensive plans include dam raises of up to 18.5 feet.

> *broader analysis by reference. This is known as tiering. Tiered documents focus on issues specific to the subsequent action and rely on the analysis of issues already decided in the broader programmatic review. Absent new information or substantially changed circumstances, documents tiering from the CALFED Final Programmatic EIS/R will not revisit the alternatives that were considered alongside CALFED's Preferred Program Alternative nor will they revisit alternatives that were rejected during CALFED's alternative development process.*

Consistent with the above guidance in the CALFED Programmatic ROD, this Final Feasibility Report utilized evaluations and alternatives development and screening included in the CALFED PEIS/R.

Summary of Problems, Needs, Opportunities, and Planning Objectives

A number of water and related resources problems, needs, and opportunities were identified for the SLWRI on the basis of the study authorization and guidance; information from prior studies, projects, and programs; existing and likely future water resources conditions; and input to the study process through public outreach. Planning objectives were then developed on the basis of identified problems, needs, and opportunities, study authorities, and other pertinent direction, including information contained in the 2000 CALFED Programmatic ROD.

Problems, Needs, and Opportunities

Water and related resources problems, needs, and opportunities include anadromous fish survival, water supply reliability, and other environmental resources, as summarized below and discussed in detail in Chapter 2.

Anadromous Fish Survival

The population of Chinook salmon in the Sacramento River has significantly declined over the last 40 years (CDFW 2014a). As with other Delta tributaries, water temperature is among the most significant factors affecting Chinook salmon abundance in the Sacramento River, especially in dry and critically dry years[1]. Various actions have been taken to address this problem, ranging from minimum flow requirements in the river to structural changes at Shasta Dam. Despite these steps, additional actions are needed to address anadromous fish survival in the upper Sacramento River.

[1] Throughout this document, water year types are defined according to the Sacramento Valley Water Year Hydrologic Classification unless specified otherwise. As defined by the Sacramento Valley Water Year Hydrologic Classification, water year types include wet, above normal, below normal, dry, and critical years.

Water Supply Reliability

Demands for water in the State exceed available supplies (Reclamation 2008b). Dramatic increases in statewide population, land use changes, regulatory requirements, and limitations on water storage and conveyance facilities have resulted in unmet water demands and subsequent increases in competition for water supplies among urban, agricultural, and environmental uses. Challenges are greatest during dry years when water becomes less available (DWR 2014b). As the population of California grows and the demand for adequate water supplies becomes more acute, the ability of the State to maintain a healthy and vibrant industrial and agricultural economy while protecting aquatic species will be increasingly difficult.

Other Environmental Resources

Other identified needs include growing demands for existing and new energy sources in California; the need to restore environmental values in the Shasta Lake area and downstream along the Sacramento River; the need for additional flood protection along the upper Sacramento River; the need for additional recreation opportunities in the north Sacramento Valley; and the need for improved water quality conditions in the Sacramento River downstream from Shasta Dam and in the Delta.

SLWRI Planning Objectives

On the basis of the identified water resources problems, needs, and opportunities described above, and study authorities and other pertinent direction, including information contained in the CALFED PEIS/R and Programmatic ROD, primary and secondary planning objectives were developed for the SLWRI. Primary planning objectives are those for which specific alternatives are formulated to address. Secondary planning objectives are actions, operations, and/or features that should be considered in the plan formulation process, but only to the extent possible through pursuit of the primary planning objectives.

- **Primary Planning Objectives**
  - Increase the survival of anadromous fish populations in the Sacramento River, primarily upstream from the Red Bluff Pumping Plant (RBPP).
  - Increase water supply and water supply reliability for agricultural, municipal and industrial (M&I), and environmental purposes, to help meet current and future water demands, with a focus on enlarging Shasta Dam and Reservoir.
- **Secondary Planning Objectives**
  - Conserve, restore, and enhance ecosystem resources in the Shasta Lake area and along the upper Sacramento River.

- Reduce flood damage along the Sacramento River.
- Develop additional hydropower generation capabilities at Shasta Dam.
- Maintain and increase recreation opportunities at Shasta Lake.
- Maintain or improve water quality conditions in the Sacramento River downstream from Shasta Dam and in the Delta.

Background

Figure 1-2. Shasta Dam Under Construction

Reclamation was established in 1902 to help meet the increasing water demands of the West. Today, Reclamation is the largest water provider in the country and the second largest producer of hydroelectric power in the western United States. Reclamation's Mid-Pacific Region is responsible for managing the CVP, which stores and delivers about 20 percent of California's developed water—7 million acre-feet (MAF) annually—to more than 250 long-term water contractors throughout California.

Shasta Dam and Reservoir were constructed from September 1938 to June 1945 (Figure 1-2). Storage of water in Shasta Reservoir began in December 1943. Installation of gates, valves, and other finish work was completed following World War II, and the project was fully operational in April 1949. Approximately 37 miles of the Union Pacific Railroad (UPRR) main line, and 21 miles of U.S. Highway 99 (Interstate 5 (I-5)) were relocated around the reservoir during construction. At the time, Shasta Dam, at 602 feet tall, was exceeded only by Hoover Dam (located in Clark County, Nevada) in height and Grand Coulee Dam (located in Grant County, Washington) in volume and surface area; today, multiple dams are larger in both respects worldwide.

Shasta Dam and Reservoir are integral elements of the CVP, with Shasta Reservoir representing about 40 percent of the total reservoir storage capacity of the CVP. Shasta Dam (Figure 1-3) is operated in conjunction with other CVP facilities to provide for the management of floodwater, storage of surplus winter runoff for irrigation in the Sacramento and San Joaquin valleys, M&I water supply, maintenance of navigation flows, protection of fish in the Sacramento River and Delta, and hydropower generation. The CVPIA added "fish and wildlife mitigation, protection, and restoration" as a priority equal to water supply, and added "fish and wildlife enhancement" as a priority equal to hydropower generation.

Figure 1-3. Present Shasta Dam

Shasta Lake supports extensive water-oriented recreation. Shasta Dam and Reservoir are within the Shasta Unit of the Whiskeytown-Shasta-Trinity NRA. Recreation within these lands is managed by USFS.

Reclamation operates Shasta Dam and Reservoir facilities in accordance with guidelines provided by the U.S. Army Corps of Engineers (USACE) for flood damage reduction. All outflows from Shasta Dam flow into and through Keswick Reservoir, located about 5 miles west of Redding. Keswick Reservoir also receives inflows from Whiskeytown Reservoir on Clear Creek.

Shasta Reservoir and Shasta Lake are used interchangeably within this Feasibility Report. Generally, however, Shasta Reservoir is used in references related to water operations for water supply, flood control, and environmental and related regulatory requirements (e.g., operations of the reservoir). In addition, Shasta Reservoir is often used in discussions related to broader CVP and SWP operations or facilities. Members of the public often refer to both the reservoir and its location as Shasta Lake.

Study Area

The SLWRI includes both a primary study area and an extended study area because of the potential influence of the proposed modification of Shasta Dam and Reservoir and subsequent system operations and water deliveries on resources over a large geographic area. The primary study area (see Figure 1-4) includes the following:

- Shasta Dam and Shasta Lake
- Lower reaches of three primary tributaries flowing into Shasta Lake (Sacramento, McCloud, and Pit rivers) and all smaller tributaries flowing into the lake
- Sacramento River between Shasta Dam and the RBPP, including tributaries at their confluence with the Sacramento River
- Trinity and Lewiston reservoirs

