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Contents

I.	EXECUTIVE SUMMARY	1
II.	INTRODUCTION	7
III.	2009 PROGRAM ACTIVITIES AND ACCOMPLISHMENTS	19

Section 3406 Activities:

(b)(1)	Anadromous Fish Restoration Program	20
(b)(1) “other”	Habitat Restoration Program	29
(b)(1) “other” & (b)(23)	Trinity River Restoration Program	35
(b)(1)(B)	Modified CVP Operations	39
(b)(2)	Dedicated 800,000 acre-feet Project Yield	42
(b)(3) & (g)	Water Acquisition Program – Instream Water	45
(b)(4)	Tracy (Jones) Pumping Plant Program	47
(b)(5)	Contra Costa Canal Pumping Plant	51
(b)(9) & (b)(19)	Flow Fluctuations and Reservoir Storage	53
(b)(10)	Red Bluff Diversion Dam	55
(b)(11)	Coleman National Fish Hatchery	59
(b)(12)	Clear Creek Restoration Program	62
(b)(13)	Spawning and Rearing Habitat Restoration Program	66
(b)(15)	Head of Old River Barrier	70
(b)(16)	Comprehensive Assessment and Monitoring Program	73
(b)(20)	Glenn-Colusa Irrigation District Program	81
(b)(21)	Anadromous Fish Screen Program	83
(c)(1)	San Joaquin River Restoration Program	87
(b)(3), (d)(1), (2) & (5)	Introduction to the Refuge Water Supply Program	90
(b)(3) & (d)(2)	Water Acquisition Program - Refuge Water	95
(d)(5)	Refuge Facilities Construction Program and San Joaquin Basin Action Plan Lands Program	97
(d)(1), (2) & (5)	Refuge Water Conveyance (Wheeling) Program	99
(g)	Ecosystem and Water Systems Operations Models	101

Section 3408 Activities:

(h)	Land Retirement Program	105

Appendices:

Appendix A	Glossary of Terms	109
Appendix B	Acronyms	113

List of Figures

Figure 1 Central Valley Project System (Map) 9
Figure 2 CVPIA Provisions by Resource Area 11
Figure 3 Central Valley Refuges Receiving CVPIA Water Supplies (Map) 12
Figure 4 Total CVPIA Obligations by Action Category and Fund Source (1993-2009) 13
Figure 5 Habitat Restoration Program Project Locations (Map) 31
Figure 6 Trinity River Restoration Program (Map) 36
Figure 7 Tracy (Jones) Pumping Plant (Location) 48
Figure 8 Rock Slough Fish Screen (Proposed) (Location) 52
Figure 9 Red Bluff Diversion Dam (Location) 56
Figure 10 Spawning Returns, Winter-Run Chinook, Sacramento River (1967-2008) (Graph) 57
Figure 11 Coleman National Fish Hatchery (Location) 60
Figure 12 Gravel Injection and Channel Restoration Sites, Clear Creek 63
Figure 13 Fall-Run Chinook Salmon Escapement, Clear Creek (2008) 64
Figure 14 Adult Spring-Run Chinook Salmon Population, Clear Creek (2001-2009) 64
Figure 15 Juvenile Fall-Run Chinook Salmon Produced/Adult Female, Clear Creek (1998-2008) 64
Figure 16 Clear Creek Channel Restoration Project Phases 65
Figure 17 Recent Gravel Placement Sites in the Sacramento, American, and Stanislaus Rivers 67
Figure 18 Spawning Locations on the American River at the Sailor Bar Gravel Placement Area During FY 2009 69
Figure 19 Estimated Total Natural Chinook Production, Central Valley (1992-2008) 75
Figure 20 Estimated Abundance of 15-year-old White Sturgeon in San Pablo and Suisun Bays, 1993-2005 76
Figure 21 Estimated Abundance of Adult Green Sturgeon in San Pablo and Suisun Bays, 1993-2005 76
Figure 22 Estimated Abundance of Adult Striped Bass in the Sacramento-San Joaquin River Delta and the Lower Portions of the Sacramento and San Joaquin Rivers, 1992-2007 77
Figure 23 Midwater Trawl Index for Young-of-the-year American Shad in the Sacramento-San Joaquin River Delta and San Pablo and Suisun Bays, 1992-2008 77
Figure 24 Glenn-Colusa Irrigation District Pumping Plant 82
Figure 25 CVPIA Fish Screens Constructed (1992-2009) 86
Figure 26 Central Valley Refuges Receiving CVPIA Water Supplies 91
Figure 27 Land Retirement Program Sites 106

List of Tables

Table 1 FY 2009 Funding Obligations by CVPIA Provision 14
Table 2 AFRP Fish Production Estimates in All Central Valley Streams (1992-2008) 28
Table 3 Chinook Salmon AFRP Production, in Battle, Butte and Clear Creeks, and Mokelumne River (1992-2008) 28
Table 4 Acres of Habitat Protected & Restored per Year (1996-2009) by the Habitat Restoration Program 30
Table 5 FY 2009 Projects Funded by the Habitat Restoration Program (HRP) 33
Table 6 Annual Target Escapement, Trinity River 37
Table 7 Instream Flow Incremental Methodology (IFIM) Studies Active as of 2009 41
Table 8 FY 2009 Use of (b)(2) Water by Location 44
Table 9 Allocation and Use of (b)(2) Water (2001-2009) 44
Table 10 Annual (b)(3) Instream Water Acquisitions, toward 200,000 acre-feet target (1994-2009) 46
Table 11 Actions to Improve Tracy Fish Collection Facility, Completed to Date 50
Table 12 Coleman National Fish Hatchery (NFH) Facility Rehabilitation Phases (1991-2009) 61
Table 13 Total Gravel (Tons) Placed by River (1997-2009) 68
Table 14 CAMP Recommended Monitoring Elements by Watershed, Implemented in 2009 78
Table 15 AFSP Projects and Cubic Feet per Second (cfs) Screened, Central Valley (1992-2009) 84
Table 16 Refuge Water Type and Mandated CVPIA Target 93
Table 17 Water Allocations by Refuge from 1989 Reports 93
Table 18 Cumulative Completed Construction Actions by Year (1997-2009) for the Refuge Facilities Construction Program and San Joaquin Basin Action Plan Lands Program 98
Table 19 Ecosystem and Water Systems Operations Models Developed (1996-2009) 103
Table 20 Land Acquired, Retired & Restored by Year at Tranquillity and Atwell Island Sites (1992-2009) 107

I. Executive Summary

Since 1992, the Bureau of Reclamation (USBR or Reclamation) and the Fish and Wildlife Service (USFWS or Service) have worked cooperatively to implement the Central Valley Project Improvement Act (CVPIA or Act), making substantial progress towards sustainable doubling of natural populations of anadromous fish, recovery of listed species, habitat restoration, and provision of water for refuges. The successes to date would not be possible without the participation of the many partnering agencies and stakeholders who provide funding, collect data, and perform monitoring of ongoing activities. The CVPIA Program continues to build upon the results from ongoing implementation studies and modeling, and adapts future actions to reflect knowledge gained.

The total funding obligated for the Central Valley Project Improvement Act (CVPIA) Program activities for fiscal year (FY) 2009 (October 1, 2008 - September 30, 2009) was $96.7 million which included approximately: $59 million from the Restoration Fund, comprised of $56.1 million from the FY 2009 appropriation and $2.9 million from prior year funds; $16.1 million from the Water and Related Resources Fund; $13.5 million from the American Recovery and Reinvestment Act (ARRA) Fund; $2.9 million from the Bay-Delta Fund; and $5.2 million from the State cost-share funds.[1] These funds were used to achieve progress toward program goals in FY 2009.

PROGRESS TOWARD GOALS

The CVPIA Program developed a Draft Implementation Plan (IP) that proposes to provide focus and direction for the CVPIA Program for the coming 10 years (2010-2019); it provides the foundation for planning, budgeting, performance management, and accountability processes. The IP was developed over a two year planning process

Black Necked Stilt - Merced National WIldife Refuge

that included both internal and external review. The internal review included participation by Reclamation and Service program managers, biologists, and engineers that are involved in the day-to-day work of program implementation. Two independent reviews, for the fisheries program and refuge water supply program (RWSP), were conducted for the external review. The IP is currently under review by both the Service and Reclamation.

As stated above, the CVPIA Program conducted independent reviews for the fisheries program and the refuge water supply program. The independent review panels provided programmatic recommendations to improve effectiveness and efficiency of the programs. Certain independent review recommendations were incorporated as future strategies and implementation

1 This funding was an accounting adjustment that resulted in an obligation of $5.2 million under the State cost-share funds.

activities in the IP. The agencies are optimistic about the ability to improve the fisheries program and refuge water supply program by adopting many of the panel's recommendations.

Over the past 17 years, the CVPIA Program has made significant improvements to wildlife and fish habitat by restoring habitat and enhancing fish passage and survival. The enormity and complexity of the Central Valley ecosystem requires a comprehensive approach with participation at all levels. The CVPIA Program must also contend with recent events such as drought, poor ocean conditions, and pelagic organism decline. Despite these continued challenges, the CVPIA Program progresses toward meeting restoration goals, based on the ongoing partnerships with stakeholders and closely coordinated implementation of activities. The ongoing activities are comprised of operational and structural improvements and include monitoring and modeling efforts. This section highlights progress made to date for activities conducted within the main resource areas of fisheries, refuge water supply and other sources. A full description of the CVPIA Program restoration progress and accomplishments is contained in the individual programs outlined in this report.

Central Valley Fisheries

This section focuses on the Anadromous Fish Restoration Program (AFRP) which serves as the overarching program to address the "fish-doubling goal." A discussion on the San Joaquin River Restoration Program (SJRRP), and the Trinity River Restoration Program (TRRP) also follows:

Anadromous Fish Doubling Goal

The "fish-doubling" goal refers to the provisions in the CVPIA Section 3406 (b)(1) which requires the natural production of anadromous fish in Central Valley rivers and streams to be sustainable, on a long-term basis, at levels not less than twice the average levels attained during the period of 1967-1991. The Final Restoration Plan developed by AFRP in 2001, guides the implementation of the actions and evaluations which were developed to address the doubing goal. The AFRP doubling goal is also supported by the other CVPIA programs responsible for restoring habitat, modifying water operations, enhancing fish passages, monitoring progress and modeling water strategies.

White-faced Ibis

For example, the Comprehensive Assessment and Monitoring Program (CAMP) assesses the progress toward the AFRP fish-doubling goals. CAMP's 2009 Annual Report contains anadromous fish monitoring data collected between 1992 and 2008 on 22 watersheds (USFWS, 2009). As of 2008, the average natural production for all races of Chinook salmon was 452,243, or approximately 46 percent of the doubling target. These numbers for Chinook salmon are the most recent numbers that have been through the Quality Assurance/ Quality Control (QA/QC) process from the California Department of Fish and Game (CDFG) Grand Tab[2].

Following are trends for fish species in the Central Valley:

- Chinook winter-run production numbers have been trending upward since 1996, but showed a sharp decline in 2007 and 2008.
- Chinook spring-run numbers have generally improved since 1991, but declined precipitously in 2008.

[2] The Grand Tab Report is a compilation of sources estimating the late-fall, winter, spring, and fall-run chinook salmon populations for streams surveyed.

- Chinook fall-run production increased from the early 1990s to 2000, but has consistently declined each year since 2002.
- Chinook late fall-run production has increased from extremely low levels in the early 1990s, but declined precipitously in 2008.
- Steelhead numbers were trending upwards but declined in 2004 and have remained low to date.
- During the 1992-2005 timeframe, the estimated number of 15-year-old white sturgeon in San Pablo and Suisun Bays exceeded the AFRP production target in one of seven years when sampling was done.
- Green sturgeon numbers have trended upwards during the doubling period.
- Striped bass numbers have declined with 2007 being the lowest estimate on record.
- Since 1967, the highest number of American shad occurred in 2003 (9,342); however, the numbers declined precipitously in 2008.

Progress towards the doubling goal is a result of coordinated action between programs supporting improvements in passage, habitat, and flow. By focusing on these three critical components, CVPIA creates conditions in which fish populations can begin to recover in a sustainable fashion. The greatest success has occurred in watersheds where these three components can be closely controlled, e.g., in Clear, Butte, and Battle Creeks and the Mokelumne River. In all four of these areas, the doubling target has been either nearly met or exceeded.

The AFRP continues to review anadromous fish production, life history requirements, restoration efforts, and the most current flow regimes in each watershed to better understand the requirements of sustainable doubling for these species in Central Valley rivers and streams.

Trinity River Restoration Program (TRRP)

The Trinity River Restoration Program implements river restoration efforts and delivery of flows to improve anadromous fisheries habitat. Historically, the Trinity River flows have been dammed and diverted to the Sacramento River providing water to the Central Valley for power generation and irrigation purposes. The dams and interrupted flows barred salmonids from upstream habitat and deteriorated downstream spawning and rearing habitat causing a severe drop in production. The goal of the restoration activities is to increase in-river spawner escapement by implementing natural and variable flow releases, re-constructing the river channel, augmenting gravel supply, and reducing fine sediment supply to the river through watershed restoration efforts. Also, since 2005, significant progress has been made by completing 17 of the 47 channel rehabilitation sites identified in the Trinity River Mainstem Fishery Restoration Environmental Impact Report/Environmental Impact Statement (EIR/EIS) and its accompanying Record of Decision (ROD). All of the infrastructure improvements necessary to allow the program to regularly achieve annual flow release goals have been implemented.

San Joaquin River Restoration Program (SJRRP)

The San Joaquin River Restoration Program (SJRRP) is a comprehensive long-term effort to restore flows and a self-sustaining Chinook salmon fishery to the San Joaquin River from Friant Dam to the confluence of Merced River, while reducing or avoiding adverse water supply impacts. Much progress has been made to continue to lay the groundwork for the restoration efforts on the San Joaquin River including further development of environmental planning documents, implementation planning for interim flow measures, and continued data collection and monitoring. The draft Fisheries Management Plan (FMP) was recently developed and released for public review and sets the foundation for an adaptive management approach and identifies program goals and objectives that are focused on meeting the requirements of the Settlement restoration goals[3]. The FMP outlines an approach to adaptively manage the reintroduction of Chinook salmon and other fishes to the San Joaquin River.

Refuge Water Supply

The Refuge Water Supply Program (RWSP) is comprised of three components: water acquisition, conveyance, and facilities construction. The RWSP's goal is to ensure all CVPIA identified refuges (wetland

3 A stipulation of Settlement (Settlement) was reached on a lawsuit known as NRDC, et al., v. Kirk Rodgers, et al.

habitat areas) annually receive water of a specified quantity, suitable flow rate, and suitable quality to support their wetland and aquatic environments. RWSP has an annual water delivery target of 555,515 acre-feet for full Level 4 water; comprised of the Level 2 annual water delivery target of 396,244 acre-feet and Incremental Level 4 water supplies of 159,271 acre-feet.

CVPIA has created Full Level 4 conveyance capacity at 14 of the 19 identified refuges served by the program. Conveyance capacity at the remaining five refuges will be addressed through construction projects planned and prioritized for the next 10 years. During 2002 through 2009, the Water Acquisition Program acquired between 30,000 and 85,000 acre-feet each year of Incremental Level 4 water. Reclamation delivered approximately 92 percent of Level 2 water on average between 2002 and 2009, and delivered approximately 52 percent of Incremental Level 4 water on average betwen 2002 and 2009.

The high cost of water continues to limit acquisition of Incremental Level 4 water. Purchasing permanent or long-term water, rather than spot market purchases, provides the most reliable source for refuge water, but these supplies have not been readily available on the market and those that are available have been cost prohibitive.

Other Resources

The Habitat Restoration Program (HRP) has protected and restored approximately 105,000 acres since program inception. This acreage is almost 4 percent of the 2.7 million acres restoration goal to restore habitat impacted by the Central Valley Project. The HRP's priority actions include purchase of fee title or conservation easements on lands where threats are significant; restoration of habitats resulting in improved conditions; and research to help facilitate species recovery.

The Land Retirement Program (LRP) purchases land, water and other property interests to protect and restore land for wildlife habitat. The LRP goals include: retirement of 15,000 acres of agricultural land by 2014; habitat restoration on 400 acres of retired lands annually; and the reduction of agricultural produced drainage water by 6,000 acre-feet annually. Program activities are implemented as part of the Land Retirement Demonstration Project (LRDP) and have resulted in the retirement of 9,006 acres. The program has restored more than 5,600 acres of total acreage retired, creating more sustainable uplands habitat.

2009 ACCOMPLISHMENTS

This section summarizes the specific FY 2009 accomplishments within the following resource areas: fisheries, refuge water supply, and other resources.

Central Valley Fisheries

The AFRP restored floodplains on the Sacramento River National Wildlife Refuge (NWR); purchased and placed 6,400 tons of spawning gravel on the Mokelumne River; and completed a feasibility study, environmental compliance documents, and project designs to construct a bypass for out-migrating salmonids at two screened diversions in Antelope Creek.

The Modified CVP Operations Program operated the system multiple times to provide benefits to anadromous fish on Clear Creek without impacting other CVP obligations or authorized purposes; completed monitoring for juvenile spring-run and fall-run Chinook salmon and steelhead rearing for the lower reach of Clear Creek; and completed modeling and a draft report for fall-run Chinook salmon and steelhead spawning on Clear Creek.

The Ecosystem and Water Systems Operations Models Program applied the CalSim II and CalLite models to evaluate provisions in the Delta smelt biological opinion[4]; assisted the National Marine Fisheries Service (NMFS) by utilizing the CalSim II, ECOSIM-W, and CalLite models to develop feasible Reasonable and Prudent Alternatives (RPA) actions for the NMFS' Operations Criteria Plan (OCAP) biological opinion; and applied the Upper Sacramento River Water Quality Model to support the Sacramento River Temperature Task Group in making and updating plans for the summer season reservoir operations, for the purposes of complying with NMFS' biological opinion RPA covering endangered winter-run Chinook salmon and to aid the planning of operations and comply with State Water Resources Control Board Order 95-1.

4 Formal Endangered Species Act Consultation on the Proposed Coordinated Operations of the Central Valley Project (CVP) and State Water Project (SWP), dated December 15, 2008.

The Dedicated 800,000 acre-feet Project-Yield program provides for the dedication and management of 800,000 acre-feet annually for the purposes of implementing fish, wildlife and habitat restoration. Although, the Sacramento and San Joaquin River Basins were classified as "dry" in water year 2009 (October 1st - September 30th), 600,000 acre-feet was available and managed for the purposes of restoration.

The Water Acquisition Program (WAP) acquired 38,500 acre-feet of water (19 percent of the 200,000 acre-feet target) to improve instream flows and habitat restoration for anadromous fish. Acquiring instream flows supports the AFRP Final Restoration Plan goals to improve spawning and rearing habitat; and to increase migration flows for fall-, winter-, and spring-run Chinook salmon and steelhead.

The Tracy (Jones) Pumping Plant Program completed recessed holding tank stress tests for various species of delta fish entrained at the Jones Pumping Plant (JPP); completed phase 1 construction of a new onsite biological resources building; and commenced with planning and review for the Two Gates Fish Protection Demonstration Project.

The Contra Costa Canal Pumping Plant Program updated screen designs to bring them up to current construction code; completed environmental documentation and permits for the construction of the fish screen; started construction of Phase II of the Rock Slough Fish Screen; and conducted fish monitoring. Phase II construction includes improvements such as coffer dams and levee embankment construction, which follows earlier Phase I construction for road and approach improvements.

The (b)(9) Flow Fluctuation and Reservoir Storage Program used (b)(2) and (b)(3) water and re-operations pursuant to (b)(1)(B) to augment and maintain flows on Central Valley Project (CVP) streams to minimize losses of anadromous fish due to flow fluctuations.

The Red Bluff Diversion Dam (RBDD) Program proceeded on the design of the permanent pumping plant which will allow for water diversions of up to 2,500-cubic feet per second (cfs); designed and constructed an interim pumping plant; and implemented operational changes to raise the gates a minimum of 18 inches to ensure protection of downstream migrating green sturgeon. Preliminary results for green sturgeon monitoring indicated spawning occurred from late-March to early July, and that the abundance of green sturgeon adults above RBDD was greater in 2009 than 2008.

Coleman National Fish Hatchery (NFH) initiated and completed construction of the visitor kiosk and included an Americans with Disabilities Act (ADA) compliant visitor parking area and ramps. No future work is planned at this site and these activities are considered complete.

The Clear Creek Restoration Program successfully met water temperature flow objectives during critical seasons. Gravel was added to increase spawning habitat at Below Dog Gulch (1,000 tons), Above Peltier Valley Bridge (770 tons), Paige Bar (1,790 tons), Above NEED Camp (980 tons), and Below NEED Camp (1,230 tons). Results from monitoring indicated that the program has increased the fall-run Chinook escapement, and steelhead and spring-run Chinook populations.

The Spawning and Rearing Habitat Restoration Program purchased and placed approximately 9,900 tons of gravel in the Sacramento River and permitted for and placed 10,500 tons of spawning gravel on the American River. The Program utilizes aerial photos, redd surveys, and boat gravel surveys for determining gravel augmentation locations.

The Head of Old River Barrier Program installed a seasonal, non-physical bubble curtain at the head of Old River to allow salmon smolts to stay in the San Joaquin River as they migrate out to the ocean. Research showed that the bubble curtain deterrance rate for Chinook salmon was 81.4%; however, the predation rate was also high, creating an offset.

The Glenn-Colusa Irrigation District (GCID) project and related testing and monitoring is complete. The completed facility screens up to 105,000 acre-feet of firm annual water supply to 20,000 acres of Sacramento NWR lands. In 2009, the program initiated the transfer of ownership of the structures to GCID and completed the operations and maintenance manual. The project and related testing and monitoring are 100% complete.

The Anadromous Fish Screen Program (AFSP) completed construction of the Phase I Meridian Farms Fish Screen Project to screen 30 cubic feet per second (cfs) at the New Grimes diversion (Sacramento River); continued implementation of a four-year screening

and monitoring program on the Sacramento River in partnership with CALFED Ecosystem Restoration Program (ERP) and the Family Water Alliance; and continued to provide technical assistance for on-going AFSP projects including the Natomas Mutual (Sacramento River), Patterson (San Joaquin River), Reclamation District (RD) 2035 (Sacramento River), Meridian Farms (Phase II) (Sacramento River), and Yuba City (Feather River) fish screens.

The Trinity River Restoration Program released flows of 454,500 acre-feet from the Lewiston Reservoir to provide adequate temperature and habitat conditions for fish and wildlife at different life stages. These released flows were within target flows of 369,000 to 815,000 acre-feet per year, and also within the dry year-target flows of 452,600 acre-feet. The TRRP also completed construction of a one-mile channel rehabilitation site associated with the Sawmill Rehabilitation Project; placed approximately 8,000 cubic yards of coarse sediment in the river; completed 10 priority watershed projects; and initiated 8 new projects.

The San Joaquin River Restoration Program completed a draft of the Fisheries Management Plan and distributed it for public review; completed environmental compliance activities for the first year of initial experimental flow releases from Friant Dam; and continued development of a plan to recirculate water back to the Friant Division long-term contractors.

The CAMP completed an annual report that synthesizes and analyzes anadromous fish monitoring data collected between 1992 and 2008 on 22 watersheds.

Refuge Water Supply

In 2009, the RWSP delivered 367,842 acre-feet of Level 2 and 39,690 acre-feet of Incremental Level 4 water toward meeting the Full Level 4 water target of 555,515 acre-feet. The program also negotiated a fifth amendment to extend the groundwater pumping reimbursement agreement with the CDFG to supplement Level 2 water at Gray Lodge Wildlife Area (WA) up to the full Level 2 allocation.

The Refuge Facilities Construction Program completed the draft Design Data Study of the Biggs West Gridley Water District (BWGWD) conveyance facilities for conveyance of refuge water supplies to Gray Lodge Wildlife Area (WA); and the San Joaquin Basin Action Plan Lands Program continued testing of the East Bear Creek Phase I Pumping Plant and Pipeline at the San Luis NWR.

Other Resources

The HRP protected an additional 5,165 acres of new habitat. To date, the program has protected approximately 98,000 acres through fee titles or conservation easements, and restored approximately 7,400 acres.

The LRP restored 385 acres to upland habitat by planting native seed mixes at the Atwell Island Land Retirement Demonstration Project site; retired 90 acres from agricultural production; eliminated the production of over 3,500 acre-feet of poor quality agricultural drainage water; and completed a draft report documenting five years of physical and biological monitoring at the Atwell Island Demonstration Project.

For a complete description of the CVPIA Program restoration progress and accomplishments, the individual programs and activities are provided in this report.

II. Introduction

FY 2009

CVPIA Funding Obligations by Funding Source

- Restoration Fund - $59 million
- Water & Related - $16.1 million
- State - $5.2 million
- Bay Delta - $2.9 million
- ARRA - $13.5 million

TOTAL - $96.7 million

For the past 17 years, the CVPIA has guided the implementation of projects supporting the protection, restoration and enhancement of fish and wildlife associated with the Central Valley Project (CVP) (Figure 1). The scope of CVPIA also covers a complex system of water transfers and contract renewals to ensure that adequate supplies remain available to support the restoration goals of CVPIA while also meeting demands of agriculture, municipal and industrial users, and power contractors. To date, approximately $1.1 billion of federal, state, and private funds have been obligated to implement CVPIA mandates.

The CVP and other water projects have helped make the Central Valley the richest agricultural region in the nation. California leads the nation in water use - both surface water and groundwater. The ability to develop and use this precious resource has been a boon to the state's economy.

This Annual Report summarizes the actions taken by Reclamation and the Service personnel, working with other federal agencies, tribes, the State of California (State), and numerous partners and stakeholders during FY 2009. Wherever possible, this report includes quantified goals and targets to more efficiently measure progress within each individual provision of the Act. In some instances, FY 2009 accomplishments were completed with funds that were obligated in prior years.

For greater detail on the programs and projects described in this report or on the progress towards achieving the Act's goals and objectives, please contact Reclamation or the Service.

BACKGROUND

The Central Valley Project's Role in California's Water Resources

For 74 years, California has depended on the CVP for a large part of its water needs, particularly for agriculture. With a climate typified by extremely variable precipitation, both temporally and regionally, the State relies heavily on dams and reservoirs to balance and manage its water resources, and on an extensive distribution system to convey water supplies for regional needs. Much of the State's water originates in the north and is conveyed southward, primarily through the Sacramento River system. Some water is diverted along the way, with the remainder flowing into the Sacramento-San Joaquin River Delta, where CVP water co-mingles with other supplies such as those of the State Water Project (SWP). A portion of the water entering the delta is pumped south; the majority discharges to the San Francisco Bay and the Pacific Ocean. The CVP today comprises 18 dams and reservoirs (able to store 9 million acre-feet of water), 11 power plants, 500 miles of canals and aqueducts, three fish hatcheries, and associated facilities including pumping plants and power lines.

The ecosystems of the Central Valley, Delta Estuary, San Francisco Bay, and Trinity River are affected by water diversions–particularly in drought years–so much so that the courts have intervened to ensure that adequate fresh water enters these ecosystems. Compliance with the Endangered Species Act (ESA) and water quality mandates requires water releases from

CVP dams to regulate water temperatures, salinity and instream flows, and limits water diversions to protect ESA-listed fish from the effects of pumping water at the Tracy (Jones) Pumping Plant in the Delta. These factors have greatly increased the competition for existing water supplies and have focused scrutiny on the ways that water resources are being used.

Environmental conditions have changed greatly since the CVP was authorized in 1935. Population growth and development have increased farm, urban, and industrial water demands. Concurrently, populations of fish and wildlife have declined, resulting in some species being listed as endangered or threatened due to severe habitat loss. In response, a new imperative for resource management and ecological stewardship has evolved.

Central Valley Project Improvement Act of 1992

In 1992, in one of its last actions of the session, the 102nd Congress passed, and the President signed, the multi-purpose water legislation known as the CVPIA. Officially designated Title 34 of Public Law 102-575, this landmark piece of legislation mandates changes in the purposes and management of Reclamation's CVP. It specifically focuses Interior on the protection, restoration, and enhancement of fish and wildlife and associated habitats and contributes to the State's interim and long-term efforts to protect the San Francisco Bay/ Sacramento-San Joaquin River Delta Estuary. The Secretary of the Interior assigned primary responsibility for implementing CVPIA's many provisions to Reclamation and the Service, both agencies of Interior.

The purpose of the CVPIA is expressed in six broad statements found in Section 3402 of the Act:

(a) To protect, restore, and enhance fish, wildlife, and associated habitats in the Central Valley and Trinity River basins of California;

(b) To address impacts of the CVP on fish, wildlife, and associated habitats;

(c) To improve the CVP's operational flexibility;

(d) To increase water-related benefits provided by the CVP to the state through expanded use of voluntary water transfers and improved water conservation;

(e) To contribute to the state's interim and long-term efforts to protect the San Francisco Bay/ Sacramento-San Joaquin Delta Estuary;

(f) To achieve a reasonable balance among competing demands for use of CVP water, including the requirements of fish and wildlife, agricultural, municipal and industrial, and power contractors.

The CVPIA Mandate

To achieve the CVPIA fish and wildlife restoration purposes and the identified goals and objectives, Congress incorporated specific programs, measures, and operational and management directives into the Act (Sections 3406 and 3408) that affect a wide variety of activities, including:

- Restoration of anadromous fish populations
- Water supplies for State and federal refuges and wildlife habitat areas
- Retirement of drainage-impaired agricultural lands
- Mitigation for other CVP-impacted fish and wildlife
- Revisions to water contracts
- Modification of water management and operations
- System-wide modeling to support decision-making
- Program monitoring to determine effectiveness
- Investigations and studies

Reclamation and the Service were joint lead federal agencies for the CVPIA Final Programmatic Environmental Impact Statement and its Record of Decision (PEIS and ROD). The PEIS and the ROD broadly identified the overall program and actions to achieve the purposes of CVPIA, including the fish and wildlife restoration provisions. Although some CVPIA provisions were implemented beginning in 1993, most were not initiated until after the ROD was signed in January 2000.

Reclamation and the Service cooperate and partner with other federal and State agencies, tribes, and local organizations to implement CVPIA actions. Reclamation and the Service use interagency agreements, memoranda

Figure 1. Central Valley Project System

of understanding, grants, and cooperative agreements to partner with entities that have the authority, interest, ability, expertise, and/or resources to implement CVPIA restoration actions.

Implementation of the CVPIA Program (Program) is federally funded primarily through two types of Congressional appropriations: Reclamation's Water and Related Resources account and the Restoration Fund established by CVPIA (Section 3407(c)(2)). The Trinity River Restoration Program (TRRP) also has received Service appropriations of about $1.5 million per year for related monitoring activities. The Restoration Fund is an account in the United States Treasury that receives funds generated through fees collected from CVP water and power contractor users, matching payments and contributions from the State of California, and donated funds. Reclamation is authorized to accumulate up to $30 million on a three-year rolling average basis (adjusted for inflation) in restoration and mitigation payments from the CVP water and power users. A maximum of $50 million (adjusted for inflation) in

annual appropriations from the Restoration Fund is allowed in any year under the CVPIA.

IMPLEMENTING THE CVPIA

Reclamation and the Service work cooperatively under Interior to implement the CVPIA. Reclamation's primary responsibilities involve engineering, water operations, water acquisitions, construction-related activities, and the submission of budgets and project funding. The Service has the responsibility for many biological issues including fish and wildlife restoration and related activities, such as managing the AFRP, Dedicated Yield, and CAMP. Program managers from each agency are assigned to develop and manage specific program activities in accordance with the applicable provisions of CVPIA. Although one agency generally is designated as the lead for a specific provision, both agencies contribute to annual work plans, budget and implementation responsibilities.

In implementing the restoration portion of CVPIA, Reclamation and the Service focus on three main fish and wildlife restoration initiatives:

- Fisheries Resource Area: Achieving the anadromous fish doubling goal; improving operational flexibility; modeling and monitoring
- Refuges Resource Area: Providing adequate water to wildlife refuges
- Other Resource Area: Mitigating terrestrial and other CVP-related impacts

Figure 2 identifies the Resource Area for each active provision of the Act and shows which provisions are completed or inactive.

Fisheries Resource Area

The Act directs Interior to:

"… 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…"

The anadromous fish doubling goal pertains to Chinook salmon, steelhead, striped bass, American shad, white sturgeon, and green sturgeon, which are believed to have been affected by CVP construction and operation.

Many of the CVPIA provisions support this goal directly or indirectly. Section (b)(1), which authorizes the AFRP, is wholly devoted to this purpose, and its process to identify reasonable restoration actions is in the 2001 Final Restoration Plan for the AFRP. Actions contained within the Final Restoration Plan were determined to be reasonable given numerous technical, legal, and implementation considerations; all AFRP actions are covered in the CVPIA PEIS/ROD.

Other CVPIA provisions that support the fish doubling goal include the fish screening activities conducted under (b)(4) Tracy (Jones) Pumping Plant Program, (b)(5) Contra Costa Canal Pumping Plant Program, (b)(20) Glenn-Colusa Irrigation District Program, and (b)(21) Anadromous Fish Screen Program (AFSP); restoration activities such as (b)(12) Clear Creek Restoration Program and (b)(13) Spawning and Rearing Habitat Restoration Program; and the many modeling and monitoring programs that provide data to support reoperation and restoration activities, namely, (b)(16) CAMP, (b)(1)(B) Modified CVP Operations, and (g) Ecosystem and Water Systems Operations Model.

The CVPIA also includes specific provisions to guide restoration in the Trinity River basin. The Trinity River is the Klamath River's largest tributary, and is geographically separate from the Central Valley and the Sacramento River. However, substantial water from the Trinity River has historically been exported through a trans-basin diversion to support water needs in the Central Valley. When the CVPIA was enacted, section (b)(23) of the law was specifically included to direct future Trinity River flows and restoration actions.

The CVPIA also contains provisions for developing a restoration plan for the San Joaquin River and instituted a fee structure for Friant Division contractors for such activities. Planning and environmental studies are currently being completed under the authority and funding of the CVPIA. A Stipulation of Settlement (Settlement) was reached on a lawsuit known as NRDC, et al., v. Kirk Rodgers, et al. The Settling Parties reached agreement on the terms and conditions of the Settlement, which was subsequently approved by Federal Court on October 23, 2006. The "Settling Parties" include the Natural Resources Defense Council (NRDC), Friant Water Users Authority (FWUA), and the U.S. Departments of the Interior and Commerce. Implementation of the Settlement, including planning, environmental studies, and other activities necessary

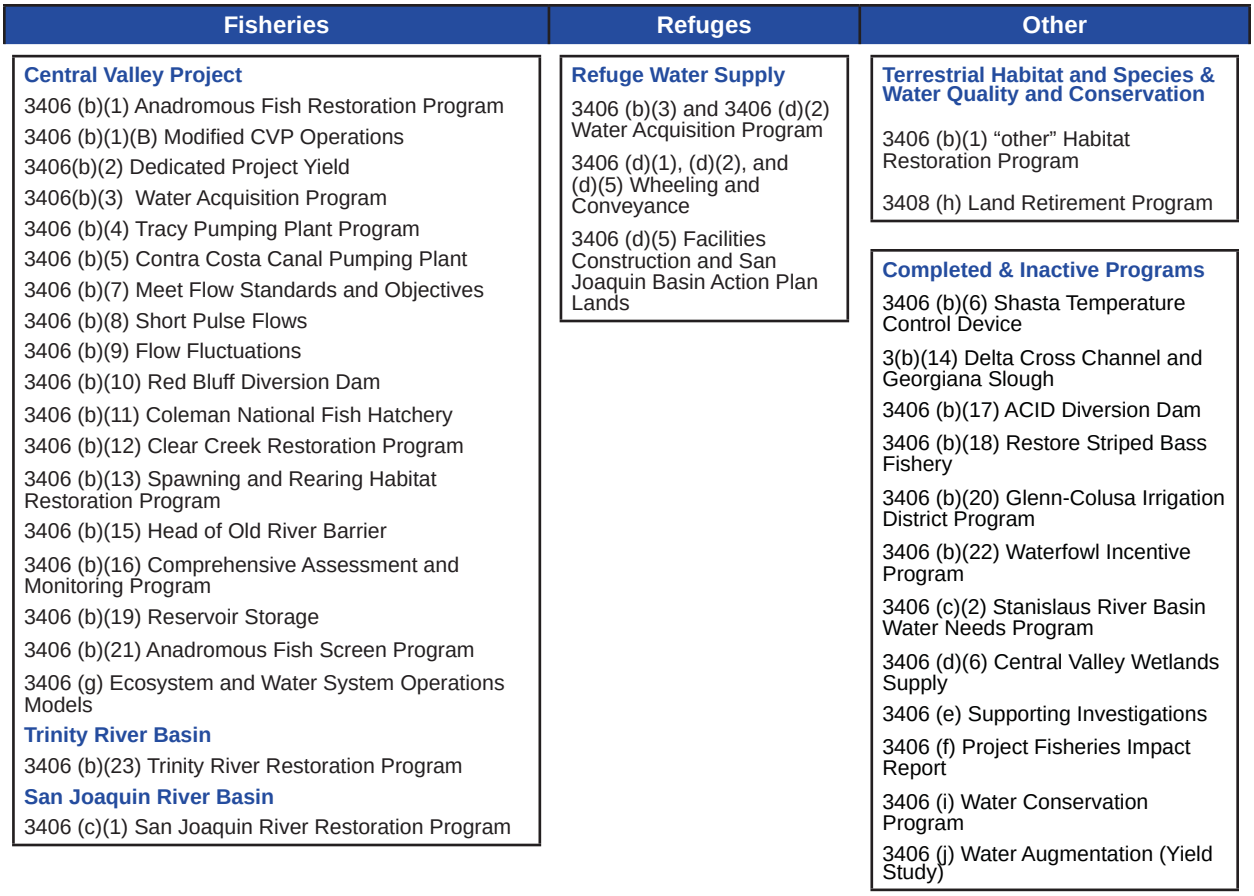


Figure 2. CVPIA Provisions by Resource Area

to achieve the Settlement's Restoration and Water Management goals are also authorized in the San Joaquin River Restoration Act (SJRRACT), included in the Omnibus Public Land Management Act of 2009. The SJRRACT, which authorizes and directs the Secretary to fully implement the Settlement, was signed by the President on March 30, 2009, and became Public Law 111-11. The SJRRACT also established the San Joaquin River Restoration Fund (SJRR Fund).

Refuges Resource Area

The CVPIA includes several provisions that are designed to contribute to the restoration of wetlands and wildlife habitat.

The Act directs Interior to:

"…provide, either directly or through contractual agreements with other appropriate parties, firm water supplies of suitable quality to maintain and improve wetland habitat areas on units of the National Wildlife Refuge System in the Central Valley of California; on the Gray Lodge, Los Banos, Volta, North Grasslands and Mendota state wildlife management areas; and on the Grasslands Resources Conservation District…"

The quantity and delivery schedules of refuge water are governed by the concepts of Level 2 and Level 4 which are outlined in more detail in the refuges sections of this report. CVPIA quantifies the specific amount of water that is to be supplied and authorizes Interior to acquire water conveyance capacity from non-federal entities and construct conveyance facilities as necessary for the delivery of water supplies to the refuges (Figure 3).