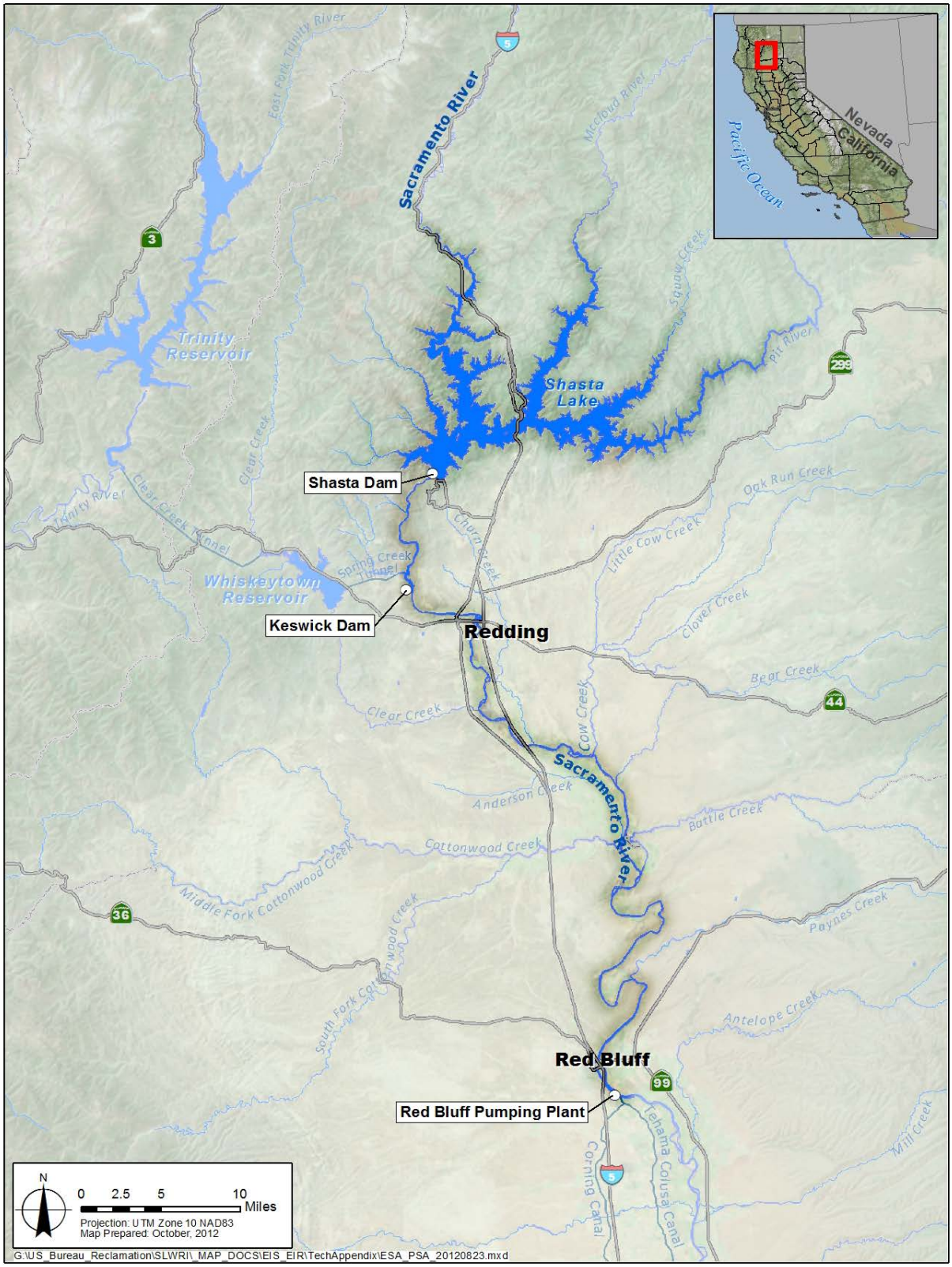

Figure 1-4. Primary Study Area—Shasta Lake Area and Sacramento River from Shasta Dam to Red Bluff Pumping Plant

The location of the RBPP was chosen as the downstream boundary of the primary study area because cold water released from Shasta Dam significantly influences water temperature conditions in the Sacramento River between Keswick Dam and the RBPP (NMFS 1993). Downstream from the RBPP, the Sacramento River landscape changes to that of a broader, alluvial stream system. The broader, slower nature of an alluvial stream system allows ambient air temperature to have a greater effect on water temperature.

The extended study area includes other areas of California that could potentially be indirectly influenced by modifying Shasta Dam and Reservoir. The extended study area encompasses the following:

- Sacramento River downstream from the RBPP facilities, including portions of major tributaries, namely the American and Feather river basins downstream from CVP and SWP reservoirs and related facilities
- Delta
- San Joaquin River basin at and downstream from CVP reservoirs and related facilities (Friant and New Melones reservoirs)
- Facilities and water service areas of the CVP and SWP (see Figures 1-5 and 1-6)

Detailed descriptions of the study area and existing conditions for physical, biological, cultural, and socioeconomic resources within the SLWRI study areas are included in Chapter 2.

The Central Valley of California is home to nearly 7 million people and a wide variety of fish and wildlife, including about 390 special-status plant and animal species (DOF 2014, DFW 2014b). The Central Valley river basins provide drinking water to over two-thirds of the Californian population. The robust economy of this region centers on an agricultural industry that is a major source of reliable, high-quality crops marketed to the Nation and the world.

Shasta Dam and Reservoir are located on the upper Sacramento River in Northern California (see Figure 1-4), about 9 miles northwest of the City of Redding; the entire lake is within Shasta County. At the top of the joint-use capacity[2] or full pool,[3] Shasta Reservoir stores 4.55 MAF and covers an area of about 29,500 acres with a shoreline of about 420 miles. The reservoir controls runoff from about 6,420 square miles. The four major tributaries to Shasta Lake are the Sacramento River, McCloud River, Pit River, and Squaw Creek, in addition to numerous minor tributary creeks and streams.

[2] Top of joint-use capacity is the reservoir water surface elevation at the top of the reservoir capacity allocated to joint use (i.e., flood control and conservation purposes).
[3] Full pool is the volume of water in a reservoir when the reservoir is fully used for all project purposes, including flood control.

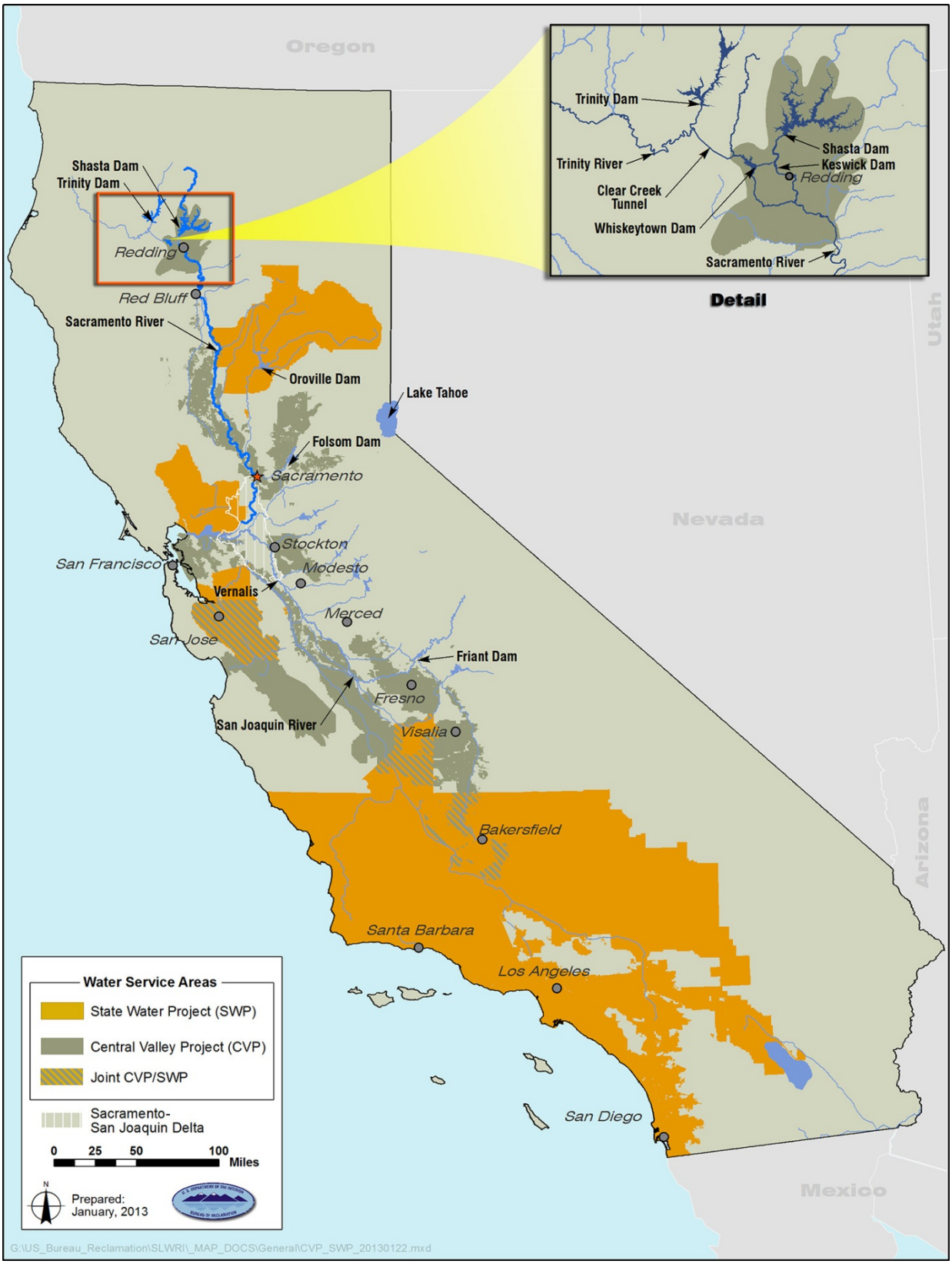

Figure 1-5. Central Valley Project and State Water Project Water Facilities and Service Areas

Figure 1-6. Major Central Valley Project and State Water Project Facilities

Most of the outflow from Shasta Dam travels south in the Sacramento River, joining runoff from tributaries such as the Feather and American rivers before entering the Delta. From the Delta, flows mingle with runoff, primarily from the San Joaquin River watershed, and travel to the Pacific Ocean through San Francisco Bay. The total drainage area of the Sacramento River at the Delta is about 26,300 square miles. The average annual runoff volume to the Delta from the Sacramento River watershed is about 17 MAF. This represents about 60 percent of the total 27.8 MAF inflow to the Delta (CALFED 1998).

Related Studies, Projects, and Programs

Various Federal and State agencies, including Reclamation, USACE, and the California Department of Water Resources (DWR), and numerous local working groups and private organizations are conducting activities pertinent to the SLWRI. Following is a summary of these pertinent prior and ongoing activities in the study area.

Activities of Federal Agencies

Department of the Interior – Bureau of Reclamation

As the owner and operator of the CVP, including Shasta Dam and Reservoir, Reclamation has many ongoing projects or continuing programs and plans relevant to the SLWRI:

- **Central Valley Project** – The CVP, the largest surface water storage and delivery system in California (see Figure 1-6), supplies water to more than 250 long-term water contractors in the Central Valley, Tulare Lake basin, and San Francisco Bay Area (Bay Area) (Reclamation 2008b and 2011c). CVP service areas, shown in Figure 1-5, cover 29 of the State's 58 counties. Shasta Reservoir accounts for approximately 40 percent of the total storage capacity of the CVP and provides for over half of the total annual water supplies delivered by the CVP. Operated by Reclamation, the CVP consists of 20 reservoirs capable of storing over 11 MAF of water; 11 power plants; 500 miles of major canals and aqueducts; and many tunnels, conduits, and power transmission lines (Reclamation 2013a). Annually, the CVP has the potential to supply about 7 MAF for agricultural, M&I, and wildlife uses (Reclamation 2008b). The CVP also provides flood damage reduction, navigation, power, recreation, and water quality benefits.

- **Prior Studies of Enlarging Shasta Dam** – Several studies have been conducted to assess the feasibility of increasing storage space in Shasta Reservoir. Evaluations of raising Shasta Dam considered structural modifications, environmental and related impacts, water supply and hydropower benefits, costs, and Federal interest. Reclamation initiated the SLWRI based on these prior studies and conclusions in the 2000

CALFED Programmatic ROD, which established the need for additional studies focusing on limited dam raise/reservoir enlargement options.

- ***Shasta Reservoir Enlargement Studies of the 1980s*** - In the 1980's Reclamation, in coordination with DWR, conducted studies that indicated that raising Shasta Dam by up to 200 feet was feasible from engineering, environmental, and economic perspectives. Shasta Reservoir enlargement also was found to provide the lowest cost of new water supplies for CVP and SWP deliveries compared with 24 other projects studied (Reclamation and DWR 1988). However, construction of Shasta Reservoir enlargement was considered financially untenable and politically infeasible at that time, given the demand for additional water and the related investment of public funding.

- ***1999 Appraisal Assessment of the Potential for Enlarging Shasta Dam and Reservoir –*** This appraisal-level study investigated three enlargement options to illustrate the potential costs, technical issues, and impacts associated with dam raises of 6.5, 102.5, and 202.5 feet (Reclamation 1999). The study recommended further evaluation of smaller raises (less than 200 feet) of Shasta Dam.

- **Central Valley Project Improvement Act** – Enacted in 1992, the CVPIA addresses conflicts over water rates, irrigation land limitations, and environmental impacts of the CVP. A major component of the CVPIA, established in Section 3406(a), is to provide equal priority and consideration to protection, restoration, and enhancement of fish, wildlife, and associated habitats of the Delta estuary and tributaries affected by the CVP.

  CVPIA Section 3406(a) included "amendments to Central Valley Project Authorizations Act of August 26, 1937." Specifically, these amendments included adding "fish and wildlife mitigation, protection, and restoration" as a priority equal to water supply, and added "fish and wildlife enhancement" as a priority equal to hydropower generation.

  The CVPIA Section 3406(b) contains specific actions and programs identified to mitigate, protect, restore, and enhance fish and wildlife. CVPIA Section 3406(b) states the following:

  > *Fish and Wildlife Restoration Activities.--The Secretary, immediately upon the enactment of this title, shall operate the Central Valley Project to meet all obligations under state and federal law, including but not limited to the federal Endangered Species Act, 16 U.S.C. s 1531, et seq., and all decisions of the California State Water Resources*

> *Control Board establishing conditions on applicable licenses and permits for the project. The Secretary, in consultation with other State and Federal agencies, Indian tribes, and affected interests, is further authorized and directed to:*
>
> *(1) Develop within three years of enactment and implement a program which makes all reasonable efforts to ensure that, by the year 2002, natural production of anadromous fish in Central Valley rivers and streams will be sustainable, on a long-term basis, at levels not less than twice the average levels attained during the period of 1967-1991; … Provided further, that the programs and activities authorized by this section shall, when fully implemented, be deemed to meet the mitigation, protection, restoration, and enhancement purposes established by subsection 3406(a) of this title…*

The program developed pursuant to this section to address the anadromous fish "doubling goal" is the Anadromous Fish Restoration Program (AFRP). In January 2001, the AFRP released the *Final Restoration Plan for the AFRP* (USFWS 2001), presenting the programmatic description of the AFRP, including a list of the prioritized actions and evaluations. The CVPIA and associated AFRP identified specific fish and wildlife restoration projects throughout the Central Valley, including habitat restoration projects and modifications to CVP facilities and operations. Many of these projects have either been completed or are currently underway, based on funding from a variety of sources. Some of the projects relevant to the SLWRI include the Red Bluff Diversion Dam (RBDD) Fish Passage Improvement Project and construction of the Shasta Dam temperature control device. The AFRP and other actions and programs identified under Section 3406(b), which are not already completed, continue to be implemented pursuant to the CVPIA, and these programs were generally included in CALFED baseline planning assumptions. Consistent with Section 3406(b)(1), these actions and programs, when fully implemented, will meet the mitigation, protection, restoration, and enhancement purposes established under the CVPIA.

The CVPIA also addresses the operational flexibility of the CVP and methods to expand the use of voluntary water transfers and improved water conservation, and initiated CVP yield studies (described below). The CVPIA dedicated approximately 1.2 MAF of water annually to fish, wildlife, and habitat restoration. Of this water, 800,000 acre-feet was dedicated to environmental needs as Section 3406(b)2 water, approximately 200,000 acre-feet was designated for wildlife refuges,

and approximately 200,000 acre-feet was dedicated for increased Trinity River flows for fisheries restoration. Through operations flexibility, this results in a net reduction of 516,000 acre-feet per year on average, and 585,000 acre-feet in the driest years, previously available to CVP contractors (Reclamation 2008b).

  - **CVP Yield Feasibility Investigation: Delivery Impact of CVPIA** – In May 2005, Reclamation quantified the water delivery impacts of the CVPIA on the CVP and analyzed a wide range of storage and conveyance projects to offset these impacts in *A CVP Yield Feasibility Investigation Report: The Delivery Impact of CVPIA* (Reclamation 2005). Total delivery impacts of the CVPIA to agricultural and M&I contractors were determined to be 516,000 acre-feet in average water years and 586,000 acre-feet in dry years, with impacts to south-of-Delta (SOD) contractors being much greater than impacts to north-of-Delta (NOD) contractors, and impacts to agricultural contractors being much greater than impacts to M&I contractors. In the report, Reclamation analyzed 90 different combinations of increased conveyance, increased NOD storage, and increased SOD storage. Reclamation recommended continued participation in CALFED programs, participation in regional and watershed integrated resource management planning activities, and continued CVP and SWP integrated operations to help offset the delivery impacts of the CVPIA.

- **Water Supply and Yield Study** – In March 2008, Reclamation prepared the *Water Supply and Yield Study*, which describes existing California statewide water demand and available supplies, as well as projected future demand, available supplies, and willingness to pay for CALFED storage and conveyance projects (Reclamation 2008b). Using demands from DWR's *California Water Plan Update 2005* (DWR 2005) and assuming no inter-basin transfers, statewide supply-demand gaps were estimated to be 2.3 MAF in average water years and 4.2 MAF in dry water years. Without investment in storage and conveyance projects, statewide supply-demand gaps were projected to grow to 4.9 MAF in average water years and 6.1 MAF in dry water years by 2030. The *Water Supply and Yield Study* also determined that if CALFED storage and conveyance projects, including the SLWRI, were constructed, the projected 2030 supply-demand gap would be reduced to 1.5 MAF in average water years and 2.2 MAF in dry water years.