Other Resource Area

The third focus of the CVPIA restoration initiatives is directed at terrestrial species and habitats and other resource impacts of the CVP. Provisions supporting this initiative include the (b)(1)"other" Habitat Restoration Program (HRP), which focuses on protecting native habitats that have been directly and indirectly affected by the CVP's construction and operation, and the 3408(h) Land Retirement Program (LRP), which purchases and retires land from agricultural production to improve water quality and provide for terrestrial habitat restoration.

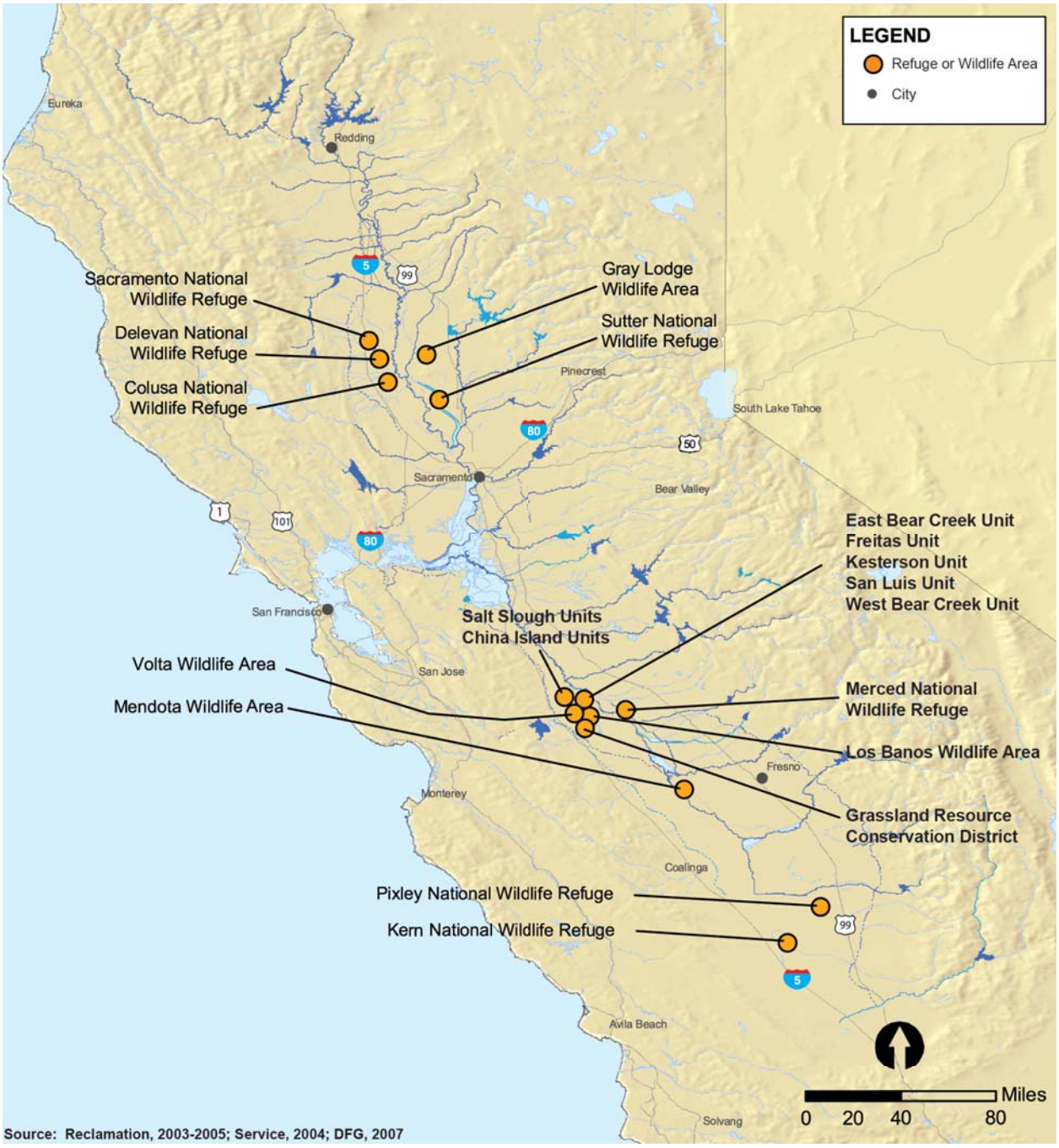


Figure 3. Central Valley Refuges Receiving CVPIA Water Supplies

FUNDING FOR ACTIVE PROVISIONS

While there were no cost estimates associated with the CVPIA in 1992, Congress has provided substantial annual appropriations of Restoration Funds and Water and Related Resources funds. As of 2009, approximately $1.1 billion has been obligated to CVPIA since its implementation in 1993 (Figure 4). For FY 2009, $96.7 million was obligated which included approximately: $59 million from the Restoration Fund, comprised of $56.1 million from the FY 2009 appropriation and $2.9 million from prior year funds; $16.1 million from the Water and Related Resources Fund; $13.5 million from the American Recovery and Reinvestment Act (ARRA) Fund; $2.9 million from the Bay-Delta Fund; also included in the obligations was an accounting adjustment that resulted in an obligation of $5.2 million under the State cost-share funds.

Table 1 lists each active provision and the amount of funding obligated in FY 2009 for the fisheries, refuges, and other resource areas.

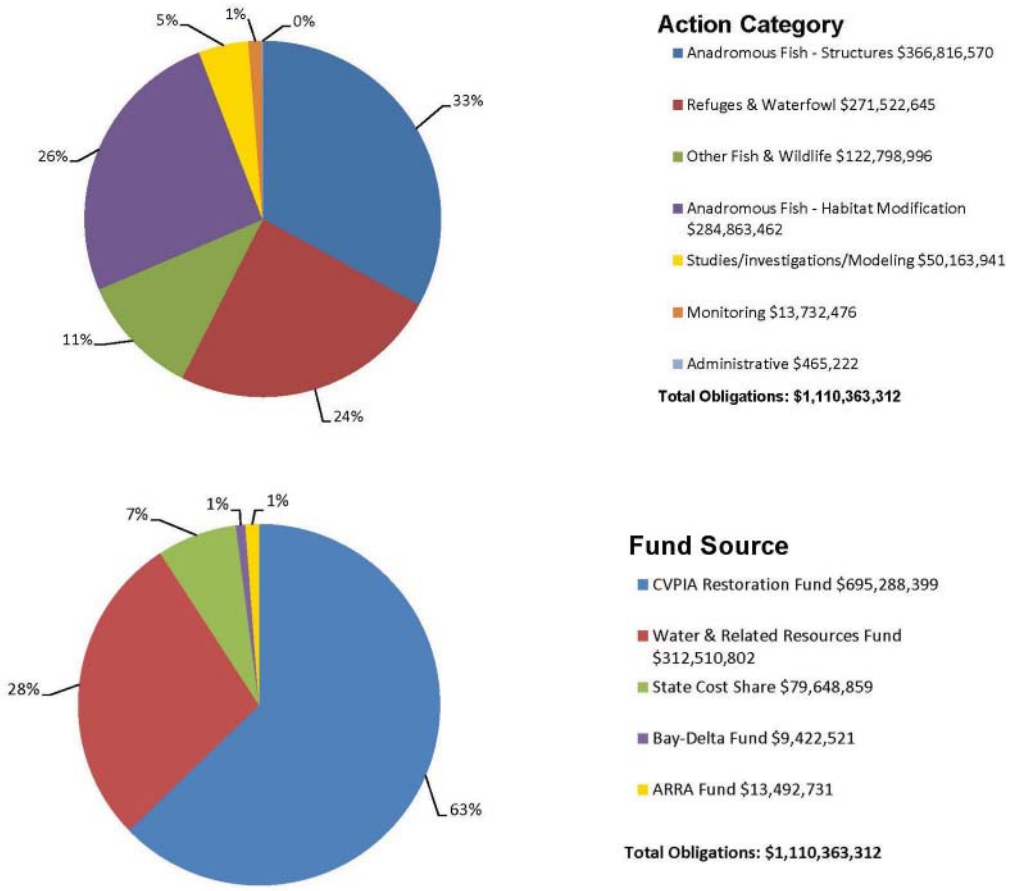


Figure 4. Total CVPIA Obligations by Action Category and Fund Source (1993-2009)

Completed and Inactive Programs

Several CVPIA provisions are now complete and/or otherwise not funded in the FY 2009 cycle. As such, the following provisions are not discussed in this report:

- 3406 (b)(6) Shasta Temperature Control Device (Complete)
- 3406 (b)(7) Meet Flow Standards and Objectives (Ongoing through operations)
- 3406 (b)(8) Short Pulse Flows (Ongoing through operations)
- 3406 (b)(14) Delta Cross Channel and Georgiana Slough (Inactive)
- 3406 (b)(17) Anderson-Cottonwood Irrigation District Diversion Dam (Complete)
- 3406 (b)(18) Restore Striped Bass Fishery (Inactive)
- 3406 (b)(22) Waterfowl Incentive Program (Complete)
- 3406 (c)(2) Stanislaus River Basin Water Needs (Complete)
- 3406 (d)(6) Central Valley Wetlands Supply (Complete)
- 3406 (e) Supporting Investigations (Complete)
- 3406 (f) Project Fisheries Impact Report (Complete)
- 3408 (i) Water Conservation (Complete)
- 3408 (j) Water Augmentation (Yield Study) (Complete)

Contract Renewals

The Act directs Interior to ". . . upon request, renew any existing long-term repayment or water service contract for the delivery of water from the Central Valley Project . . ."

Since the passage of CVPIA, Reclamation has completed interim and long-term contract renewals

Table 1. FY 2009 Funding Obligations by CVPIA Provision

	Provision		Water & Related Funds*	Restoration Funds*	State*	Bay Delta*	ARRA*
3405(a)	Water Transfer Program		0	0	0	$418,000	0
3406(b)(1)	Anadromous Fish Rest.		0	$6,349,800	0	0	0
3406(b)(1)	“other” - Habitat Restoration		0	$1,449,000	0	0	0
3406(b)(1)	“other” - Trinity River		$3,788,000	$2,512,000	0	$794,000	$20,000
3406(b)(1)	“other” - San Joaquin River		0	($188,000)	0	0	0
3406(b)(1)(B)	Modified CVP Operations		0	$300,000	0	0	0
3406(b)(2)	Dedicated 800,000 acre-feet		0	$663,000	0	0	0
3406(b)(3)	Water Acquisition Instream		0	$6,001,000	0	0	0
	VAMP		0	$6,149,000	0	0	0
	Level 4		0	$6,154,000	0	0	0
3406(b)(4)	Tracy (Jones) Pumping Plant		$1,593,000	0	0	0	0
	Two Gates		0	0	0	$175,000	0
3406(b)(5)	Contra Costa Canal		$116,000	0	$1,000	0	$6,884,000
3406(b)(9)	Flow Fluctuations		0	$4,000	0	0	0
3406(b)(10)	Red Bluff Diversion Dam		$4,173,000	0	0	0	$6,589,000
3406(b)(11)	Coleman Fish Hatchery		0	0	0	0	0
3406(b)(12)	Clear Creek Restoration		$3,000	$745,000	<16,000>	0	0
3406(b)(13)	Spawning and Rearing		0	$1,061,000	$9,000	0	0
3406(b)(15)	Head of Old River Barrier		0	0	0	0	0
3406(b)(16)	Comp. Assessment and Monitoring		0	$1,243,000	0	0	0
3406(b)(19)	Reservoir Storage		0	0	0	0	0
3406(b)(20)	Glenn-Colusa Irrigation		$33,000	0	0	0	0
3406(b)(21)	Anadromous Fish Screen		$3,145,000	$3,920,000	0	$500,000	0
3406(b)(23)	Trinity River Restoration		$3,026,000	0	0	0	0
3406(c)(1)	San Joaquin River		0	$13,820,000	0	$998,000	0
3406(d)(1)	Refuge Water Supply			Level 2 conveyance included in (d)(5)			
3406(d)(2)	Refuge Water Supply			Level 4 acquisition included in (b)(3)			
3406(d)(5)	Refuge Fac. Const.	Construction	0	$3,925,000	0	$12,000	0
		Wheeling	0	$8,351,000	0	0	0
3406(d)(5)	San Joaquin Basin Action Plan Lands		$208,000	$443,000	0	0	0
3406(g)	Ecosystem and Water Systems Operations Models		0	$898,000	0	0	0
3408(h)	Land Retirement Program		$48,000	$460,000	0	0	0
3406(b)(6)	Shasta TCD (State Cost-Share Accounting Adjustment)[1]			<5,226,000>	5,226,000		
TOTAL FUNDING OBLIGATED			$16,133,000	$59,033,800	$5,220,000	$2,897,000	$13,493,000

* Rounded for presentation purposes
Amounts in ( ) = credit amount

1 Accounting adjustment; moving costs from Restoration Fund to State Cost-share, which resulted in an obligation.

for the various CVP divisions and units. To date, Reclamation has executed 132 forty-year renewal contracts with Sacramento River Water Right Settlement contractors; 87 long-term renewal contracts with contractors from the Sacramento River Division, including the Trinity River, Shasta, Black Butte and Tehama-Colusa and Corning Canals units, Delta-Mendota Canal Division, and Friant divisions. 26 long-term renewal contracts have either been negotiated or are in the process of being negotiated and are awaiting execution. 13 Sacramento River Water Right Settlement contractors elected not to renew and two contracts are pending renewal.

Long-term renewal contracts for the seven Cross Valley contractors are currently being negotiated, as are contracts for the Sacramento Municipal Utility District (SMUD) and the City of Tracy. Reclamation and the nine San Luis Unit contractors have completed negotiations for long-term renewal contracts, and are awaiting execution pending completion of final environmental documentation, including consultations with the Fish and Wildlife Service and the National Oceanic and Atmospheric Administration (NOAA).

Water Transfers

Water transfers are a means by which existing water supplies can be reallocated from one user to another to assist in meeting existing and future water needs within the state.

In order to assist California urban areas, agricultural water users and others in meeting their future water needs, CVPIA specifically authorizes all individuals or districts – who received CVP water under contract – to transfer, subject to certain terms and conditions, all or a portion of the water they receive under such contracts to other water users within the state for any purpose recognized as beneficial under state law.

Reclamation has approved the transfer of CVP water in the following categories for the 2009 water year:

- 402,446 acre-feet of CVP agricultural water was approved for agricultural purposes
- 1,736 acre-feet of CVP agricultural water was approved for municipal and industrial purposes
- 10,650 acre-feet of CVP municipal and industrial water was approved for agricultural purposes
- 8,838 acre-feet of CVP municipal and industrial water was approved for municipal and industrial purposes
- 18,687 acre-feet of CVP agricultural water approved to Reclamation's Refuge Water Acquisition Program

RECENT DEVELOPMENTS

The CVPIA Program faces several challenges. First, is the scope and overall complexity of the project which is a long-term effort to restore the Central Valley ecosystem that involves federal, State, local and tribal entities, as well as public and private interests. Compounding the program complexity are recent events on the regional, national, and international scale, such as court ordered delta pumping restrictions, west coast salmon fishery closure, and climate change. The drought in California continued in Water Year (WY) 2009 (October 1 – September 30) which was classified as a dry year. These conditions impacted water deliveries for agriculture and municipal and industrial users as well as affected the availability and cost of water to purchase on the open market for refuge water deliveries. Several recent developments have directly effected future implementation of CVPIA actions, including the Pelagic Organism Decline (POD), water project operations biological opinions (BO), the Office of Management and Budget (OMB) performance management process, the outcome of independent reviews, and the development of a draft long-term plan for CVPIA implementation.

Pelagic Organism Decline

Abundance indices calculated by the California Department of Fish and Game (CDFG) through 2009 show continued low abundance of four pelagic fishes in the upper San Francisco Estuary (the delta and Suisun Bay). These fishes include two native species, delta smelt and longfin smelt, and two non-native species, age-0 striped bass and threadfin shad. The 2009 indices for delta smelt and threadfin shad were the lowest ever recorded. Delta water diverters reduced pumping in response to the decline. The decline has also heightened the need to improve fish protection in the south delta and at the intake to Contra Costa Canal to further minimize the loss of these pelagic fish species due to exports. Revised federal ESA BO's have been issued by the

Service and the NMFS that specifically address the need for additional fish protection due to exports.

Water Project Operations Biological Opinions

The 2008 Biological Assessment on the Continued Long-term Operations of the CVP and the State Water Project (Operations BA) provides a detailed project description of the CVP system as a whole, including operations, modeling, and forecasting. The Operations BA contains an analysis of the effect of CVP operations on federally-listed threatened and endangered species, providing a basis for consultation with NMFS and the Service regarding mitigation to reduce those effects. Based upon the BA, the Service and NMFS issued BO's stating their conclusions about potential effects of CVP and SWP operations.

On December 15, 2008, the Service issued its BO analyzing the effects of the CVP and SWP operations on the threatened delta smelt. The conclusion of the BO is that continued operations of the CVP and SWP, as proposed in the BA, are likely to jeopardize the continued existence of delta smelt. As a result, the Service provided a reasonable and prudent alternative (RPA) for CVP and SWP operations that the Service believes will avoid the likelihood of jeopardizing the continued existence of delta smelt.

On June 4, 2009, NMFS issued its BO analyzing the effects of the CVP and SWP operations on threatened and endangered (T&E) salmonids and other listed species (e.g., green sturgeon). The conclusion of the BO is that continued operations of the CVP and SWP, as proposed in the BA, would jeopardize the continued existence of Sacramento River winter-run Chinook, Central Valley spring-run Chinook, Central Valley steelhead, Southern Distinct Population Segment of North American green sturgeon, and Southern Resident killer whales. As a result, NMFS provided a RPA for CVP and SWP operations that NMFS believes will avoid the likelihood of jeopardizing the continued existence of listed species.

The Program will address the BO's by committing substantial resources toward certain RPA requirements including: completion of the new pumping plant and fish screen at the Red Bluff Diversion Dam; completion of the Contra Costa Pumping Plant No. 1 fish screen; operational changes; dedication of instream water supplies; implementation of fish and wildlife restoration actions and evaluations in the Delta, lower Sacramento River, Stanislaus River, and Antelope Creek; fisheries monitoring; and construction of anadromous fish screens.

The 2008 Service BO and the 2009 NMFS BO have both been challenged in Federal District Court. The litigation on both BOs is ongoing.

Program Assessment Rating Tool

The OMB Program Assessment Rating Tool (PART) was developed to assess and improve the performance of federal programs. A PART review helps identify a program's strengths and weaknesses to inform funding and management decisions aimed at making the program more effective. The PART therefore looks at all factors that affect and reflect program performance including program purpose and design; performance measurement, evaluations and strategic planning; program management; and program results. Because the PART includes a consistent series of analytical questions, it allows programs to show improvements over time and allows comparisons between similar programs.

A PART was performed for CVPIA in 2006, and the Program was given a rating of "adequate." OMB required several improvements actions, some of which were implemented in 2007 and 2008 and some which extended into FY 2009. In 2009, the Program completed two Independent Reviews, developed a Draft Implementation Plan, and continued to track performance toward the PART performance measures. In 2009, OMB began transitioning to a new system, the Performance Information Management System (PIMS) to replace PART. The Program will continue to coordinate with OMB as the new PIMS requirements are defined.

Independent Reviews

An independent review is a process through which a panel of experts evaluates a program and makes recommendations to improve its effectiveness. Each panel is comprised of independent professionals and academics with expertise in relevant areas. The purpose of these independent reviews is to provide programmatic recommendations and guidance to the CVPIA Program

to improve effectiveness and efficiency and maximize restoration progress in a time of limited resources.

Reclamation and the Service sponsored two independent reviews: one to evaluate the anadromous fisheries activities and one to evaluate the refuge water supply activities. These two elements represent a substantial portion of the annual Restoration Fund expenditures.

The purpose of the fisheries independent review was to seek recommendations on how to implement the CVPIA fisheries programs more efficiently and effectively to reach the fish doubling goals described in Section 3406(b)(1) of the Act. The fisheries independent review convened preparatory panel sessions where program managers presented the scientific, program management, and other background information used to support the fishery restoration plans and activities. The six-member panel convened privately to review the program and develop draft recommendations. The preparatory panel sessions and the panel deliberation sessions were conducted May 2008 through October 2008. The final report from the fisheries independent review panel was submitted to Reclamation and the Service in December 2008 (FY 2009). The independent review panel provided valuable recommendations for improving the CVPIA fish restoration program, including recommendations to improve the program's science-based framework, reorganize the program structure and management, improve program implementation by making full use of CVPIA authorities, and improve collaboration.

In 2009, the refuges independent review was completed. The purpose of the refuges independent review was to seek recommendations on how to implement the RWSP more efficiently and effectively to reach the goals of providing Full Level 4 water. The independent refuges evaluation is focused on the Central Valley refuges goals described in Sections 3406(d)(1 – 5) of the Act. The refuges independent review convened preparatory panel sessions in February 2009 to present the scientific, program management, and other background information used to support the refuges restoration plans and activities. The five-member panel convened privately to review the program and develop draft recommendations; the panel deliberation sessions were conducted between March 2009 and May 2009. The final report from the refuges independent review panel was submitted to Reclamation and the Service in November 2009. The report provided specific recommendations and made findings on five major elements of the RWSP: program management, water supply, water conveyance, program metrics, and refuge management. The panel recommendations included: transfer programmatic authority and Restoration Fund monies for acquiring all Incremental Level 4 water to an independent, third-party entity; prioritize the funding and completion of remaining external conveyance construction projects; realign and optimize management structure of the RWSP to optimize flexibility and fungibility of Level 2 Water and any Incremental Level 4 Water; and modify policies and practices that are inconsistent with the intent of the Act to improve CVP operations and deliver 100 percent of all Level 2 water to the refuge system.

Reclamation and the Service considered the recommendations of both panels as they developed the Implementation Plan (see below) that will guide Program priorities and activities over the next 10 years. The Implementation Plan addresses the independent reviews by adopting certain recommendations and incorporating them as future strategies and implementation activities. The agencies are optimistic about the ability to improve the fisheries and refuges program by adopting many of the panel's recommendations.

Implementation Plan

The CVPIA Program developed an Implementation Plan (IP) that will provide focus and direction for the CVPIA Program for the coming 10 years (2010-2019); it provides the foundation for planning, budgeting, performance management, and accountability processes. The IP focuses on providing objectives and strategies for the following resource areas: Fisheries, Refuges, Other, and CVPIA Program Management.

The IP was developed over two years through internal and external processes. The internal process included participation by Reclamation and Service program managers, biologists, and engineers that are involved in the day-to-day work of Program implementation; these meetings culminated with the development of prioritized activities in each of the resource areas. As stated above, independent review panels also reviewed Program accomplishments and prepared recommendations for the fisheries and refuges programs regarding priorities and efficiencies to maximize progress towards the restoration goals. Certain independent review panel recommendations are incorporated into the IP as future

strategies and activities. The IP is currently under review by both the Service and Reclamation.

LOOKING AHEAD

Quantifying goals and results will be increasingly important as Reclamation and the Service seek to focus Program dollars on areas that can provide the greatest return on investment. In the case of this portion of CVPIA, currently funded through the Restoration Fund and focused on restoration efforts, return on investment is measured generally by increases in the natural production of anadromous fish; the delivery of water to wildlife refuges that is of suitable quality and quantity; the protection and restoration of sensitive species and habitats; the retirement and restoration of agricultural lands; the completion of structural improvements; and the implementation of operational changes to affect flows. The Program also measures completion of restoration activities pursuant to the Trinity River Restoration Plan, and additional specific goals exist for individual CVPIA Program activities, as discussed throughout this annual report.

The data generated from CVPIA modeling and monitoring activities support the identification of these performance targets and also provide results and feedback on the effectiveness of actions. Planning and coordination between the various provisions will increase the effectiveness of resource allocation and decision-making. Close coordination between the programs is seen as critical to the success of CVPIA's long-term goals.

The CVPIA Program is a complex, long-term effort to restore the Central Valley ecosystem that involves federal, State, local, and tribal entities, as well as public and private interests. Because of the scope and overall complexity, and large number of stakeholders involved in CVPIA, it is important that the Program clearly articulate specific, measureable goals for the restoration and a strategy for achieving the goals. The next steps will be to establish benchmarks for measuring progress in restoring the ecosystem. Reporting on annual goals will occur each year. Longer term or interim outcome oriented goals that will serve as a blueprint of how the restoration will occur, will be developed. This will enable all of the participating agencies to establish appropriate priorities and milestones for accomplishing the entire effort and improve their ability to accomplish the restoration in a timely and efficient manner. This will also help ensure that the participating agencies do not duplicate or counter each other's efforts.

The IP was developed to guide decision-making in the planning and execution of the CVPIA Program over the next 10 years. The objectives and strategies contained in the IP are intended to maintain the momentum, guide the CVPIA Program through the uncertainties it faces, and provide stability for the future alignment of the CVPIA Program. The courses of action set forth in the strategies and activities in the IP, coupled with site-specific decision analysis that incorporate local and regional stakeholder considerations, will enable effective management of an integrated program. The Program is optimistic about the future and looks forward to carrying out the important mission enumerated in the Act.

III. 2009 Program Activities and Accomplishments

This section summarizes FY 2009 program accomplishments, funding obligations from all funding sources, authorizing language from CVPIA, and background information for each active provision. Wherever possible, each program includes quantified goals and targets to measure progress towards the Act's implementation. The following programs are discussed in this section:

- Anadromous Fish Restoration Program
- Habitat Restoration Program
- Trinity River Restoration Program
- Modified CVP Operations
- Dedicated 800,000 acre-feet Project Yield
- Water Acquisition Program - Instream Water
- Tracy (Jones) Pumping Plant Program
- Contra Costa Canal Pumping Plant
- Flow Fluctuations and Reservoir Storage
- Red Bluff Diversion Dam
- Coleman National Fish Hatchery
- Clear Creek Restoration Program
- Spawning and Rearing Habitat Restoration Program

Chinook salmon

- Head of Old River Barrier
- Comprehensive Assessment and Monitoring Program
- Glenn-Colusa Irrigation District Program
- Anadromous Fish Screen Program
- San Joaquin River Restoration Program
- Introduction to the Refuge Water Supply Program
- Water Acquisition Program - Refuge Water
- Refuge Facilities Construction Program and San Joaquin Basin Action Plan Lands Program
- Refuge Water Conveyance (Wheeling) Program
- Ecosystem and Water Systems Operations Models
- Land Retirement Program

Anadromous Fish Restoration Program

Fisheries Resource Area (Central Valley)

FY 2009

CVPIA Funding Obligations by Funding Source

- Restoration Fund - $6,349,800

TOTAL - $6,349,800

Accomplishments

- Conducted several activities to improve habitat for anadromous fish by providing flows and improved physical habitat including: floodplain restoration on the Sacramento River NWR and purchased and placed 6,400 tons of spawning gravel on the Mokelumne River
- Continued to improve the opportunity for adult fish to reach their spawning habitats by providing funding to complete the environmental permits and construction bid package for the Antelope Creek Crossing Repair Project
- Conducted several activities to collect fish data to facilitate evaluation of restoration actions including: funding the monitoring at the Coleman National Fish Hatchery's barrier weir fish ladder and providing funds to implement seven ongoing long term monitoring tasks on Clear Creek

CVPIA Section 3406(b)(1)

"The Secretary . . .is authorized and directed to . . . develop within three years of enactment and implementation 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." The section also states, "this goal shall not apply to the San Joaquin River between Friant Dam and the Mendota Pool, for which a separate program is authorized under subsection 3406(c) of this title; 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; And provided further, That in the course of developing and implementing this program the Secretary shall make all reasonable efforts consistent with the requirements of this section to address other identified adverse environmental impacts of the Central Valley Project not specifically enumerated in this section."

Based on the Act's language, Interior developed the Anadromous Fish Restoration Program (AFRP) as the overarching program to address anadromous fish doubling in the Central Valley. The AFRP goal is to at least double the natural production of anadromous fish on a long-term, sustainable basis. The specific system-wide doubling targets for natural production of anadromous fish are categorized by fish run/species, per year:

- Chinook salmon
  - Winter-run 110,000
  - Spring-run 68,000
  - Fall-run 750,000
  - Late Fall-run 68,000
- Steelhead 13,000
- Green sturgeon 2,000
- White sturgeon 11,000

- Striped bass 2,500,000
- American shad 4,300

Subsequent to the Act's passage, the AFRP developed a series of planning reports that culminated in the Final AFRP Restoration Plan (Final Restoration Plan) in 2001. As acknowledged in the CVPIA ROD, the Final Restoration Plan guides the implementation of the actions and evaluations which were developed to address the doubling goal. The 289 actions and evaluations in the Final Restoration Plan are categorized by six programmatic-level objectives:

- Improve habitat for all life stages of anadromous fish through provision of flows of suitable quality, quantity, and timing, and improved physical habitat
- Improve survival rates by reducing or eliminating entrainment of juveniles at diversions
- Improve the opportunity for adult fish to reach their spawning habitats in a timely manner
- Collect fish population, health, and habitat data to facilitate restoration actions evaluation
- Integrate habitat restoration efforts with harvest and hatchery management
- Involve partners in implementing and evaluating restoration actions

The CVPIA Program is implementing these actions and evaluations to further efforts to meet the doubling goals for the natural production of anadromous fish.

MEASURING SUCCESS

Meeting Program Objectives

Key actions and evaluations undertaken or completed in 2009 include the following (grouped by program objectives):

Objective 1: Improve habitat for all life stages of anadromous fish through provision of flows of suitable quality, quantity, and timing, and improved physical habitat

Cottonwood Creek – Funds were provided this year to develop a sediment budget and assist in determining the cause of streambed instability. The study includes analyses of geomorphologic data from 1939 to present; quantifies spatial and temporal characteristics of sediment supply, storage, and transport in the system; and identifies the effects of sediment transport dynamics on perceived channel and watershed changes. The Non-native Invasive Plant Management and Control Project was funded in FY 2009 to complete the environmental compliance documents and permitting to eradicate non-native noxious and invasive plants within the riparian corridor of Cottonwood Creek. These projects are a cooperative effort with the Cottonwood Creek Watershed Group and address Actions 1 and 5 in the Final Restoration Plan.

Sacramento River – Phase II of the La Barranca Unit Restoration Project at the Sacramento River National Wildlife Refuge (NWR) was implemented during this reporting period. The 116 acre orchard was removed, roots and branches picked out, the soil was harrowed, and the site prepared for future restoration work. A restoration plan for this site was completed giving two options for planting designs based on the hydrologic, geologic, edaphic (soil), biologic (baseline special status species, migratory birds, plants and vegetation) and historic conditions at the site; and outlined the implementation strategies for the site. The La Barranca Restoration Plan is available on the AFRP website at http://www.fws.gov/stockton/afrp/. This project was funded with FY 2008 funds and addresses Action 9 and Evaluations 1 and 5 in the Final Restoration Plan.

Yuba River – The Hammon Bar Habitat Restoration Project Phase 2, of 4 phases, (Final Restoration Plan Evaluation 4) was funded in FY 2009 to complete a juvenile fish habitat assessment, land use analysis, permits, and designs. The pre-project assessment was completed this year for potential riparian habitat restoration targeting juvenile Chinook salmon and steelhead. This assessment involved geomorphic, hydrologic, hydraulic, and vegetation components, and included substantial public outreach. A topographic map for restoration planning and preliminary conceptual diagrams for restoration projects at Hammon Bar and locations upstream as far as Parks Bar were also developed during this reporting period. The permits and final designs are still being developed but should be completed next year. This project is a cooperative effort between the USFWS, California Department of Fish and Game (CDFG), the South Yuba River Citizens League (SYRCL), Western Aggregates Inc., Yuba Outdoor Adventures, and the Yuba Preservation Foundation.

Mokelumne River – The Mokelumne River Spawning Habitat Improvement Project (Final Restoration Plan Action 7) purchased and placed 6,400 tons of spawning gravel to improve natural production of Chinook salmon and steelhead at several spawning sites. This project enhanced an estimated 0.23 miles of river raising the streambed elevation, increasing the gradient and flow control features needed to provide gravel mobility and create additional downstream habitat in subsequent years. This project area is rigorously characterized each year for spawning use, bed form and function, and provides a foundation project for the Spawning Habitat Integrated Rehabilitation Approach (SHIRA) as conducted by UC Davis. This information will be available in the final report after the project is completed in 2012. This project is a cooperative effort between the USFWS and the East Bay Municipal Utility District.

Cosumnes River – The Spawning Habitat Restoration Project (Final Restoration Plan Action 6 and Evaluation 3) received additional FY 2009 funds to purchase and place more and higher quality spawning gravel in the restored channel area, as well as place additional gravel upstream for gravel recruitment. The site was monitored and characterized for spawning use, bed form and function during this reporting period. This information will be available in the final report after the project is completed in 2010. AFRP is collaborating with Fisheries Foundation of California (FFC), Omochumne-Hartnell Water District, Robertson-Bryan, Inc., and CDFG and has leveraged $232,500 in cost share and in-kind services to date.

Stanislaus River – AFRP FY 2009 funds were provided for the implementation phase for both the Honolulu Bar and Lancaster Road floodplain and side-channel enhancement projects. Topographic, bathymetric, and vegetation surveys have been completed and preliminary conceptual plans have been developed for both projects. These projects are being designed to increase juvenile salmonid rearing habitat and decrease predation (Final Restoration Plan Action 2). The Stanislaus River Restoration Plan was completed during this reporting period and is available on the AFRP website at http://www.fws.gov/stockton/afrp/. AFRP also participated in two outreach festivals, two river clean ups, various public meetings, and began the planning for a Stanislaus River Salmon Festival during this reporting period. These outreach activities have increased community and stakeholder support for the restoration projects in this watershed. AFRP is partnering with the U.S.

Mokelumne River Spawning Habitat Improvement Project – Before (top) and After (bottom)

Army Corps of Engineers, USBR, Natural Resources Conservation Service (NRCS), CDFG, East Stanislaus Resource Conservation District, Tri-Dam, and FFC to host the Salmon Festival.

Tuolumne River – A Conceptual Plan to restore 120 acres of riparian floodplain and implement instream gravel augmentation as well as improve floodplain function and connectivity to the river at Bobcat Flat was completed this year (Final Restoration Plan Action 2). Both the survey work for the pre-project assessment and the permitting were initiated in FY 2009. AFRP is collaborating with Friends of the Tuolumne and the CDFG.

Merced River – Outreach, education, permitting and planning for three different floodplain and channel restoration projects (Final Restoration Plan Action 3) were initiated in FY 2009. The Merced River Ranch Project final designs were completed during this reporting period. A draft Environmental Assessment/Initial Study Report has been completed. The flow parameters, topographic surveys, benthic macro-invertebrate sampling, and substrate quality assessments

were completed for all three floodplain and channel restoration projects. AFRP is collaborating with Santa Fe Aggregates, Inc., CDFG, CALFED Ecosystem Restoration Program (ERP), and the California Department of Water Resources (DWR).

Objective 2: Improve survival rates by reducing or eliminating entrainment of juveniles at diversions

Antelope Creek – The Juvenile Fish Passage Improvement Project at Edwards Diversion Dam (Final Restoration Plan Action 1) was initiated in FY 2008 to have environmental compliance and construction plans developed. The juvenile fish passage improvement will prevent out-migrating salmonids from becoming entrained in the two diversion canals at Edwards Diversion Dam. Although the diversions are screened, no bypass system was installed during construction due to site complexity. The Tehama County Resource Conservation District (TCRCD) completed a feasibility study, the environmental compliance documents, and project designs during this reporting period. FY 2009 funds have been obligated for implementation, and construction is expected to begin in the summer of 2010. This project is a cooperative effort between the USFWS, CDFG, NMFS, TCRCD, Los Molinos Mutual Water Company, and the Edwards Ranch.

Butte Creek – Over the past several years many projects, which benefit salmonid survival and production, have been funded by AFRP to facilitate passage and reduce entrainment at facilities in the Butte Creek watershed. Two final reports evaluating juvenile spring-run Chinook salmon entrainment were completed in FY 2009. The Lower Butte Creek Project, Phase III Consolidated Action Summary Report (July 2009 draft) is currently under review. Both of these evaluation projects were funded with FY 2006 AFRP funds and address Evaluations 1-9 for Butte Creek in the Final Restoration Plan. The reports show that implementing the potential actions (screens) would reduce entrainment and contribute to increases in juvenile-to-adult survival of Butte Creek spring-run Chinook salmon, though the individual benefits of the potential actions on population performance appears to be small due to other diversions in the system that still need to be addressed. For more information on these activities and recently completed final reports visit the AFRP website at http://www.fws.gov/stockton/afrp/.

Objective 3: Improve the opportunity for adult fish to reach their spawning habitats in a timely manner

Antelope Creek – A road crossing in the CDFG Tehama Wildlife Area is currently a barrier to spring- and fall-run Chinook salmon during dry years. In FY 2008, this project received USFWS National Fish Passage Program funds to develop the environmental compliance and construction designs for the Antelope Creek Crossing Repair Project in the Tehama Wildlife Area (Final Restoration Plan Action 1). In FY 2009, AFRP funds were added to this project to obtain formal permissions and permits, and complete a construction bid package. This project is a cooperative effort between the USFWS and CDFG.

Battle Creek – The Battle Creek Salmon and Steelhead Restoration Project (Final Restoration Plan Actions 2, 6, and 7) has seen significant progress in the past two years. Although no AFRP funds were used on the Restoration Project in FY 2009, the AFRP provided technical assistance and collaborated with partners to develop and implement restoration actions in this watershed. Phase 1A of the Restoration Project includes installing fish screens and ladders at the North Battle Creek Feeder and Eagle Canyon diversion dams and removing Wildcat diversion dam and appurtenant conveyance systems on the North Fork; installing Eagle Canyon Canal pipeline; and modifying Asbury dam on Baldwin Creek. USBR funded Phase 1A with $49.25 million. The National Environmental Policy Act (NEPA) ROD and construction bids were prepared during this reporting period. In April 2009, $26 million in funds from the American Recovery and Reinvestment Act (ARRA) were identified and a Phase 1B Implementation Agreement was drafted. For more information on the progress of these collaborative efforts go to http://www.usbr.gov/mp/battlecreek/index.html.

Big Chico Creek – The permitting and environmental documentation for the Iron Canyon Fish Ladder Project (Final Restoration Plan Action 2) that was funded in FY 2007 will be completed in FY 2010. The California Environmental Quality Act (CEQA) Initial Study was completed in FY 2009 and progress is being made on the other permits. Construction funds are being sought by Chico State University Foundation, but so far have not been fully attained. Completion of the new passage facility at Iron Canyon will provide access to an estimated 8 miles of quality spring-run Chinook salmon

habitat. This is a cooperative project with the USFWS, CDFG, and Chico State University.