- **Coordinated Long-Term Operation of the CVP and SWP** – In June 2004, Reclamation prepared the 2004 Operations Criteria and Plan (2004 OCAP) to provide a description of facilities and the operating environment of the CVP and SWP. Using operational information presented in the 2004 OCAP, Reclamation and DWR developed the

2004 OCAP Biological Assessment (2004 OCAP BA), prepared as part of the consultation process required by Section 7 of the Federal Endangered Species Act (ESA).

Reclamation consulted with NMFS and the U.S. Department of the Interior, Fish and Wildlife Service (USFWS) on the 2004 OCAP, and the two agencies issued the 2004 NMFS Biological Opinion (2004 NMFS BO) (NMFS 2004) and 2005 USFWS Biological Opinion (USFWS 2005 BO), respectively. In 2007, the District Court for the Eastern District of California (District Court), in *Natural Resources Defense Council v. Kempthorne*, found the 2005 USFWS BO to be unlawful and inadequate. In May 2008, in *Pacific Coast Federation of Fishermen's Associations v. Gutierrez*, the District Court found the 2004 NMFS BO to be unlawful and inadequate. The District Court remanded both BOs to the agencies.

In 2008, Reclamation provided the USFWS and NMFS the *Biological Assessment on the Continued Long-Term Operations of the CVP and SWP* (2008 Long-Term Operation BA). USFWS and NMFS released their BOs in 2008 and 2009, respectively.

In the 2008 USFWS BO, the USFWS concluded that the long-term operations of the CVP and SWP would jeopardize the continued existence of delta smelt and adversely modify its critical habitat. Consequently, the USFWS developed a Reasonable and Prudent Alternative (RPA) to avoid jeopardy.

In the 2009 NMFS BO, NMFS similarly concluded that the long-term operations of the CVP and SWP would jeopardize the continued existence of listed salmonids, steelhead, green sturgeon, and killer whales; it also developed an RPA to avoid jeopardy to the species. The RPA included conditions for revised water operations, habitat restoration and enhancement actions, and fish passage actions. Actions were brought challenging the USFWS and NMFS BOs (2008 and 2009) under ESA and the Administrative Procedure Act (APA), concerning the effects of the CVP and SWP on endangered fish species.

2008 USFWS BO Litigation On December 27, 2010, the District Court entered an "Amended Order on Cross-Motions for Summary Judgment" (Doc. 761), remanding the 2008 USFWS BO to the USFWS without vacatur. On May 4, 2011, the District Court issued an amended Final Judgment, ordering the USFWS to complete a final revised BO by December 1, 2013.

In August 2011, the District Court enjoined implementation of USFWS RPA Component 3 (Action 4), the fall X2 requirements, which require

a monthly average position of not greater than 74 km in wet years or 81 km in above normal water years eastward of the Golden Gate Bridge. That injunction is no longer in-effect.

The United States and NRDC appealed the District Court's decision invalidating the 2008 USFWS BO. NRDC also challenged the District Court's finding that Reclamation was required to prepare an EIS on its provisional acceptance of the RPA included in the 2008 USFWS BO. Water user plaintiffs cross-appealed the District Court's opinion. On March 13, 2014, the Ninth Circuit Court of Appeals reversed that part of the District Court's opinion that questioned the validity of the 2008 USFWS BO, but affirmed the District Court's finding that Reclamation violated in NEPA in failing to prepare an EIS on its provisional acceptance of the RPA included in the 2008 USFWS BO.

2009 NMFS BO Litigation In September 2011, the District Court remanded the 2009 BO to NMFS, without vacatur, finding in favor of the Federal government on some counts and in favor of water contractor plaintiffs on other counts. The District Court has ordered NMFS to prepare a draft BO no later than October 1, 2016. To meet that schedule, Reclamation must issue a draft EIS evaluating the environmental impacts associated with implementing the draft NMFS BO by April 1, 2017 (six months after receiving the draft BO), and a final EIS no later than March 28, 2018. Reclamation must prepare an EIS on any RPA included in the draft NMFS BO by February 1, 2018; NMFS must release a final BO by that same date. Reclamation must issue a ROD, deciding whether to accept the RPA or an alternative, by April 29, 2018. The United States has appealed the District Court's decision, and that appeal is still pending in the Ninth Circuit Court of Appeals.

Summary In February 2013, Reclamation requested reinitiation of ESA Section 7 consultation, to which USFWS and NMFS agreed.

Currently, although the Ninth Circuit Court of Appeals upheld the validity of the 2008 USFWS BO, the USFWS is obligated to issue (or reissue) a BO by December 1, 2015. On that same date, Reclamation must issue a Final EIS analyzing the environmental impacts associated with operating the CVP and SWP under the USFWS BO.

On the NMFS side, NMFS must issue a draft BO to Reclamation no later than October 1, 2016. Reclamation must issue a final EIS no later than February 1, 2018. On that same date, February 1, 2018, NMFS must release a final BO. Reclamation has until April 29, 2018 to issue a ROD.

Operational and Modeling Assumptions for SLWRI These legal challenges have resulted in uncertainty with regard to operational constraints for the CVP and SWP. As a result, evaluations of potential effects of the alternatives in the SLWRI Preliminary DEIS were based on available modeling analysis at that time, which reflected operations described in the 2004 OCAP BA and the Coordinated Operations Agreement between Reclamation and DWR for the CVP and SWP. These analyses were suitable for comparison purposes, and reflected expected variation among the alternatives, including the type and relative magnitude of anticipated impacts and benefits.

In 2012 Reclamation updated the operational assumptions and modeling for the SLWRI to reflect operations described in the 2008 Long-Term Operation BA (as updated due to new facilities, the passage of time, legislation, and litigation), the 2008 USFWS BO, and the 2009 NMFS BO. These assumptions were used to guide refinement, modeling, and evaluation of alternatives and were used as the basis of analysis in the SLWRI DEIS, the Final EIS, and this Final Feasibility Report. Water operations defined in the RPA were included in existing and future conditions SLWRI modeling evaluations, as described in the Modeling Appendix to the accompanying EIS. As described in the Modeling Appendix, restoration and enhancement actions and fish passage actions for the Sacramento River and its tributaries were not included in existing or future conditions operations modeling.

Despite the uncertainty resulting from the ongoing consultation process, the 2008 Long-Term Operation BA and the 2008 and 2009 BOs issued by the fishery agencies contain the most recent estimate of potential changes in water operations that could occur in the near future.

- **Red Bluff Fish Passage Improvement Project** – The RBDD, now operated with gates raised year-round, is located on the Sacramento River downstream from Shasta Dam. The RBDD gates, when lowered, created Lake Red Bluff and provided for diversion of CVP irrigation water via the Tehama-Colusa and Corning canals. Ineffective fish passage at the RBDD led to development of the Fish Passage Improvement Project and the construction of the screened RBPP, completed in September 2012. The RBPP allows diversion of CVP water from the Sacramento River into the Tehama-Colusa and Corning canals while the RBDD gates remain locked in the raised position, providing unimpeded passage for threatened and endangered fish species (Reclamation 2011d).

- **Trinity River Restoration Program** – The 2.5 MAF Trinity Reservoir conveys water from the Trinity River to the Sacramento River basin for export to the Central Valley. The Trinity ROD proposes rehabilitation

of the Trinity River through restoration activities to restore and maintain the river's fishery resources impacted by Trinity Dam and Reservoir (Reclamation 2000). One of the major elements of the Trinity River ROD is reducing the average annual water exports from the Trinity River basin into the Sacramento River basin. Ongoing actions related to implementing the Trinity River Restoration Program include seasonal flow management, channel rehabilitation, and sediment management along the Trinity River, which can affect conditions on the Sacramento River within the SLWRI primary study area.

- **Battle Creek Salmon and Steelhead Restoration Project** – The Battle Creek Salmon and Steelhead Restoration Project focuses on restoring the winter-run, spring-run, fall-run and late fall-run Chinook salmon and steelhead populations in Battle Creek, one of the most important anadromous fish spawning streams in the Sacramento Valley. Actions include removing dams; constructing fish screens, ladders, and bypass facilities; and augmenting flows to increase salmonid habitat (Reclamation 2014a). Construction of initial phases began in 2010 and is expected to continue through 2019.

Department of the Interior – Bureau of Land Management

The U.S. Department of the Interior, Bureau of Land Management (BLM) is responsible for administering natural resources, lands, and mineral programs on approximately 250,000 acres of public land in Northern California, and is involved in numerous restoration and conservation projects in the study area. An existing Memorandum of Agreement (MOA) between BLM and Reclamation defines the relationships and responsibilities of the agencies regarding the management of Federal interests in the study area.

Department of the Interior – Fish and Wildlife Service

USFWS has participated in numerous projects and programs within the study area because the upper Sacramento River is recognized as critical habitat for endangered winter-run Chinook salmon and other threatened or endangered species. The AFRP was developed in 1995 to accomplish the CVPIA goal of doubling natural production of anadromous fish in Central Valley streams on a long-term, sustainable basis through improvement of natural ecosystem functions (i.e., increased stream flows, eliminating entrainment at diversions) (USFWS 1995).

In early February 2007, as part of the Fish and Wildlife Coordination Act (FWCA) (48 statute 401, as amended, 16 U.S. Code (USC) 661 et seq.), USFWS provided Reclamation with a revised draft *Planning Aid Memorandum* (PAM). The PAM is intended to (1) summarize USFWS views and position on planning and implementation efforts under water resources legislation and programs such as the CVPIA and CALFED, (2) identify potential beneficial and adverse effects to fish and wildlife resources for further evaluation, and (3) provide recommendations to the SLWRI planning process to maximize project

benefits for aquatic and terrestrial species, while congruent with the USFWS Mitigation Policy, as published in the *Federal Register*, Vol. 46, No. 15 January 23, 1981, and amended in the *Federal Register* of February 4, 1981. The 2007 PAM focuses on the SLWRI planning process, pertinent environmental analysis and protections, and allocation of project benefits should Shasta Lake be enlarged.

The USFWS has also prepared a Draft Coordination Act Report consistent with the FWCA, as provided for in Section 2(b) of the FWCA (48 stat. 401, as amended). The report assesses potential project effects on fish and wildlife resources and provides recommendations on how to avoid or minimize adverse effects.

Department of the Interior – Bureau of Indian Affairs

The Bureau of Indian Affairs (BIA) provides services directly or through contracts, grants, or compacts to Federally recognized tribes. Programs administered through the BIA include social services, natural resources management on trust lands, economic development programs, law enforcement and detention services, administration of tribal courts, implementation of land and water claim settlements, housing improvement, disaster relief, replacement and repair of schools, repair and maintenance of roads and bridges, and the repair of structural deficiencies on high hazard dams. Pursuant to NEPA, BIA is a cooperating agency for the accompanying EIS.

Department of Commerce – National Marine Fisheries Service

NMFS is required under the Federal ESA to assess factors affecting listed salmonid species in the Central Valley, identify recovery criteria, identify the entire suite of actions necessary to achieve these goals, and estimate the cost and time required to carry out the actions. One program to attain these goals, the *Proposed Recovery Plan for Sacramento River Winter-Run Salmon*, presents restoration goals and actions, including improved water quality and flows, some of which would be applied within the SLWRI study area (NMFS 1997). In addition, the *Public Draft Recovery Plan for the Evolutionarily Significant Units of Sacramento River Winter-run Chinook Salmon and Central Valley Spring-run Chinook Salmon and the Distinct Population Segment of Central Valley Steelhead* (NMFS 2009b) *and Final Recovery Plan for the Evolutionarily Significant Units of Sacramento River Winter-run Chinook Salmon and Central Valley Spring-run Chinook Salmon and the Distinct Population Segment of Central Valley Steelhead* (NMFS 2014) also present actions to help meet recovery goals.

Department of Agriculture – Forest Service

USFS manages recreation within the Whiskeytown-Shasta-Trinity NRA, which includes nearly all lands along the Shasta Lake shoreline. USFS is also involved in fire hazard and fuel reduction projects, forest health and ecosystem management, timber sales, conservation planning, wildlife monitoring, wildlife habitat improvement, recreation facilities, and administration of the *Aquatic*

Conservation Strategy of the Northwest Forest Plan (USFS 1994). Reclamation and the USFS entered into a MOA in 1986 for the coordinated administration of the Shasta and Trinity Units of the NRA with the CVP. Pursuant to NEPA, USFS is a cooperating agency for the accompanying EIS.

Environmental Protection Agency

The U.S. Environmental Protection Agency (EPA) develops standards and criteria for water quality pursuant to the Federal Clean Water Act (CWA), and issues permits for discharges under the CWA. Under CWA Section 404, the EPA develops regulations for USACE compliance and reviews permits issued by USACE to regulate the discharge of dredged or fill material into waters of the United States, including wetlands. Section 404(c) of the CWA authorizes EPA to veto a USACE decision to issue a permit if a proposed action would have an unacceptable effect on municipal water supplies, shellfish beds and fishery areas, wildlife, or recreational areas.

The EPA is involved in remediation and cleanup activities related to the Iron Mountain Mine Superfund site in the Spring Creek drainage, which is a tributary to Keswick Reservoir. These activities are significantly reducing acid and metal contamination in surface water entering the Sacramento River.

Department of Defense – U.S. Army Corps of Engineers

In 1977, USACE prescribed the operating space and developed the operating rules at Shasta Dam and Reservoir for flood damage reduction. In addition to Shasta Dam and Reservoir regulation rules, USACE has conducted various studies and implemented many projects and programs that affect the upper Sacramento River and its tributaries. Several key efforts include the March 1999 *Post-Flood Assessment* (USACE 1999) and the *Sacramento and San Joaquin River Basins Comprehensive Study* (USACE 2002). Additionally, under the CWA Section 404, USACE issues permits to regulate the discharge of dredged or fill material into waters of the United States, including wetlands, and conduct NEPA review of its permitting action.

Activities of State Agencies

Following are State projects and plans relevant to the SLWRI.

California Department of Water Resources

DWR is the owner and operator of the SWP, and manages ongoing projects or continuing programs relevant to the SLWRI:

- **State Water Project** – The SWP delivers water to the Feather River Settlement Contractors and SWP contract entitlements in the Feather River basin, Bay Area, San Joaquin Valley, Tulare basin, and Southern California water service areas. The SWP has contracted a total of 4.23 MAF for average annual delivery: about 2.5 MAF for the Southern California Transfer Area; nearly 1.36 MAF for the San Joaquin Valley; and the remaining 370,000 acre-feet for the San Francisco Bay, central

coast, and Feather River areas. Modifications of Shasta Dam and Reservoir could increase net water supplies for the SWP. The SWP is operated in conjunction with the CVP according to the 1986 *Agreement Between the United States and the State of California for the Coordinated Operation of the Central Valley Project and the State Water Project*, commonly known as the "Coordinated Operations Agreement." This agreement defines how Reclamation and DWR share their joint responsibility to meet Delta water quality standards and the water demands of senior water right holders, and how the two agencies share surplus flows.

- **California Water Plan** – DWR's *California Water Plan* provides a framework for water managers, legislators, and the public to consider options and make decisions regarding California's water future (DWR 2009). The plan, which is updated every 5 years, presents basic data and information on California's water resources, including water supply evaluations and assessments of agricultural, urban, and environmental water uses to quantify the gap between water supplies and uses. The plan also identifies and evaluates existing and proposed statewide demand management and water supply augmentation programs and projects to address the State's water needs.

  DWR's goal in preparing the plan is to meet requirements of the California Water Code (CWC), receive broad support among those participating in California's water planning, and be a useful document for the public, water planners throughout the State, legislators, and other decision-makers (DWR 2009). As a master plan, it guides the control, protection, conservation, development, management, and efficient use of the water resources of the State (CWC Section 10005(a)).

  DWR completed the *California Water Plan Update 2009* in December 2009 (DWR 2009), and released to public in March 2010. The implementation plan contained in the plan addresses 13 objectives supported by 92 related actions, which were taken in part from DWR's 2008 climate change white paper (DWR 2008a). Several other companion State plans were considered in preparing the draft objectives and related actions. Identified objectives address water conservation, recycling, and reuse; conjunctive management of water supply sources; environmental enhancement; flood protection and floodplain enhancement; and management for a sustainable Delta; and identifies several other objectives for management of water resources in California. Analysis and conclusions presented in the *California Water Plan Update 2009* were used in assessing the need for modification of Shasta Dam and Reservoir to provide additional water supply reliability outside the CVP.

Through rigorous public involvement and State and Federal agency coordination processes, DWR and other agencies developed and released the Draft *California Water Plan Update 2013* in December 2013 (DWR 2013b) and released the finalized *California Water Plan Update 2013* in October 2014 (DWR 2014b).

- **Integrated Regional Water Management Plans** – Integrated Regional Water Management Plans (IRWMP) are collaborative endeavors to manage diverse aspects of water resources in a regional approach. IRWMPs integrate planning for water supply, water quality, wastewater treatment, stormwater management, and flood control on a regional scale that involves multiple jurisdictions, watersheds, political regions, agencies, and stakeholders. To date, IRWMPs have been developed for 87 percent of the state's geographic area and 99 percent of the state's population (DWR 2014a).