Cottonwood Creek – The Anderson-Cottonwood Irrigation District (ACID) siphon is becoming exposed once again in Cottonwood Creek and poses a passage problem for adult salmonids. Funds were provided during this reporting period to complete the environmental documentation permits and design for the Cottonwood Creek ACID Siphon Project (Final Restoration Plan Action 2). This is a cooperative project with USFWS, CDFG, ACID, NMFS, and the landowners.

Cow Creek – Clover Creek, tributary to Cow Creek, has an agricultural dam and exposed siphon, both of which are complete barriers. AFRP provided FY 2007 funds to the Western Shasta Resource Conservation District (WSRCD) for the Millville Diversion Environmental Compliance Project (Final Restoration Plan Action 3) to complete all environmental compliance documents necessary to obtain permits to modify the diversion dam for fish passage. The conceptual design for a boulder weir fishway was developed in FY 2009. This project will eventually open up 10 miles of historic habitat to fall-run Chinook salmon and Central Valley steelhead trout. The DWR Fish Passage Improvement Program is providing the initial engineering design. This is an interagency effort with DWR, CDFG, CALFED ERP, and the NRCS.

Calaveras River – Final designs for the Budiselich Flashboard Dam boulder weir fishway were completed this year. The joint NEPA/CEQA Programmatic Environmental Assessment/Initial Study was also completed during this reporting period. The Calaveras River Passage Improvement Project (Final Restoration Plan Action 3) will begin implementation to replace and/or retrofit migration impediments to salmon and steelhead in the lower Calaveras River. This project will restore access to about 10 miles of habitat. This project is a cooperative effort between the USFWS, Stockton East Water District, FFC, the University of the Pacific, CDFG, and DWR.

Cosumnes River – The Cosumnes River Passage Improvement Project (Final Restoration Plan Evaluation 2) was funded in FY 2009 to improve fish passage at Rooney Dam. This project will eliminate this migration barrier by constructing a four-tiered boulder weir fishway. The environmental documents and designs were completed this year and construction began in the fall of 2009. AFRP is collaborating with FFC, Omochumne-Hartnell Water District, Robertson-Bryan, Inc., and CDFG.

Fish passage barriers at the Budiselich Flashboard Dam in the Calaveras River (top) and Rooney Dam in the Cosumnes River (bottom)

Objective 4: Collect fish population, health and habitat data to facilitate evaluation of restoration actions

Battle Creek - FY 2009 funds were provided to continue an adult escapement survey of natural-origin steelhead and winter-, spring-, and late-fall Chinook salmon to monitor progress towards meeting the AFRP doubling goal production targets in Battle Creek. Monitoring occurred at the Coleman National Fish Hatchery's barrier weir fish ladder between March 1 and August 1, 2009. This is the first year for testing the motion-detection capabilities on a Digital Video Recorder and preliminary data suggest that motion–detection is capturing nearly 100% of adult salmonid passage at the barrier weir fish ladder where viewing conditions are optimal. This new technology promises to provide significant time and cost savings in the future. A rotary screw trap was also operated to measure downstream passage of natural-origin juvenile

salmonids. These studies assist with evaluating benefits resulting from habitat restoration actions and summary reports are available at http://www.fws.gov/redbluff/cvpia.html.

Bear, Cottonwood, and Cow creeks – The video weir monitoring project for Bear, Cottonwood, and Cow Creeks was implemented from October to December 2008. As an additional element in FY 2009, the Bear Creek site was operated for a longer time period (through April 2009) to determine the feasibility of determining adult steelhead escapement. The information is utilized to calculate natural production estimates and is used to guide AFRP restoration efforts and evaluate program performance. Annual summary reports are available on the AFRP website at http://www.fws.gov/stockton/afrp/. This work was completed through a cooperative effort of the USFWS, CDFG, WSRCD, and the Cottonwood Creek Watershed Group.

Clear Creek – AFRP FY 2009 funds were provided for the Clear Creek Anadromous Salmonid Monitoring Program (CCASMP) to continue to evaluate progress towards meeting the AFRP doubling goal production targets in this watershed. The CCASMP consists of seven ongoing, long-term monitoring tasks which include the operation of a segregation weir for spring and fall Chinook salmon; adult Chinook salmon (spring and late-fall) and steelhead escapement monitoring; juvenile salmonid production monitoring; fall Chinook spawning area mapping; and juvenile Chinook habitat use evaluation. Annual reports for these activities are available at http://www.fws.gov/redbluff/cvpia.html.

Mill Creek – A pilot study to assess the feasibility of counting adult Chinook salmon escapement in Mill Creek using a fixed-location hydroacoustic split-beam array (DTx) and a Dual-frequency Identification Sonar (DIDSON) was funded in FY 2007 and completed this year. The study concluded that the DIDSON was more effective and accurate in streams with high turbidity than either the DTx or the video weir. Results were comparable to those obtained by CDFG in 2008 through a Redd survey. The DIDSON may prove to be a cost effective alternative to traditional escapement surveys. The final report for this project was submitted February 2009 and is available on the AFRP website at http://www.fws.gov/stockton/afrp.

Sacramento River – AFRP FY 2009 funds were provided to monitor juvenile green sturgeon and winter Chinook salmon escapement and juvenile production on the mainstem Sacramento River downstream of the Red Bluff Diversion Dam. These activities will evaluate progress towards meeting the AFRP doubling goal production targets for these species. Annual reports are available at http://baydelta.ca.gov/Php/Special_Reports/red_bluff.php.

Yuba River – Two VAKI Riverwatcher fish counting systems were operated as a demonstration project in 2009 and used to count the number of fish passing upstream of the north and south fish ladders at the Daguerre Point Dam. AFRP purchased these monitoring systems in FY 2005 and the CDFG operates them with oversight by the South Yuba River Citizens League. Data were collected to better understand the timing, abundance, population trends, and response to changing flow and temperature conditions of adult spring- and fall-run Chinook salmon, and Central Valley steelhead in the Lower Yuba River (Final Restoration Plan Action 7). This information will help improve management of these species in the Lower Yuba River, including actions such as salmonid habitat restoration projects and providing appropriate in-stream flow regimes. A draft Monitoring and Evaluation Plan was also developed during this reporting period to evaluate instream flows as part of the Lower Yuba River Accord.

Calaveras River – Data were collected on steelhead and fall-run Chinook salmon passage and stranding to provide information to improve flow management and inform prioritization and evaluation of passage impediments. These assessments were done in partnership with the FFC and address the Final Restoration Plan Action 3 and Evaluation 2 for this watershed.

Stanislaus River – FY 2009 accomplishments included the collection of both juvenile and adult passage data via rotary screw trapping (juveniles) and a fish counting weir (adults) operated in partnership with Tri-Dam (Final Restoration Plan Action 1). The rotary screw trapping was funded with FY 2007 (b)(16) CAMP and (b)(2) Dedicated Project Yield funds. A study to determine the relative contribution rates of juvenile Chinook salmon that migrate as fry versus smolt out-migrants to adult escapement was initiated this year with USBR New Melones Revised Plan of Operations funding. The study uses state of the art microchemistry and microstructure techniques to assess juvenile migratory history from adult otoliths recovered in the river by CDFG. These studies assist with evaluating

benefits resulting from habitat restoration actions; summary reports are available on the AFRP website at http://www.fws.gov/stockton/afrp.

Merced River – Rotary screw trapping to track juvenile salmonid outmigration was conducted in FY 2009. The data will be used to assist in evaluating the benefits of habitat restoration actions. The project used FY 2008 USFWS Fisheries Program funds. A summary report for this activity is available on the AFRP website at http://www.fws.gov/stockton/afrp.

Objective 5: Integrate habitat restoration efforts with harvest and hatchery management

Mokelumne River – A final report was completed documenting the proportion of hatchery versus natural origin Chinook salmon for the 2004 escapement estimate. The study used otolith microstructure and microchemistry data to demonstrate that hatchery origin Chinook salmon are much more dominant than expected, with estimates of 97%. This study was funded in FY 2006 and the report is available on the AFRP website at http://www.fws.gov/stockton/afrp.

Objective 6: Involve partners in the implementation and evaluation of restoration actions

The AFRP continued to work extensively with partners to develop and implement restoration projects. AFRP works closely with local landowners, watershed groups, agencies, professional societies, and other interested parties to share restoration and anadromous fish expertise, leverage resources, and represent program goals at public and technical meetings. For example, AFRP worked with the Fishery Foundation of California to form diverse partnerships with multiple stakeholders that are interested in improving salmonid habitat and fish passage in the Cosumnes and Lower Calaveras Rivers. AFRP is also collaborating with the Friends of the Tuolumne to restore floodplain and riparian habitats in the Tuolumne River. These efforts can potentially leverage about $4 million in additional funding that can be used to address restoration activities in these watersheds. AFRP is currently collaborating with DWR and Pacific Gas & Electric (PG&E) through the Habitat Expansion Agreement Steering Committee to restore Central Valley spring-run Chinook salmon and steelhead. These efforts can potentially leverage $15 million in additional funding for habitat restoration activities that can be used to recover these threatened species. Since 2001, AFRP has been successful in leveraging more than $12 million in the Yuba River, $4.8 million in the Merced River, and more than $9.8 million in the Tuolumne River through various funding sources such as CALFED ERP, DWR 4-Pumps, Tuolumne Irrigation District (ID), Merced ID, Yuba County Water Agency, and NRCS for anadromous fish restoration activities. These are just some examples of the many partners and programs AFRP collaborates with in many of its restoration projects.

Natural Production Doubling

In addition to assessing progress by implementing the Restoration Plan actions and evaluations, progress toward achieving the doubling goals can be assessed by calculating the production of naturally spawning fish. Although AFRP has production goals for all anadromous fish, the program's restoration actions and evaluations have focused on Chinook salmon, as, in general, AFRP restoration activities benefit all anadromous fish. Table 2 summarizes the status of Central Valley-wide natural production of Chinook salmon, steelhead, sturgeon, striped bass, and American shad in relation to the doubling goals and the baseline period. The average natural production of Central Valley-wide Chinook salmon in the doubling period (1992-2008) is currently 452,243 and below the doubling goal target of 990,000 total anadromous fish. The natural production average of Central Valley-wide Chinook salmon has been decreasing in the last few years as evidenced by the low adult escapement estimates in 2006, 2007, and 2008 resulting from poor ocean returns (Lindley et. al. 2009). Specifically, the average natural production of winter-run, spring-run, fall-run, and late fall-run Chinook salmon in the doubling period (1992-2008) are 7,789; 15,446; 409,061; and 19,946, respectively. The average production for steelhead in the doubling period (1992-2008) is 1,127. The average natural production of white sturgeon and green sturgeon, 1992 through 2005, is 5,507 and 2,201, respectively. Striped bass average natural production from 1992 to 2007 is 885,670. American shad natural production in the doubling period (1992 to 2008) is 2,680. These numbers are the most recent numbers that have been through the quality assurance/quality control (QA/QC) process from the CDFG Grand Tab. Updates and revisions are posted throughout the year on the AFRP website, and published in the Comprehensive Assessment and Monitoring Program annual report (USFWS, 2009).

The Final Restoration Plan also provides doubling goals for specific rivers and creeks. Substantial gains to date are seen in watersheds where a significant investment has been made in flow, passage, and habitat restoration (Battle, Butte, and Clear creeks). Average Chinook salmon production for the period of 1992-2008 has exceeded the doubling goal target on Battle, Butte, and Clear Creeks, and is just below the goal on the Mokelumne River, as seen in Table 3.

In order to more accurately assess natural production, AFRP is demonstrating new escapement counting technologies, such as the Alaskan weir (Stanislaus River), Vaki-infra-red counting systems (Stanislaus and Yuba Rivers), video weir monitoring (Bear, Cottonwood, and Cow Creeks), and hydroacoustics (Mill Creek). The AFRP is also supporting a study which should better define the percentage of hatchery-origin fish in escapement by looking at sulfur isotope (32S:34S) ratios in otoliths taken from natural spawning Chinook salmon from the Mokelumne River and comparing these to ratios observed in hatchery produced stocks. This information will provide methods to derive more accurate estimates of natural production.

Performance Measures

The AFRP tracks progress toward several performance measures. The average natural production of Central Valley-wide Chinook salmon in the doubling period (1992-2008) is currently 452,243 and below the 2009 target of 625,000 total Chinook salmon (reporting on PART). Also reporting on PART, since 1995, of the 73 high and medium priority structural actions and evaluations in the Final Restoration Plan, 30 (41%) have been completed.

Reporting on the CVPIA Program Activity Review (CPAR), of the 128 Final Restoration Plan actions with endpoints, 43 (34%) have been completed. The 128 Restoration Plan actions include 53 structural actions and 75 non-structural actions. Of the 53 structural actions with endpoints, 20 (38%) have been completed. A total of 23 (31%) of the 75 non-structural actions with endpoints have been completed. Actions requiring annual or in perpetuity projects such as gravel augmentation (replacing gravel lost behind dams) and flow augmentation are not considered to have endpoints. Status of these actions are also reported under other provisions of the CVPIA such as the (b)(2), (b)(3), and (b)(13) programs.

Table 2. AFRP Fish Production Estimates in All Central Valley Streams (1992-2008)

Anadromous Fish Species and Watershed[1]	AFRP Annual Doubling Goals[2]	Average Baselines (1967-1991)[3]	Average Natural Production (1992-2008)[4]	Average % Natural Production Difference From Baseline[5]
All Chinook runs, all Central Valley streams	990,000	497,240	452,243	-9
Fall-run, all Central Valley streams	750,000	374,217	409,061	9
Winter-run, all Central Valley streams	110,000	54,417	7,789	-86
Spring-run, all Central Valley streams	68,000	34,425	15,446	-55
Late fall-run, all Central Valley streams	68,000	34,182	19,946	-42
Steelhead, all Central Valley streams	13,000	6,574	1,127	-83
Green sturgeon, all Central Valley streams	1,966	983	2,201[6]	124
White sturgeon, all Central Valley streams	11,000	5,571	5,507[6]	-1
Striped bass[7]	2,500,000	1,252,259	885,670[7]	-29
American shad[8]	4,300	2,129	2,680	26

Table 3. Chinook Salmon AFRP Production, in Battle, Butte and Clear Creeks, and Mokelumne River (1992-2008)

Chinook Salmon Species and Watershed[1]	AFRP Annual Doubling Goals[2]	Average Baselines (1967-1991)[3]	Average Natural Production (1992-2008)[4]	Average % Natural Production Difference From Baseline[5]
Battle Creek, fall-run	10,000	5,012	19,801	295
Battle Creek, late fall-run	550	273	675	147
Butte Creek, fall-run	1,500	763	2,823	270
Butte Creek, spring-run	2,000	1,017	10,948	976
Clear Creek, fall-run	7,100	3,574	11,606	225
Mokelumne River, fall-run	9,300	4,679	8,564	83

[1] Only streams and rivers with complete salmon production data sets (1992-2008) are shown.

[2] Annual doubling goals were derived from "Mills, T.J. and F. Fisher. 1994. Central Valley Anadromous Sport Fish Annual Run-size, Harvest, and Population Estimates, 1967 through 1991, California Department of Fish and Game. 62pp" and published in "USFWS. 2001. Final Restoration Plan for the Anadromous Fish Restoration Program, A Plan to Increase Natural Production of Anadromous Fish in the Central Valley of California. Released as a Revised Draft on May 30, 1997 and adopted as final on January 9, 2001. CVPIA, AFRP, Stockton, CA. [http://www.fws.gov/stockton/afrp/restplan_final.cfm]."

[3] Baseline escapement data were derived from Mills and Fisher (1994) and used to generate natural production estimates for the doubling goal baseline period, 1967 through 1991.

[4] Grand Tab, California Department of Fish and Game. Data from this publication was used to generate natural production estimates for the doubling goal, 1952 through 1966, and the doubling period, 1992 through 2008.

[5] The percent of increased natural production over baseline for each watershed was calculated by subtracting baseline natural production (1967-1991) from natural production (1992-2008), dividing the result by baseline natural production (1967-1991), and multiplying by 100.

[6] Data is through 2005.

[7] Production target for striped bass is expressed as the abundance of legal-sized striped bass estimated annually by the CDFG. Data is through 2007.

[8] Production target for American shad is expressed as the juvenile index as derived from the CDFG fall midwater trawl in the Delta.

Habitat Restoration Program

Other Resource Area

FY 2009

CVPIA Funding Obligations by Funding Source

- Restoration Fund - $1,449,000

Accomplishments

- Contributed funding towards the protection of 5,165 acres (through acquisition)
- Funded eight projects that focused on high priority species and habitats impacted by the CVP. Of the eight projects funded by the HRP in FY 2009, four are research, two are acquisition, one is restoration, and one is outreach. Habitats that will benefit include vernal pools; riparian; grasslands; oak woodlands; alkali scrub; and riverine dunes. Species that will benefit include California red-legged frog; vernal pool invertebrates; vernal pool plants; San Joaquin kit fox; Tipton kangaroo rat; blunt-nosed leopard lizard; Contra Costa wallflower; Antioch Dunes evening primrose; and Lange's metalmark butterfly.

CVPIA Section 3406(b)(1) "other"

"…in the course of developing and implementing this program the Secretary shall make all reasonable efforts consistent with the requirements of this section to address other identified adverse environmental impacts of the CVP not specifically enumerated in this section."

The Habitat Restoration Program (HRP), under section (b)(1) "other", benefits federally listed Central Valley species and their habitats that were adversely impacted by construction and operation of the CVP and are not specifically addressed in other CVPIA sections. Habitat loss and fragmentation due to urbanization and agriculture conversion occurred on an estimated 2.7 million acres as a result of CVP construction and operation (Interim Contract Renewals, February 1995).

The HRP's priority actions, considered most effective and critical to species' conservation and recovery, include purchase of fee title or conservation easements on lands where threats are significant; targeted restoration of CVP-impacted habitats where actions will markedly improve conditions; research to facilitate species recovery; and, when funds are available, public outreach, education, planning, and land management. These actions support the program's output goal of contributing to restoring the 2.7 million acres impacted by the CVP construction and operation.

To help direct conservation actions into high-priority areas and assist applicants in developing competitive proposals, the HRP developed a Geographic Information System (GIS)-based "Project Area Map" that defines the program's geographic focus area. The HRP also developed a "High Priority Species List" that defines species identified in various recovery plans (both resources are available on the HRP Web site: http://www.usbr.gov/mp/cvpcp).

HIGH PRIORITY SPECIES AND HABITATS

To date, the HRP has allocated about $25.5 million to fund approximately 97 projects supporting the recovery of federally listed threatened and endangered species such as:

- San Joaquin kit fox
- Giant kangaroo rat

- Blunt-nosed leopard lizard
- California red-legged frog
- Giant garter snake
- Bay checkerspot butterfly
- Valley elderberry longhorn beetle
- Riparian brush rabbit
- Riparian woodrat
- Lange's metalmark butterfly
- Vernal pools species (plants and invertebrates)
- Gabbro soil plants

Figure 5 maps the HRP project locations from 1996-2009.

Since 1996, HRP funds have been used to acquire (protect) more than 98,000 acres and restore more than 7,300 acres, for a total of more than 105,000 acres; this contributes towards one of the HRP's performance goals. The 105,000 acres is almost 4 percent of the 2.7 million acres restoration goal to restore habitat impacted by the CVP. As shown in table 4, the bulk of the acreage was acquired in 1998 as part of the Wells Fargo (Simon Newman and Romero Ranches) project.

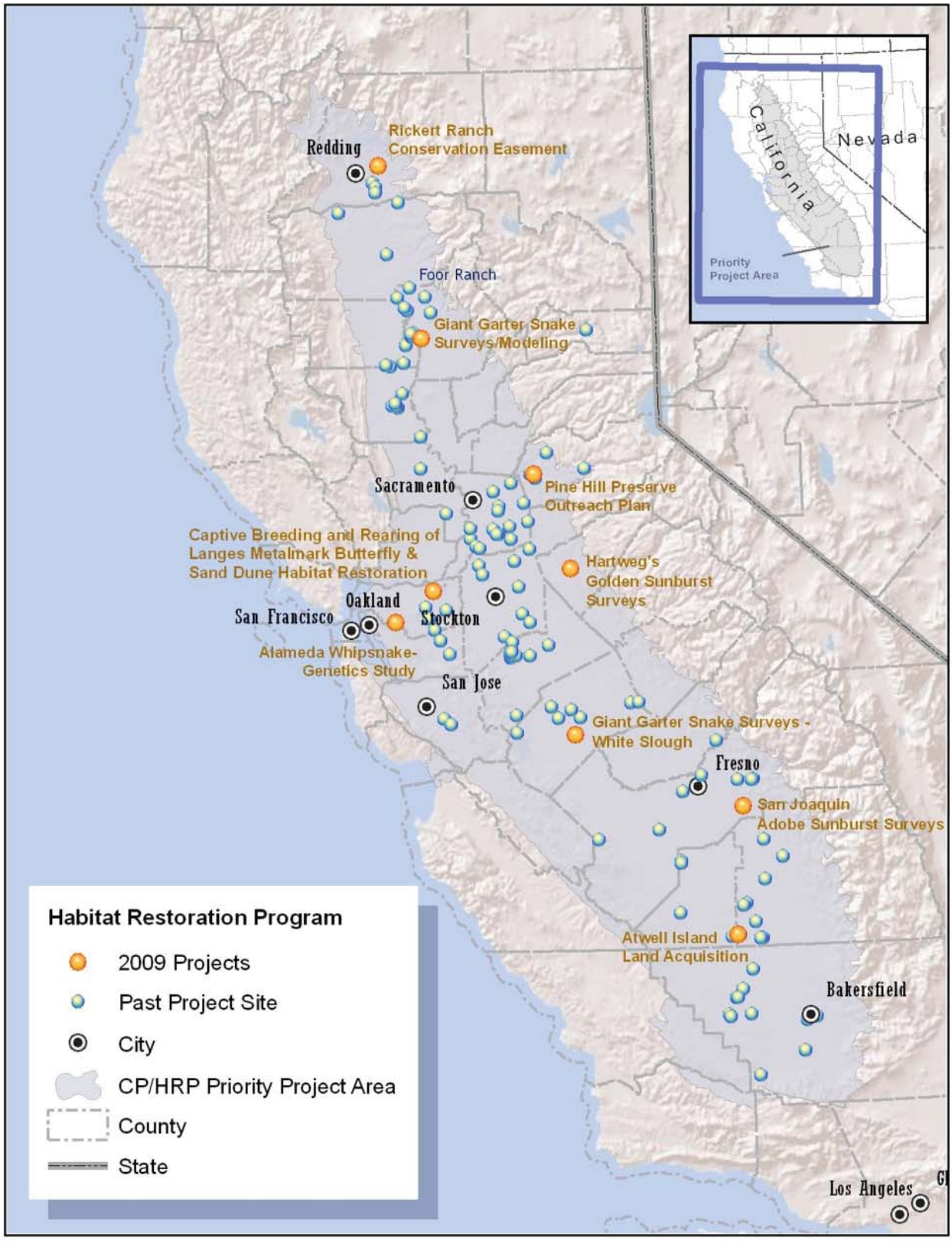
Acres of habitat that have been protected and restored can also be calculated based on the percentage of funding from the HRP and from contributing partners. Of the 105,000 acres, almost 12,000 acres have been acquired or restored with contributions solely from the HRP (Table 4). This represents about 11 percent of funding contributed by the HRP towards important protection and restoration actions. Partners have contributed about 89 percent of the funding. By joining with partners, the HRP program is able to expand its ability to meet program goals.

Acquisition only covers the purchase of the land; further effort is required to restore the desired habitat. Habitats

Table 4. Acres of Habitat Protected & Restored per Year (1996-2009) by the Habitat Restoration Program

Year	Total Acres of Habitat Protected and Restored for Projects that the HRP Contributed Towards with Partners		Acres of Habitat Protected and Restored Based on Percentage the HRP Contributed Towards the Total Acres	
	Habitat Protection (acres protected via fee title acquisition and conservation easements)	Habitat Restoration (acres restored)	Habitat Protection (acres protected via fee title acquisition and conservation easements)	Habitat Restoration (acres restored)
1996	3,018	0	362	0
1997	284	617	149	485
1998	74,146	0	4,399	0
1999	1,180	0	554	0
2000	1,426	206	366	78
2001	2,831	0	529	0
2002	2,211	0	122	0
2003	2,866	0	459	0
2004	719	432	129	106
2005	755	3,370	5	2,352
2006	193	731	21	364
2007	1,603	122	16	48
2008	1,787	1,908	1	446
2009	5,165	0	944	0
Subtotal	**98,184**	**7,386**	**8,056**	**3,879**
Total	**105,570**		**11,935**	
Goal/Target	**2.7 million**			

Figure 5. Habitat Restoration Program Project Locations



Restoration Project Sites are general approximations of project locations. Some projects have multi-locations and are represented by one data point.

protected and restored include vernal pool, riparian, alkali scrub, foothill chaparral, valley-foothill hardwood and grassland. Post-monitoring certain project sites has revealed high rates of success with restoration activities. For example, riparian vegetation at several locations (e.g., Llano Seco) has experienced an approximately 80 percent survival rate. Another example is the new pond construction downstream of known California red-legged frog populations at Spivey Pond in El Dorado County which helped expand populations of this species. The HRP partnered with the American River Conservancy and the Bureau of Land Management (BLM) to help purchase Spivey Pond. The pond supports one of the few known populations of California red-legged frogs. In 2005, the HRP funded construction of a pond downstream of Spivey Pond, where occurrence of the species has recently been recorded. Additionally, in 2009, funds were provided for surveys of the giant garter snake, a federally threatened species, in the San Joaquin Valley. The discovery of 14 snakes in this area is the first confirmed population in the county in 15 years.

Since 1996, 71 surveys and studies and 13 planning, management, and outreach actions have been funded by the HRP. These actions also contribute to the overall goal of species recovery.

MEASURING SUCCESS

In fiscal year 2009, HRP funds were used to fund a balanced set of actions that focused on high-priority species and habitats impacted by the CVP (Table 5). Progress reports are available for all projects and may be requested from the HRP program managers. Table 5 summarizes the FY 2009 projects.

Snake Marsh pre-restoration. The invasion of yellow water primrose in the marsh.

Snake Marsh post-restoration (approximately 1 year from initiation of construction). Removal of yellow water primrose in a 1-acre area created open water habitat to benefit the federally threatened giant garter snake.

Rickert Ranch property (Shasta County). In FY 2009, the HRP contributed funds towards acquisition of 5,085 acres of multiple habitat types to benefit several federally listed and other species.

Giant garter snake. In FY 2009, the HRP funded a study which resulted in a population of the federally threatened giant garter snake being discovered in San Joaquin County for the first time in 15 years. Photo by Eric Hansen.

Table 5. FY 2009 Projects Funded by the Habitat Restoration Program (HRP) (continued on page 34)

Project	Status	Significance
Shasta Land Trust (SLT) - Acquisition of conservation easement on the 5,085-acre Rickert Ranch property in Shasta County. The easement will protect this working cattle ranch as well as its cultural and natural resources including riparian habitat, grasslands, vernal pools, vernal swales, and oak woodlands. HRP funded $415,000.	**On-going -** The conservation easement is under review by the land owners and funding agencies. The baseline conditions and monitoring reports are being developed.	Supports species and habitat protection: Lands surrounding the easement property are threatened with development. Protecting the ranch will benefit habitats for a host of potentially occurring species including valley elderberry longhorn beetle, vernal pool fairy shrimp, vernal pool tadpole shrimp, slender orcutt grass, Green's popcorn flower, and CA red-legged frog.
American Land Conservancy (ALC) – Fee title acquisition of 80 acres of San Joaquin Valley upland habitat to enhance and improve conditions for listed wildlife species near Atwell Island in Kings County. HRP funded $110,000.	**On-going -** ALC has contacted the landowners of the 80-acre parcel to ascertain if there are willing sellers. When ALC receives a positive reply, it will initiate the process to get the property under option, complete an appraisal, and complete environmental assessments. If there are no findings as a result of the environmental assessments, the project should close and transfer to BLM will be completed.	Supports species and habitat protection: The primary goal of the acquisition is to permanently protect habitat for Tipton kangaroo rats, a federally endangered species; a secondary goal is to create a larger contiguous conserved habitat within BLM's Atwell Island Project area through land acquisitions. Besides the Tipton kangaroo rat, other species such as the San Joaquin kit fox, blunt-nosed leopard lizard, tri-colored blackbird, mountain plover, and western spadefoot toad will also benefit from the acquisition.
USFWS, Antioch Dunes NWR - Funding will contribute toward the continuation of captive propagation of the Lange's metalmark butterfly at the Moorpark College in the Exotic Animal Training & Management Program facility (Moorpark, CA). Additionally, it will continue the restoration of dune habitat for the butterfly, Contra Costa wallflower, and Antioch Dunes evening primrose at Antioch Dunes NWR in Contra Costa County. HRP funded $125,656	**On-going -** In August of 2009, eight butterflies were collected from the Sardis unit, and one from PG&E East parcel. Surveys for Lange's metalmark butterfly were conducted in Sept. 2009. A grazing study was implemented in spring of 2009.	Supports species and habitat protection and restoration: The Lange's metalmark butterfly (federally endangered) is on the verge of extinction and is found only at the Antioch Dunes NWR; restoration of dunes habitat is enhancing native buckwheat host plant survivability and recovery of the wallflower and primrose, two federally endangered species.
Mr. Eric Hansen, Private Consultant and Researcher – The goals of the project are: Determine presence-absence of the giant garter snake (GGS) in the eastern Delta; establish control sites needed to evaluate effects of seasonal variability; assess current status of GGS and potential habitat; provide demographic and methodological foundation for future research; and formulate recommendations for water and habitat management for GGS in the San Joaquin County. HRP funded $122,648.	**On-going -** The field portion of the study began in July 2009 and ended in September 2009. Various data were gathered including number of individuals, size of occupied areas, and reproductive status. Tissue samples were also collected for genetic analysis. The final report is due in March 2010.	Supports species and habitat protection: Certain portions of San Joaquin County have not been surveyed for GGS, a federally threatened species, since 1994. The study resulted in the discovery of 14 GGS, which means it is the first confirmed population in the county in 15 years.

Table 5. FY 2009 Projects Funded by the Habitat Restoration Program (HRP) (Continued)

Project	Status	Significance
Vollmar Consulting - Study will determine current status of all known extant occurrences of Hartweg's golden sunburst and San Joaquin adobe sunburst in the eastern San Joaquin Valley, as well as surveys for new potential habitat. HRP funded $53,620.	**On-going -** Vollmar Consulting has obtained initial verbal permission to conduct surveys on approximately 500 acres of new potential habitat in southern Stanislaus County. They will begin cataloguing targeted survey sites in December 2009 and begin the formal process of obtaining landowner access beginning in January 2010. They will begin conducting field surveys around early March 2010.	Supports species and habitat protection: The Hartweg's golden sunburst (federally endangered) and San Joaquin adobe sunburst (federally threatened), will be the subject of 5-year Reviews by the Fish and Wildlife Service in 2010. The last comprehensive surveys for these species were conducted in 1990 as part of status surveys to determine the need for federal listing. A total of 62 known occurrences of the species will be visited with the project, as well as surveys of up to 1,000 acres of new potential habitat.
US Geological Survey (USGS) - Study will entail an evaluation of the genetic relationships among and within recovery units of the Alameda whipsnake in Alameda County. HRP funded $91,570.	**On-going -** Funds are being used to assess the genetic distinctiveness of the Alameda County whipsnake relative to other populations of the California whipsnake. All DNA sequencing and genotyping will be completed by the end of this December for the tissue samples in hand. USGS intends to fill in a few geographic sampling gaps by collecting more snakes in April 2010.	Supports species and habitat protection: The degree of genetic divergence among the recovery units for the Alameda whipsnake, a federally endangered species, has never been determined. The results of the study will aid in determining whether the existing recovery units and corridors accurately reflect the genetic structure of the species, and whether the current plan promotes recovery by protecting the full range of genetic variation that is present.
USGS - Study will assess the probability of detecting populations of the giant garter snake in Butte County, at sites based on site conditions and survey method; quantify the relationship of habitat, microhabitat, and vegetative conditions with occurrence and abundance of the snake; and develop a predictive model and map that can identify where snake populations are likely to occur or identify sites appropriate for repatriation studies. HRP funded $60,000.	**On-going** - All ESA permits/consultation completed and Interagency Agreement between USBR and USGS has been consummated. USGS has arranged for access onto survey sites and has completed preliminary habitat modeling. Survey/trapping will begin in spring of 2010.	Supports species and habitat protection: This project will provide quantitative guidelines for future surveys that seek to establish presence or absence of the giant garter snake in Butte County, and the occupancy/abundance model will help direct future research and conservation efforts for the species.
BLM, Pine Hill Preserve - The project will provide public outreach about gabbro soil rare plants and their habitats. The mission of the Pine Hill Preserve is to conserve in perpetuity the rare plant species and communities of the western El Dorado County gabbro soil formation. Five out of eight rare plant species protected at the Preserve are listed under the Federal Endangered Species Act. Currently, the Preserve provides protection and management for 4,122 acres of rare plant habitat. HRP funded $48,000.	**On-going** - As of October 2009, the plan is 80% finished. BLM staff are developing new brochures, signs, and other outreach and educational materials.	Supports species and habitat protection: The development of a plan to guide and implement public outreach and educational activities at the Preserve, and the implementation of recovery activities associated with public outreach, will help to promote protection, conservation, and recovery of rare plant species at the Preserve. Species that will benefit include Stebbin's morning glory, Pine Hill ceanothus, Pine Hill flannelbush, El Dorado bedstraw, Layne's butterweed, Red Hills soaproot, Bisbee Peak rush-rose, and El Dorado mule-ears.

Trinity River Restoration Program

Fisheries Resource Area (Trinity River Basin)

FY 2009

CVPIA Funding Obligations by Funding Source

- Restoration Fund - $ 2,512,000
- Water and Related - $ 6,814,000
- Bay Delta - $ 794,000
- ARRA - $ 20,000

TOTAL - $10,140,000

Accomplishments

- Released flows of 454,500 acre-feet from the Lewiston Reservoir to provide adequate temperature and habitat conditions for fish and wildlife
- Completed construction of one channel rehabilitation site covering a project area of one mile in length associated with the Sawmill Rehabilitation Project
- Placed approximately 8,000 cubic yards of coarse sediment
- Implemented new construction projects including road upgrades at the Grass Valley Creek and Indian Creek watershed; rehabilitation in the area burned by the 2008 Junction City Fire; and expansion and sediment removal in the Dark Gulch sediment retention basin
- Funded new projects for implementation in 2010 including phase II road storm-proofing in the Democrat Gulch drainage and sediment reduction in the China Gulch and Dutch Creek drainages

CVPIA Section 3406(b)(1) "other" and 3406(b)(23)

"…That in the course of developing and implementing this program the Secretary shall make all reasonable efforts consistent with the requirements of this section to address other identified adverse environmental impacts of the Central Valley Project not specifically enumerated in this section"; and

"In order to meet Federal trust responsibilities to protect the fishery resources of the Hoopa Valley Tribe, and to meet the fishery restoration goals of the Act of October 24, 1984, Pub. L. 98-541, provide through the Trinity River Division, for water years 1992 through 1996, an instream release of water to the Trinity River of not less than 340,000 acre-feet per year for the purposes of fishery restoration, propagation, and maintenance…"

The completion of the Trinity and Lewiston Dams in 1964 allowed water from the Trinity River to be diverted to the Sacramento River and California's Central Valley for power generation and irrigation purposes. The dams barred salmonids from more than 100 miles of upstream habitat, and deteriorated downstream spawning and rearing habitat by reducing the magnitude and variability of water flows. By the 1990s, salmonid production in the Trinity River had dropped by more than 80 percent.

The Trinity River Restoration Program (TRRP) is dedicated to the improvement of anadromous fisheries habitat in the Trinity River Basin (Figure 6). The program uses two authorities: CVPIA section 3406 (b)(1) "other" for river restoration and CVPIA section 3406 (b)(23) for delivering flows.

The Trinity River Mainstem Fishery Restoration Environmental Impact Report/Environmental Impact Statement (EIR/EIS) and its accompanying Record of Decision (ROD) were completed and signed by the

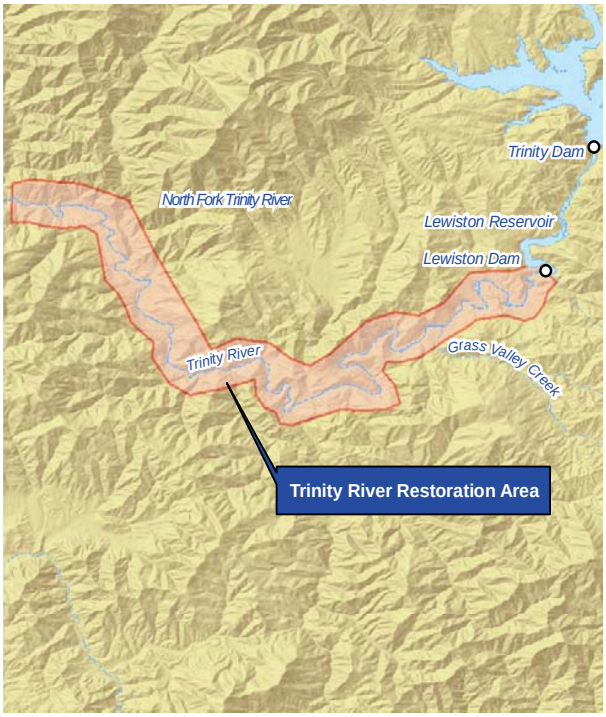


Figure 6. Trinity River Restoration Program

Secretary of the Interior, with concurrence of the Hoopa Valley Tribe, in December 2000. The ROD identified a series of restoration actions, including a monitoring and assessment program, to make program adjustments as required. Since 2001, the TRRP has been implementing these restoration activities, focusing on the upper 40 miles of the Trinity River between Lewiston Dam and the confluence with the North Fork of the Trinity River.

Working in partnership with Native American tribes, other federal agencies, the State of California, Trinity County, and a broad cross-section of stakeholders, Reclamation plans and implements restoration activities and makes management recommendations to the Trinity Management Council to adjust the program's annual work plan based on information generated by monitoring and evaluation. Enabling legislation (PL 98-541, as amended) established a series of goals to achieve and maintain healthy, stable fisheries populations. A combination of outcome-based goals and output-based goals were developed to measure the progress of the program.

Escapement Increases – The outcome-based goal is indicated by natural and hatchery-produced adult spawner escapement to the Trinity River, as indicated in Table 6. The 1983 EIS for the Trinity River Basin Fish and Wildlife Management Program documented the in-river spawner escapement goals and the Trinity River Salmon and Steelhead Hatchery production goals developed by CDFG. The goals were subsequently adopted by the TRRP as escapement numbers. The in-river goals represent the total number of naturally produced adult spawners for the Trinity River Basin below Lewiston Dam and exclude fish caught by the fisheries.