  The Sacramento Valley IRWMP was formally adopted under CWC 10541 on December 12, 2006, as a framework to guide the management of water resources in the Sacramento Valley in an integrated and regional approach (Northern California Water Association 2006). Input from water agencies, landowners, local governments, and conservation organizations was used to develop the IRWMP, which was adopted with formal resolutions by more than 40 public water entities in the Sacramento Valley. The Sacramento Valley IRWMP region includes the Sacramento Valley floor and foothills area, overlies the Sacramento and Redding groundwater basins, and encompasses parts of ten counties.

State Water Resources Control Board

The State Water Resources Control Board (State Water Board) is responsible for allocating surface water rights, setting statewide policy to protect water quality, coordinating and supporting the State's nine Regional Water Quality Control Boards (Regional Water Boards), and enforcing laws and regulations protecting the State's waterways. Both the CVP and SWP operate pursuant to water right permits and licenses issued by the State Water Board for water storage, releases, and diversions.

Over time, the State Water Board has issued decisions that modify the terms and conditions of CVP and SWP water rights. In August 1978, the State Water Board adopted the Water Quality Control Plan (WQCP) for the Delta and Suisun Marsh and Water Right Decision 1485 (D-1485), requiring Reclamation and DWR to operate the CVP and SWP to meet all of the 1978 WQCP objectives, except a portion of the southern Delta salinity objectives. In 1991, the State Water Board issued revised water quality objectives in the *Delta Water Quality Control Plan for Salinity, Temperature, and Dissolved Oxygen* (State Water Board 1991). In May 1995, the State Water Board adopted the *Bay-Delta*

Water Quality Control Plan (State Water Board 1995) superseding both the 1978 and 1991 plans.

Beginning in 1996, the State Water Board engaged in proceedings to determine responsibility for meeting water quality standards in the Delta. Because the issues were so complex, the State Water Board divided the water right proceedings into eight phases. The State Water Board completed Phases 1 through 7 of these proceedings in 1999, leading to issuance of D-1641 in December of 1999. The State Water Board adopted D-1641 as part of the State Water Board's implementation of the 1995 *Bay Delta Plan.* D-1641 amended certain water rights, including temporarily amending certain terms and conditions of the CVP and SWP water rights, by assigning responsibilities to the persons or entities holding those rights to help meet certain water quality and flow requirements outlined in the 1995 *Bay Delta Plan*, including new protections for Delta fisheries. The goal of Phase 8 was to allocate permanent responsibility for satisfying the flow-related water quality objectives of the 1995 Bay-Delta WQCP among water right holders in the watersheds of the Sacramento, Cosumnes, and Calaveras rivers. As a result of the 2009 Delta Reform Act, the State Water Board has initiated a new administrative process to evaluate water outflow requirements on upstream tributaries to the Delta. This may, if implemented, significantly impact CVP and SWP operations, as well as those of other upstream reservoirs.

California Department of Fish and Game

The California Department of Fish and Wildlife (CDFW) manages California's fish and wildlife resources, overseeing the restoration and recovery of species listed by the California Endangered Species Act (CESA) as threatened and endangered. CDFW participates in conservation planning, environmental compliance and permitting, coordinated resources management planning, and restoration and recovery programs within the study area.

Delta Stewardship Council

The Delta Stewardship Council was established by the California Legislature as part of the comprehensive water legislation, Senate Bill (SB) 1, the 2009 Delta Reform Act, and is tasked with protecting the Delta and the critical role the Delta serves through implementing two "coequal goals." The coequal goals are (1) providing a more reliable water supply for California, and (2) protecting, restoring, and enhancing the Delta ecosystem. The coequal goals are to be achieved in a manner that protects and enhances the unique cultural, recreational, natural resource, and agricultural values of the Delta as an evolving place (CWC Section 85054). Members of the council include representatives from different areas of the State who offer diverse expertise in fields, such as agriculture, science, the environment, and public service.

The California Legislature established the Delta Stewardship Council to do the following:

> *"…provide for the sustainable management of the Sacramento-San Joaquin Delta ecosystem, to provide for a more reliable water supply for the state, to protect and enhance the quality of water supply from the Delta, and to establish a governance structure that will direct efforts across state agencies to develop a legally enforceable Delta Plan."*

The council is entrusted to integrate issues, such as water flows, water quality, environmental protection, emergency management, economics, the Delta as an evolving place, conveyance alternatives, upstream impacts, flood risk management, and climate change, into one coherent management system.

Delta Plan The Delta Plan is a comprehensive, long-term management plan for the Delta (Delta Stewardship Council 2013). Required by the 2009 Delta Reform Act, it creates new rules and recommendations to further the state's coequal goals for the Delta: Improve statewide water supply reliability, and protect and restore a vibrant and healthy Delta ecosystem, all in a manner that preserves, protects and enhances the unique agricultural, cultural, and recreational characteristics of the Delta.

Developed through eights drafts, hundreds of hours of public meetings and thousands of public comments over two years, the Delta Plan is guided by the best available science. The Delta Plan is founded on cooperation and coordination among affected agencies. The Delta Plan is also enforceable through regulatory authority, as spelled out in the Delta Reform Act that requires state and local agencies to be consistent with the Delta Plan.

The Delta Plan was unanimously adopted by the Delta Stewardship Council on May 16, 2013. Subsequently its 14 regulatory policies were approved by the Office of Administrative Law, a state agency that ensures the regulations are clear, necessary, legally valid, and available to the public. The Delta Plan became effective with legally-enforceable regulations on September 1, 2013.

The Delta Plan recommends timely completion of the Bay Delta Conservation Plan (BDCP). When completed, the BDCP must be incorporated into the Delta Plan if it meets certain statutory requirements described under CWC 85320 (Delta Stewardship Council 2013).

Implementing the Delta Plan in conjunction with the BDCP could change CVP and SWP operations and could possibly affect operations of Shasta Dam and Reservoir. However, the Delta Plan, as with the BDCP, is still in the planning phase, and no specific plan has been authorized for implementation.

California Water Commission

The California Water Commission is comprised of nine members, responsible for advising the Director of DWR, approving DWR rules and regulations, monitoring and reporting on SWP construction and operations, and holding

public hearings on proposed SWP facilities. Additionally, the commission advises congressional appropriations committees on funding for USACE and Reclamation water resource projects in California. Under the Safe, Clean, and Reliable Drinking Water Supply Act, the commission is further tasked with selecting water storage projects for State bond funding toward project benefits "that improve the operation of the state water system, are cost effective, and provide a net improvement in ecosystem and water quality conditions."

California's 2009 Comprehensive Water Package included SB 1, which gave the Commission new responsibilities regarding the distribution of public funds set aside for the public benefits of water storage projects, and developing regulations for the quantification and management of those benefits. Projects that could be funded by a state water bond would be selected by the Commission through a competitive public process ranking potential projects based on the expected return for public investment as measured by the magnitude of the public benefits provided. These public benefit categories include:

> *(1) Ecosystem improvements, including changing the timing of water diversions, improvement in flow conditions, temperature, or other benefits that contribute to restoration of aquatic ecosystems and native fish and wildlife, including those ecosystems and fish and wildlife in the Delta.*
>
> *(2) Water quality improvements in the Delta, or in other river systems, that provide significant public trust resources, or that clean up and restore groundwater resources.*
>
> *(3) Flood control benefits, including, but not limited to, increases in flood reservation space in existing reservoirs by exchange for existing or increased water storage capacity in response to the effects of changing hydrology and decreasing snow pack on California's water and flood management system.*
>
> *(4) Emergency response, including, but not limited to, securing emergency water supplies and flows for dilution and salinity repulsion following a natural disaster or act of terrorism.*
>
> *(5) Recreational purposes, including, but not limited to, those recreational pursuits generally associated with the outdoors.*

California voters approved Proposition 1, "Water Bond. Funding for Water Quality, Supply, Treatment, and Storage Projects," on November 4, 2014, for $7.5 billion, which includes $2.7 billion for storage projects. Proposition 1 and the related AB 1471, passed by the California State Legislature in August 2014, replaced the previous water bond, SB 7, that was passed as part of 2009

Comprehensive Water Package. However, Proposition 1, section 79751 specifies:

> *Projects for which the public benefits are eligible for funding under this chapter consist of only the following:*
>
> *(a) Surface storage projects identified in the CALFED Bay-Delta Program Record of Decision, dated August 28, 2000, except for projects prohibited by Chapter 1.4 (commencing with Section 5093.50) of Division 5 of the Public Resources Code.*

Due to potential impacts on McCloud River resources (see Chapter 25, "Wild and Scenic River Considerations for McCloud River," of the accompanying Final EIS) and related provisions in Section 5093.50 of the California Public Resources Code (PRC), these provisions in Proposition 1 may limit bond funding for enlargement of Shasta Dam and Reservoir under the NED Plan, or any plan authorized for implementation, if the State or its agencies determine that such actions are prohibited by Chapter 1.4 of the PRC.