The output-based goals are indicated by four criteria:

Increasing minimum flow releases – Measured by annual acre-feet of instream flow releases to meet tribal trust responsibilities and fishery restoration goals; the target flow release is between 369,000 and 815,000 acre-feet per year, with potential peak flows to 11,000 cfs by 2008 and annually thereafter. The flow releases vary by water year type: 368,600 acre-feet (critically dry), 452,600 acre-feet (dry), 464,500 acre-feet (normal), 701,000 acre-feet (wet), and 815,200 acre-feet (extremely wet). The variable flow releases are designed to provide adequate temperature and habitat conditions for fish and wildlife at different life stages.

Implementing construction projects – Measured by progress toward completion of 47 mechanical channel rehabilitation projects and all necessary infrastructure improvements. Since 2005, 17 of the 47 channel rehabilitation sites identified in the ROD have been completed. Completion of the remaining 47 mechanical channel rehabilitation projects is targeted for FY 2014. It is anticipated that maintenance and other site enhancements will be required for an additional three years to ensure functionality of these sites.

Coarse sediment management – Goals for coarse sediment management are to increase the total quantity of coarse sediment stored in the Trinity River, and to reduce bed surface grain sizes to facilitate bed mobility and salmonid spawning. Progress toward these goals is assessed by measuring coarse sediment transport through a bedload sampling program; documenting the quantities of coarse sediment added to the river through rehabilitation site construction and gravel augmentation; and mapping of bed sediment characteristics. Specific targets are to place 7,000 cubic yards of gravel in the upper river per year, to verify that gravel augmentation volumes equal or exceed the flux of gravel transported out of the upper river, and to reduce reach-averaged median bed surface grain sizes to approximately 3-inch diameter particles.

Table 6. Annual Target Escapement, Trinity River

Target Trinity River Natural Adult Spawner Escapement	Target Trinity River Hatchery-Produced Adult Spawner Escapement
62,000 fall-run Chinook salmon	9,000 fall-run Chinook salmon
6,000 spring-run Chinook salmon	3,000 spring-run Chinook salmon
40,000 steelhead	10,000 steelhead
1,400 coho	2,100 coho

Watershed restoration – Watershed restoration and associated activities are intended to reduce the quantity of fine sediment (particles less than about 1/4 inch in diameter) in the Trinity River by reducing fine sediment production and delivery from tributary watersheds, and by increasing fine sediment transport rates in the Trinity River. Quantitative targets include achieving a long-term reduction in the total quantity of fine sediment stored in the Trinity River between Lewiston Dam and the North Fork Trinity River by at least 250,000 cubic yards, to reduce fine sediment delivery to the upper river by 10,000 to 20,000 cubic yards per year, and to annually transport as much or more fine sediment downstream as is delivered to the upper river from tributary watersheds.

Since 2001, the CVPIA Restoration Fund has allocated approximately $12 million to the TRRP. The program has implemented 17 of the 47 target mechanical channel rehabilitation projects and all of the infrastructure improvements necessary to allow the program to regularly achieve annual flow release goals, including dam releases, of up to 11,000 cfs in an extremely wet year. Significant accomplishments made by the TRRP include:

- Construction of 17 channel rehabilitation projects (Hocker Flat, four sites near Canyon Creek, three sites near Indian Creek, and nine sites in the Lewiston area).
- Addition of more than 30,400 cubic yards of coarse sediment for spawning and geomorphic purposes.
- Construction of three replacement bridges and upgrade of an approach road/culvert allowing full implementation of the ROD flow regime.
- Completion of a comprehensive inventory of floodplain structures for more than 500 privately owned parcels.
- Improvement of 1.5 miles of road accessing private homes.
- Relocation of one house and modification of more than 25 other smaller structures.
- Renovation of 122 domestic water or sewer systems.
- Completion of a programmatic EIR/ Environmental Assessment (EA) that will streamline the environmental review process for coarse sediment augmentation activities and the remaining channel rehabilitation projects.

Reclamation and TRRP partners have implemented full ROD flows since 2005, following successful resolution of litigation that initially constrained ROD flows in 2001-2004. Water year types since 2005 have included Extremely Wet, Dry, and Normal with volumes ranging from 453,000 acre-feet to 815,000 acre-feet. Full implementation of ROD releases are now possible based on water year type. Approximately 1.9 million acre-feet more water has been released to the river over the past nine years than would have occurred without the ROD.

MEASURING SUCCESS

Outcome-based Target – Escapement Increases

To date, the annual escapement targets have not been met. Monitoring suggests an upward trend in coho salmon and steelhead run size over the last 13 years, but a continuing decline in fall-run Chinook returning adult spawners. The CDFG responded to increases in 2006 and 2007 record fish runs in steelhead numbers by instituting a larger take limit for hatchery steelhead for recreational anglers in the Trinity River during the 2008 fishing season. The variable nature of these populations

is demonstrated in 2008 run size estimates, which showed a smaller steelhead run than the past two years, but with a somewhat higher percentage of wild fish. Preliminary 2009 weir counts indicate a slight increase in steelhead though these are mostly hatchery fish.

Output-based Targets

Increasing Minimum Flow Releases

Water Year 2009 was classified as a dry water year in accordance with the ROD resulting in 454,500 acre-feet being released from the Lewiston Reservoir, which met the target flow release of between 369,000 and 815,000 acre-feet per year and the dry year target of 452,600 acre-feet.

Implementing Construction Projects

In FY 2009, the program completed construction of one channel rehabilitation site covering a project area of one mile in length associated with the Sawmill Rehabilitation Project. This project will provide increased geomorphic and hydraulic complexity to this high priority area of the river and provide greater diversity of fish habitats, supporting a wide range of life stages. Completion of this site in 2009 brings the total number of mechanical channel rehabilitation projects to 17 (36% complete toward goal). The TRRP has received ARRA funds to expedite the completion of five channel rehabilitation projects in 2010 and expects to complete the remaining 25 sites by 2014.

Coarse Sediment Management

In 2009, the program placed 5,700 cubic yards of gravel in the mainstem of the Trinity River as part of the Sawmill channel rehabilitation construction contract to improve spawning and rearing habitat, as well as facilitate the creation of needed geomorphic features farther downstream. An additional 2,300 cubic yards was directly injected to the river by mechanical conveyor during peak fishery restoration flows in April 2009. In total, the program placed about 8,000 cubic yards of coarse sediment in the river during 2009, exceeding the annual target of 7,000 cubic yards.

The program has made substantial progress toward restoring the total quantity of coarse sediment stored in the upper river to pre-dam levels. A total of more than 64,400 cubic yards of coarse sediment has been added to the upper river since dam closure, with about 30,400 cubic yards of that total being placed since 2003. A current update of sediment budgets previously computed through WY 2000 that incorporates recent augmentation quantities and recent estimates of the coarse sediment loads transported downstream suggests that the total quantity of coarse sediment stored in the upper river is similar to that of pre-dam levels.

Watershed Restoration

In 2009, TRRP completed 10 priority watershed projects that were funded with 2008 funds and initiated eight new projects. The 2009 TRRP funding amount of $280,000 was leveraged with other funding sources to bring in an additional $365,000 to watershed restoration on Trinity River tributaries. New projects under construction in 2009 are road upgrades at the Grass Valley Creek and Indian Creek watershed; rehabilitation in the area burned by the 2008 Junction City Fire; and expansion and sediment removal in the Dark Gulch sediment retention basin. New projects funded in 2009 for implementation in 2010 are phase II road storm-proofing in the Democrat Gulch drainage and sediment reduction in the China Gulch and Dutch Creek drainages. These projects are expected to prevent up to 65,000 cubic yards of fine sediment from being delivered to the Trinity River.

Sawmill Rehabilitation Project during winter base flow with large woody debris in side channel. Large woody debris serves as habitat for frys and juveniles and structure for geomorphic purposes.

Modified CVP Operations

Fisheries Resource Area (Central Valley)

FY 2009

CVPIA Funding Obligations by Funding Source

- Restoration Fund - $300,000

Accomplishments

- Reoperated the system multiple times to provide benefits to anadromous fish on Clear Creek
- Completed response-to-comments document for stakeholder review of draft report for spring- and fall-run Chinook salmon and steelhead spawning on the Yuba River and sensitivity analysis for above report
- Completed monitoring for juvenile spring-run and fall-run Chinook salmon and steelhead rearing for the lower reach of Clear Creek
- Completed modeling and draft report for fall-run Chinook salmon and steelhead spawning on Clear Creek
- Completed monitoring for fisheries investigation task "Clear Creek Biovalidation – how well does IFIM compare to field observations"
- Completed fisheries investigation task "Re-examine Clear Creek data on adult Spring Chinook – is the increase in Weighted Useable Area due to an increase in quality or is it an increase in area?"

CVPIA Section 3406(b)(1)(B)

"As needed to achieve the goals of this program, the Secretary is authorized and directed to modify CVP operations to provide flows of suitable quality, quantity, and timing to protect all life stages of anadromous fish, except that such flows shall be provided from the quantity of water dedicated to fish, wildlife, and habitat restoration purposes under paragraph (2) of this subsection; from the water supplies acquired pursuant to paragraph (3) of this subsection; and from other sources which do not conflict with the fulfillment of the Secretary's remaining contractual obligations to provide CVP water for other authorized purposes. Instream flow needs for all Central Valley Project controlled streams and rivers shall be determined by the Secretary based on recommendations of the U.S. Fish and Wildlife Service after consultation with the California Department of Fish and Game."

The flow of water in rivers and streams is essential for all fish life stages: spawning, fry emergence, juvenile development, outmigration, and passage back to spawning grounds. Flows help maintain a healthy environment for fisheries by maintaining sufficient stream depth and optimal temperatures for spawning and rearing. Periods of high flow also move sediments downstream which establish and maintain the river bottom. Reclamation and the Service are dedicated to creating optimal flows to increase anadromous fish populations consistent with the doubling goal.

Reoperating the system under CVPIA Section (b)(1)(B) is done by changing and coordinating planned releases between CVP dams when doing so improves instream conditions without impacting other CVP obligations or authorized purposes. Interior modifies base condition CVP operations using (b)(2) water, (b)(3) water, and by "reoperating" the system to provide instream benefits to anadromous fish.

Determining the instream flow needs in CVP streams is an ongoing process that is being addressed in part by the Instream Flow Requirements Program, which provides scientific information to the CVPIA program to assist in developing recommendations for instream flow needs for anadromous fish in Central Valley streams. The

Instream Flow Incremental Methodology (IFIM) is a habitat-based model developed by the Service to assess instream flow needs for aquatic resources, including anadromous fish. The program goal is to provide up to nine specified instream flow studies. Studies funded under section (b)(1)(B) focus on CVP streams (Sacramento, American, and Stanislaus rivers and Clear Creek). Studies funded under section (b)(1) focus on all other Central Valley streams. Generally there is an IFIM modeling project for each life stage of anadromous fish within each segment of the Sacramento, American, Merced and Yuba Rivers and Clear, South Cow and Butte Creeks.

Collecting IFIM Field Data in South Cow Creek

The Service uses the IFIM to demonstrate the effect of varying flows of water within specific watersheds. The information developed by IFIM are used by (b)(2) program managers in developing recommendations for instream flow in CVP streams and by other Service program managers for other Central Valley streams.

The IFIM process follows four basic steps:

1. Monitoring, consisting of data collection
2. Modeling, consisting of analysis
3. Peer review by U.S. Geological Survey (USGS), CALFED, consultants or academics
4. Production of a final report

Since 1995, IFIM studies have been completed for the Sacramento, American, and Merced Rivers and Butte Creek; the data generated by these studies have been used by the Service to negotiate flow changes that have a dramatic effect on fish production. For instance, the Butte Creek IFIM study showed that increasing water flows from 40 to 120 cfs during the fall season would increase the amount of spawning habitat for spring-run Chinook salmon by a significant 72 percent. Based on these data, the Service's Energy and Instream Flow branch negotiated changes to annual operating plans that resulted in an increase in fall flows to 60 cfs in 2004 and 2007 and 75 cfs in 2005 and 2006. These flows were agreed to between resource agencies and PG&E during development of the annual operating plan. Establishing these flow-habitat relationships was critical to the development of the annual operating plan for Butte Creek.

Based on these data, in FY 2009 the Service recommended that the Federal Energy Regulatory Commission (FERC) consider new terms for Butte Creek between the Centerville Dam and Powerhouse that would allow the full 120 cfs flow in Butte Creek from September 1 to March 15- a critical period covering the spawning and emergence of fry.

Another example of the use of IFIM data is the American River IFIM study (2003) which demonstrated that the amount of spawning habitat for fall-run Chinook salmon and steelhead increased considerably with flows increasing up to 2,000 cfs . In 2009, the data from this IFIM study were used to justify operational changes in the allocation of (b)(2) water in the American River and flows were maintained in the 800 to 950 cfs range from October through February to provide as much spawning habitat as possible.

As noted above, the Service has completed modeling for the Sacramento (2003, 2005), Merced (1997) and American (2003) Rivers and Butte Creek (2003), generating valuable data to determine optimum flows. The Service has continued to prioritize additional rivers for IFIM modeling. Prioritization is based on a number of factors:

- Feasibility - Is there an upcoming FERC relicensing that provides a platform for change?
- T&E species - Are there threatened and endangered species that would benefit from operational changes?
- Species - How many salmonid races/species are present?
- Complications - Are other actions needed to improve passage and access to spawning grounds before operational flow changes would have an effect?

Based on these factors, from 2001 to 2008 the Service added the Yuba and Tuolumne rivers and Clear and

South Cow creeks to the priority list of rivers to be modeled over the next five years. The scope of the IFIM program was broadened in FY 2009 to include fisheries investigations, with the goal of providing scientific information to other CVPIA programs to use in assessing fisheries restoration actions.

Since 1995, 12 IFIM studies have been completed meeting the program goal to provide up to nine IFIM studies under the (b)(1)(B) authority.

MEASURING SUCCESS

In FY 2009, the CVP reoperated the system multiple times to provide benefits to anadromous fish on Clear Creek without impacting other CVP obligations or authorized purposes. These reoperations improved conditions on Clear Creek without changing the total amount of CVP water being released.

Table 7 illustrates progress on the studies that were active in 2009. (Dates indicate completion of an activity.)

As shown in Table 7, the major accomplishments for 2009 include the following:

Yuba River – Completion of response-to-comments document for stakeholder review of draft report for spring- and fall-run Chinook salmon and steelhead spawning and sensitivity analysis for above report.

Clear Creek – Completion of monitoring for juvenile spring-run and fall-run Chinook salmon and steelhead lower reach rearing and completion of modeling and draft report for fall-run Chinook salmon and steelhead lower reach spawning.

Fisheries Investigations – Completion of monitoring for fisheries investigation task "Clear Creek Biovalidation – how well does IFIM compare to field observations" and completion of fisheries investigation task "Re-examine Clear Creek data on adult Spring Chinook – is the increase in Weighted Useable Area due to an increase in quality or is it an increase in area?"

Table 7. Instream Flow Incremental Methodology (IFIM) Studies Active as of 2009

River	IFIM Modeling Project	Monitoring	Modeling	Peer Review	Final Report
Yuba	Spring and fall-run Chinook salmon and steelhead fry and juvenile rearing	FY 2007	FY 2008	FY 2010	FY 2010
	Redd dewatering and juvenile Chinook and steelhead stranding	FY 2007	FY 2008	FY 2010	FY 2010
	Spring- and fall-run Chinook salmon and steelhead spawning	FY 2004	FY 2006	FY2006	FY 2010
Clear Creek	Spring-run Chinook salmon and steelhead upper reach spawning	FY 2005	FY 2006	FY 2007	FY 2007
	Fall-run Chinook salmon and steelhead lower reach spawning	FY 2008	**FY 2009**	FY 2010	FY 2010
	Juvenile spring-run Chinook salmon and steelhead upper reach rearing	FY 2007	FY 2010	FY 2010	FY 2010
	Juvenile spring-run and fall-run Chinook salmon and steelhead lower reach rearing	**FY 2009**	FY 2010	FY 2010	FY 2010
South Cow Creek	Fall-run Chinook salmon fry and juvenile rearing	FY 2010	FY 2010	N/A	FY 2010
Fisheries Investi-gation	Clear Creek Biovalidation – how well does IFIM compare to field observations	**FY 2009**	FY 2010	N/A	FY 2010
	Re-examine Clear Creek data on adult Spring Chinook – is the increase in Weighted Useable Area due to an increase in quality or is it an increase in area?	N/A	**FY 2009**	N/A	**FY 2009**

Dedicated 800,000 acre-feet Project Yield

Fisheries Resource Area (Central Valley)

FY 2009

CVPIA Funding Obligations by Funding Source

- Restoration Fund - $663,000

Accomplishments

- Due to low CVP storage and dry hydrology the (b)(2) shortage provision limited fish actions to 600,000 acre-feet (for the second consecutive year). This water was managed for fish, wildlife, and habitat restoration purposes
- Augmented low base flows on Clear Creek, the American River, and the Stanislaus River
- Assisted in meeting WQCP requirements with water from the American River
- Used (b)(2) water in conjunction with acquired (b)(3) water for juvenile salmonid outmigration on the Stanislaus River
- Curtailed exports to assist in meeting WQCP Delta requirements, to comply with FWS and NOAA Biological Opinions, and to meet the VAMP export target during the April 17 to May 17 period

CVPIA Section 3406 (b)(2)

"…dedicate and manage annually 800,000 acre-feet of Central Valley Project yield for the primary purpose of implementing the fish, wildlife, and habitat restoration purposes and measures authorized by this title; to assist the State of California in its efforts to protect the waters of the San Francisco Bay/Sacramento-San Joaquin Delta Estuary; and to help meet such obligations as may be legally imposed upon the Central Valley Project under state or federal law following the date of enactment of this title, including but not limited to additional obligations under the federal Endangered Species Act…"

WATER MANAGEMENT

Interior has the responsibility to annually dedicate and manage 800,000 acre-feet of CVP (b)(2) water for fish, wildlife, and habitat restoration purposes. This water is accounted as CVP releases and decreased CVP export pumping, relative to a hypothetical pre-CVPIA baseline operation. The accounting specifically looks at changes in operations on the American River (Nimbus Dam), Sacramento River (Keswick Dam), Stanislaus River (Goodwin Dam), Clear Creek (Whiskeytown Dam) and the delta pumps.

Generally, (b)(2) fish actions fall into the following categories:

- Instream flow augmentations on CVP-controlled streams to protect salmon and steelhead and contribute toward meeting AFRP Final Restoration Plan flow objectives.
- Increased releases from Goodwin Reservoir to help meet the Water Quality Control Plan (WQCP) requirements for San Joaquin River flows at Vernalis for fish and wildlife standards.
- Increased releases from Keswick and/or Nimbus reservoirs to help meet the WQCP fish and wildlife standards.
- Export reductions at the CVP Tracy (Jones) pumps to protect at-risk fish species (notably salmon, steelhead, and delta smelt) and to help meet the WQCP Delta standards.

In the past, the management of (b)(2) water was coordinated with the management of CALFED's Environmental Water Account (EWA), since the use of both (b)(2) and EWA often contributed concurrently to

the CVPIA's goal of doubling the natural production of anadromous fish and protection of other aquatic resources, including endangered fish species. However, in 2009 there was very little EWA water to manage.

In the 2009 water year, both the Sacramento and San Joaquin River Basins were classified as "dry," which resulted in reduced deliveries of CVP water to certain users within the CVP. For that reason, and consistent with Section 3406(b)(2) of the CVPIA and the Department of the Interior's (Interior) May 2003 (b)(2) Policy, total (b)(2) water was ultimately limited to 600,000 acre feet during the 2009 water year. In addition, two new Biological Opinions (BOs) on the Long Term Operations of the Central Valley Project and State Water Project were issued during the 2009 water year (USFWS BO in December 2008 for the protection of the federally-listed delta smelt, and the NOAA BO in June 2009 for the protection of listed salmonids and sturgeon). Both BOs affected the use of (b)(2) water (see Table 8).

Throughout the 2009 water year, Interior managed (b)(2) water consistent with recent court rulings, including:

1. The Ninth Circuit Court's decision in Bay Inst. of San Francisco v. United States, 87 Fed. Appx 637 (2004), confirming Interior's discretion to give effect to the "hierarchy of purposes" in Section 3406(b)(2), and

2. The U.S. District Court for the Eastern District of California's memorandum opinion in San Luis & Delta Mendota Water Authority v. Department of the Interior (SLDMWA), 1:97-cv-6140, 1:98-cv-5261 OWW DLB (E.D. Cal. Sept. 19, 2008), concerning Interior's (b)(2) accounting for the 2004 water year.[1] Interior continued to manage (b)(2) water in accordance with Interior's May 9, 2003 (b)(2) Policy and Interior's December 17, 2003 (b)(2) Guidance Memo.

1 In that opinion, Judge Wanger stated that the "primary purpose" of CVPIA Section 3406(b)(2) "includes all those fish and wildlife restoration activities specifically described in section 3406(b)," including "water dedicated to accomplish the anadromous fish doubling goal set forth in section 3406(b)(1)" and "water needed to accomplish any of the other specifically enumerated programs listed in section 3406(b)(2). SLDMWA, at 43 (underline in original). Thus, "if an action taken under the WQCP and/or ESA predominantly contributes to one of the primary purpose programs (e.g., fish doubling), it must be counted toward the 800,000 AF limit." *Id.* at 48. In so doing, Judge Wanger recognized that there may be some "primacy" to section 3406(b)(1) in relation to other stated purposes of section 3406(b), but he did not rule on that question. *Id.* at 45.

MONITORING AND EVALUATION

The (b)(2) program funds specific monitoring and evaluation projects to assess the effectiveness of the use of the (b)(2) water.

In addition, other projects throughout the Central Valley provide real-time fish monitoring data which helps inform decisions on when and where (b)(2) fish actions should be taken. On a weekly basis, fishery biologists and CVP and SWP operators update the CALFED Data Assessment Team on fish movements and project operations in the Sacramento River, San Joaquin River and the delta. The sites sampled include the mainstem Sacramento and San Joaquin Rivers, their major tributaries and various locations in the delta, including the export facilities. Reclamation and the Service provide preliminary daily (b)(2) accounting periodically though the year and a final detailed accounting of (b)(2) fish actions on an annual basis, usually in December following the close of the water year. This information is posted on Reclamation's, Mid-Pacific Region, Central Valley Operations Office home page at www.usbr.gov/cvo.

MEASURING SUCCESS

The 800,000 acre-feet annual allocation has been fully utilized each water year since 2000 when the (b)(2) accounting began, with four notable exceptions:

In wetter precipitation years (2005 and 2006) a portion of the dedicated water was banked pursuant to CVPIA Section 3408(d) for use in the subsequent year. In water year 2008 (critically dry) and 2009 (dry), only 600,000 acre-feet of (b)(2) was available for fish actions (Table 9).

In addition to other restoration activities, the increased instream flows, made possible by CVPIA's (b)(2) provision, have helped maintain or improve salmon and steelhead habitat and populations in CVP-controlled streams, and export reductions at critical times have helped protect delta smelt as well as salmon and steelhead in the delta.

Table 8. FY 2009 Use of (b)(2) Water by Location

River	Action	Timeframe	Results
American	Augmented low base flows	October 2008 – February 2009	Contributed towards AFRP Final Restoration Plan flow objectives and improved conditions for fall-run Chinook and steelhead during spawning, incubation, and rearing.
	Assisted in meeting WQCP Delta requirements	Intermittent, spring water year 2009	Assisted in meeting WQCP delta outflow.
Clear Creek	Augmented low base flows throughout water year 2009	Intermittent, November 2008 – September 2009	Contributed to AFRP Final Restoration Plan flow objectives and improved instream conditions for fall-run Chinook, spring-run Chinook, and steelhead during spawning, incubation, rearing, and downstream migration.
Stanislaus	Augmented low base flows	Intermittent, fall and winter water year 2009	Contributed towards AFRP Final Restoration Plan flow objectives and improved instream conditions for fall-run Chinook and steelhead during spawning and rearing periods.
	(b)(2) water used in conjunction with acquired (b)(3) water to provide pulse flow in spring 2009 for juvenile salmon and steelhead outmigration (during April 17 to May 17 period)	April – May 2009	Improved survival of salmon and steelhead smolts emigrating down the Stanislaus and San Joaquin Rivers, and improved habitat conditions in the central and southern delta for listed aquatic species.
CVP Jones Pumping Plant	Export curtailments to assist in meeting WQCP Delta requirements	Intermittent, winter and spring water year 2009	Protected estuarine habitat for anadromous fishes and other estuarine dependent species.
	Export curtailments related to Delta Cross Channel gate closure	November – December 2008	Benefitted winter-run and spring-run Chinook outmigrants and other species.
	Export curtailments to help meet Biological Opinion requirements for delta smelt	Intermittent, winter and spring water year 2009	Provided increased protection for delta smelt (ESA threatened) and minimized entrainment at the CVP pumps.
	Export curtailment to meet export target during the April 17 to May 17 period	April – May 2009	Benefitted San Joaquin Basin fall-run Chinook and steelhead outmigration, contributed to AFRP Final Restoration Plan flow objectives, and contributed to protection for listed delta smelt.

Table 9. Allocation and Use of (b)(2) Water (2001-2009)

Allocation and Use of (b)(2) Water by Year (Approximate)				
Year	(b)(2) Allocated (acre-feet)	Fisheries (acre-feet)	Unused* (acre-feet)	Banked (acre-feet)
2001	800,000	798,000		
2002	800,000	793,000		
2003	800,000	796,000		
2004	800,000	800,000		
2005	800,000	672,000		128,000
2006	800,000	422,000	183,000	195,000
2007	800,000	798,000		
2008	600,000	600,000		
2009	600,000	600,000		

* Section 3406 (b)(2)(D): If the quantity of water dedicated under this paragraph, or any portion thereof, is not needed for the purposes of this section, based on a finding by the Secretary, the Secretary is authorized to make such water available for other project purposes.

Water Acquisition Program – Instream Water

Fisheries Resource Area (Central Valley)

FY 2009

CVPIA Funding Obligations by Funding Source

- Restoration Fund - Instream Water - $ 6,001,000
- Restoration Fund - VAMP - $ 6,149,000

TOTAL - $12,150,000

Accomplishments

- Acquired 38,500 acre-feet for San Joaquin River Agreement/Vernalis Adaptive Management Plan

CVPIA Sections 3406(b)(3) and 3406(g)

"The Secretary . . . is authorized and directed to develop and implement a program in coordination and in conformance with the plan required under paragraph (1) of this subsection for the acquisition of a water supply to supplement the quantity of water dedicated to fish and wildlife purposes under paragraph (2) of this subsection…. The program should identify how the Secretary intends to utilize, in particular the following options: improvements in or modifications of the operations of the project; water banking; conservation; transfers; conjunctive use; and temporary and permanent land fallowing, including purchase, lease, and option of water, water rights, and associated agricultural land."

The Water Acquisition Program (WAP) acquires water to supplement the 800,000 acre-feet of dedicated CVP yield ((b)(2) water) for fisheries. The target for instream acquisitions is 200,000 acre-feet per year, for use on the San Joaquin and Sacramento Rivers and their tributaries, as described in the CVPIA PEIS/ROD. The WAP also acquires water for CVPIA-designated refuges and wildlife management areas. WAP activities for refuge water acquisitions are discussed in Section 3406 (b)(3) and (d)(2), Water Acquisition Program-Refuge Water.

The WAP is designed to acquire instream flows to meet two primary objectives in support of the AFRP Final Restoration Plan:

- Improve spawning and rearing habitat
- Increase migration flows for fall-, winter- and spring-run Chinook salmon and steelhead

MANAGING FLOWS PURSUANT TO SAN JOAQUIN RIVER AGREEMENT AND VERNALIS ADAPTIVE MANAGEMENT PLAN

In support of these objectives, WAP acquires instream flows in support of the Vernalis Adaptive Management Plan (VAMP) which is a component of the San Joaquin River Agreement (SJRA). This acquired water provides additional spring and fall fishery flows on the Stanislaus, Tuolumne, Merced, and lower San Joaquin Rivers.

VAMP is a scientifically-based fishery management plan that determines the relationships between flows, exports, and other factors on fish survival in the Sacramento-San Joaquin Delta. The SJRA and VAMP govern the operation of water in the lower San Joaquin River to ensure that pulse flows and other flows are provided to support restoration of anadromous fish in the river. Specifically, the spring flows assist in the outmigration of juvenile salmonids and can help meet water quality

requirements. Fall flows assist adult salmon migrating into the tributaries prior to spawning.

The WAP, in cooperation with the Central Valley Operations Office (CVO), and the San Joaquin River Group Authority's (SJRGA) member agencies, acquires and manages water to provide additional spring and fall fishery flows on the Stanislaus, Tuolumne, Merced and lower San Joaquin Rivers. The increased flows primarily benefit Chinook salmon, which can account for more than 70 percent of the statewide commercial harvest, as well as numerous resident and anadromous fish species.

MEASURING SUCCESS

Since 2001, the program has acquired an average of approximately one half of the 200,000 acre-feet annual target almost exclusively on the lower San Joaquin. The actual volume of water acquired each year fluctuates based on the basin hydrology, reservoir storage and the water supplies available to WAP pursuant to the SJRA. The costs for the water acquired pursuant to the VAMP agreement are fixed by the SJRA. In FY 2009, the program acquired 38,500 acre-feet for SJRA/VAMP.

Table 10 shows the volume of water purchased for the years 1994 through 2009.

Reclamation has not been able to acquire the full 200,000 acre-feet of target flows due to a lack of willing sellers and the high cost of water on the open market. In addition to the water identified in the SJRA, on occasion WAP has been able to acquire instream flows in the Sacramento Valley by entering into one-year transfers with local water agencies that have transferable water to sell. However, in this reporting year, water was not acquired for instream purposes in the Sacramento Valley due to lack of available water supplies for permanent acquisition, that would benefit anadromous fish.

Table 10. Annual (b)(3) Instream Water Acquisitions, toward 200,000 acre-feet target (1994-2009)

Year	Annual Water Acquisitions (acre-feet)	Percentage of 200,000 Acre-Feet Target
1994	76,441	(38%)
1995	0	
1996	16,161	(8%)
1997	155,983	(78%)
1998	80,000	(40%)
1999	174,498	(87%)
2000	108,880	(54%)
2001	109,785	(55%)
2002	68,105	(34%)
2003	91,526	(46%)
2004	98,211	(49%)
2005	148,500	(74%)
2006	148,500	(74%)
2007	92,145	(46%)
2008	106,490	(53%)
2009	38,500	(19%)

Tracy (Jones) Pumping Plant Program

Fisheries Resource Area (Central Valley)

FY 2009

CVPIA Funding Obligations by Funding Source

- Water and Related - $1,593,000
- Bay Delta - Two Gates - $ 175,000

TOTAL - $1,768,000

Accomplishments

- Continued study efforts to determine Tracy Fish Collection Facility present-day fish salvage efficiencies for various species of delta fish entrained at the JPP
- Completed assessment of the outdated Bates Table used for establishing fish hauling densities during transport
- Continued research and pilot studies for improved debris and predator management at the TFCF
- Completed recessed holding tank stress tests for various species of delta fish entrained at the JPP
- Collected water quality data at the entrance to the DMC intake canal
- Distributed Tracy Research Volume Series and Technical Bulletins
- Updated the Tracy Research Program website
- Completed phase 1 of construction of a new onsite biological resources building
- Commenced with planning and review for the Two Gates Fish Protection Demonstration Project, including
  - Establishment of joint State-Federal teams to expedite the review and processing of the Demonstration Project
  - Completion of CALFED Science Program Independent Review Panel evaluation of the Demonstration Project
  - Establishment of a Demonstration Project web site and enhanced public interaction

CVPIA Section 3406(b)(4)

"Develop and implement a program to mitigate for fishery impacts associated with operations of the Tracy Pumping Plant. Such program shall include, but is not limited to improvement or replacement of the fish screens and fish recovery facilities and practices associated with the Tracy Pumping Plant."

The original Tracy Fish Collection Facility (TFCF) was built in the 1950s to protect fish entering the Delta Mendota Canal (DMC) by way of the Jones Pumping Plant (JPP) (Figure 7). The facility provides multi-use water from the Sacramento-San Joaquin Delta (delta) to the Central Valley of California. The program's primary purpose is to mitigate for south delta fishery impacts at the federal JPP. The program's current primary objective is to develop and implement new, modern-day, cost-effective fish collection, holding, transport and release technology and operational procedures that will improve fish protection in the south delta at the entrance to the JPP. The data and information generated will help evaluate present-day operations and efficiencies for TFCF, as well as assisting DWR with improvements to their fish screens located at the JF Skinner Fish Protection Facility (Skinner).

Tracy Fish Facility Improvement Program (TFFIP) research is performed in cooperation between Reclamation's Mid-Pacific Region and research and engineering groups located at the USBR Denver Technical Service Center. Research planning and execution is enhanced through coordination, review

Figure 7. Tracy (Jones) Pumping Plant

and assistance from others including CDFG, DWR, the Service, NMFS, universities, private consultants, and the San Luis Delta Mendota Water Authority.

Due primarily to budgetary constraints, Reclamation and DWR management agreed in 2005 not to proceed with construction of new full-scale testing/fish screen facilities in the south delta. Instead the agencies opted to develop and implement improvement actions at the existing TFCF and Skinner fish salvage facilities (including improved technology and operational procedures) to reduce fish losses and improve fish salvage success while achieving CVPIA goals as well as federal ESA biological opinion objectives. This new strategy was the outcome of the CALFED South Delta Fish Facility Forum (SDFF) discussions in 2005 which included representatives from the State and federal water agencies, regulatory agencies, and stakeholders interested in south delta exports and fishery impacts.

IMPLEMENTING THE SOUTH DELTA FISH FACILITY FORUM STRATEGY

Since the TFFIP was implemented, physical and operational changes to the TFCF have shown some improvement in Reclamation's ability to successfully salvage all species of delta fish, including anadromous fish, and release them safely back into the delta estuary. Reclamation estimates that it will take approximately another four to six years to fully assess the existing TFCF and implement all remaining physical and operational improvements presently identified at TFCF.

Although the refocused 2005 TFCF improvement program has not been in place long enough for complete assessment, preliminary results have revealed that several factors have made the Tracy facility less effective towards screening and salvaging fish than it was in the 1950s:

1. **Changes in south delta hydrology** - Implementation of the SWP, in addition to increased pumping at Jones and other delta actions, lowered the water elevation at the JPP intake by a few feet and increased primary channel velocities which reduces salvage efficiency.

2. **Invasive species** - Introduction of new vegetative species such as water hyacinth and egeria densa (pond weed) have caused clogging of screens and other equipment. This resulted in a higher level of fish stress and mortality and caused the louvered bypass system to operate less efficiently, thus resulting in fewer fish making it to the holding tanks for transport back out to the delta.

3. **Predators** - An increase in predators, such as striped bass, within the TFCF has caused a significant increase in fish mortality during the salvage process, prior to and including fish holding and hauling.

Since 1992, Reclamation has identified 23 "actions" related to improving fish protection at the existing TFCF. and full implementation is not expected until 2013 at the earliest. Additional actions could be added to the program as needed, in response to any unforeseen issues or concerns that may require further analysis, assessment, and improvements. The program has not defined specific fish loss reduction targets, although recent 2009 NOAA Fisheries BO RPAs have stipulated that Reclamation shall improve the whole facility efficiency for the salvage of Chinook salmon, Central Valley steelhead, and southern Distinct Population Segment of green sturgeon so that overall survival is greater than 75 percent for each species. The program's primary "goal" is to implement and complete the 23 identified actions, which should result in increased survivability of all delta fish species entering the DMC intake at the TFCF.

MEASURING SUCCESS

Program Actions

To date, the program has completed 14 of 23 actions (Table 11), or 61 percent of the program's present goal. Actions in 2009 included continued study efforts to determine the TFCF's present-day fish salvage efficiency for different species of fish; completion of the outdated Bates Table used for establishing fish hauling densities during transport; ongoing improvement to debris and predator management as well as hydraulic control of the facility; completion of recessed holding tank stress tests; collection of water quality data at the entrance to the DMC; distribution of various Tracy Research Volume Series and publications; and updating the Tracy Research Web site. Also, Reclamation continued construction of a new onsite research building; phase 1 of construction is complete (phase 2 remains to be completed).

Another significant component was added to the program in FY 2009 with initiation of the Two Gates Fish Protection Demonstration Project. The Demonstration Project was developed by the Metropolitan Water District of Southern California and the San Luis & Delta Mendota Water Authority (SLDMWA) to test alternative ways of protecting delta smelt. The 5-year experiment is designed to modify flows in the Sacramento-San Joaquin Delta to reduce entrainment of smelt and other sensitive aquatic species in CVP and SWP export pumps. There was progress made in 2009 towards construction and installation of the Two Gates Demonstration Project with the completion of initial planning and project review. FY 2009 accomplishments included the establishment of joint State-Federal teams to expedite the review and processing of the Demonstration Project, completion of the CALFED Science Program Independent Review Panel evaluation of the Demonstration Project, and establishment of a Demonstration Project web site and enhanced public interaction. Additionally, there was ongoing development of Draft Environmental Assessment, Finding of No Significant Impact (FONSI), Biological Assessment and Biological Opinions.

Program Research

The program has published 42 volumes of research-related activities to date. The information from the Tracy Research Volume Series includes Technical Publications and a PhD Dissertation and is used by Reclamation in implementing improvements at the TFCF as well as by DWR for implementing improvements at the Skinner facility. In addition, information generated from the research and assessment efforts at the TFCF is used by other scientists when assessing fishery impacts at the export pumps on a delta-wide scale. In 2009, the program completed distribution of Tracy Research Volume Series No. 42 and Tracy Technical Bulletins 2008-1, -2 and -3, as well as updating and redistributing Volume No. 13 ("Guidance to Authors"). The program also published a PhD Dissertation related to fish holding stress on Chinook salmon.

The program facilitated the ongoing development of the Tracy Research technical website and enhanced data accessibility. The information contained on the website is used by many of the scientists and engineers studying the Sacramento-San Joaquin Delta region for fishery and water quality affects and concerns.

In 2010, the program will continue to address the three primary areas of concern, namely improved debris management, improved predation management, and improved hydraulic control of the facility.