CALTRANS

Caltrans is the state agency responsible for highway, bridge, and rail transportation planning, construction, and maintenance. A major transportation route through the Shasta Lake area is Interstate 5. A new Antlers Bridge for Interstate 5 is currently under construction on the Sacramento River Arm of Shasta Lake. This bridge replacement project will accommodate increased water surface elevations associated with an enlarged Shasta Dam. The Pit River Bridge, constructed by Reclamation in 1938, is a multipurpose structure, carrying both Union Pacific Railroad and Interstate 5 traffic.

Joint Activities of Federal and State Agencies

Following are programs and plans relevant to the SLWRI that were developed or are being developed as collaborations between Federal and State agencies.

Sacramento Valley Water Management Program

The Sacramento Valley Water Management Program (SVWMP) is a collaborative effort to increase water supplies for farms, cities, and the environment by responding to water rights issues associated with implementation of the 1995 Bay-Delta WQCP (State Water Board 1995). SVWMP originated from Phase 8 of the State Water Board water right proceedings.

Through the SVWMP, a *Short-Term Settlement Agreement* was executed in December 2002 by more than 40 water suppliers in the Sacramento Valley (Upstream Water Users), Reclamation, DWR, USFWS, CDFW, Contra Costa Water District, and SWP contractors representing agricultural and municipal water users in Southern California, the central coast, and the San Joaquin Valley. The *Short-Term Settlement Agreement* specifically identified an

enlargement of Shasta Lake as a potential long-term project (SVWMP 2002). Execution of this agreement resulted in the State Water Board dismissing the Phase 8 process on January 31, 2003.

The *Short-Term Settlement Agreement* includes stipulations regarding implementing a series of short-term projects identified in the *Short-Term Workplan* (SVWMP 2001) to fill unmet demands in the Sacramento Valley, and to provide between 92,500 acre-feet and 185,000 acre-feet of water to off-set CVP and SWP water supplies used to meet Upstream Water Users' responsibilities for the 1995 *Bay Delta Plan*, respectively, during certain water year types. These projects would be owned and operated by the Upstream Water Users.

Reclamation and DWR issued a Notice of Intent (NOI) and Notice of Preparation (NOP), respectively, in August 2003 to prepare a PEIS/R to analyze the potential effects of implementing five categories of short-term projects: water management, reservoir reoperation, system improvements, surface water and groundwater planning, and other nonstructural actions such as water transfers. This PEIS/R is not yet available; therefore, a programmatic approach to implementing projects identified in the *Short-Term Workplan* has not been developed. However, some individual projects identified in the *Short-Term Workplan* are under development or have been implemented by various organizations participating in the SVWMP.

CALFED Bay-Delta Program

Following the 1994 Bay-Delta Accord, CALFED, a collaboration of numerous Federal, State, and local agencies, established a program to address water quality, ecosystem quality, water supply reliability, and levee system integrity. Major CALFED programs include the Conveyance, Water Transfer, Environmental Water Account, Water Use Efficiency, Water Quality, Levee System Integrity, Ecosystem Restoration and Watershed Management, and Storage programs.

The Preferred Program Alternative in the CALFED PEIS/R (CALFED 2000c) identified an enlargement of Shasta Lake as one of five surface water storage projects to be investigated and "aggressively pursue[d]" by CALFED:

> *Shasta Lake enlargement [that] would include a 6- to 8-foot raise of the existing dam, expanding capacity by approximately 300 TAF. The enlargement could help offset losses of Trinity River diversions to the Sacramento River, improve the cold water reserve in Shasta Lake to regulate Sacramento River water temperatures, and improve overall water supply reliability.*

The CALFED PEIS/R also addressed the California Public Resources Code's protection of the McCloud River, stating that:

> *The most significant environmental impact appears to be inundation of a few hundred yards of the McCloud River; the California Public Resources Code Section 5093.542 seeks to protect the free-flowing McCloud River but also provides for investigations for potential enlargement of Shasta Dam.*

Following issuance of the CALFED Final PEIS/R in July 2000, the CALFED agencies issued the CALFED Programmatic ROD in August 2000 which identified 12 action plans. Specifically, plans were identified for the Governance, Ecosystem Restoration, Watersheds, Water Supply Reliability, Storage, Conveyance, Environmental Water Account, Water Use Efficiency, Water Quality, Water Transfer, Levees, and Science programs. The CALFED agencies then began implementing Stage 1 of the Programmatic ROD, including the first 7 years of a 30-year program to establish a foundation for long-term actions.

The CALFED Programmatic ROD identified project-specific study of expanding CVP storage in Shasta Lake by approximately 300,000 acre-feet, including work to accomplish the following:

- Resolve legal issues to allow State agency cooperation
- Complete feasibility study and preliminary design
- Complete environmental review and documentation, obtain Federal authorization and funding, and begin construction.

The CALFED Programmatic ROD also provided for tiering environmental review for actions included in the CALFED PEIS/R, as described previously in the chapter.

To provide historical background and context for development of the SLWRI, the following description is quoted from the 2000 CALFED Programmatic ROD:

> *<u>Introduction</u>: The CALFED Bay-Delta Program is an unprecedented effort to build a framework for managing California's most precious natural resource: water. California and the Federal government in partnership are launching the largest, most comprehensive water management program in the world. This is the most complex and extensive ecosystem restoration project ever proposed. It is also one of the most intensive water conservation efforts ever attempted. It is the most far-reaching effort to improve the drinking water quality of millions of Californians as well as an unprecedented commitment to watershed restoration. And it is the most significant investment in storage and conveyance in decades.*

The CALFED Bay-Delta Program began in May 1995 to address the complex issues that surround the Bay-Delta. The CALFED Bay-Delta Program is a cooperative, interagency effort of 18 State and Federal agencies with management or regulatory responsibilities for the Bay-Delta. The CALFED Program is a collaborative effort including representatives of agricultural, urban, environmental, fishery, and business interests, Indian tribes and rural counties who have contributed to the process.

The San Francisco Bay/Sacramento-San Joaquin Delta (Bay-Delta) estuary is the largest estuary on the West Coast. It is a maze of tributaries, sloughs, and islands and a haven for plants and wildlife, supporting over 750 plant and animal species. The Bay-Delta includes over 738,000 acres in five counties. The Bay-Delta is critical to California's economy, supplying drinking water for two-thirds of Californians and irrigation water for over 7 million acres of the most highly productive agricultural land in the world.

The Bay-Delta is also the hub of California's two largest water distribution systems - the Central Valley Project (CVP) operated by the U.S. Bureau of Reclamation (Reclamation) and the State Water Project (SWP) operated by the California Department of Water Resources (DWR). Together, these water development projects divert about 20 to 70 percent of the natural flow in the system depending on the amount of runoff available in a given year. These diversions, along with the effects of increased population pressures throughout California, exotic species, water pollution, and numerous other factors have had a serious impact on the fish and wildlife resources in the Bay-Delta estuary.

The droughts of 1987-92 demonstrated just how vulnerable California is to water shortages. More recent conflicts between water quality, fish protection and water supply also demonstrate how little flexibility there is in the current system. With the State's population expected to grow from 34 million today to 59 million in 2040, the need to conserve, to build our capacity, and to manage our water system more efficiently is no longer just a goal, it is a reality.

Before CALFED, all agreed on the importance of the Bay-Delta estuary for both fish and wildlife habitat and as a reliable source of water, but few agreed on how to manage and protect this valuable resource. The CALFED Bay-Delta Program was established to develop a long-term comprehensive plan that will

restore ecological health and improve water management for beneficial uses of the Bay-Delta system. Over the last five years, hundreds of individuals have spent thousands of hours discussing and debating options for a long-term restoration and management plan for the Bay-Delta estuary. The task is fourfold: 1) to restore the ecological health of a fragile and depleted Bay-Delta estuary; 2) improve the water supply reliability for the State's farms, and growing cities that draw water from the Delta and its tributaries, including 7 million acres of the world's most productive farmland; 3) protect the drinking water quality of the 22 million Californians who rely on the Delta for their supplies; and 4) protect the Delta levees that ensure its integrity as a conveyance and ecosystem. Through the Bay-Delta Advisory Council, State and Federal agencies have worked with stakeholders and the public to shape these options into this framework for a comprehensive plan.

The CALFED Program and the CALFED Agencies have approached many ecosystem and water management issues from a regional perspective: what makes the most sense for the affected region. The regions, which include their respective watersheds, are the Sacramento Valley, the San Francisco Bay Area, the Delta, Westside San Joaquin Valley, San Joaquin River/South San Joaquin Valley, and Southern California. Although each region raises unique ecosystem and water management issues, each region's issues affect the health and function of the Bay-Delta system as a whole. Those regional issues nevertheless need regional solutions that contribute to overcoming the challenges facing the Bay-Delta system. In crafting regional solutions, the CALFED Program has also identified and considered the other, independent actions taken by Federal, State, and local agencies operating outside the CALFED Program. In addition, CALFED has taken into account its obligations to comply with ongoing commitments, such as the commitments included in the State's area of origin laws.