Tracy Fish Collection Facility

Table 11. Actions to Improve Tracy Fish Collection Facility, Completed to Date

	Actions	Start Date	Completion Date
1	Implemented periodic predator removals	1992	1992 (“ongoing”)
2	Upgraded instrumentation at the TFCF	1992	1993
3	Replaced high pressure utility pump with low pressure utility pump	1995	1996
4	Epoxy coated recessed collection tanks	1997	1997
5	Constructed aquaculture facility onsite	1997	2005
6	Constructed extraction device for Chinese mitten crabs/debris removal	1998	1999
7	Installed air system in recessed collection tanks	1999	1999
8	Developed onsite laboratory for fish taxonomic work	1999	1999
9	Added air system to fish haul trucks	2000	2000
10	Upgraded fish count area to accommodate DNA sampling & fish ID	2000	2000
11	Updated fish identification key for training of operators	2000	2000
12	Replaced worn (“leaky”) bypass transition boxes	2003	2004
13	Replaced fish transfer bucket with new/improved fish transfer bucket	2006	2008
14	Replaced fish haul trucks with new/improved fish haul trucks	2006	2008
15	Constructed new biological resources building	2006	2010*
16	Replaced existing trash rack cleaner with new/improved trash rack cleaner	2006	2010*
17	Replaced primary louvers/cleaners with new primary louvers/cleaning system	2006	2013*
18	Replaced secondary louver/cleaners with new secondary louvers/ cleaning system	2006	2011*
19	Developed land onsite to improve ability to conduct research and operate the facility	2006	2012*
20	Construct new secondary screening and transfer system	2010	2016*
21	Construct new aquaculture facility onsite	2012	2013*
22	Automate velocity control pumps for the fish bypass system	2013	2014*
23	Construct third fish release site	2014	2015*

* Estimated Completion Date

Contra Costa Canal Pumping Plant

Fisheries Resource Area (Central Valley)

FY 2009

CVPIA Funding Obligations by Funding Source

- Water and Related - $ 116,000
- State - $ 1,000
- ARRA - $6,884,000

TOTAL - $7,001,000

Accomplishments

- Updated screen designs to bring up to current construction code
- Completed environmental documentation and permits for the construction of the fish screen
- Conducted fish monitoring at Rock Slough headworks and Pumping Plant No. 1
- Started construction of Phase II of the Rock Slough Fish Screen

CVPIA Section 3406(b)(5)

"…Develop and implement a program to mitigate for fishery impacts resulting from operations of the Contra Costa Canal Pumping Plant No. 1. Such a program shall provide for construction and operation of fish screening and recovery facilities, and for modified practices and operations."

The Contra Costa Canal is an essential feature of the Contra Costa Water District (CCWD), delivering water from the delta to the district's treatment facilities and raw-water customers. The canal is a 48–mile–long facility that starts at Rock Slough in East Contra Costa County and ends at the Terminal Reservoir in Martinez. Four pumping stations currently lift water 124 feet above sea level from Rock Slough, then gravity propels the water to its terminus in Martinez.

Contra Costa Pumping Plant No. 1 is located at the head of the Contra Costa Canal. Operation of the Contra Costa Pumping Plant No. 1, without adequate screening or alternative mitigation, results in fish mortality. In addition to the CVPIA mandate, the 2004 Los Vaqueros BO extension, requires that a fish screen be built at Rock Slough (Figure 8). This program is focused on improving operation of the Rock Slough Intake to minimize loss of fish through three main activities:

- Design and construct a fish screen for CCWD's Pumping Plant No.1 and one or more new intake structures
- Work with CCWD to modify operations (change the pumping schedule) to take less water when fish are nearby
- Make interim annual mitigation payments to the Service to compensate for presumed losses of delta smelt during continued Contra Costa Pumping Plant operation in the absence of a fish screen

Because fish losses at pumping stations, dams and diversions are of concern throughout the CVP system, currently several CALFED Stage 1 studies are under way, including the Los Vaqueros Reservoir Expansion Study, Rock Slough Water Quality Improvement Study, and various ecosystem restoration projects and studies. These studies may benefit other programs, including the Tracy (Jones) Pumping Plant Program (b)(4), the AFSP (b)(21), and other Central Valley actions for endangered species in addition to the Contra Costa Canal Pumping Plant Program (b)(5).

MEASURING SUCCESS

Fish Screen

In 1996, the Contra Costa Fish Screen Management Team and the Contra Costa Technical Advisory Committee (Team)[1], were formed to provide technical assistance to the (b)(5) program; the Teams reviewed preliminary designs and recommended cost-saving alternatives and improvements. By 2002, the group had completed 90 percent of the fish screen designs and related environmental documents. However, because of concerns regarding the cost and effectiveness of the proposed screen design, Reclamation reassessed all available design alternatives, completing this review in 2007. Also in 2007, Reclamation contracted for an interim Cumulative Impacts Assessment for the Contra Costa Canal Mitigation Program, which will serve as the basis for future National Environmental Policy Act (NEPA) documentation. This document presents the potential effects of the currently identified potential fish screen alternatives.

Prior to 2009, a decision by Reclamation and USFWS to screen Rock Slough had been delayed several times due to funding and appropriate land acquisition. In 2009, the program received American Recovery and Reinvestment Act (ARRA) funding to build a new fish screen. The project will eliminate the annual incidental take of ESA listed species due to project pumping effects as described in previous NMFS (2009) and USFWS (Los Vaqueros 2009) BOs. The project is consistent with the NMFS Operations Criteria and Plan (OCAP) BO issued June 4, 2009.

In 2009, the program used ARRA funding to update the fish screen design to bring it up to current construction code and completed environmental documentation and permits for the project.

The program started construction of Phase II of the Rock Slough Fish Screen in September 2009. These improvements include in-water work such as coffer dams and levee embankment construction; these improvements are required to immediately meet in-water work restrictions. Phase III, the construction of the fish screen and appurtenances is scheduled for completion in November 2011.

Fish monitoring continued through 2009 according to the monitoring plan.

Figure 8. Rock Slough Fish Screen (Proposed)

Rock Slough Fish Screen, North Coffer Dam

Equipment staging for the commencement of Phase II of the Rock Slough Fish Screen

1 The team is made up of representatives from CDFG, DWR, Service, Reclamation, NOAA Fisheries, and the Contra Costa Water District (CCWD)

Flow Fluctuations and Reservoir Storage

Fisheries Resource Area (Central Valley)

FY 2009

CVPIA Funding Obligations by Funding Source

- Restoration Fund - $4,000

TOTAL - $4,000

Accomplishments

Minimized losses of anadromous fish due to flow fluctuations by:

- Maintaining Clear Creek flows using a combination of (b)(2) water and (b)(1)(B) reoperation
- Augmenting American River flows from October 2008 through March 2009 with (b)(2) water to minimize redd dewatering for fall-run Chinook and steelhead
- Augmenting Stanislaus River flows with (b)(3) water October through mid-December 2008 and used (b)(2) water in early February to minimize a potential flow fluctuation

Developed the Interim Emergency Response Plan in October 2008; the plan was implemented in WY 2009 to increase protection of three listed anadromous salmonid species. The plan covers the American and Sacramento Rivers.

CVPIA Section 3406(b)(9)

"(9) Develop and implement a program to eliminate, to the extent possible, losses of anadromous fish due to flow fluctuations caused by the operation of any Central Valley Project storage or re-regulating facility…"

And CVPIA Section 3406(b)(19)

"(19) Reevaluate existing operational criteria in order to maintain minimum carryover storage at Sacramento and Trinity River reservoirs to protect and restore the anadromous fish of the Sacramento and Trinity Rivers in accordance with the mandates and requirements of this subsection and subject to the Secretary's responsibility to fulfill all project purposes, including agricultural water delivery."

The timing and volume of water flows are critically important to the successful spawning, rearing, and out-migration of anadromous fish. River and stream flow fluctuations caused by operation of any CVP storage or reregulating facility can therefore result in fish losses through mortality of holding and spawning adults, decreased egg viability in redds due to thermal distress, redd dewatering and isolation, or stranding of juveniles. The CVPIA (b)(9) Flow Fluctuation Program's goal is to minimize these losses by moderating changes in CVP releases on Clear Creek and the Sacramento, American, and Stanislaus Rivers to the extent possible to protect and restore anadromous fish to the Central Valley (see Figure 1 for location map).

The tools available to minimize losses include (b)(1)B reoperation (changing dam operations based on (b)(1)B data) and the use of the dedicated yield in section 3406 (b)(2). Specific performance goals were not established for this program. Rather, this program's activities are directed by CVPIA provisions that allow for operational changes that will enhance habitat for anadromous fish.

Supporting the (b)(9) Flow Fluctuation Program is the (b)(19) Reservoir Storage Program, which evaluates water storage across the Sacramento, American and Trinity Rivers to meet anticipated demands for water by fisheries as well as agricultural, municipal and industrial users. The Reservoir Storage Program seeks to maintain carryover water storage and to deliver appropriately

timed flows and flows of adequate quality to support fisheries restoration as well as meet other project purposes.

Reclamation and the Service convened weekly interagency (b)(2) team meetings in water year 2009 to determine how to minimize damaging flow fluctuations to the extent possible on CVP-controlled streams (Clear Creek, Sacramento River, American River, and the Stanislaus River).

MEASURING SUCCESS

Clear Creek: Outside of flood control periods or large precipitation events, there typically are no extreme flow fluctuations on Clear Creek. In water year (WY) 2009 (October 2008 through September 2009), Clear Creek flows were maintained using a combination of (b)(2) water and (b)(1)(B)) reoperation. Large flow fluctuations originating from Whiskeytown Dam did not occur.

Sacramento River: On December 1, 2006, a flow fluctuation study was published by the Service, pursuant to Section 3406 (b)(1)(B), that identified the relationships between flow fluctuations and redd dewatering and juvenile stranding for Chinook salmon and steelhead in the Sacramento River between Keswick Dam and Battle Creek. The Service uses this report as guidance for determining when to initiate surveys. Due to extremely low storage levels and dry hydrology in water year 2009, flows on the Sacramento River were relatively low and stable in the fall and winter of 2008/2009. From mid-November 2008 through March 2009 large flow fluctuations did not occur (coincident with the greater part of salmon and steelhead spawning and rearing periods)

American River: On December 11, 2001, a 1997-2000 flow fluctuation study was published by the CDFG that documented the optimal flow rates and flow timing to support fisheries restoration for salmon and steelhead in the lower American River. In water year 2009, American River flows were augmented using (b)(2) water from October 2008 through early March 2009. Large flow fluctuations during this period did not occur. The American River Operations Work Group continued to meet monthly to discuss both the American River operations and to discuss the work to determine threshold flows and ramping rates required to protect lower American River fishery resources.

The Interim Emergency Response Plan for the American and Sacramento Rivers, developed in October 2008, was implemented on the ground in the spring and summer of 2009. On three separate occasions (May, August, and September) crews monitored potential isolation areas on the American River. No rescue efforts were necessary, but valuable insights on flow fluctuations at specific sites were obtained, such as identifying potential stranding sites.

Stanislaus River: In water year 2009, Stanislaus River flows were augmented using (b)(3) water from October through early December 2008. A small volume of (b)(2) water was used in early February to augment flows and avoid a potential flow reduction.

Other Activities: Reclamation coordinated with the CDFG, the Service, and NMFS to develop the Interim Emergency Response Plan for the American and Stanislaus Rivers in October 2008. The monitoring and rescue provisions in the plan were implemented in WY 2009 to increase protection of three listed anadromous salmonid species, winter-run Chinook salmon, spring-run Chinook salmon, and Central Valley steelhead, in the American and upper Sacramento Rivers during periods when the operation of Reclamation's facilities could have resulted in the stranding or isolation of such listed species. In WY 2009, several monitoring surveys took place on the American River but fish rescue efforts were not needed.

The American River from Guy West Bridge

Red Bluff Diversion Dam

Fisheries Resource Area (Central Valley)

FY 2009

CVPIA Funding Obligations by Funding Source

- Water and Related - $ 4,173,000
- ARRA - $ 6,589,000

TOTAL - $10,762,000

Accomplishments

- Achieved unimpeded passage for approximately 80 percent of adult spring-run Chinook and virtually all adult green sturgeon based on the current operation of the facility (two-month closure of the gates)
- Changed operations to raise the gates a minimum of 18 inches to ensure protection of downstream migrating green sturgeon
- Proceeded on the design of the permanent pumping plant
- Designed and constructed an interim pumping plant
- Conducted several monitoring efforts including sampling of green sturgeon eggs, larvae, and juveniles and surveillance and velocity measurements of the interim pump screens
- Completed the final report for the 2007 study on Chinook salmon genetics assessment

CVPIA Section 3406(b)(10)

"Develop and implement measures to minimize fish passage problems for adult and juvenile anadromous fish at Red Bluff Diversion Dam…"

The Red Bluff Diversion Dam (RBDD) is located on the Sacramento River about 2.5 miles southeast of the city of Red Bluff (Figure 9). The dam has 11 gates, which when partially closed, divert water to the Tehama-Colusa and Corning canals to provide water for farmers, the Sacramento National Wildlife Refuges (SNWR), and minor municipal and industrial uses. In the summer, the dam creates a seasonal lake in a wide portion of the Sacramento River, which attracts wildlife as well as recreational users.

Until 1987, the RBDD gates remained closed year round, impeding migration of salmonids above the dam and preventing passage of sturgeon. In 1987, the gates were opened between December 15 and April 1 to allow passage of winter-run chinook; the spawning distribution shifted, with less spawning below the RBDD and more spawning in colder water above the dam. However, the improved passage still blocked adult green sturgeon (ESA-listed), white sturgeon, and many adult winter- and spring-run Chinook (both ESA-listed); this continued to cause spawning in downstream waters too warm for successful egg incubation. In addition, losses of out-migrating juvenile salmon were measured at up to 50 percent, and increased feeding and ambush settings created a dysfunctional predator-prey relationship between the out-migrating salmonids and the native Sacramento pikeminnow.

A 1993 BO required that the gates remain out of the river or "open" for eight months of the year (from September 15 through May 15) to allow for expanded passage of winter-run Chinook. As a result of this and complementary CVPIA actions, the population index for the winter-run Chinook dramatically increased and juvenile predation dropped.

Winter-run Chinook spawning returns showed a significant population increase from nearly 700 to 17,000 after 1998 through 2006 (see figure 10). Declines in 2007 and 2008 were primarily caused by unusually poor ocean environmental conditions and not the result

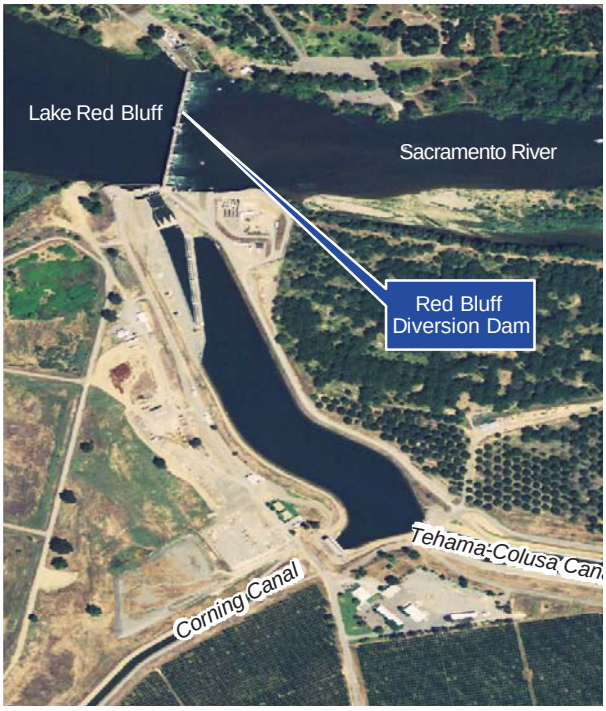


Figure 9. Red Bluff Diversion Dam

of any changes at RBDD. Both the fall- and winter-run spawning distributions changed significantly after the raised gates period with fish spawning further upriver.

In 2007, Reclamation implemented operational changes at RBDD in response to the loss of at least 10 adult green sturgeon at or below the dam. The loss is attributed to gates operations at Red Bluff based on an unusually large number of green sturgeon "holding" in the vicinity of the dam, the nature of the injuries seen on the carcasses, and the location of some carcasses. It was inferred that the fatalities occurred when the gates were lowered for a brief, emergency closure and/or when the gates were closed for the season. To protect the fish from further losses, when possible, gates are now kept "open" or raised a minimum of one foot from the river floor.

Reclamation and the Tehama Colusa Canal Authority issued a draft EIS/EIR in 2002 to evaluate six alternatives of a new pumping plant, gravity diversions, fish ladders and gates' open/close timing to improve fish passage. Delays in selecting an alternative resulted from the process of listing of the green sturgeon as a threatened and endangered species. Following listing, the EIS/EIR was recirculated in 2006 to include discussion of the Operations Criteria and Plan (OCAP) BO requirements, and to make it clear the assessment of the potential impacts to the green sturgeon was unchanged. Reclamation's stated preference was a two-month gate closure and construction of a new screened pumping plant. However, it was recognized that operations of a new pumping plant would be determined as part of the OCAP ESA consultation.

The purpose of the RBDD Program is to minimize anadromous fish passage problems to allow access to and safe egress from upstream habitat while maintaining water deliveries to the SNWR and other water contractors. The program has one outcome target and two output targets, as follows:

- Outcome target: achieve annual passage of 80 to 100 percent of adult spring-run salmon and 50 to 100 percent of adult green sturgeon
- Output target: supply Full Level 4 water to the SNWR
- Output target: complete RBDD infrastructure improvements as necessary to achieve annual fish passage targets and to be capable of full time operation, if needed

One of the program goals has been met:

Refuge Water Conveyance Capacity

The mandated goal to supply Full Level 4 water to the SNWR was met several years ago by installation of a siphon on the Glenn-Colusa Irrigation District (GCID) Canal at Stony Creek to allow year-round deliveries. Use of the RBDD for this purpose was therefore abandoned, although the planned changes at Red Bluff will provide a back-up to conveyance via GCID's facilities.

MEASURING SUCCESS

Fish Passage

Based on the current operation of the facility (two-month closure of the gates), approximately 80 percent of the adult spring-run Chinook and virtually all adult green sturgeon achieve unimpeded upstream passage.

No further green sturgeon fatalities have been observed since the operational changes were implemented by Reclamation at RBDD in 2007 (gates are kept "open" or raised a minimum of one foot from the river floor). In 2009, the gates began to be raised a minimum of 18 inches to ensure protection of downstream migrating green sturgeon.

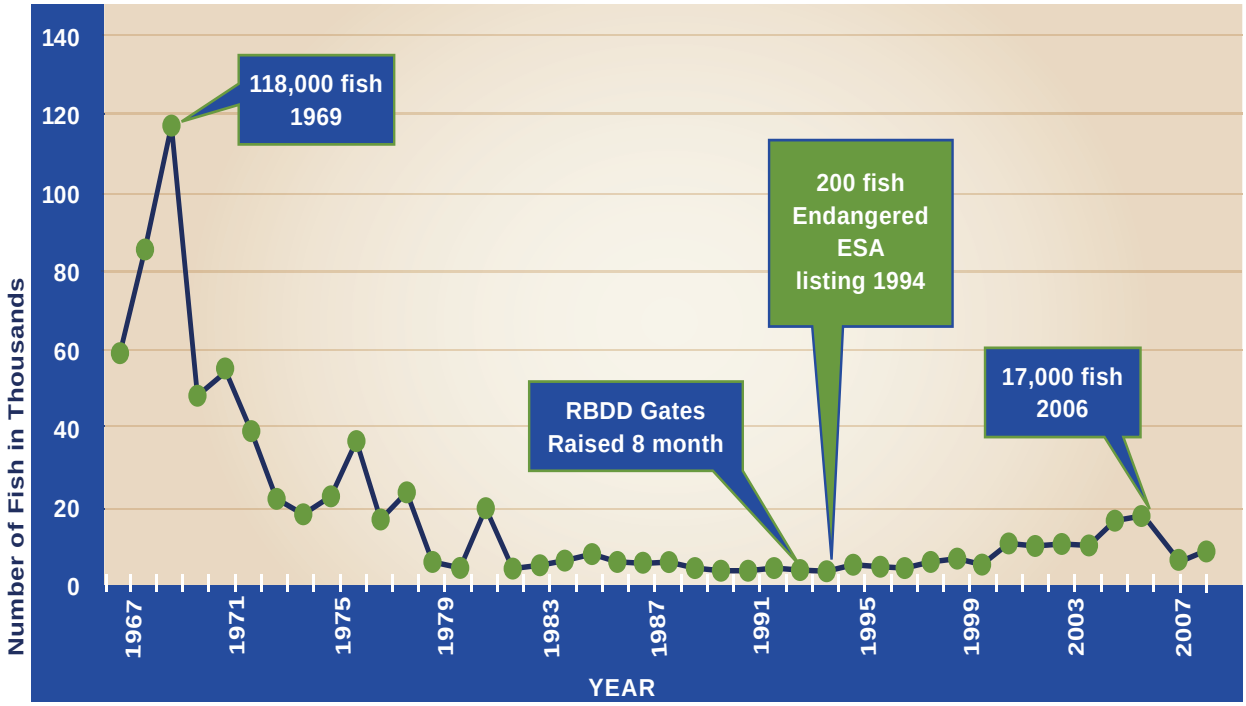


Figure 10. Spawning Returns, Winter-Run Chinook, Sacramento River (1967-2008)

Infrastructure Improvements

A Record of Decision was signed July 16, 2008, following completion of ESA consultation on the planned construction. Alternative 2b of the EIS/EIR was identified as the preferred alternative; it includes keeping gates out or "open" for 10 months of the year (closing them only in July and August), adding a fourth pump to the Red Bluff Research Pumping Plant (RBRPP) and building a 1,680-cfs pumping plant that would increase the existing pumping capacity fourfold, providing a more reliable water supply. Subsequent ESA consultations assumed construction of a 2,500 cfs facility, forgoing any reliance on the existing pumping plant.

In 2009, the program received American Recovery and Reinvestment Act (ARRA) funding to build a new pumping plant. The completion of the new pumping plant will assist the program in meeting output and outcome targets and therefore minimize passage problems for anadromous fish. In FY 2009, plans proceeded on the design of the permanent pumping plant; construction of the facility is scheduled to start early in FY 2010 with the ARRA funding, even though full funding has not yet been secured. Contrary to the anticipated continued use of the dam for the mid-summer months, the pumping plant is now expected to be used year round in light of the OCAP consultation.

In December 2008, NMFS required an additional two months of gates opening during the construction of the pumping plant, necessitating the design and construction of an interim pumping plant by May 2009. The interim pumping plant was built on schedule, but has encountered mechanical problems with the pumps, along with the observation that a few of the fish screens did not meet fish screening engineering criteria. However, the interim pumping plant still successfully delivered water when needed.

Monitoring

Green Sturgeon Egg and Larval Monitoring

Sampling of green sturgeon spawning habitat using artificial substrate mats to acquire eggs continued for the second of three seasons. In 2009, green sturgeon eggs were sampled from four sites. Eggs were sampled above, at, and below RBDD. Preliminary results indicate that green sturgeon spawning occurred from late-March to early July.

Green sturgeon larval sampling, for migrating young of the year, occurred in 2009 using a benthic D-net. Preliminary data suggests that the abundance of green sturgeon adults above RBDD was greater in 2009 than 2008 as evidenced by greater total capture of green

sturgeon larvae using the D-net. Additionally, larvae and juveniles were sampled from the RBDD rotary traps in 2009.

Video Evaluation and Velocity Monitoring at the Interim Pump Screens

The program used underwater video cameras to test the suitability of available technology for monitoring and to conduct surveillance of the interim pump screens. Specifically, the surveillance was to document whether fish are being impacted by the pumps (i.e., impingement, impaired swimming/avoidance ability, impact with the screen, etc). The results from 2009 are still under analysis. This project is expected to continue in FY 2010.

The program also conducted velocity measurements at the interim pump fish screens to determine whether the pumps or screens are operating within specified parameters. A draft preliminary report of the 2009 findings is currently under review. This monitoring is expected to continue during FY 2010.

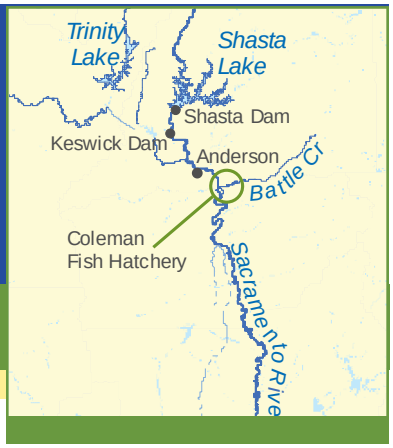
Chinook Salmon Genetics Assessments at the Red Bluff Diversion Dam

The program has been collaborating with an on-going study of Chinook salmon genetics at the RBDD since 2007. Chinook salmon tissue samples are collected at the fish trapping facility of the RBDD. In 2009, the final report for calendar year 2007 study was completed.

Conceptual Rendering of the New Fish Screen and Pumping Facilities (courtesy of CH2M Hill)

Coleman National Fish Hatchery

Fisheries Resource Area (Central Valley)



FY 2009

CVPIA Funding Obligations by Funding Source

- None

Accomplishments

- Completed construction of a visitor kiosk at the Coleman NFH

CVPIA Section 3406(b)(11)

"Rehabilitate and expand the Coleman National Fish Hatchery by implementing the U.S. Fish and Wildlife Service's Coleman National Fish Hatchery Development Plan, and modify the Keswick Dam Fish Trap to provide for its efficient operation at all project flow release levels and modify the basin below the Keswick Dam spillway to prevent the trapping of fish…"

The Coleman National Fish Hatchery (NFH) Complex is one of the largest production facilities of salmon and steelhead in the United States. The hatchery, located on Battle Creek near the town of Anderson, was constructed in 1942 to partially offset impacts to salmon and steelhead populations caused by the construction of the Shasta and Keswick dams–which had eliminated almost 200 miles of salmon and steelhead habitat (Figure 11).

In order to continue to mitigate the effects of these dams, the goals of Section 3406(b)(11) of the CVPIA are as follows:

- Rehabilitate and expand the Coleman NFH by implementing the Station Development Plan for Coleman NFH on Battle Creek
- Modify the fish trap at Keswick Dam to ensure efficient operation at all project flow release levels
- Modify the basin below the Keswick Dam spillway to prevent the trapping of fish

The program has an output-based performance goal to complete the infrastructure improvements to enhance conditions for anadromous fish and maintain hatchery production targets as identified in the 1987 Coleman National Fish Hatchery Station Development Plan (SDP) and subsequently modified over the last 22 years by management requirements.

Specific modifications to the SDP include non-completion of Phases 6, 7 and 8, which called for expansion of a water treatment facility up to 65,000 gallons per minute (gpm) and the construction of 20 additional 15-foot by 150-foot raceways for juvenile rearing. Further, while the SDP called for provisions to produce winter Chinook salmon at Colman NFH, a multi-agency decision resulted in the use of $1 million of CVPIA funds for constructing the Livingston Stone National Fish Hatchery in 1997 below Shasta Dam for the production of that species. Subsequently, the production targets, as identified in the Coleman NFH's 2001 biological assessment, are as follows:

- Livingstone Stone NFH: Approximately 200,000 winter-run Chinook salmon pre-smolts

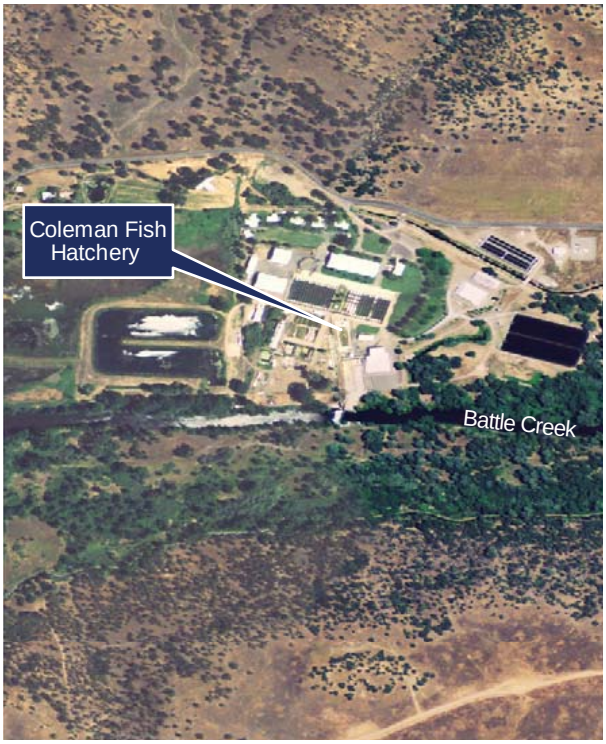


Figure 11. Coleman National Fish Hatchery

- Coleman NFH: 12 million fall-run Chinook salmon smolts, 1 million late-fall-run Chinook salmon smolts and 600,000 steelhead smolts

MEASURING SUCCESS

The 1987 SDP outlined a nine-phase strategy to rehabilitate the hatchery and implementation was authorized through the 1992 passage of CVPIA legislation. As shown in Table 12, four of these phases were largely implemented prior to 1994 CVPIA funding with approximately $11.2 million from the Service. Since CVPIA funding of (b)(11), which began in 1994, CVPIA has invested an additional $22 million to further the goals of the SDP. Due to fish production modifications and resource management decisions by program management, to date three phases have been cancelled or suspended (Phases 6-8). The two phases that remain to be implemented are expected to be completed by 2010 (Phases 2 and 9).

Fish Production Targets

Fish production targets have essentially been met since the 1998 construction of Livingston Stone NFH. Actual annual production may vary around the target depending on factors such as numbers of available brood stock and egg survival rates.

Ozone Water Treatment Facility

Since the ozone water treatment facility reached full ozone production capacity of 30,000 gpm in 2000 (full water filtration capacity of 45,000 gpm reached in 2002), juvenile fall-run Chinook have been reared and released with no incidence of viral disease. This was a first in the history of the hatchery. Also important is that the construction of the water treatment facility supports the CALFED-funded Salmon and Steelhead Restoration Project's efforts to restore 42 miles of habitat in upper Battle Creek by promoting and allowing opportunity for passage of adult anadromous salmonids above the hatchery's water source. Although the anadromous salmonids that ascend Battle Creek above the hatchery's water source carry a variety of pathogens, the ozone water treatment plant disinfects the water and reduces the likelihood of on-station disease outbreaks.

Domestic Water System and Visitor Facility Improvements

In 2005 and 2006, the CVPIA implemented a program to rehabilitate the domestic water system to ensure high-quality treated drinking water for station staff and the tens of thousands of visiting public.

In 2006, the program began design of a visitor kiosk and informational panels at the Coleman NFH; design was completed in FY 2008. Construction of the visitor kiosk was initiated and completed in FY 2009 and included an Americans with Disabilities Act (ADA) compliant visitor parking area and ramps. Construction cost overruns precluded the ability to purchase information panels.

Visitor Kiosk at Coleman National Fish Hatchery

Table 12. Coleman National Fish Hatchery (NFH) Facility Rehabilitation Phases (1991-2009)

Phase	Status	Funding
1. Water treatment facility to 20,000 gpm	Completed pre-1999	Service, Reclamation
2. Facility Rehabilitation	In process	Service, Reclamation
3. Feed storage building	Completed 1991	Service
4. Barrier weir and fish ladder	Completed 1992	Service
5. Pollution abatement system	Completed 1992	Service
6. Increase treatment plant size to ozone generation from 20,000 gpm to 45,000 gpm	Ozone water treatment and water filtration facilities reached 30,000 gpm capacity in 2000 and 45,000 gpm capacity in 2002; no plans to further build out ozone facility to full capacity as prescribed by Phase 6 of the SDP	Reclamation
7. Construction of 20 additional 5-foot by 150-foot raceways for juvenile rearing	No longer applicable	No longer applicable
8. Increase plant size from 45,000 gpm to 65,000 gpm	No longer applicable	No longer applicable
9. Improve visitor facility	In process	Reclamation

Clear Creek Restoration Program

Fisheries Resource Area (Central Valley)

FY 2009

CVPIA Funding Obligations by Funding Source

- Water and Related - $ 3,000
- Restoration Fund - $ 745,000
- State - (16,000)
- **TOTAL - $ 732,000**

Amounts in ( ) = credit amount
Credit amounts are due to de-obligations being larger than current year obligations

Accomplishments

- Flows were increased to 200 cfs from mid-September through mid-June and to an average of 135 cfs during the summer
- Flows to achieve temperature control were met 99 percent of the time
- Gravel was added at Below Dog Gulch (1,000 tons), Above Peltier Valley Bridge (770 tons), Paige Bar (1,790 tons), Above NEED Camp (980 tons), and Below NEED Camp (1,230 tons)
- Fall Chinook escapement was 7,677 compared to the average baseline escapement of 1,689 between 1967 and 1991
- Adult spring-run Chinook increased from a low of zero in 2001 to 120 in 2009
- Adult steelhead populations increased as indicated by redd counts, from approximately 38 in 2001 to 409 in 2009
- Began permitting and design work for the Clear Creek Long-Term Spawning Gravel Supply Project that could supply 23 years worth of gravel for Clear Creek

CVPIA Section 3406(b)(12)

"Develop and implement a comprehensive program to provide flows to allow sufficient spawning, incubation, rearing, and outmigration for salmon and steelhead from Whiskeytown Dam as determined by instream flow studies conducted by the California Department of Fish and Game after Clear Creek has been restored and a new fish ladder has been constructed at the McCormick-Saeltzer Dam…"

The construction of McCormick-Saeltzer Dam in 1903; construction of Whiskeytown Dam in the 1960s; and aggregate and gold mining in Clear Creek, caused widespread degradation of creek habitat. This led to precipitous drops in Chinook salmon and steelhead spawning and juvenile production. In order to reverse the trend, CVPIA developed and implemented a restoration program that improved instream habitat allowing greater spawning and rearing success.

The program focuses on five distinct problem areas and uses the following goals to track progress:

1. **Instream flow**: Use approximately 80,000 acre-feet of (b)(2) water dedicated annually; variable target dependant on hydrology and biological conditions,
   - Provide at least 90 percent of the maximum possible habitat
   - Meet temperature targets at least 98 percent of days with no more than two consecutive temperature exceedence days
2. **Fish passage**: Obtain unimpeded fish passage past McCormick-Saeltzer Dam site through its removal,
3. **Gravel placement**: Recreate 347,288 square feet of usable spawning habitat that existed before construction of Whiskeytown Dam by 2020 by adding 25,000 tons of gravel annually,

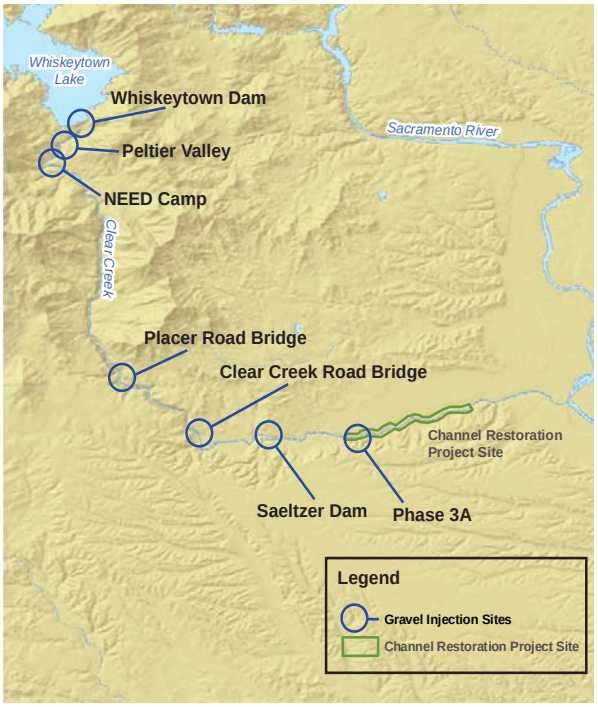


Figure 12. Gravel Injection and Channel Restoration Sites, Clear Creek

4. **Channel restoration**: Restore two stream miles by 2010 (from approximately river mile 2.5 to 4.5),

5. **Erosion control**: Implement highest priority and cost effective erosion control projects by 2003.

Two of the program goals have been met:

Fish Passage

Passage at McCormick-Saeltzer Dam was achieved in 2000 through the dam's complete removal and the opening of 12 additional miles of habitat.

Erosion Control

The highest priority erosion areas were completed prior to 2003 (specifically, work on approximately 13 miles of dirt roads). An Erosion Inventory Report was completed in 1996. Between 1997 and 2001, the highest priority erosion control projects were implemented by cooperators from the Western Shasta Resource Conservation District, the Service, National Park Service (NPS), and the Bureau of Land Management (BLM). All feasible and cost-effective projects were finished by 2001 and no further work is expected.

MEASURING SUCCESS

Progress against the remaining program goals is summarized in the following sections.

Instream Flow

An average of approximately 80,000 acre-feet of (b)(2) water is used annually to meet flow requirements, temperature objectives, and the instream habitat goal.

Pre-CVPIA baseline flows were 50 cfs between January and October, and 100 cfs in November and December. Flows have increased to 200 cfs from mid-September through mid-June and to an average of 135 cfs during the summer.

Flows to achieve temperature control of 60°F from June 1 through September 15 and 56°F from September 15 through October 31 were met 99 percent of the time in 2009.

Lastly, the program has met the instream habitat goal of 90 percent weighted useable area for fish use for the last seven years including in FY 2009. This goal is met with (b)(2) water.

Gravel Placement

Since 1995, an estimated 116,000 tons of gravel have been injected at specific locations on the creek, resulting in a steady increase in spawning habitat (Figure 12). This added gravel has recharged spawning gravel within approximately three miles of the creek. In 2009, gravel was added at Below Dog Gulch (1,000 tons), Above Peltier Valley Bridge (770 tons), Paige Bar (1,790 tons), Above NEED Camp (980 tons), and Below NEED Camp (1,230 tons) for a total of 5,770 tons (23% of the program's annual goal).

Securing a long-term gravel supply is critical for re-establishing sediment transport processes that create and maintain fish habitat. In FY 2009, permitting and design work began for the Clear Creek Long-Term Spawning Gravel Supply Project that could supply 23 years worth of gravel for Clear Creek at a fraction of the current cost by using remnant mine tailings adjacent to the creek.

A 10-year programmatic environmental assessment for restoration on Clear Creek was finalized in 2009. This will provide NEPA coverage for the next ten years.

Channel Restoration

The two-mile stream channel is 80 percent restored (Figure 16). Phases 1, 2A, 2B, 3A, and 3B are complete. Phase 3B floodplain revegetation is expected to begin in FY 2010. Spawning surveys in 2008 showed that Phase 3B increased the total amount of spawning habitat by 15 percent. Phase 3C is not complete. An inventory of future channel restoration needs was initiated but canceled due to the shortfall in Restoration Funds in 2008; the inventory will be scheduled in 2011.

Adaptive Management and Monitoring

Through addressing the program goals, the Clear Creek Restoration Program has increased fall-run Chinook escapement, and steelhead and spring-run Chinook populations. In 2008 (FY 2009), fall Chinook escapement was 7,677 compared to the average baseline escapement of 1,689 between 1967 and 1991, as shown in Figure 13. This 2008 escapement is remarkable compared to escapements in the rest of the Central Valley watersheds which were much lower due to the coast-wide collapse of Chinook salmon fishery. In 2008, all other Central Valley fall-run Chinook escapements decreased and as a whole were only 20% of the 1992 to 2007 average. Similarly, adult steelhead populations also continued to increase on Clear Creek, as indicated by redd counts, increasing from approximately 38 in 2001 to 409 in 2009. Figure 14 depicts the increase of adult spring-run Chinook from a low of zero in 2001 to 120 in 2009. All of the cohorts of spring Chinook have increased since restoration began.

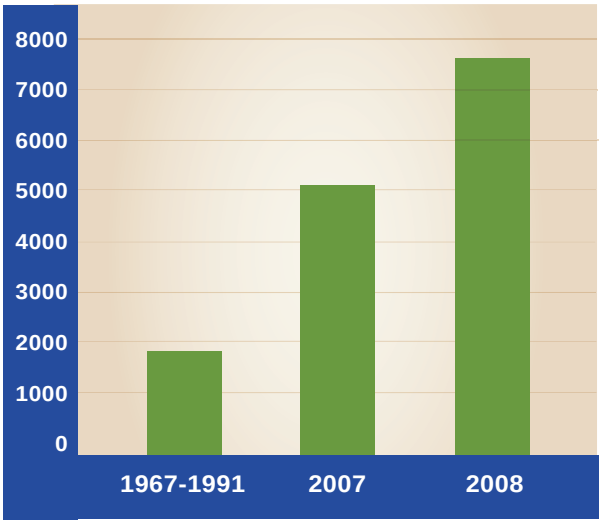


Figure 13. Fall–Run Chinook Salmon Escapement, Clear Creek (2008)

Despite the increases in adult populations, juvenile fall-run Chinook production has decreased since 1996 from 7.4 to 3.4 million fish, and the number of juvenile fall-run Chinook produced per adult female has decreased from about 3,000 in 1998 to a low of 300 in 2005, as shown in Figure 15. These decreases are due in part to excessive amounts of fine sediment in the stream channel that could be removed by intermediate flows that would flush the sediment downstream. The Clear Creek Restoration Program is pursuing the use of flushing flows from the CALFED Environmental Water Program to remove fine sediment from the stream channel. The pilot project would target flows of 3,250 cfs from the Whiskeytown Gloryhole for one day.

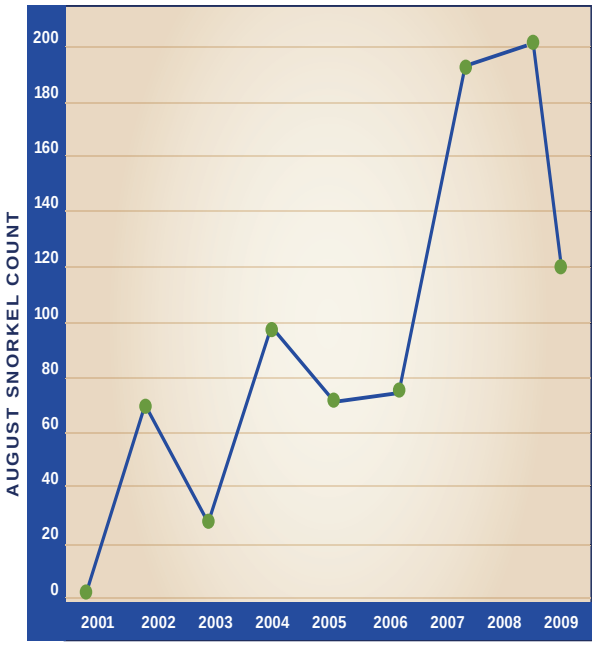


Figure 14. Adult Spring-Run Chinook Salmon Population, Clear Creek (2001-2009)

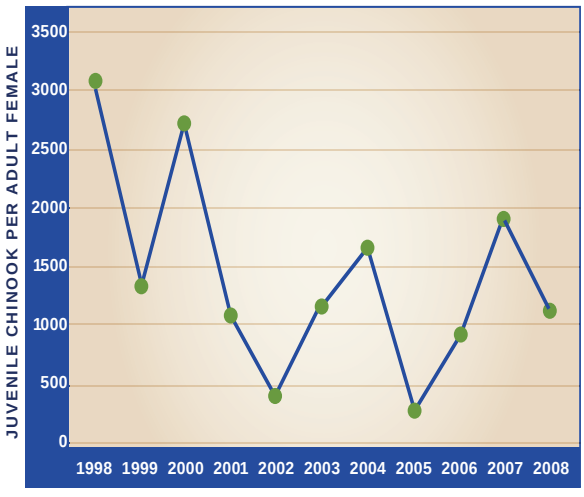


Figure 15. Juvenile Fall-Run Chinook Salmon Produced/Adult Female, Clear Creek (1998-2008)

Direct observation studies of the Phase 3A and Phase 3B restoration projects continued to indicate that overall both projects performed well at providing juvenile Chinook rearing habitat, although boulder clusters and one type of rootwad structure performed poorly.

Implementation of the NEED Camp Spawning Gravel Injection, Summer 2009

Figure 16. Clear Creek Channel Restoration Project Phases

Spawning and Rearing Habitat Restoration Program

Fisheries Resource Area (Central Valley)

FY 2009

CVPIA Funding Obligations by Funding Source

- Restoration Fund - $1,061,000
- State - $ 9,000

TOTAL - $1,070,000

Accomplishments

Sacramento River

- Purchased and injected 9,900 tons of gravel
- Monitoring showed that winter-run Chinook preferentially use injected gravel sites for spawning

American River

- Redd density for Chinook and steelhead combined on the 2009 placed gravel was about 0.022 redds per square meter, near the program goal of 0.03 redds per square meter
- Egg retention in FY 2009 was ten percent, meeting the program goal
- Permitted for and placed 10,500 tons of spawning gravel at Sailor Bar
- Acquired aerial photography documenting Chinook spawning throughout the river
- Completed testing and permitting for a long term local gravel source from historic mining operations along the river
- Produced spawning gravel from dredger tailings at Mississippi Bar
- Mapped spawning distribution and monitored juvenile fish use at placement site
- Assessed intragravel conditions and invertebrate colonization

CVPIA Section 3406(b)(13)

"Develop and implement a continuing program… to restore and replenish spawning gravel…and rearing habitat… on the American, Stanislaus and Sacramento Rivers…shall include preventive measures…"

The construction of Central Valley Project dams has had dramatic effects on the rivers in which they are placed; one effect is the prevention of rocks, gravel, dirt and other substrates from passing through them. Absent the dams, these materials would move into the river providing habitat needed for successful spawning and juvenile rearing. The (b)(13) program represents a continuous effort to restore spawning and rearing habitat in the Upper Sacramento River from Keswick Dam to the Red Bluff Diversion Dam, in the American River downstream of Nimbus Dam, and in the Stanislaus River downstream from Goodwin Dam.

The average annual gravel deficits on CVP streams are based on scientifically developed estimates for the amount of gravel that the dams retain:

- Sacramento River–50,000 cubic yards (65,000 tons)
- Stanislaus River–20,000 cubic yards (26,000 tons)
- American River–57,200 cubic yards (74,000 tons)

With gravel deficits of this magnitude and the cost of acquiring gravel, the program focuses on sites that are thought to have the most benefit to increase the quality and quantity of spawning and rearing habitat. The program goals are to annually place 10,000 tons in the Sacramento River, 3,000 tons in the Stanislaus River, and 7,000 tons in the American River. Two criteria guide the identification of gravel placement sites: the need for spawning habitat; and accessibility to the river by truck, helicopter, or sluice to deliver the gravel. All gravel is placed according to criteria developed by the CDFG

and NMFS. Figure 17 shows recent gravel placement locations.

ASSESSING NEED

Aerial photos, redd surveys, snorkel surveys, and boat surveys are utilized to identify areas for augmentation. Spawning densities show that there are more anadromous fish than available spawning habitat in some years. Future gravel placements are based on data from these surveys.

Once the gravel is placed, Reclamation and the Service monitor the spawning and rearing occurring at and near the restored sites to determine the program's effectiveness. The program monitors fish use, habitat suitability, and several other variables to help determine success.

Fish Use

Since the program's implementation, monitoring has shown improvement (see below under measuring success) in spawning distribution relative to total escapement (Sacramento and Stanislaus Rivers) and redd density per square meter (American River). Salmonids have been observed spawning on the gravel at each of the placement sites on the three rivers. Aerial photography and onsite ground surveys have documented the location of salmon redds and juvenile salmonids have been observed rearing in the vicinity of the gravel.

The goal for the Sacramento River gravel placement areas is 25 percent of spawning salmonids using the gravel placement reach; the goal for the Stanislaus River gravel placement areas is 10 percent of spawning salmonids using the gravel placement sites. The goal for the American River is 0.03 redds per square meter on emplaced gravel and less than 10 percent egg retention.[1]

Habitat Suitability

The suitability of gravel for spawning is an important indicator used to determine future gravel placement actions. Ongoing gravel studies examine areas with new and old gravel to determine if the gravel has suitable:

Figure 17. Recent Gravel Placement Sites in the Sacramento, American, and Stanislaus Rivers

permeability for egg survival; size of gravel for making redds; depth for fish to utilize it and for redds to be fully submerged; and velocity to provide oxygen and other nutrients.

All gravel placements now utilize the data collected on the Stanislaus River in 2005 that determined the optimum size of gravel to create adequate permeability. The 2005 study compared man made riffles created with varying sizes of gravel and determined that survival (egg to fry) was best in the mixture with a smaller sized gravel component.

MEASURING SUCCESS

Sacramento River

In the Sacramento River, winter-run Chinook salmon spawning increased from an average percentage of one percent of the Chinook population spawning in the gravel placement reach prior to CVPIA to an average of 33 percent spawning in the area that gravel was added since CVPIA was enacted (1993-2008). These numbers mean that now a greater proportion of fish use the gravel placement area near the dam where water temperature is coolest. The ability of fish to spawn in areas with cooler water should enhance survival of the listed runs. Monitoring showed that winter-run Chinook preferentially use injected gravel sites for spawning.

[1] Egg retention refers to female salmon that die before spawning. It is determined by cutting dead salmon open and examining the proportion of total eggs remaining (retained)

In 2009 approximately 9,900 tons of gravel (99% of annual target) were purchased and placed in the Sacramento River. Refer to Table 13 for total gravel placed by river, from 1997 to 2009. The gravel was placed on the side of the river channel at the Salt Creek site. The gravel will be distributed naturally as high flow events occur in the river. Monitoring work in progress on the Sacramento River includes: conducting substrate mapping of the river bottom, mapping channel cross sections to examine channel evolution, preparing a gravel budget for the river using a sediment transport model, and analyzing past aerial spawning survey data in relation to project locations.

Stanislaus River

No activities were conducted in the Stanislaus River in 2009. Meetings with local residents near the permitted placement reach at Knights Ferry resulted in the decision to focus on different project locations on the Stanislaus River in future years.

American River

Studies in the American River identified existing areas of overly high-density spawning by salmonids, indicating spawning habitat area limitations. The program used this data in FY 2009 to prioritize gravel placement to improve these conditions. Accomplishments in 2009 on the American River included the permitting, processing, and placement of 10,500 tons of spawning gravel (150 percent of annual target) at Sailor Bar. The monitoring included measurements of spawning habitat quality, fish use, invertebrate colonization and acquisition of aerial photography documenting Chinook spawning throughout the river. Redd density in 2009 for Chinook and steelhead combined on the placed gravel was about 0.022 redds per square meter (149 redds in 6,800 square meters of placed gravel), near the goal of 0.03 redds per square meter (Figure 18). More than half of the observed in-river steelhead spawning in 2009 occurred on this project. Chinook egg retention in FY 2009 was 10 percent, meeting the goal, although Chinook escapement of 2,742 in-river spawners was the lowest ever recorded.

In 2009, with the assistance of the Water Forum, the program processed gravel from historic gold mining operations piled along the river at Mississipi Bar. To process the gravel, City of Sacramento workers sorted and washed it. Local gravel availability is low so utilizing on-site gravel sources reduced the cost of projects.

The program developed a draft planning framework for the American River to focus activities and to accomplish tasks in as efficient, effective and scientifically defensible way as possible. The scope of the planning framework covers spawning and rearing habitats. The framework includes a vision statement, management goals, design standards, and testable hypotheses. The program intends to develop planning framework documents for all three of the CVP (b)(13) streams in the future.

Processing (sorting and washing) dredger tailings along the American River to produce spawning gravel.

Placing spawning gravel in the American River at Sailor Bar.

Table 13. Total Gravel (Tons) Placed by River (1997-2009)

River	Total Gravel Placed Since 1997 (Tons)	Gravel Placed in 2009 (Tons)	Annual Target (Tons)	Percent of Annual Target for 2009
Sacramento	180,700	9,900	10,000	99%
Stanislaus	14,100	0	3,000	0%
American	23,500	10,500	7,000	150%

American River at Sailor Bar 2009 gravel placement area showing pre-project (top photo) and post-project (bottom photo) conditions. Pre-project conditions consisted of cobbles too large for spawning and little juvenile rearing habitats. Spawning sized gravel was added to a riffle to create suitable spawning habitat and rock piles were added for fish cover and to enhance invertebrate production.

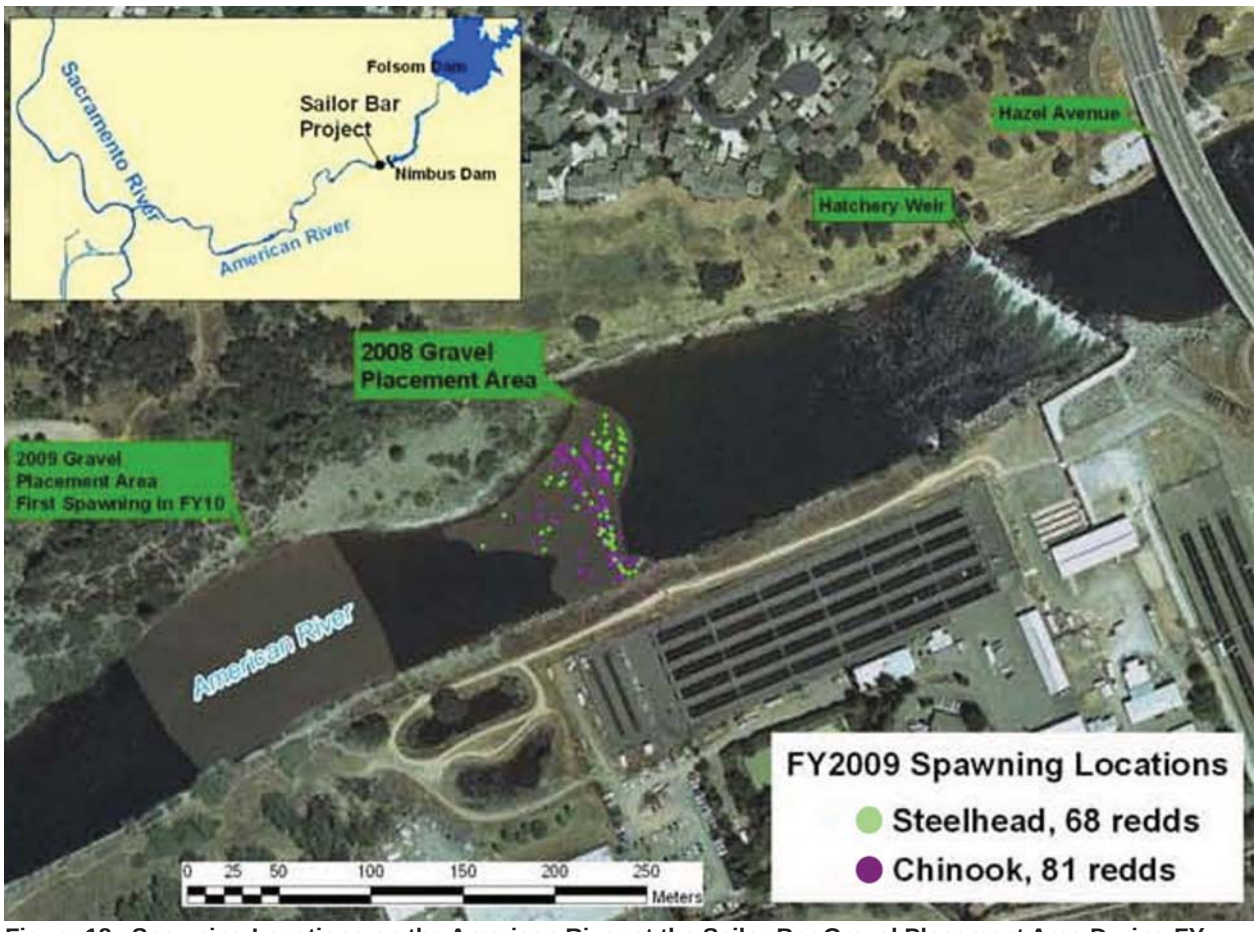


Figure 18. Spawning Locations on the American River at the Sailor Bar Gravel Placement Area During FY 2009

Head of Old River Barrier

Fisheries Resource Area (Central Valley)

FY 2009

CVPIA Funding Obligations by Funding Source

None

Accomplishments

- Installed and monitored a seasonal, non-physical bubble curtain at the head of Old River

CVPIA Section 3406(b)(15)

"Construct, in cooperation with the State of California and in consultation with local interests, a barrier at the head of Old River in the Sacramento-San Joaquin Delta to be operated on a seasonal basis to increase the survival of young outmigrating salmon that are diverted from the San Joaquin River to Central Valley Project and State Water Project pumping plants and in a manner that does not significantly impair the ability of local entities to divert water..."

The South Delta Improvement Program (SDIP) was a joint federal and State program that covered a series of proposed actions to improve water levels and water quality in the southern part of the Sacramento-San Joaquin Delta, protect salmon in the San Joaquin River, and improve water supply reliability for south of delta contractors and environmental uses.

In support of SDIP, to reduce the number of fall- and late fall-run Chinook salmon that enter the Old River and to reduce entrainment at the CVP and SWP export facilities, the CVPIA has authorized the construction of a permanent operable fish gate at the head of the Old River to keep young salmon in the San Joaquin River as they migrate to the ocean in the spring. In addition, a fish ladder at the head of Old River would give passage to those adult salmon entrained into delta channels to the spawning grounds in the San Joaquin River.

The three agricultural gates and limited dredging would protect water levels and water quality in the south delta channels. Water levels are protected by keeping the gates open when the tide is coming in (flood) and closing the gates to trap some of the tide at a specific elevation. Water quality would be improved during periods of poor San Joaquin River water quality by the circulation of water caused by the gate operations.

Although the Final EIS/EIR to study the potential impacts and benefits of the proposed SDIP was completed in December 2006 and the agencies have continued to move the project toward the construction and implementation phase, the issuance of the BOs on the operations of the CVP and SWP by the Service and NMFS was required prior to construction. These BOs cover the gate operations only; a separate BO for the construction effects is also required. The Service issued a BO in December 2008 on operations of the CVP and SWP that includes gate operations. NMFS subsequently issued a BO on operations of the CVP and SWP in June 2009. The NMFS BO precluded the construction of the barriers until more is known about critical habitat and species effects. A rock barrier would reduce the San Joaquin River flows into the south delta where that flow is needed to sustain delta smelt habitat.

In the absence of a permanent operable gate, the Head of Old River Barrier was closed this year with a non-

physical "bubble curtain" from April 15 to May 15 to allow salmon smolts to stay in the San Joaquin River as they migrate out to the ocean. The bubble curtain is comprised of three components: sound, bubble curtain, and hi-intensity light-emitting diode (LED) strobe lights. A statistically significant proportion of Chinook salmon were deterred by the bubble curtain; the deterrence rate was 81.4%. However, the predation rate was so high that the protection efficiency was not statistically different between barrier off and barrier on. The data suggest that much of the gains accomplished by the bubble curtain's determent of smolts are offset by the predators in the adjacent scour hole.

MEASURING SUCCESS

A seasonal, temporary rock barrier at the head of Old River has been installed for 12 of the 16 CVPIA years (1992-2008), helping to keep fish in the San Joaquin River. The temporary barrier was not installed in four years (1995, 1998, 1999, and 2005) due to high flows. A seasonal, temporary bubble curtain was installed at the head of Old River in 2009. Until the permanent gates are constructed, temporary barriers of some sort will continue to be placed to reduce salmonid fish losses, unless there is a conflict with the in-delta habitat flow requirements for delta smelt.

Reclamation worked in coordination with Fish Guidance Systems (Southampton, England), Jacobs Engineering (Southampton, England), EIMCO Water Technologies (Salt Lake City, UT), Hydroacoustic Technology Inc. (Seattle, WA), the San Joaquin River Group Authority (Davis, CA) and the California Department of Water Resources (Sacramento, CA) to design, implement, and monitor the non-physical barrier. Funding for the installation of the bubble curtain and monitoring was provided by CALFED.

The monitoring of the Old River Barrier was conducted by Reclamation with the cooperation of the Vernalis Adaptive Management Program (VAMP) team. The VAMP team used acoustic telemetry to assess survival rate in several routes through the Sacramento-San Joaquin Rivers Delta.

The primary release point for the 2009 VAMP experiments was Durham Ferry, several miles upstream of the San Joaquin River-Old River Divergence. The Chinook smolts with acoustic transmitters that were released there and survived to the Divergence were detected by an array of hydrophones deployed in the vicinity of the Divergence. These detections provided measures of Deterrence Efficiency and Protection Efficiency as the Chinook smolts pass through the area of the Old River Barrier.

In addition to acoustic telemetry, a Dual-frequency Identification Sonar (DIDSON) camera was deployed immediately upstream of the barrier. The DIDSON recorded images throughout the period after each VAMP release. These DIDSON recordings were used primarily to observe the behavior of fishes in the vicinity of the barrier.

A report was written by Reclamation Technical Service Center to document the results of the monitoring. The report is titled "Effectiveness of a Non-Physical Fish Barrier at the Divergence of the Old and San Joaquin Rivers (CA)".

Sound projectors, strobe lights and bubble line constructed in modules on shore

First third of the bubble line installed and functioning at the Old River Barrier

Comprehensive Assessment and Monitoring Program

Fisheries Resource Area (Central Valley)

FY 2009

CVPIA Funding Obligations by Funding Source

- Restoration Fund - $1,243,000

TOTAL - $1,243,000

Accomplishments

- Produced an annual report that quantifies the production of anadromous fish from the Central Valley and assesses progress toward the AFRP fish production goals
- Continued work with the Pacific States Marine Fisheries Commission to develop statistical and structural design recommendations for a comprehensive database to document and understand changes in the abundance of juvenile Chinook salmon
- Updated the CAMP web site (www.fws.gov/sacramento/CAMP/index.htm) which functions as a resource for all reports and documents pertaining to CAMP

CVPIA Section 3406(b)(16)

"…Establish, in cooperation with independent entities and the State of California, a comprehensive assessment program to monitor fish and wildlife resources in the Central Valley to assess the biological results and effectiveness of actions implemented pursuant to this subsection…."

CAMP assesses progress toward the AFRP fish doubling goals, stated in section 3406 (b)(1), by monitoring natural production of adult anadromous fish in the Central Valley and comparing these data to AFRP production targets. CAMP activities focus on nine anadromous fish taxa: Chinook salmon (fall-, late fall-, winter-, and spring-run), steelhead, striped bass, American shad, white sturgeon, and green sturgeon.

CAMP primarily relies on other entities (e.g., CDFG) to collect the information it analyzes and synthesizes. To the extent that funding is available, the program works with partners to provide partial funding to complete high-priority monitoring projects.

In 1997, a CAMP Implementation Plan was developed. It describes methods and procedures for: (1) monitoring anadromous fish species in California's Central Valley, and (2) assessing the biological results and effectiveness of different categories of restoration activities. The plan identifies 82 monitoring elements that are required to assess progress toward the AFRP fish doubling goals. In FY 2009, 71 of these activities were conducted, generally by entities outside of the program, such as the state and water districts (Table 14). In 2004, the CAMP issued a contract to evaluate statistical procedures for assessing progress toward the fish doubling goals and determining sustainability of production increases. The report, which was developed by Ken Newman (USFWS) and Dave Hankin (Humboldt State University), cited a need for better Chinook salmon data, including watershed-specific escapement estimates for naturally spawned and hatchery fish; watershed-specific juvenile production estimates; and ocean, mainstem and tributary angler catches. Implementation of these recommendations is frequently constrained by the budgetary limitations of entities that collect data.

MEASURING SUCCESS

The CAMP performance measure is to develop an annual report. Toward that end, the CAMP has produced seven annual reports since program inception. These documents were finalized in 1998, 1999, 2001,

2002, 2007, 2008, and 2009. Each report monitors the production of anadromous fish and assesses progress toward the AFRP fish production targets during different periods.

The 2009 annual report synthesizes and analyzes anadromous fish monitoring data collected between 1992 and 2008 on 22 watersheds. Because the process of collecting and reporting data is time consuming, data are only available for American shad and the four runs of Chinook salmon through 2008; striped bass through 2007; and green and white sturgeon through 2005. Figure 19 provides a graph depicting the natural production of four runs of Chinook salmon from 22 watersheds in the Central Valley; figures 20 and 21 show estimated abundance of white and green sturgeon in San Pablo and Suisun Bays; figure 22 shows estimated abundance of adult striped bass in the Sacramento - San Joaquin River Delta and the downstream portions of the Sacramento and San Joaquin Rivers; and figure 23 provides a graph depicting the midwater trawl index for young-of-the-year American shad in the Sacramento - San Joaquin River Delta and San Pablo and Suisun Bays. Additional figures and data for striped bass, American shad, white sturgeon, green sturgeon, and individual runs of Chinook salmon from 1992 to 2008 are contained in the 2009 CAMP annual report posted on the CAMP web site. At the present time, a coordinated and comprehensive program for monitoring steelhead does not exist; however, a variety of entities are working to develop such a program.

Overall, the 2009 annual report concludes that the majority of the AFRP production targets have not been met on a regular basis, which suggests a substantial increase in restoration efforts will be required to promote measurable increases in the production of the above-mentioned fish taxa and thereby achieve the AFRP production targets.

Concerns about low Chinook salmon numbers prompted a closure of the ocean harvest of Central Valley Chinook salmon in 2008 and 2009. The inland harvest of fall-run Chinook salmon in the Central Valley was also dramatically curtailed in those same years to improve the probability that the number of salmon will increase in the future.

In addition to the aforementioned annual report, the CAMP had several other accomplishments in FY 2009. These include: (1) working with partners to review, revise, and improve protocols for collecting, analyzing, and storing Chinook salmon data from the Yuba River; these data are necessary to assess trends in the production of Chinook salmon and thereby infer the effects of restoration activities; (2) providing funding to mark juvenile Chinook salmon at the Coleman National Fish Hatchery and Nimbus Fish Hatchery with the goal of developing more accurate estimates of the natural production of adult Chinook salmon; (3) developing databases that characterize rotary screw trap operations, stream discharge measurements, and water temperature data; these databases will be used to identify data gaps and facilitate CVPIA staff's access to data that are currently being collected; (4) funding contracts that analyze existing Chinook salmon data with the goal of assessing the effects of restoration activities; and (5) updating and maintaining the CAMP website which acts as a portal for disseminating information pertaining to the CAMP and anadromous fish monitoring activities in the Central Valley.

In FY 2009, 66 of the 82 CAMP-recommended monitoring elements were completed (Table 13). Two were completed with the assistance of CVPIA funds or staff. These included: (1) operation of a rotary screw trap in the Stanislaus River that was funded with CAMP and AFRP funds, and (2) operation of a rotary screw trap in the Merced River that was facilitated with AFRP staff assistance. 64 monitoring elements were conducted by other entities, e.g., CDFG.

Program Planning & Evaluation

In FY 2009, the CAMP developed a proposal to develop a Comprehensive Fisheries Assessment and Monitoring Program (CFAMP). As proposed, the CFAMP would engage in activities that have a programmatic focus substantially greater than what historically has been undertaken by the CAMP. The CFAMP would also act to integrate CVPIA-funded data collection activities at a scale that does not currently exist. The proposal will be reviewed by CVPIA managers and staff, and if deemed to be desirable, the CAMP would lead an effort to develop a CFAMP Implementation Plan. That plan would describe the relative roles and responsibilities of different CVPIA programs pertaining to anadromous fish; establish mechanisms for collecting more robust, integrated data sets; and identify strategies for developing management recommendations that improve the efficacy of future restoration actions.

The CAMP program was expanded in FY 2009 to include a new data manager position on its permanent staff. This individual's role will focus on: (1) assessing current data being collected by all CVPIA programs; (2) conducting management and program manager meetings to determine data needs for decision making; (3) coordinating data management activities with other federal and State agencies and other organizations; (4) conducting data management training; and (5) developing short-term and long-term data management plans.

USFWS staff collecting juvenile salmon data using rotary screw traps below the Red Bluff Diversion Dam

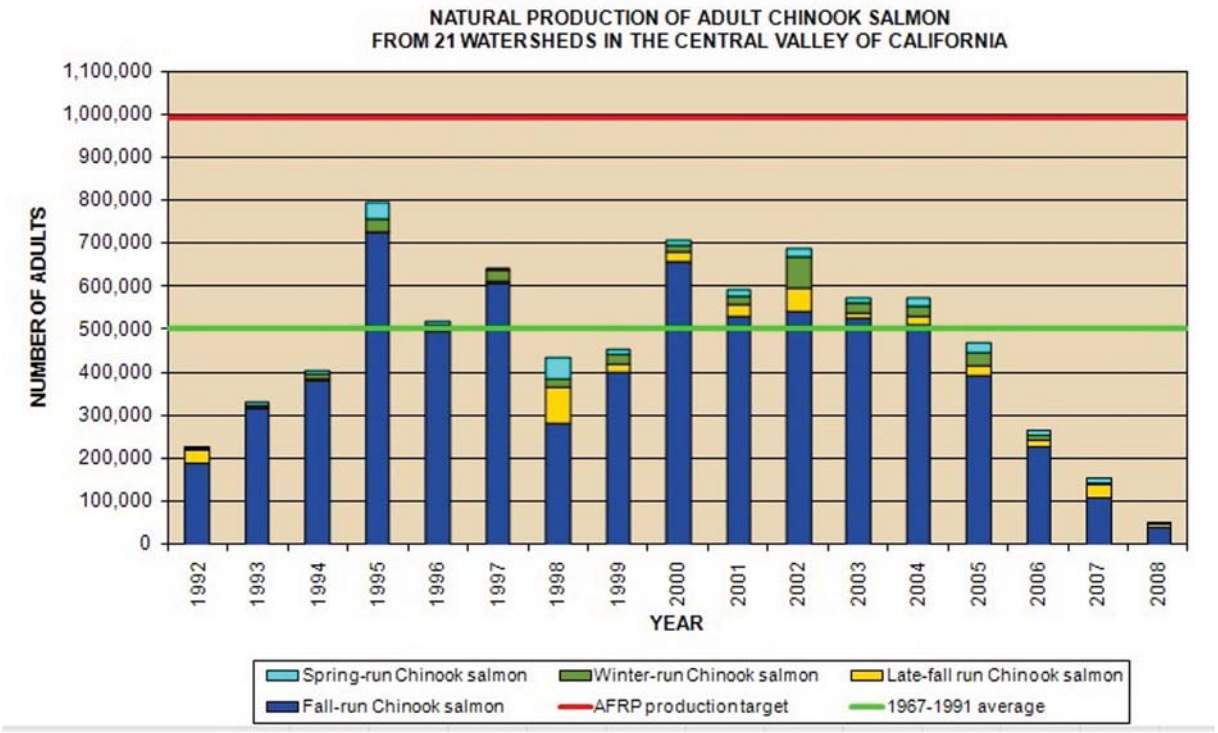


Figure 19. Estimated Total Natural Chinook Production, Central Valley (1992-2008)

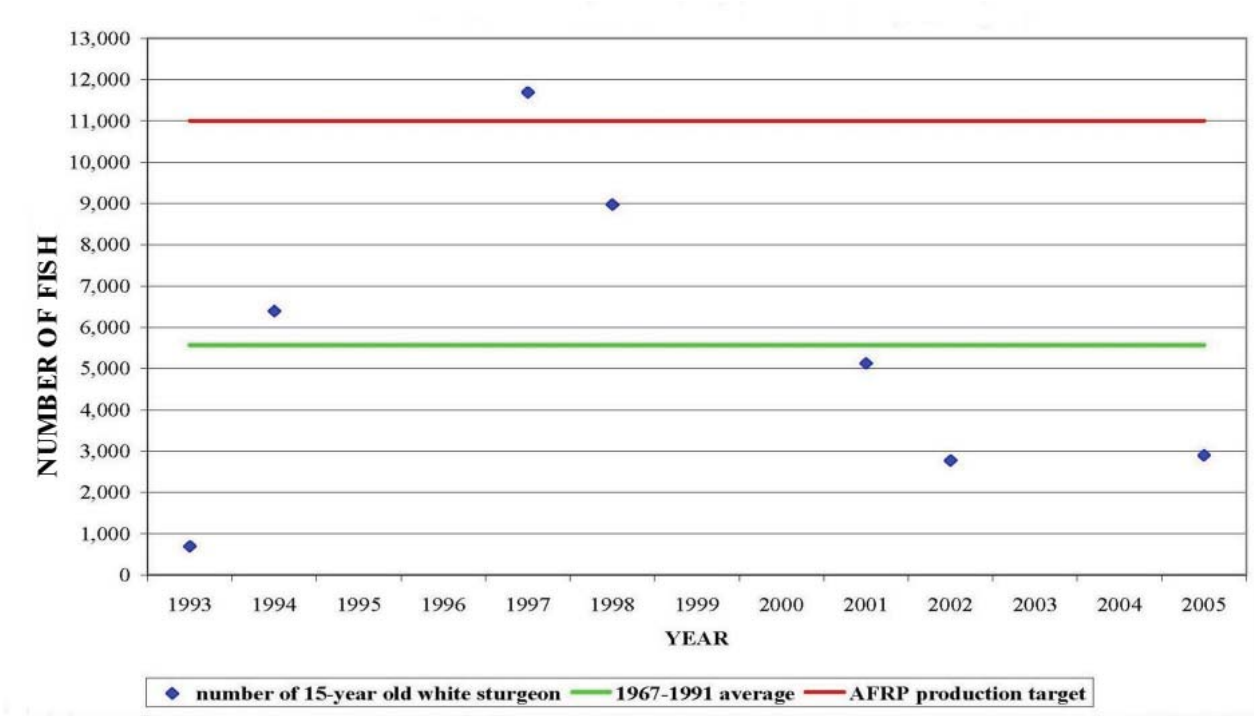


Figure 20. Estimated Abundance of 15-year-old White Sturgeon in San Pablo and Suisun Bays, 1993-2005

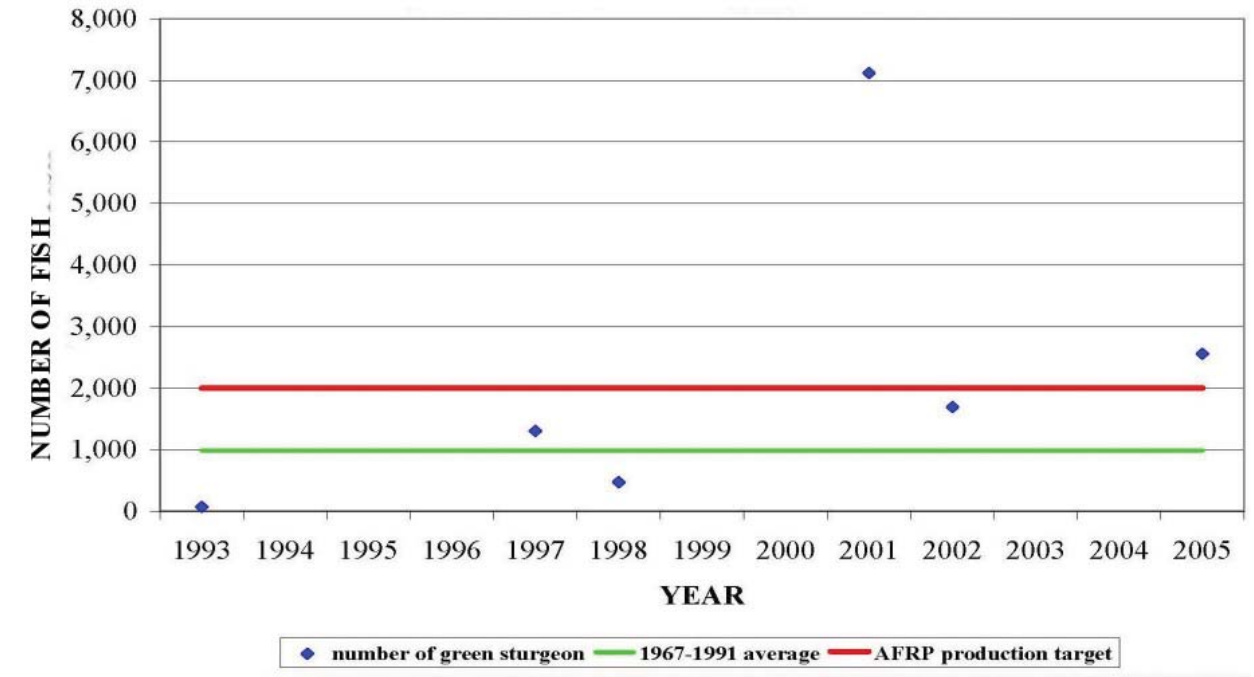


Figure 21. Estimated Abundance of Adult Green Sturgeon in San Pablo and Suisun Bays, 1993-2005

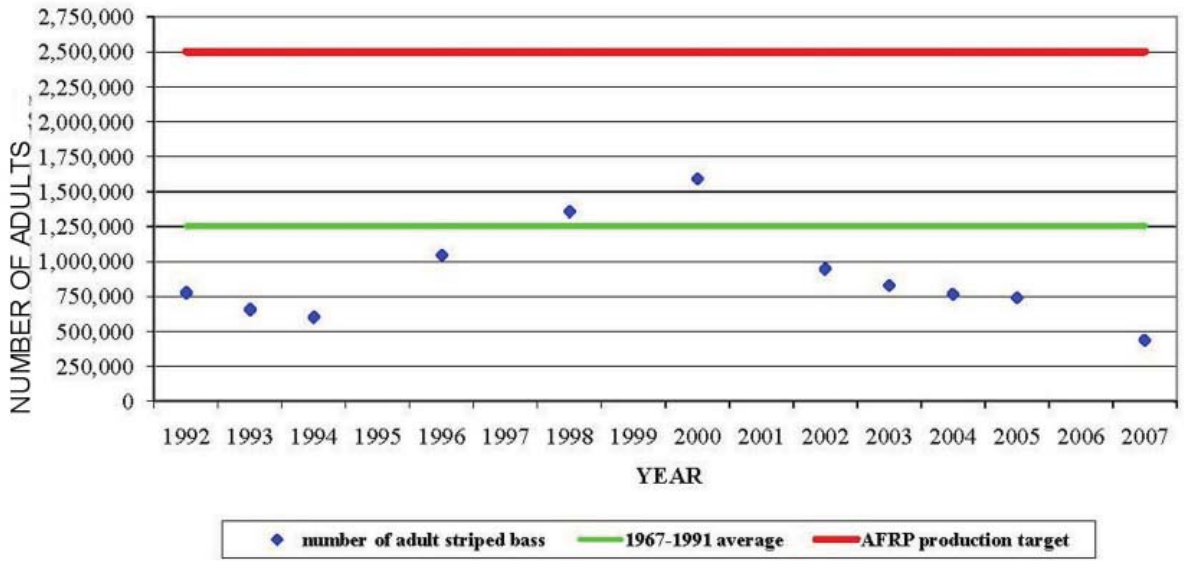


Figure 22. Estimated Abundance of Adult Striped Bass in the Sacramento-San Joaquin River Delta and the Lower Portions of the Sacramento and San Joaquin Rivers, 1992-2007. Note: 2004, 2005, and 2007 estimates are provisional and only include male fish.