Consistent with the stated purposes of CALFED Bay-Delta Program since its outset in 1995, it is not the intent of this program to address or solve all of the water supply problems in California. The CALFED program is directly or indirectly tied to a number of specific project proposals that would help toward meeting California's water needs for a wide variety of beneficial uses. CALFED is an important piece of a much larger picture that is the continuing responsibility of local, regional, State and Federal jurisdictions.

> *Bay-Delta Accord: Seeking solutions to the resource problems in the Bay-Delta, State and Federal agencies signed an agreement in June 1994 to (1) coordinate their actions to meet water quality standards to protect the Bay-Delta estuary; (2) coordinate the operation of the State Water Project (SWP); and the Central Valley Project (CVP) more closely with recent environmental mandates; and (3) develop a process to establish a long-term Bay-Delta solution to address four categories of problems: ecosystem quality, water quality, water supply reliability, and levee system vulnerability.*
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> *This agreement laid the foundation for the Bay-Delta Accord and CALFED. The Accord, formally called the Principles for Agreement on Bay-Delta Standards between the State of California and the Federal Government, detailed interim measures for both environmental protection and regulatory stability in the Bay-Delta. On December 15, 1994, the Accord was signed by State and Federal resource agencies, as well as by stakeholders representing many local water agencies and environmental organizations. Under the terms of a December 1999 extension, the Accord formally expires when this ROD is executed* [August 28, 2000]. *Thereafter, the provisions in the Accord are replaced in their entirety by the provisions and agreements in this ROD and associated documents.*

In 2004, the federal CALFED Bay-Delta Authorization Act (Public Law 108-361) directed the Secretary of Interior to use the CALFED Programmatic ROD as a "general framework for addressing the CALFED Bay-Delta Program" (Section 103 (a) (1)). Further, Public Law 108-361 authorized the Secretary of the Interior to carry out the activities described in paragraphs (1) through (10) of Subsection (d), which includes "planning and feasibility studies for projects to be pursued with project-specific study for enlargement of (1) the Shasta Dam in Shasta County" (Section 103 (d) (1) (A) (i)).

CALFED Storage Program Element

As one of the primary CALFED program elements, the Water Storage Program addresses both surface water and groundwater storage opportunities and objectives. Results of initial evaluations to formulate this program were presented in the Integrated Storage Investigation Report – Initial Surface Water Storage Screening (CALFED 2000b), which assessed and screened numerous potential reservoir sites. Of many potential surface water storage projects considered, five were included in the Preferred Program Alternative for consideration during early phases of CALFED implementation. CALFED identified DWR and Reclamation as joint lead State and Federal agencies, respectively, for the site-specific planning and feasibility studies of the five potential surface storage projects; DWR was identified as the sole lead agency for addressing groundwater storage opportunities.

The five surface water storage projects are SLWRI, In-Delta Storage, Los Vaqueros Reservoir Enlargement, Sites Reservoir (also known as North-of-the-Delta Offstream Storage (NODOS)), and Upper San Joaquin River Basin Storage. For Shasta Dam and Reservoir, the CALFED Preferred Program Alternative included a proposed 6.5-foot raise of Shasta Dam, which would expand the reservoir by approximately 256,000 acre-feet. Potential benefits of an expanded reservoir include an increased pool of cold water available to maintain lower Sacramento River temperatures needed by certain fish, and other water management benefits, such as water supply reliability. In 2010, DWR developed the CALFED Surface Storage Investigations Progress Report (DWR 2010) to provide an overview of the status of and new analyses conducted for the CALFED surface storage investigations.

Bay-Delta Conservation Plan

The BDCP is being prepared through a collaboration of Federal, State, and local water agencies, Federal and State fish agencies, environmental organizations, and other interested parties. The BDCP consists of an array of conservation measures to achieve the biological goals and objectives, including: components for water conveyance facilities and operations; conservation components, including land acquisition for major habitat restoration efforts in the Delta; and components related to reducing other stressors on the Bay-Delta ecosystem. The conservation measures and effects assessment related to achieving the BDCP's overall planning goals are incorporated by reference into the December 2013 BDCP Draft Environmental Impact Report/DEIS (DEIR/S) (DWR 2013a). The BDCP conservation strategy consists of multiple components that are designed to collectively achieve the overall BDCP planning goals of ecosystem conservation and water supply reliability. The conservation strategy includes biological goals and objectives; conservation measures; avoidance and minimization measures; and a monitoring, research, and adaptive management program.

Four broad concepts have been studied to address urban water quality, water supply reliability, and environmental concerns in the Delta: physical barriers, hydraulic barriers, through-Delta facilities, and isolated facilities. Several alternative Delta conveyance facilities are being evaluated as part of the plan. Depending on the alternative, the water conveyance facility components could create a new conveyance mechanism to divert water from the north Delta to existing SWP and CVP export facilities in the south Delta, interacting with operational guidelines to achieve the planning goal outlined above. Modifications of Shasta Dam and Reservoir could allow for increased system flexibility and further use of new Delta conveyance facilities, providing for even greater water supply reliability benefits.

The Draft BDCP and BDCP DEIR/S were made available to the public for a review and comment period, effective December 13, 2013 through July 29, 2014. On August 27, 2014 it was announced that a partially Recirculated Draft BDCP, EIR/S, and Implementing Agreement will be published in early 2015.

The recirculated documents will include those portions of each document that warrant another public review before publication of final documents.

Activities of Regional and Local Entities/Agencies

Following are regional and local activities relevant to the SLWRI.

Sacramento River Conservation Area Program

The Sacramento River Conservation Area Forum (SRCAF) is a nonprofit organization formed in compliance with California's 1986 SB 1086 legislation to manage aquatic resources along the upper Sacramento River from Keswick Dam to Verona. The program established and managed by SRCAF is responsible for preserving remaining riparian habitat, reestablishing a continuous riparian ecosystem along the Sacramento River between Redding and Chico, and reestablishing riparian vegetation along the river from Chico to Verona. The *Upper Sacramento River Fisheries and Riparian Habitat Management Plan* (Resources Agency 1989) identifies specific actions to help restore the Sacramento River fishery and riparian habitat between Keswick Dam and the confluence of the Feather River, including actions specific to the study area.

Iron Mountain Mine Restoration Plan

The Iron Mountain Mine Trustee Council was formed to oversee restoration activities associated with the Iron Mountain Mine, and comprises representatives from five agencies (USFWS, CDFW, NMFS, BLM, and Reclamation). The Iron Mountain Mine complex is a Superfund site in the Spring Creek drainage, which is a tributary to Keswick Reservoir. A restoration plan identifies actions to address injuries to, or lost use of, natural resources resulting from acid mine drainage from the Iron Mountain Mine complex (USFWS, DFG, NOAA, BLM, Reclamation 2002). The plan includes restoration of salmonid populations, riparian habitat, and instream ecological functions.

Riparian Habitat Joint Venture

The Riparian Habitat Joint Venture promotes conservation and restoration of riparian habitat to support native bird populations. Recommended conservation efforts in the SLWRI study area include conservation of lower Clear Creek as a prime breeding area for yellow warblers and song sparrows. The Sacramento River is targeted for restoration of riparian habitat to support the yellow-billed cuckoo, bank swallow, Swainson's hawk, and yellow-breasted chat.

Resource Conservation Districts

Resource Conservation Districts (RCD) are locally governed agencies responsible for conserving resources within their districts by implementing projects on public and private lands, and educating landowners and the public about resource conservation. Activities include resources management, watershed management, conservation, and restoration programs. In the primary study area, districts include the Western Shasta County RCD and Tehama

County RCD. To the east are the Fall River and Pit River RCDs, and to the west and north are the Trinity County and Shasta Valley RCDs.

Other Public and Private Organizations and Programs

Other public and private organizations, programs, and plans related to the SLWRI include the following:

- Battle Creek Watershed Conservancy
- California Trout
- Cantara Trustee Council
- Clear Creek Coordinated Resource Management Plan
- Cottonwood Creek Watershed Group
- Cow Creek Watershed Management Group
- Lakehead Community Development Association
- McCloud River Coordinated Resource Management Plan
- Pit River Watershed Alliance
- Sacramento River Preservation Trust
- Sacramento River Watershed Program
- Sacramento Watersheds Action Group
- Shasta Lake Business Owners Association
- Shasta Land Trust
- Stillwater-Churn Creek Watershed Alliance
- Sulphur Creek Coordinated Resource Management Plan
- The Nature Conservancy (McCloud River Preserve and Lassen Foothills projects)
- The Trust for Public Land
- Winnemem Wintu