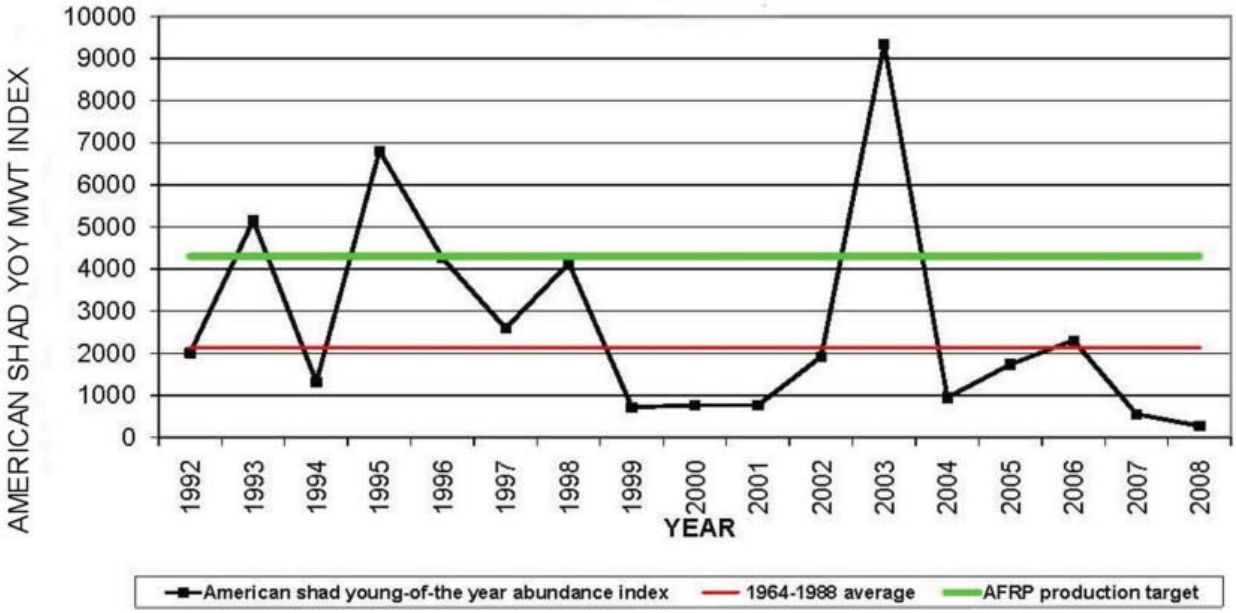


Figure 23. Midwater Trawl Index for Young-of-the-year American Shad in the Sacramento-San Joaquin River Delta and San Pablo and Suisun Bays, 1992-2008.

Table 14. CAMP Recommended Monitoring Elements by Watershed, Implemented in 2009

CAMP Element	Monitoring Method	Watershed	Species	Lead Agency	FY 2009 Element Status
4	Angler survey	American River	Fall-run Chinook salmon	CDFG	Completed
1	Carcass survey	American River	Fall-run Chinook salmon	CDFG	Completed
2	Hatchery count	American River	Fall-run Chinook salmon	CDFG	Completed
3	Hatchery marking	American River	Fall-run Chinook salmon	USFWS	Completed
76	Rotary screw trap	American River	Fall-run Chinook salmon	CDFG	Not completed
65	Rotary screw trap	Battle Creek	Fall-run Chinook salmon	USFWS	Completed
34	Carcass survey	Battle Creek	Late fall-run Chinook salmon	USFWS/CDFG	Not completed
6	Hatchery count	Battle Creek	Fall-run Chinook salmon	USFWS	Completed
35	Hatchery count	Battle Creek	Late fall-run Chinook salmon	USFWS	Completed
51	Hatchery count	Battle Creek	Steelhead	USFWS	Completed
7	Hatchery marking	Battle Creek	Fall-run Chinook salmon	USFWS	Completed
36	Hatchery marking	Battle Creek	Late fall-run Chinook salmon	USFWS	Completed
52	Hatchery marking	Battle Creek	Steelhead	USFWS	Completed
5	Video camera	Battle Creek	Fall-run Chinook salmon	CDFG/USFWS	Completed
70	Rotary screw trap	Big Chico Creek	Fall-run Chinook salmon	CDFG	Not completed
71	Rotary screw trap	Big Chico Creek	Spring-run Chinook salmon	CDFG	Not completed
8	Carcass survey	Butte Creek	Fall-run Chinook salmon	CDFG	Completed
72	Rotary screw trap	Butte Creek	Fall-run Chinook salmon	CDFG	Not completed
73	Rotary screw trap	Butte Creek	Spring-run Chinook salmon	CDFG	Not completed
45	Snorkel survey	Butte Creek	Spring-run Chinook salmon	CDFG	Completed
9	Carcass survey	Clear Creek	Fall-run Chinook salmon	CDFG	Completed
64	Rotary screw trap	Clear Creek	Fall-run Chinook salmon	USFWS	Completed
10	Carcass survey	Deer Creek	Fall-run Chinook salmon	CDFG	Completed
68	Rotary screw trap	Deer Creek	Fall-run Chinook salmon	CDFG	Completed
69	Rotary screw trap	Deer Creek	Spring-run Chinook salmon	CDFG	Completed
46	Snorkel survey	Deer Creek	Spring-run Chinook salmon	CDFG	Completed
14	Angler survey	Feather River	Fall-run Chinook salmon	CDFG	Completed
11	Carcass survey	Feather River	Fall-run Chinook salmon	DWR	Completed
12	Hatchery count	Feather River	Fall-run Chinook salmon	CDFG	Completed
13	Hatchery marking	Feather River	Fall-run Chinook salmon	CDFG	Completed
82	Hatchery marking	Feather River	Spring-run Chinook salmon	CDFG	Completed
74	Rotary screw trap	Feather River	Fall-run Chinook salmon	DWR	Completed
81	Angler survey	Merced River	Fall-run Chinook salmon	CDFG	Not completed
15	Carcass survey	Merced River	Fall-run Chinook salmon	CDFG	Completed
16	Hatchery count	Merced River	Fall-run Chinook salmon	CDFG	Completed
17	Hatchery marking	Merced River	Fall-run Chinook salmon	CDFG	Completed
80	Rotary screw trap	Merced River	Fall-run Chinook salmon	USFWS	Completed with CVPIA funds
18	Carcass survey	Mill Creek	Fall-run Chinook salmon	CDFG	Completed
47	Redd survey	Mill Creek	Spring-run Chinook salmon	CDFG	Completed
66	Rotary screw trap	Mill Creek	Fall-run Chinook salmon	CDFG	Completed
67	Rotary screw trap	Mill Creek	Spring-run Chinook salmon	CDFG	Completed
22	Angler survey	Mokelumne River	Fall-run Chinook salmon	CDFG	Completed
20	Hatchery count	Mokelumne River	Fall-run Chinook salmon	CDFG	Completed
21	Hatchery marking	Mokelumne River	Fall-run Chinook salmon	CDFG	Completed

Table 14. CAMP Recommended Monitoring Elements by Watershed (continued)

CAMP Element	Monitoring Method	Watershed	Species	Lead Agency	FY 2009 Element Status
19	Ladder count	Mokelumne River	Fall-run Chinook salmon	East Bay Municipal Utility District	Completed
77	Rotary screw trap	Mokelumne River	Fall-run Chinook salmon	East Bay Municipal Utility District	Completed
23	Ocean harvest	Pacific Ocean	Fall-run Chinook salmon	CDFG	Not completed
39	Ocean harvest	Pacific Ocean	Late fall-run Chinook salmon	CDFG	Not completed
44	Ocean harvest	Pacific Ocean	Winter-run Chinook salmon	CDFG	Not completed
50	Ocean harvest	Pacific Ocean	Spring-run Chinook salmon	CDFG	Not completed
54	Mark-recapture	Sacramento-San Joaquin River Delta	Striped bass	CDFG	Completed
56	Mark-recapture	Sacramento-San Joaquin River Delta	White sturgeon	CDFG	Completed
57	Mark-recapture	Sacramento-San Joaquin River Delta	Green sturgeon	CDFG	Completed
55	Midwater trawl survey	Sacramento-San Joaquin River Delta	American shad	CDFG	Completed
26	Aerial redd count	Sacramento River	Fall-run Chinook salmon	CDFG	Completed
37	Aerial redd count	Sacramento River	Late fall-run Chinook salmon	CDFG	Completed
42	Aerial redd count	Sacramento River	Winter-run Chinook salmon	CDFG	Completed
27	Angler survey	Sacramento River	Fall-run Chinook salmon	CDFG	Completed
38	Angler survey	Sacramento River	Late fall-run Chinook salmon	CDFG	Completed
49	Angler survey	Sacramento River	Spring-run Chinook salmon	CDFG	Completed
53	Angler survey	Sacramento River	Steelhead	CDFG	Completed
25	Carcass survey	Sacramento River	Fall-run Chinook salmon	CDFG	Completed
41	Carcass survey	Sacramento River	Winter-run Chinook salmon	CDFG	Completed
40	Hatchery marking	Sacramento River	Winter-run Chinook salmon	USFWS	Completed
61	Rotary screw trap	Sacramento River/ Glenn-Colusa Irrigation Diversion	Winter-run Chinook salmon	CDFG	Not completed
62	Rotary screw trap	Sacramento River/ Glenn-Colusa Irrigation Diversion	Fall-run Chinook salmon	CDFG	Not completed
63	Rotary screw trap	Sacramento River/ Glenn-Colusa Irrigation Diversion	Spring-run Chinook salmon	CDFG	Not completed
24	Ladder count	Sacramento River-Red Bluff Diversion Dam	Fall-run Chinook salmon	USFWS	Completed
43	Ladder count	Sacramento River-Red Bluff Diversion Dam	Winter-run Chinook salmon	USFWS	Completed
48	Ladder count	Sacramento River-Red Bluff Diversion Dam	Spring-run Chinook salmon	USFWS	Completed
58	Rotary screw trap	Sacramento River-Red Bluff Diversion Dam	Winter-run Chinook salmon	USFWS	Completed
59	Rotary screw trap	Sacramento River-Red Bluff Diversion Dam	Fall-run Chinook salmon	USFWS	Completed
60	Rotary screw trap	Sacramento River-Red Bluff Diversion Dam	Spring-run Chinook salmon	USFWS	Completed
28	Angler survey	San Joaquin River	Fall-run Chinook salmon	CDFG	Not completed
30	Angler survey	Stanislaus River	Fall-run Chinook salmon	CDFG	Not completed
29	Carcass survey	Stanislaus River	Fall-run Chinook salmon	CDFG	Completed
78	Rotary screw trap	Stanislaus River	Fall-run Chinook salmon	USFWS	Completed with CVPIA funds

Table 14. CAMP Recommended Monitoring Elements by Watershed (continued)

CAMP Element	Monitoring Method	Watershed	Species	Lead Agency	FY 2009 Element Status
31	Carcass survey	Tuolumne River	Fall-run Chinook salmon	CDFG	Completed
79	Rotary screw trap	Tuolumne River - Grayson Ranch	Fall-run Chinook salmon	Turlock Irrigation District	Completed
33	Angler survey	Yuba River	Fall-run Chinook salmon	CDFG	Completed
32	Carcass survey	Yuba River	Fall-run Chinook salmon	CDFG	Completed
75	Rotary screw trap	Yuba River	Fall-run Chinook salmon	CDFG	Completed

Glenn-Colusa Irrigation District Program

Fisheries Resource Area (Central Valley)

FY 2009

CVPIA Funding Obligations by Funding Source

- Water and Related - $33,000

TOTAL - $33,000

Accomplishments

- Completed the operations and maintenance manual
- Initiated the transfer of ownership of the structures to GCID

CVPIA Section 3406(b)(20)

"Participate with the State of California and other federal agencies in the implementation of the on-going program to mitigate fully for the fishery impacts associated with operations of the Glenn-Colusa Irrigation District's Hamilton City Pumping Plant. Such participation shall include replacement of the defective fish screens and fish recovery facilities associated with the Hamilton City Pumping Plant…"

In the 1980s it was determined that the operation of the Glenn-Colusa Irrigation District (GCID) Pumping Plant was inadvertently trapping small fish in the intake channel due to the high pumping velocity and that modifications to the existing fish screens were required (Figure 24). The program installed additional screening mechanisms and modified the intake and discharge channels to improve hydraulic conditions for returning fish to the river. These interim measures allowed GCID to continue to pump part of its water allocation while screening and bypassing back to the Sacramento River up to 20 million juvenile salmon and other species per year.

Following a lengthy design, environmental analysis, and permitting process that spanned more than 10 years, construction began in the spring of 1998 on the retrofit and extension of the existing fish screen and modifications to the open channel. A replacement water control structure and access bridge was completed just downstream from the fish screen structure. Construction of all features was completed in spring 2001; to determine if the facility is operating per the design criteria, biological and hydraulic testing has been ongoing.

MEASURING SUCCESS

Mitigating Project Impacts

The biological and hydraulic testing and monitoring program of the screen system started in summer 2001. To date, the testing program has not found any fish loss attributed to the operation of the fish screen system.

The primary impact on terrestrial species involved the federally listed valley elderberry longhorn beetle. Beetle habitat existed adjacent to the pumping plant and would likely have been affected by the construction. Mitigation was accomplished by transplanting 211 elderberry shrubs from the fish screen construction area to 29 acres of land purchased in fee for the Service along the river. The program also planted 6,718 elderberry bush associate plants to mimic natural riparian habitat conditions, and has provided 10 years of maintenance

and monitoring on the adjacent site to ensure survival of all species. The Service has accepted the mitigation areas and incorporated them into an existing refuge.

2009 Accomplishments

The principal efforts in 2009 were to complete the operations and maintenance manual; initiate the transfer of ownership of the structures to GCID; and close out the cost sharing assistance agreements and associated activities.

The project and related testing and monitoring are 100 percent complete. The completed facility screens up to 105,000 acre-feet of firm annual water supply to 20,000 acres of Sacramento National Wildlife Refuge lands.

Glenn-Colusa Irrigation District Fish Screen

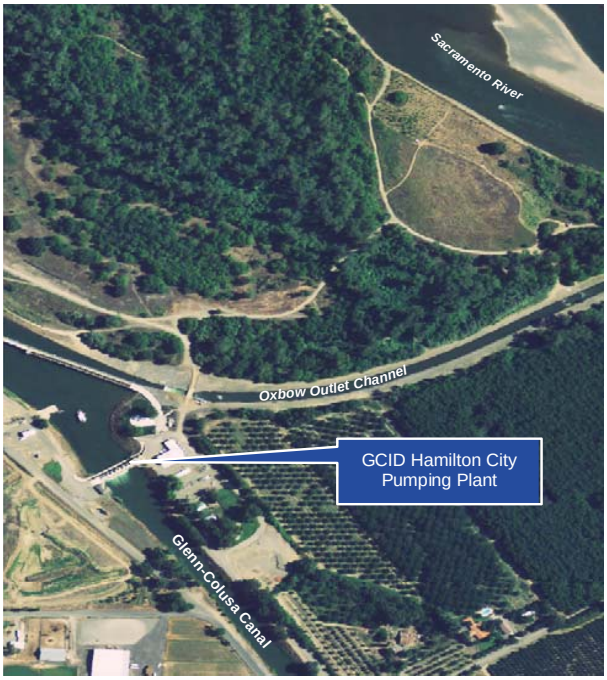


Figure 24. Glenn-Colusa Irrigation District Pumping Plant

Anadromous Fish Screen Program

Fisheries Resource Area (Central Valley)

FY 2009

CVPIA Funding Obligations by Funding Source

- Restoration Fund - $3,920,000
- Water and Related - $3,145,000
- Bay Delta - $ 500,000

TOTAL - $7,565,000

Accomplishments

- Completed construction of the Phase I Meridian Farms Fish Screen Project to screen 30 cfs at the New Grimes diversion (Sacramento River)
- Continued implementation of a four-year screening and monitoring program on the Sacramento River in partnership with CALFED ERP and the Family Water Alliance. Activities included monitoring at three diversion sites and selection of an additional five sites to monitor in 2010
- Continued to provide technical assistance for on-going AFSP projects including the Natomas Mutual (Sacramento River), Patterson (San Joaquin River), RD 2035 (Sacramento River), Meridian Farms (Phase II) (Sacramento River), and Yuba City (Feather River) fish screens

CVPIA Section 3406(b)(21)

"Assist the State of California in efforts to develop and implement measures to avoid losses of juvenile anadromous fish...measures shall include but shall not be limited to construction of screens on unscreened diversions, rehabilitation of existing screens, replacement of existing non-functioning screens, and relocation of diversions to less fishery-sensitive areas."

The AFSP assists the State of California in efforts to develop and implement measures, including construction, replacement, and rehabilitation of fish screens and relocation of diversions, to protect juvenile Chinook salmon, steelhead trout, green sturgeon, and white sturgeon from entrainment at priority water diversions throughout the Central Valley and Sacramento-San Joaquin Delta. The AFSP actions contribute to the goal defined in CVPIA Section 3406(b)(1), which requires Interior to make all reasonable efforts to double the natural production of anadromous fish in Central Valley streams.

To date, the AFSP has assisted the state in screening 25 diversions ranging from 17 cfs to 960 cfs for a cumulative total of approximately 4,600 cfs (Table 15).

Currently, there are approximately 4,560 remaining unscreened diversions, including:

- Approximately 750 in the Sacramento River system
- Approximately 950 in the San Joaquin River system
- Approximately 2,500 in the Sacramento-San Joaquin Delta
- Approximately 360 in the Suisun Marsh basin

A long-term implementation plan is being developed for CVPIA that will identify priority restoration actions including fish screens; therefore, the exact number of screens to be constructed in the future has not yet been defined.

The AFSP provides assistance to the state by matching state funding. The AFSP can provide up to 50 percent of the cost of a fish screen project. In recent years, state funding for fish screens has come through the CALFED Ecosystem Restoration Program (ERP). The AFSP

Table 15. AFSP Projects and Cubic Feet per Second (cfs) Screened, Central Valley (1992-2009)

	Project Completed	Project Location*	CFS Screened (Annual)	Number of Projects (Annual)
1992-1995	N/A	N/A	0	0
1996	Pelger Mutual Water Company	Sacramento River	40	1
	Wilson Ranch	Sacramento River	40	1
1997	Suisun Resource Conservation District	Suisun Marsh	93	5
	Maxwell ID	Sacramento River	100	1
	Parrot-Phelan (M&T)	Sacramento River	150	1
1998	Western Canal	Butte Creek	siphon	1
1999	Browns Valley ID	Yuba River	65	1
	Gorrill Land Company	Butte Creek	122	1
	Adams Ranch (Rancho Esquon)	Butte Creek	135	1
	RD 1004	Sacramento River	290	1
	Princeton-Cordora Glenn & Provident ID	Sacramento River	605	1
2000	Dayly Lee	Steamboat Slough	20	1
	RD 108 (Wilkins Slough)	Sacramento River	832	1
2001	N/A	N/A	0	0
2002	N/A	N/A	0	0
2003	Lower Butte Creek (Wier #3)	Butte Creek (Sutter Bypass)	fish ladders & barriers	1
2004	Fairbairn (City of Sacramento)	American River	210	1
	Banta Carbona	San Joaquin River	260	1
2005	Sacramento River Water Treatment Plant (City of Sacramento)	Sacramento River	245	1
2006	RD 999	Sacramento River	100	1
2007	Sutter Mutual	Sacramento River	960	1
2008	RD 108 (Emery Poundstone)	Sacramento River	300	1
2009	Meridian Farms Phase I (New Grimes)	Sacramento River	30	1
TOTAL			**4,597**	**25**

* See Figure 25

also provides technical support to a diverter during the planning, design, and construction phases of a fish screen project.

MEASURING SUCCESS

In 2009, construction was completed on the Phase I Meridian Farms (New Grimes) Fish Screen Project. This project constructed a new 30 cfs screened pumping plant with fish screen located north of the unscreened Grimes diversion. This fish screen project protects out-migrating spring-, fall-, and winter-run Chinook salmon and Central Valley steelhead as well as resident game and non-game fish from entrainment. Operation and maintenance of the fish screen is the responsibility of Meridian Farms Water Company.

In 2009, the AFSP continued to provide technical assistance (design, environmental and/or permitting) for several large fish screen projects which have not yet secured full construction funding, including:

- Natomas Mutual: Project to consolidate five diversions totaling 630 cfs into two screened diversions on the Sacramento River
- Patterson Irrigation: Project to screen a 195 cfs diversion on the San Joaquin River

- RD 2035: Project to screen a 400 cfs diversion on the Sacramento River
- Meridian Farms Phase II: Project to consolidate two diversions totaling 135 cfs into a one screened diversion on the Sacramento River
- City of Yuba City Fish Screen: Project to screen a 74 cfs municipal diversion on the Feather River

In 2009, the AFSP continued implementation of a a four-year screening and monitoring program in partnership with CALFED ERP and the Family Water Alliance. The AFSP is implementing this program to assess the biological benefits of fish screening and to help prioritize future fish screening efforts. This program, which includes collection of fish loss data prior to installing fish screens, is focused on the Sacramento River. Activities conducted for this monitoring program in 2009 included monitoring at three diversion sites and selection of an additional five sites to monitor in 2010.

The AFSP issued the following final reports: "Literature Search and Data Analysis of Fish Loss at Unscreened Diversions in California's Central Valley", "Evaluation of Unscreened Diversions 2007-2008", and "Surveys of Water Diversions in the Sacramento River – 2008". This information will improve understanding of which specific diversions are the most important to screen by allowing correlation of site-specific characteristics to fish entrainment data from past and future monitoring efforts. The AFSP participated in and supported CALFED ERP Fish Screen Forum workshops to enhance agency coordination on fish screen projects and share technical information pertaining to fish screening.

Meridian Farms New Grimes Diversion Fish Screen Project (Sacramento River). This is a stainless steel wedgewire cylindrical fish screen with internal and external cleaning brushes. A track allows the screen to be pulled up for inspections and during non-irrigation periods.

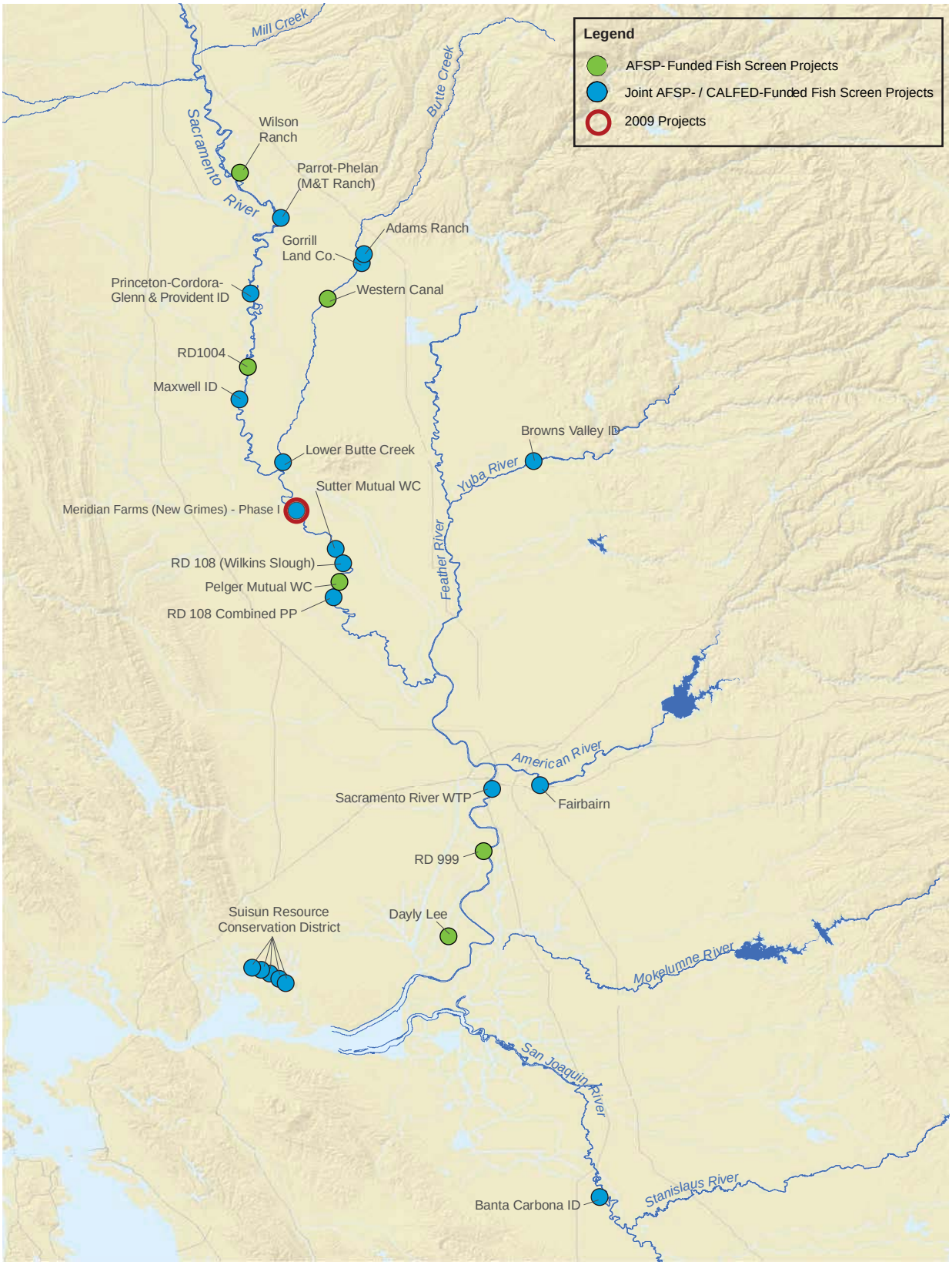


Figure 25. CVPIA Fish Screens Constructed (1992-2009)

San Joaquin River Restoration Program

Fisheries Resource Area (San Joaquin River Basin)

FY 2009

CVPIA Funding Obligations by Funding Source

- Restoration Fund - $13,820,000
- Bay Delta - $ 998,000

TOTAL - $14,818,000

Accomplishments

- Continued work on a Program-level environmental document that analyzes the impacts of the implementation of the SJRRP
- Completed a draft of the Fisheries Management Plan and distributed for public review
- Completed environmental compliance activities for the first year of initial experimental flow releases from Friant Dam, termed Interim Flows
- Continued preparation of specific operational guidelines for releasing Restoration Flows and the framework for the Recovered Water Account
- Continued development of a plan to recirculate water back to the Friant Division long-term contractors

CVPIA Section 3406(c)(1)

"The Secretary shall . . . develop a comprehensive plan which is reasonable, prudent, and feasible to address fish, wildlife, and habitat concerns on the San Joaquin River, including but not limited to the streamflow, channel, riparian habitat, and water quality improvements that would be needed to reestablish where necessary and to sustain naturally reproducing anadromous fisheries from Friant Dam to its confluence with the San Francisco Bay/Sacramento-San Joaquin Delta Estuary."

The San Joaquin River is a major tributary to the Sacramento-San Joaquin Delta, historically providing flows from the southern Central Valley. Section 3406(c)(1) mandates the preparation of a reasonable, prudent and feasible comprehensive plan to reestablish and sustain naturally reproducing salmon in the San Joaquin River below Friant Dam to the confluence with the Sacramento-San Joaquin Delta Estuary.

THE SAN JOAQUIN RIVER RESTORATION PROGRAM

Federal Authorization and Legislation

The San Joaquin River Restoration Program (SJRRP) is currently authorized under the CVPIA and the agencies responsible for the management of the SJRRP include Reclamation, the Service, NMFS, DWR, and CDFG. The San Joaquin River Restoration Settlement Act, included in the Omnibus Public Land Management Act of 2009, was signed by the President on March 30, 2009, and became Public Law 111-11. The San Joaquin River Restoration Settlement Act authorizes and directs the Secretary to fully implement the San Joaquin River Restoration Settlement of NRDC[1], et al. v. Kirk Rodgers, et al. (Settlement).

MEASURING SUCCESS

In FY 2009, significant progress was made towards supporting the development of the Program Environmental Impact Statement/Report (PEIS/R) and implementing specific actions in the Settlement, consistent with CVPIA Section 3406(c)(1) and the San

1 The Natural Resources Defense Council

Joaquin River Restoration Settlement Act. Specific accomplishments in FY 2009 include:

Program-wide Activities

- Continued work on a Program-level environmental document that analyzes the impacts of the implementation of the Settlement.
- Provided public access to SJRRP activities through the web, quarterly updates mailed to a broad distribution list, public meetings, public technical feedback meetings, and briefings at local forums.
- Initiated expanded outreach activities for landowners adjacent to the river by providing notifications and field advisories for field activities, holding monthly landowner meetings, and executing a financial assistance agreement with a local agency to provide for a landowner coordinator. Continued to negotiate the terms for Temporary Entry Permits with landowners and the San Joaquin River Resources Management Coalition to allow for access to private property to collect needed data for environmental documentation and facility designs.
- Provided an on-the-ground tour from Friant Dam to the confluence of the Merced River through the Water Education Foundation specific to the SJRRP.

Interim Flow Releases

Restoration Activities

- Developed and released for public review a draft Fisheries Management Plan (FMP). The FMP incorporates Strategic Habitat Conservation Planning concepts and lays out a structured approach to adaptively manage the reintroduction of Chinook salmon and other fishes to the San Joaquin River. The FMP also incorporates many of the recommendations from the Independent Review of the CVPIA Fisheries Program including the following: public feedback in the development process; a life-cycle oriented conceptual model framework; quantitative modeling tools; and a peer review process. The public draft FMP was released in June 2009.
- Completion of a draft 2010 Interim Flow Fisheries Implementation Plan detailing specific monitoring procedures and recommendations to gather the appropriate fisheries and physical habitat needs.
- Completion of a draft Fish Reintroduction schedule that identifies the necessary steps required for the U.S. Fish and Wildlife ESA 10(A)(1)(a) permit application and the subsequent National Marine Fisheries Service Experimental Population Designation (ESA 10(j)) rule making.
- Completed the planning, environmental compliance, and permitting activities for the first year of initial experimental flow releases from Friant Dam, termed Interim Flows, that began on October 1, 2009.
- Initiated planning, environmental compliance, and design efforts for two of the high priority, Phase 1 channel improvements identified in the Settlement:
  - Reach 4B, Eastside Bypass, and Mariposa Bypass Low Flow Channel and Structural Improvements Project, and
  - Mendota Pool Bypass and Reach 2B Channel Improvements Project
- Continued the collection of data regarding cultural resources, topography, geology, and other data required to complete site-specific environmental reviews and engineering designs on public lands and private property where access has been obtained.
- Began drilling activities for groundwater monitoring wells on public rights-of-way and private property where access has been granted to monitor Interim Flows.
- Began blunt-nosed leopard lizard surveys in the Eastside and Mariposa bypasses.

Water Management Activities

- Continued progress on the development of specific operational guidelines for releasing Restoration

Flows and the framework for a Recovered Water Account.

- Continued progress on development of a plan to recirculate water back to the Friant Division long-term contractors.
- Initiated the preparation of Guidelines for Financial Assistance to Local Projects.
- Initiated the Friant-Kern and Madera Canals Expansion Feasibility Study.
- Initiated the Friant-Kern Canal Reverse Flow Pumpback Feasibility Study.

Introduction to the Refuge Water Supply Program

Refuges Resource Area

CVPIA Section 3406(b)(3)

"3406 (b)(3) Develop and implement a program in coordination and in conformance with the plan required under paragraph (1) of this subsection for the acquisition of a water supply to supplement the quantity of water dedicated to fish and wildlife purposes under paragraph (2) of this subsection and to fulfill the Secretary's obligations under paragraph 3406(d)(2) of this title…."

CVPIA Section 3406(d)(1)

"3406 (d)(1)Upon enactment of this title, the quantity and delivery schedules of water measured at the boundaries of each wetland habitat area described in this paragraph shall be in accordance with Level 2 of the "Dependable Water Supply Needs" table for those habitat areas as set forth in the Refuge Water Supply Report and two-thirds of the water supply needed for full habitat development for those habitat areas identified in the "San Joaquin Basin Action Plan/Kesterson Mitigation Action Plan Report…"

CVPIA Section 3406(d)(2)

"3406 (d)(2) Not later than ten years after enactment of this title, the quantity and delivery schedules of water measured at the boundaries of each wetland habitat area described in this paragraph shall be in accordance with Level 4 of the "Dependable Water Supply Needs" table for those habitat areas as set forth in the "Refuge Water Supply Report" and the full water supply needed for full habitat development for those habitat areas identified in the "San Joaquin Basin Action Plan/ Kesterson Mitigation Action Plan Report..."

CVPIA Section 3406(d)(5)

"3406 (d)(5) The Secretary is authorized and directed to construct or to acquire from non-Federal entities such water conveyance facilities, conveyance capacity, and wells as are necessary to implement the requirements of this subsection; provided, that such authorization shall not extend to conveyance facilities in or around the Sacramento-San Joaquin Delta Estuary..."

The Refuge Water Supply Program (RWSP) is comprised of three components :

Water Acquisition

- 3406 (b)(3) Water Acquisition Program (WAP) - acquisition of Incremental Level 4 quantities specified in 3406 (d)(2)

Conveyance

- 3406 (d)(1), (2) & (5) Refuge Water Conveyance – delivery of Level 2 water and Incremental Level 4 water

Facilities Construction

- 3406 (d)(5)
  - Refuge Facilities Construction – specific facilities construction to support delivery of water to those lands identified in the *Report on Refuge Water Supply Investigations, March 1989* report; and

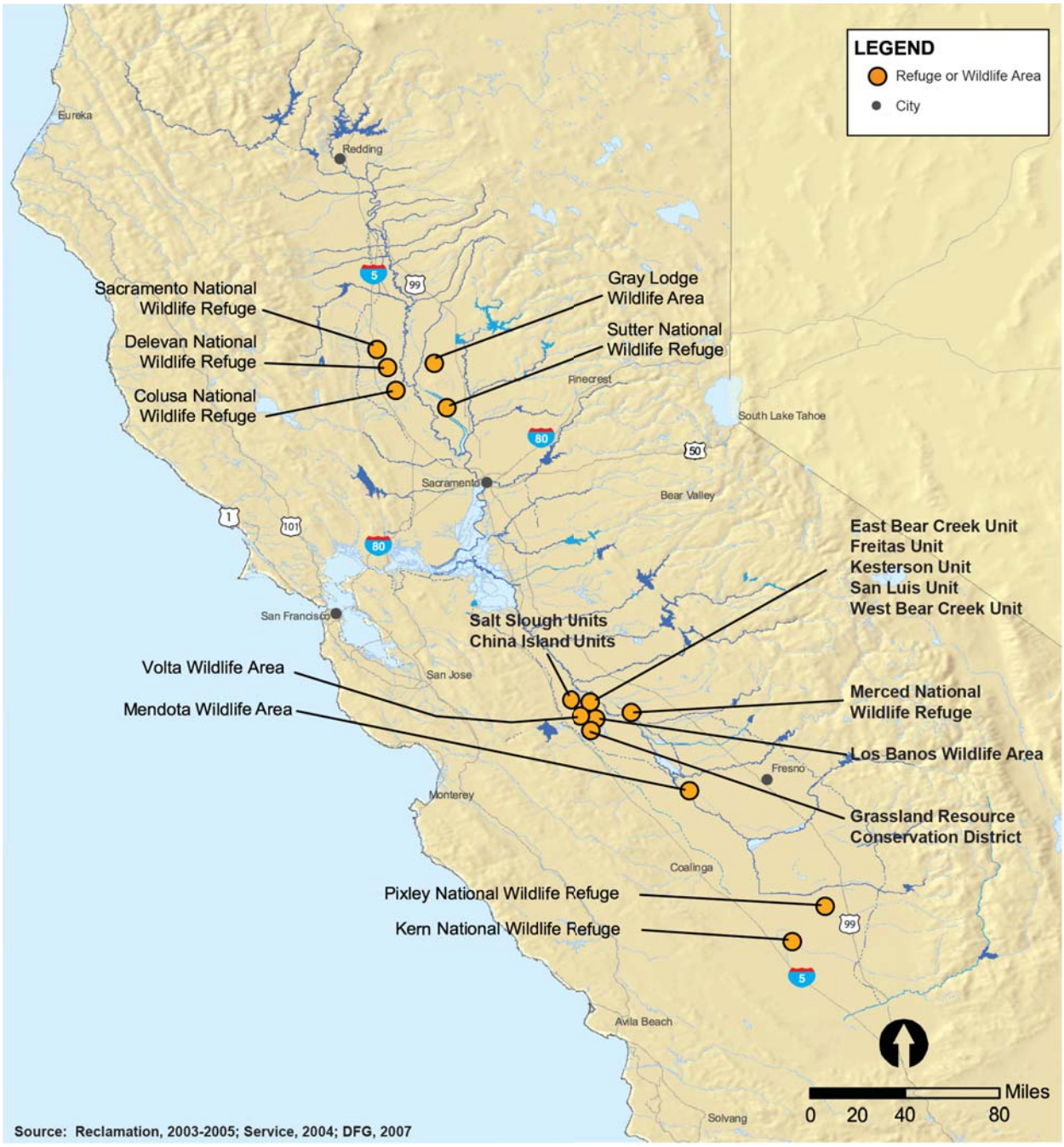


Figure 26. Central Valley Refuges Receiving CVPIA Water Supplies

- San Joaquin Basin Action Plan Lands (SJBAPL) – specific facilities construction to support delivery of water to the lands specified in the *San Joaquin Basin Action Plan/ Kesterson Mitigation Action Plan, December 1989* report

The RWSP's goal is to ensure that all CVPIA identified wetland habitat areas, hereinafter referred to as refuges, annually receive water of specified quantity, suitable flow rate, and suitable quality to support their wetland and aquatic environments. A total of 19 refuges are served by the program (shown in Figure 26). The RWSP's water accounting of acquisitions and deliveries is done in accordance with Reclamation's Mid-Pacific Region's water service contract year (CY). The CY begins March 1 and ends on the last day of February in the following year. The RWSP components (acquisition, conveyance, and construction) work together to implement the CVPIA provisions.

The RWSP's three water types are defined as Level 2 water, Incremental Level 4 water, and Full Level 4 water, as shown in Table 16.

Level 2 is the amount of water required for minimum wetlands and wildlife habitat management, based on historic average annual deliveries before 1989. Reclamation is required to annually provide full Level 2 water supplies. Most Level 2 water is provided from the yield of CVP water. A portion of Level 2 water is provided from non-CVP diverse sources. The Level 2 annual water delivery target is 396,244 acre-feet.

Full Level 4 is the total annual amount of water identified for each refuge in CVPIA as required for optimum wetlands and wildlife habitat development and management. The Full Level 4 water delivery target for the 19 refuges is 555,515 acre-feet.

Incremental Level 4 water is the difference between Level 2 and Full Level 4 water supplies; it equals 159,271 acre-feet. Each year, Reclamation strives to provide as much Incremental Level 4 water as possible. The CVPIA specifies that Reclamation must acquire this Incremental Level 4 water supply through voluntary measures such as water conservation, conjunctive use, purchase, lease, donation, or similar activities.

Level 2 and Full Level 4 allocation numbers were derived from two reports titled "*Report on Refuge Water Supply Investigations March 1989*" and "*San Joaquin Basin Action Plan/Kesterson Mitigation Action Plan December 1989*" published by Interior and incorporated into CVPIA by reference. These reports collated all existing information on existing and required water use, power needs, surface water delivery systems, groundwater availability, recreation, wildlife resources, and habitat management objectives for all of the refuges. Based on this information, alternative plans were formulated to provide dependable water supplies for each refuge, utilizing several water delivery "options," including Level 2 and Level 4.

Table 17 shows the Level 2 and Incremental Level 4 amounts of water allocated to each refuge according to the 1989 reports. Allocations under the refuge water supply contracts between Reclamation and refuge managing agencies vary somewhat between Level 2 and Incremental Level 4 amounts, and this is footnoted in Tables 15 and 16. However, the total Level 4 allocations for each refuge remain the same.

Long-Term Supply Contracts Provide Stability for Refuge Operators

To ensure reliability for refuge managers, Reclamation entered into long-term water supply contracts with the three refuge managing agencies: CDFG, the Service, and Grassland Water District (GWD). These contracts have a performance period of 25 years and are renewable, representing Reclamation's commitment under CVPIA to provide sufficient water for wetlands and aquatic habitats.

Each year in February or March and monthly thereafter through May, Reclamation's Central Valley Operations Office announces the water supply allocation available to the CVP contractors and CVPIA refuges (Level 2 water) for the current CY. Level 2 water is water from CVP yield. Concurrently, the Interagency Refuge Water Management Team (IRWMT) establishes the initial annual Level 2 and Incremental Level 4 water delivery schedules for each refuge by March 1. The IRWMT is comprised of representatives from Reclamation, the Service, CDFG, GWD, and the Central Valley Joint Venture. The creation of this team was established through a provision in the long-term water supply contracts.

Use of Groundwater for Refuge Water Supplies

The RWSP strives to expand its current diversification of sources of water to meet the needs of the refuges in the absence of surface water supplies, which is subject to variable hydrologic conditions, and sufficient funding for water acquisition. For example, the RWSP has pursued groundwater projects in partnership with local water districts. The primary advantage of groundwater is that it usually does not require external conveyance if the groundwater sources can be located at or near the refuges. The lower cost of groundwater is also an advantage, although one downside is that in some locations groundwater has poorer quality, particularly in the San Joaquin Valley. It is critical to monitor groundwater quality so as not to degrade the general quality of water on the refuges.

The Pixley and Merced National Wildlife Refuges and the Gray Lodge Wildlife Area have used groundwater to provide a portion of their Level 2 supplies, and

Table 16. Refuge Water Type and Mandated CVPIA Target

Water Type	Volume Required by the Act (Acre-Feet Per Year)
Level 2 water	396,244[a]
Incremental Level 4 water	159,271[a]
Full Level 4 water	555,515

[a] The totals of 396,244 ac-ft of Level 2 water and 159,271 ac-ft of Incremental Level 4 water from the "1989 Reports" differ from the totals of Level 2 and Incremental Level 4 water under the Water Supply Contracts by 26,007 ac-ft. Level 2 water under the Water Supply Contracts includes Replacement water of 26,007 ac-ft. Replacement water is water which Reclamation provides from Central Valley Project yield to certain CVPIA refuges through contracts with refuge managing agencies executed prior to the passage of CVPIA. Under the Water Supply Contract, the Incremental Level 4 amounts have been reduced by this same amount.

Table 17. Water Allocations by Refuge from 1989 Reports

Refuge Name - Region	Full Level 4 Water (Acre-Feet)	Level 2 Water (Acre-Feet)	Incremental Level 4 Water (Acre-Feet)
Grassland Water District (private) - San Joaquin Valley			
Grassland Resource Conservation District	180,000	125,000	55,000
CA Department of Fish and Game - Sacramento Valley			
Gray Lodge Wildlife Area	44,000	35,400	8,600
CA Department of Fish and Game - San Joaquin Valley			
Volta Wildlife Area	16,000	10,000	6,000
Los Banos Wildlife Area	25,000	16,670	8,330
Salt Slough Unit	10,020	6,680	3,340
China Island Unit	10,450	6,967	3,483
Mendota Wildlife Area	29,650	18,500	11,150
U.S. Fish and Wildlife Service - Sacramento Valley			
Sacramento National Wildlife Refuge	50,000	46,400	3,600
Delevan National Wildlife Refuge	30,000	20,950	9,050
Colusa National Wildlife Refuge	25,000	25,000	0
Sutter National Wildlife Refuge	30,000	23,500	6,500
U.S. Fish and Wildlife Service - San Joaquin Valley			
San Luis Unit	19,000	13,350	5,650
Kesterson Unit	10,000	3,500	6,500
West Bear Creek Unit	10,810	7,207	3,603
Freitas Unit	5,290	3,527	1,763
Merced National Wildlife Refuge	16,000	13,500	2,500
East Bear Creek Unit	13,295	8,863	4,432
U.S. Fish and Wildlife Service - Tulare Lake Basin			
Kern National Wildlife Refuge	25,000	9,950	15,050
Pixley National Wildlife Refuge	6,000	1,280	4,720
TOTAL	555,515	396,244[a]	159,271[a]

[a] The totals of 396,244 ac-ft of Level 2 water and 159,271 ac-ft of Incremental Level 4 water from the "1989 Reports" differ from the totals of Level 2 and Incremental Level 4 water under the Water Supply Contracts by 26,007 ac-ft. Level 2 water under the Water Supply Contracts includes Replacement water of 26,007 ac-ft. Replacement water is water which Reclamation provides from Central Valley Project yield to certain CVPIA refuges through contracts with refuge managing agencies executed prior to the passage of CVPIA. Under the Water Supply Contract, the Incremental Level 4 amounts have been reduced by this same amount.

will continue to use groundwater. Reclamation is participating in additional studies and projects that may result in further increases in groundwater usage as part of long-term refuge water supplies. For example, Reclamation has funded a three year project to examine the utility of integrating groundwater as part of the Incremental Level 4 water supplies provided to those refuges served by the GWD.

In FY 2009, Reclamation initiated rehabilitation of existing groundwater wells and the design and construction of new groundwater pumping wells at Gray Lodge and Volta Wildlife Areas, Pixley National Wildlife Refuge, and Grassland Resource Conservation District under the ARRA. Once completed, these groundwater pumping wells will provide groundwater to these refuges. These ARRA funded groundwater pumping wells are expected to be operational by late fall 2010.

Improving Quality of Water Supplies

In late FY 2007, Reclamation entered into an agreement with GWD to implement a water quality monitoring program on lands within the Grasslands Ecological Area. GWD will be monitoring water quality on the Grassland Resource Conservation District, and refuge lands managed by CDFG and the Service. Equipment installation and initial data collection began in 2009. The data generated will be used to manage wetlands more efficiently and monitor the quality of water leaving the refuges.

The RWSP has developed a draft Refuge Water Quality Best Management Practices (BMP) Plan, with the Service as project lead. The BMP Plan is a requirement of the 2005 CALFED legislation to reduce water quality impacts of refuge discharges that receive federal water and discharge into the San Joaquin River. The plan is expected to be finalized in FY 2010 and its conclusions will be put into practice in future years.

The RWSP has already initiated an activity included in the draft BMP plan. This activity implements a water quality monitoring program to track flows and discharges from CVPIA refuges to the San Joaquin River.

Refuge Independent Review

In FY 2009, the RWSP participated in the Refuge Independent Review process. The RWSP developed presentations, provided supportive documentation, performed research, drafted responses to panel inquiries, and coordinated response efforts between RWSP staff and public meeting participants. This activity was a result of the Office of Management and Budget (OMB)'s Program Assessment and Rating Tool (PART) process.

Water Acquisition Program - Refuge Water

Refuges Resource Area

FY 2009

CVPIA Funding Obligations by Funding Source

- Restoration Fund - $6,154,000

TOTAL - $6,154,000

Accomplishments

- Acquired 31,663 acre-feet of water for Incremental Level 4 deliveries during FY 2009
- Modified agreement with GWD to continue to implement a water quality monitoring program on lands within the Grassland ecological area

CVPIA Sections 3406(b)(3) and 3406(d)(2)

Per the Act, Full Level 4 water supplies were to be delivered to all CVPIA refuges on an annual basis by 2002. Unfortunately, this target was not and has not been achieved for the following key reasons: 1) insufficient funding; 2) variable hydrology (currently, California is experiencing a prolonged drought that may be entering its fourth year); 3) lack of water; 4) lack of willing sellers; and 5) variable water market conditions that are influenced by hydrology, water availability, crop market prices, as well as other factors. The uncertainties inherent in these reasons in any given year, makes the acquisition of Incremental Level 4, which has a limited budget, unpredictable and very challenging.

During FY 2002 through FY 2009, the Water Acquisition Program (WAP) acquired between 30,000 and 85,000 acre-feet each year of Incremental Level 4 water for CVPIA refuges. These acquisitions relied primarily on transfers from the San Joaquin River Exchange Contractors, one-year transfers from other CVP contractors and groundwater purchases. The average of this volume represents approximately 40 percent of the mandated Incremental Level 4 water quantity (159,271 acre-feet).

Pintail Ducks, Sacramento National Wildlife Refuge

MEASURING SUCCESS

FY 2009 was a dry year (third year of a drought), resulting in very few willing sellers and much higher water prices. Consequently, the WAP was able to purchase only 31,663 acre-feet of water for Incremental Level 4 purposes. Of this amount, approximately 21,737 acre-feet were obtained from the Exchange Contractors, 4,727 acre-feet from Stevenson Water District, and 5,199 acre-feet from a groundwater project operated by the GWD.

In FY 2009, Reclamation modified its agreement with GWD to continue to implement a water quality monitoring program on lands within the Grassland ecological area. GWD will be monitoring water quality on GWD, CDFG refuge lands and USFWS lands. The data generated will be used to manage wetlands more efficiently and monitor the quality of water leaving the refuges.

Refuge Facilities Construction Program and San Joaquin Basin Action Plan Lands Program

Refuges Resource Area

FY 2009

CVPIA Funding Obligations by Funding Source

• Restoration Fund	-	$4,368,000
• Bay Delta	-	$ 12,000
• Water and Related	-	$ 208,000
TOTAL	-	**$4,588,000**

Accomplishments

- Completed draft Design Data Study for conveyance facilities of the BWGWD for conveyance of Refuge water supplies to Gray Lodge WA, covering canal water level study, flow measurement study, seepage study, proposed system improvements, and cost estimates
- Developed a HEC-RAS[1] model to provide preliminary design for the composite (selected) alternative to convey Level 4 water supplies through the BWGWD system
- Issued a one year extension for continued monitoring of canal water levels and flows. This data was used to refine the HEC-RAS model as final design commenced in late 2009
- Continued testing of the East Bear Creek Phase I Pumping Plant and Pipeline, San Luis NWR, Los Banos, CA. Revised operating procedures were implemented and tested

[1] HEC-RAS is a computer program that modelts the hydraulics of water flow through natural rivers and other channels.

CVPIA Section 3406(d)(5)

As of FY 2009, Reclamation has the physical ability to deliver Full Level 4 supplies to 14 of the 19 CVPIA refuges.

The Refuge Facilities Construction Program and the San Joaquin Basin Action Plan Lands Program identified 17 construction projects (with a total of 46 major structures or actions) required to provide Full Level 4 conveyance capacity to all CVPIA refuges. These infrastructure improvements can be divided into two categories:

- Modify existing facilities–Existing conveyance facilities can be upgraded to overcome capacity constraints
- Construct new facilities–New facilities are constructed where there is no existing system, or where modifications to an existing system would not be sufficient to meet demand

To date, these two programs have completed 31 of the 46 major structures or actions identified in the environmental documents and related design and specification documents. Table 18 lists all major structures or actions completed, with 1997 being the first year for completion.

MEASURING SUCCESS

Refuge Facilities Construction Program – 2009 Accomplishments

Reclamation completed the draft Design Data Report on conveyance facilities of the Biggs-West Gridley Water District (BWGWD) for conveyance of Refuge water supplies to Gray Lodge WA. This report analyzes several aspects of the proposed conveyance facility including canal water levels, flow through the facility, and seepage; the report also provides a list of system improvements and cost estimates. Also, Reclamation completed a composite HEC-RAS model that was a combination of alternatives for the conveyance facilities of the BWGWD. The composite alternative further

refined the extent of conveyance system improvements needed to satisfy the delivery of Full Level 4 water supplies to the Gray Lodge WA.

The program developed an internal draft acquisition plan for BWGWD to contract final design services. Reclamation continued to evaluate design-build options and construction sequencing plans.

Reclamation extended the intensive monitoring of the BWGWD canal system to collect information on operations and canal response to changes in the water supply.

San Joaquin Basin Action Plan - 2009 Accomplishments

Work in FY 2009 consisted of the final construction inspections and in-depth testing of the Phase I, East Bear Creek Pumping Plant and Pipeline at the San Luis NWR in Los Banos, California. Final training exercises to familiarize USFWS staff with the operation of the pumping plant and related facilities are expected to occur in the first quarter of FY 2010 and the project will be substantially complete the second quarter of FY 2010.

East Bear Creek Unit, Storage and Regulating Reservoir

Table 18. Cumulative Completed Construction Actions by Year (1997-2009) for the Refuge Facilities Construction Program and San Joaquin Basin Action Plan Lands Program

Fiscal Year	Number of Major Structures/ Actions (Completion Percent of 46 Major Structures/Actions Target)
1997	3 actions (7%)
1998	5 actions (11%)
1999	11 actions (24%)
2000	21actions (46%)
2001	22 actions (48%)
2002	23 actions (50%)
2003	24 actions (52%)
2004	28 actions (61%)
2005	30 actions (65%)
2006	30 actions (65%)
2007	31 actions (67%)
2008	31 actions (67%)
2009	31 actions (67%)

Refuge Water Conveyance (Wheeling) Program

Refuges Resource Area

FY 2009

CVPIA Funding Obligations by Funding Source

- Restoration Fund - $8,351,000

TOTAL - $8,351,000

Accomplishments

- Delivered approximately 367,842 acre-feet of Level 2 water to the refuges in FY 2009; approximately 56,991 acre-feet was delivered from diverse sources such as groundwater and water rights water
- Delivered approximately 39,690 acre-feet of Incremental Level 4 water to the refuges in FY 2009
- Negotiated a fifth amendment to extend the groundwater pumping reimbursement agreement with CDFG. Groundwater combined with limited surface water deliveries provides Full Level 2 water supplies at Gray Lodge Wildlife Area
- Continued the cost share development process to determine current cost share apportionment for the State of California related to Incremental Level 4 water supplies
- Continued management of a conservation easement of 113 acres of giant garter snake mitigation habitat
- Completed final design on Gray Lodge/Pixley Well Construction Project
- Participated in the Refuge Independent Review process

CVPIA Sections 3406(d)(1), (2), and (5)

Reclamation delivered approximately 92 percent of Level 2 water on average, between 2002 and 2009[1]. This includes water from diverse sources other than CVP yield. Reclamation also delivered approximately 52 percent of Incremental Level 4 water on average during this same time period. These percentages are based on the water allocations from the refuge Water Supply Contracts.

Numerous biological benefits have resulted from a reliable year-round water supply through CVPIA that adequately meets the delivery schedule for wetland management on CVPIA refuges. Habitat is now available during the months of August and early September that benefits early migrant waterfowl and shorebirds; habitat is also provided for resident wildlife and their young during a critical time of the year when wetland habitat can be particularly limited by hydrology. Applying water for semi-permanent and permanent wetland habitat in the spring and summer directly benefits the recovery of special status species such as the giant garter snake, white-faced ibis, and tricolored blackbirds. Wintering wildlife also benefit from this habitat diversity.

Seasonal wetlands are now maintained and de-watered to coincide with peak migration times of shorebirds and waterfowl. Timely de-watering also promotes the germination and irrigation of important moist-soil food plants, such as swamp timothy grass and watergrass. These plants provide a high-energy food source through both their seeds and associated invertebrate communities. The increase in supply reliability allows wetland managers to lower water depths to make seeds and invertebrates available without the fear of having wetlands completely evaporate.

[1] Accounting for Refuge water deliveries is in accordance with Reclamation's refuge Contract Water Year, which begins March 1 and ends on the last day of February in the following year.

MEASURING SUCCESS

In FY 2009, approximately 367,842 acre-feet of Level 2 water was delivered to the refuges. Of that number, 56,991 acre-feet were from diverse sources other than Project water, such as water rights water and groundwater. And approximately 39,690 acre-feet of Incremental Level 4 water (after accounting for conveyance losses of 1,349 acre-feet) was delivered to the refuges.

Snow Geese, Sacramento National Wildlife Refuge

In FY 2009, Reclamation negotiated an amendment to the Gray Lodge WA groundwater pumping reimbursement agreement with CDFG and extended the term through the end of Contract Water Year 2009. Groundwater is combined with limited surface water deliveries to provide full Level 2 water supplies at Gray Lodge WA.

Reclamation continued the cost share development process to determine current cost share apportionment for the State of California related to Incremental Level 4 water supplies, including water acquisition, certain conveyance facilities construction, and water delivery costs. This process covers FY 2001-2007, and efforts are coordinated with the Service, CDFG, and DWR. The resulting task order will culminate with an invoice to CDFG for their cost share portion.

Reclamation and the Service continued management of a conservation easement of 113 acres of giant garter snake habitat on a privately-owned site in Glenn County. Providing this habitat satisfies the mitigation requirements made necessary by CVPIA refuge conveyance construction activities in the Sacramento Valley. The site was restored from agricultural use to wildlife habitat in 2002 and is maintained annually from May 1 through September 30 in order to meet the critical habitat needs of the giant garter snake during its active season.

Final design was completed for the Gray Lodge and Pixley Well Construction Project. This project will result in additional groundwater for use as a portion of Level 2 water supplies at the Gray Lodge WA and Pixley National Wildlife Refuge.

Ecosystem and Water Systems Operations Models

Fisheries Resource Area (Central Valley)

FY 2009

CVPIA Funding Obligations by Funding Source

- Restoration Fund - $898,000

TOTAL - $898,000

Accomplishments

- Applied CalSim II and CalLite models to evaluate provisions in the Delta smelt biological opinion
- Assisted NOAA in utilizing CalSim II, ECOSIM-W and CalLite models to develop feasible Reasonable and Prudent Alternatives for the biological opinion
- Applied the Upper Sacramento River Water Quality Model to support the Sacramento River Temperature Task Group in making and updating plans for the summer season reservoir operations
- Expanded the water quality modeling capabilities on the existing San Joaquin Basin temperature model to include features of modeling water quality parameters (EC concentration and salt loading)
- Engaged consultants services to assist the Service in updating and enhancing the existing salmon population model, inSALMO, for future fishery management modeling needs
- Developed a short-term modeling plan to evaluate modeling tools and future modeling goals
- Continued the development of surface and subsurface watershed and operations model linkage – HGS and CalSim

CVPIA Section 3406(g)

"The Secretary, in cooperation with the State of California and other relevant interests and experts, shall develop readily usable and broadly available models and supporting data to evaluate the ecologic and hydrologic effects of existing and alternative operations of public and private water facilities and systems in the Sacramento, San Joaquin, and Trinity River watersheds. The primary purpose of this effort shall be to support the Secretary's efforts in fulfilling the requirements of this title through improved scientific understanding concerning, but not limited to, the following:

(1) a comprehensive water budget of surface and groundwater supplies, considering all sources of inflow and outflow available over extended periods;

(2) related water quality conditions and improvement alternatives, including improved temperature prediction capabilities as they relate to storage;

(3) surface-ground and stream-wetland interactions;

(4) measures needed to restore anadromous fisheries to optimum and sustainable levels in accordance with the restored carrying capacities of Central Valley rivers, streams, and riparian habitats;

(5) development and use of base flows and channel maintenance flows to protect and restore natural channel and riparian habitat values;

(6) implementation of operational regimes at State and Federal facilities to increase springtime flow releases, retain additional floodwaters, and assist in restoring both upriver and downriver riparian habitats;

(7) measures designed to reach sustainable harvest levels of resident and anadromous fish, including development and use of systems of tradeable harvest rights;

(8) opportunities to protect and restore wetland and upland habitats throughout the Central Valley;

(9) measures to enhance the firm yield of existing Central Valley Project facilities, including improved management and operations, conjunctive use opportunities, development of offstream storage, levee setbacks, and riparian restoration."

The goal of the Ecosystem and Water Systems Operations Models Program (EWSOMP) is to develop the measures specified in the Act that are broadly available and readily accessible and to develop supporting data to evaluate existing and alternative water management strategies. By demonstrating the effect of water operations on quality and quantity of various habitats, these models improve the scientific understanding of ecosystems in the Sacramento, San Joaquin and Trinity watersheds.

As part of the model development process, the program continues to support hydrologic and biologic data collection. Measures to determine the effectiveness of the models and timeframes for this program have not yet been determined.

Since 1998, EWSOMP has provided a high level of support for the development of the integrated CVP/SWP water operation model, CalSim II. The primary benefit of CalSim II has been for planning investigations, including the 2008 Operations Criteria and Plan (OCAP). CalSim II has been used in many studies, including the ongoing CALFED storage and conveyance investigations. CalSim II is available for public review and use. A new version of the model, CalSim III, was jointly developed by Reclamation and DWR in FY 2007. The key objectives in developing the CalSim III model includes: 1) increasing spatial resolution of surface water and conveyance systems so water demand, water supply and water use patterns can be developed in association with local water agencies, with results used for local planning studies; and 2) calibrating the water use efficiency factors using historical diversion data. To respond to the periodic need for less detailed and more rapid analyses, a water management screening tool (CalLite) was also developed in FY 2007. The CalLite model is available to the public through DWR's website. As with any model, improvements continue to be made.

In addition to CalSim II, CalSim III, and CalLite model development, the program has supported the development and application of other types of river management and ecological models. These include water quality, groundwater, fish population, and riparian habitat models used by Reclamation; Service; federal and State water contractors; and public interest organizations for modeling support of operations and planning. This program also supports Reclamation and Service staff participating in modeling forums, professional organizations, conferences and training courses and provides support for model application to State and local partners.

MEASURING SUCCESS

EWSOMP continues to perform data collection activities to support modeling and improve the scientific understanding of ecosystems in the Sacramento, San Joaquin and Trinity watersheds. To date, the program has completed eight types of models of the nine identified in the Act

The models that have been completed are the Upper Sacramento River Water Quality Model (USRWQM), the Riparian Habitat Establishment Model (RHEM), CalSim II, and Land Atmosphere Water Simulation (LAWS). Models that are currently being updated to enhance modeling capabilities include Ecologically Cogent Operations Suite of Integrated Models (ECOSIM), Individual-Based Salmon Life-Cycle Framework (inSALMO) fish population model, HydroGeoSphere (HGS), and SALMOD. CalSim III, San Joaquin Basin Temperature Model, and CalLite model modifications have not been completed (Table 19).

In FY 2009, Reclamation and the Service jointly developed a short-term modeling plan for evaluating the modeling tools and future modeling goals. This short-term plan will set the stage for developing the long-term modeling needs for this program.

Of the models listed in Table 19, the following are currently under development or undergoing significant modifications:

Table 19. Ecosystem and Water Systems Operations Models Developed (1996-2009)

Model	Description	Act Model Type	Initiation/ Operational Date	Agencies Involved in Development
CalSim II	Used for coordinated system-wide planning and operations of CVP and SWP water projects	1, 9 & 6	1998/2002	Reclamation, DWR, Service, federal/State water contractors, Sacramento Valley Settlement Contractors
CalSim III	Used for coordinated system-wide planning and operations of CVP and SWP water projects	1, 9 & 6	2007	Reclamation, DWR, Service, federal/State water contractors, Sacramento Valley Settlement contractors and San Joaquin Valley Exchange Contractors
CalLite	Used for coordinated system-wide operations and water management decision projects	1, 9 & 6	2007	Reclamation, DWR and State water contractors
Upper Sacramento River Water Quality Model (USRWQM)	Used to aid Sacramento River Temperature Task Group in making and updating plans for the summer season reservoir operations	2	2001/2003	Reclamation, Service, NOAA, NMFS, CALFED Integrated Storage Investigation (ISI)
Upper San Joaquin Basin Temperature Model	Used to evaluate basin-wide water temperature and reservoir operation relations	2	2007	CDFG and Reclamation
Riparian Habitat Establishment Model (RHEM)	Used for planning and operations of reservoirs for the recruitment and survival of riparian vegetation. The program no longer supports this modeling activity. Currently, the North of Delta Offstream Storage Investigation (NODOS) project supports this modeling activity	5	2007	Reclamation, CALFED ISI
InSalmo	Used in planning studies to evaluate effects of reservoir operations on anadromous fish spawning, incubation and rearing	4 & 8	1996/2005	Developed by the Service. In FY 2009 Reclamation initiated a contract to enhance the model
SALMOD	Used in planning studies to evaluate effects of reservoir operations on anadromous fish spawning, incubation and rearing habitats	4 & 8	1996/2005	Developed by USGS and refined by USGS and Reclamation contractors; used by Reclamation, Service and CALFED ISI
Land Atmosphere Water Simulation (LAWS)	Used to develop hydrologic budgets and water demands for CalSim model. The program no longer supports this model. Currently, the modeling activity is supported by NODOS Project	6 & 9	2002/2006	Reclamation
HydroGeoSphere (HGS)	Used for planning of surface and subsurface hydrologic interactions related to water supply, water quality and ecosystem restoration	1 & 3	2003/2005	Reclamation
Ecologically Cogent Operations Suite of Integrated Models (ECOSIM)	Used for analyses of changes to the macroscopic water resources for CVP/SWP operations	1, 9 & 6	1998/1998	Service

Water Operations Tools – CalSim II/III Model

The major accomplishments for the CalSim II model in FY 2009 included Service modelers applying CalSim II and CalLite models to evaluate provisions in the Delta smelt biological opinion. At the request of NOAA, Service modelers also applied CalSim II, ECOSIM-W and CalLite models to develop feasible Reasonable and Prudent Alternatives (RPA) for the biological opinion.

CalSim III achieved significant improvement for evaluating hydrology and groundwater in the Sacramento Basin. In FY 2009, Reclamation and DWR modelers continued the improvements and applications of the Graphic Users Interface (GUI) for CalSim III.

Water Management Tool – CalLite Model

In FY 2009, Reclamation and DWR continued testing the CalLite model and incorporated the climate change impacts and sea level rise capabilities. The base model was released in the summer of 2009. This tool provides more rapid and interactive policy evaluation for water conditions and water management actions in the Central Valley. The major accomplishment in FY 2009 was CalLite's extensive use in evaluating part of the 2008 USFWS OCAP biological opinion and its extensive use in screening alternatives for the Bay-Delta Conservation Plan (BDCP).

Ecosystem Modeling Tools Development

A major accomplishment in FY 2009 for ECOSIM was its extensive use in modeling the 2009 NOAA OCAP biological opinion.

Fish Population Modeling Tool

The Service, in coordination with Reclamation, initiated a contract in FY 2009 to significantly enhance the inSALMO fish population model. The purpose of improving this model is to prepare inSALMO for real world management in the Central Valley by adjusting and adding the focus to: 1) seasonal flow/temperature relation to the operations decision, 2) better usage on environmental water, and 3) planning and evaluation of restoration activities.

Surface and Subsurface Integrated Modeling

The linkage of HydroGeoSphere and CalSim includes four major tasks. These tasks include: 1) conduct literature review; 2) modify code; 3) verify and validate the linkage; and 4) prepare historical and future meteorological data for input into the linked model. In FY 2009, the literature review of existing linkage approaches of optimization and groundwater modeling was completed. A brain-storming session was undertaken to initiate evaluation of the linkage between optimization and fully-coupled numerical models. Due to the complexity of the system, the temperature module (based on field data from the San Joaquin Basin) will be continuously tested in FY 2010.

Water Quality Modeling Tools – Water Quality and Temperature Models

The major water quality modeling activities in FY 2009 included: 1) the application of the Upper Sacramento River Water Quality Model to support the Sacramento River Temperature Task Group in making and updating plans for the summer season reservoir operations; and 2) enhancement of the water quality electrical conductivity (EC) concentration and salt loading modeling capability of the existing San Joaquin Basin temperature model. The San Joaquin water quality improvement tasks continued in FY 2009 and will be completed in early FY 2010.

Land Retirement Program

Other Resource Area

FY 2009

CVPIA Funding Obligations by Funding Source

- Restoration Fund - $460,000
- Water and Related - $ 48,000

TOTAL - $508,000

Accomplishments

- Retired 90 acres from agricultural production
- Restored 385 acres to upland habitat by planting native seed mixes at the Atwell Island Land Retirement Demonstration Project site
- Eliminated the production of over 3,500 acre-feet of poor quality agricultural drainage water
- Distributed native seed for the restoration of San Joaquin Valley conservation lands from the decommissioned San Joaquin Valley Native Plant Nursery
- Performed appraisals on seven parcels of land (280 acres) for acquisition at the Atwell Island Land Retirement Demonstration Project site
- Completed a draft report documenting five years of physical and biological monitoring at the Atwell Island Demonstration Project

CVPIA Section 3408(h)

"The Secretary is authorized to purchase from willing sellers land and associated water rights and other property interests…which receives Central Valley Project water under a contract executed with the United States, and to target such purchases to areas deemed most beneficial to the overall purchase program, including the purposes of this title."

The Land Retirement Program (LRP) purchases land, water and other property interests from willing sellers who receive CVP water. By ceasing irrigation of these agricultural lands, the program reduces the volume of agricultural drainage produced, and provides the opportunity to protect and restore the retired land for wildlife habitat.

The San Joaquin Valley Drainage Program (SJVDP) recommended retiring 75,000 acres of drainage impaired farmland from irrigated agricultural production by 2040 (SJVDP, 1990). The LRP has three targets that support this long-term goal:

- Retire 15,000 acres of agricultural land by 2014 for the Land Retirement Demonstration Project (LRDP)
- Restore appropriate habitat on 400 acres of retired lands per year on LRDP sites
- Reduce the production of agricultural drainage water annually by 6,000 acre-feet upon completion of the LRDP

The LRDP was implemented in 1999 at two sites in the western San Joaquin Valley (Tranquillity, managed by Reclamation) and the Tulare Lake Basin (Atwell Island, managed by BLM) to study the environmental impacts of land retirement and to evaluate cost-effective restoration strategies for retired lands (Figure 27).

As stated above, the original program goal was to acquire and retire 15,000 acres for the LRDP. This included 8,000 acres in the Tulare Basin (Atwell Island Site) and 7,000 acres in the San Joaquin Basin (Tranquillity Site). Westlands Water District subsequently retired approximately 100,000 acres in the San Joaquin Basin which superseded the CVPIA land retirement program goals for acquisition in the San Joaquin basin. The program does not plan to pursue any

further land acquisition at the Tranquillity site, but does plan to complete the 8,000 acre goal in the Tulare Basin (Atwell Island Site). When the LRDP acquisition is complete, the program will have acquired 8,000 acres at the Atwell Island site and 2,090 acres at the Tranquillity site for a total of 10,090 acres. To complete the program goal of acquiring 8,000 acres at the Atwell Island site, the program needs to acquire an additional 700 acres at Atwell Island.

MEASURING SUCCESS

Retiring and Restoring Lands

Of the targeted 15,000 acres, to date Interior has acquired approximately 9,300 acres and retired (removed from irrigated agriculture) over 9,000 acres from agricultural production. In 2009, the program retired 90 acres and restored 385 acres of retired land to upland wildlife habitat (Table 20).

In 2009, appraisals were requested for 200 acres of land at the Atwell Island site; offers on these parcels are pending. Willing sellers were also identified for an additional 280 acres and the program performed appraisals on these seven parcels of land for acquisition at the Atwell Island LRDProject site. This will contribute to the 700 acres remaining to be acquired at this site to meet the program goal.

On average, the LRP has exceeded its land restoration performance goal of 400 acres per year. Since 1998, the LRP has restored approximately 5,600 acres. Complete restoration to upland habitats found in the San Joaquin Valley will take many years to achieve, but the program has developed cost effective restoration techniques and continues to adapt these techniques to achieve desired habitat values.

Successful habitat restoration techniques have been developed at the Atwell Island project site. In 2009, 400 acres were planted with seeds of local desert adapted native plants. A good response of annual flora was observed at the restoration sites in the spring of 2009. Approximately 2,400 linear feet of canal bank was also planted with perennial native grasses, shrubs, and trees. Contracts were awarded for collection of seed from native plants in the project vicinity and to grow-out several species that are rare in the wild. Also in 2009, the program distributed native seed for the restoration

Figure 27. Land Retirement Program Sites

of San Joaquin Valley conservation lands from the decommissioned San Joaquin Valley Native Plant Nursery.

Restoration efforts on retired lands immediately increased biodiversity and abundance, including Special Status Species. Wildlife surveys of restored units observed important findings of sensitive San Joaquin Valley wildlife species, including populations of endangered Tipton kangaroo rats, burrowing owls, coast horned lizards, San Joaquin Valley coachwhips, Swainson's hawks and a sensitive plant called Hoover's woolystar. The Atwell Island wildlife sightings database now contains more than 18,000 observations. Using the database, BLM developed plant and animal lists and a photo-illustrated flora for the Atwell Island Project Area.

Reducing Agricultural Drainage

Implementing the LRDP has eliminated the production of approximately 3,500 acre feet of poor quality drain water annually, including in 2009. Five years of groundwater monitoring at the LRDP sites show a declining shallow water table in response to land retirement. The water table responses observed at the LRDP sites are representative of conditions present at a high percentage of lands that are targeted for retirement in the western San Joaquin Valley and the Tulare Lake Basin. The declining shallow water table

Table 20. Land Acquired, Retired & Restored by Year at Tranquillity and Atwell Island Sites (1992-2009)

	Acres Acquired (Annual)		Acres Retired from Agriculture (Annual)	Acres Restored (Annual)
Year	Atwell Island	Tranquillity	Atwell Island and Tranquillity	Atwell Island and Tranquillity
1992	0	0	0	0
1993	0[a]	0	0	0
1994	0	0	0	0
1995	0	591	591	0
1996	0	0	0	0
1997	0	0	0	0
1998	0	995	994	1,220
1999	0	60	61	100
2000	2,645[b]	0	2,645	777
2001	1,414	444	686	702
2002	1,510	0	1,698	373
2003	616	0	250	261
2004	155	0	570	308
2005	625	0	850	349
2006	38	0	38	416
2007	213	0	213	475
2008	0	0	320	320
2009	0	0	90	385
TOTAL	**7,216**	**2,090**	**9,006**	**5,686**

[a] Prospect Island (1228 acres) was purchased in 1995 in Sacramento before the Demonstration Project was initiated and is not considered part of or counted toward the Land Retirement Demonstration Project acquisition total.

[b] 455 acres of this purchase in Atwell Island Water District was paid for by CVP Conservation Program.

observed beneath demonstration project lands indicates the success of land retirement as a drainage reduction strategy.

The declining shallow water table is an important aspect of land retirement because the groundwater beneath the LRDP lands is generally of poor quality with high concentrations of salt and trace elements such as selenium. As long as the water table continues to decline as expected in response to land retirement, the selenium in the groundwater should have no consequences to biota at the site. Decreasing selenium and salinity trends in the surface soil indicate that upward flux of salt and selenium from capillary rise and evaporation of shallow groundwater at the soil surface is minimal, and that some downward leaching of soluble selenium and salt from surface soils occurred during the five-year LRDP study. Selenium concentrations in biota have not changed significantly over the study period and are below concentrations of concern to the U.S. Environmental Protection Agency (EPA) and the Service.

In 2009, a draft report documenting five years of physical and biological monitoring at the Atwell Island Demonstration Project was completed.

APPENDIX A: GLOSSARY OF TERMS

Acre-foot (AF): The quantity of water required to cover one acre to a depth of one foot. Equal to 1,233.5 cubic meters (43,560 cubic feet)

Anadromous fish: Stocks of salmon, steelhead, striped bass, white and green sturgeon, and American shad that ascend the Sacramento and San Joaquin rivers and their tributaries and the Sacramento-San Joaquin Delta to reproduce after reaching maturity in the San Francisco Bay or the Pacific Ocean; fish species that spend most of their lives in the ocean but reproduce in fresh water

Anadromous Fish Restoration Program (AFRP): A program authorized by the CVPIA to address anadromous fish resource issues in Central Valley streams that are tributary to the Delta

Biota: Total collection of organisms of a geographic region or a time period

CALFED Bay-Delta Program: A unique collaboration among 25 state and federal agencies that came together to improve California's water supply and the ecological health of the San Francisco Bay/Sacramento-San Joaquin River Delta

Capillary rise: Movement of water upwards from the water table (the top of the groundwater) into the unsaturated soil above; can be likened to a dry sponge (the unsaturated soil) being placed on top of a wet surface (the water table), the sponge sucking up water being similar to capillary rise in soils

Central Valley: Area in the central portion of California bounded by the Cascade Range to the north, the Sierra Nevada to the east, the Tehachapi Mountains to the south and the coast ranges and San Francisco Bay to the west

Central Valley Project (CVP): As defined by Section 3403(d) of the CVPIA, "all Federal reclamation projects located within or diverting water from or to the watershed of the Sacramento and San Joaquin rivers and their tributaries as authorized by the Act of August 26, 1937 (50 Stat. 850) and all Acts amendatory or supplemental thereto, ..."

Central Valley Project water: As defined by Section 3403(f) of the CVPIA, "all water that is developed, diverted, stored, or delivered by the Secretary in accordance with the statutes authorizing the Central Valley Project in accordance with the terms and conditions of water rights acquired pursuant to California law."

Central Valley Project Improvement Act (CVPIA): Public Law 102-575, Title 34. This law was passed in 1992 for the following purposes:

a) Protect, restore, and enhance fish, wildlife, and associated habitats in the Central Valley and Trinity River basins of California

b) Address impacts of the Central Valley Project on fish, wildlife and associated habitats

c) Improve the operational flexibility of the Central Valley Project

d) Increase water-related benefits provided by the Central Valley Project to the State of California through expanded use of voluntary water transfers and improved water conservation

e) Contribute to the State of California's interim and long-term efforts to protect the San Francisco Bay/Sacramento-San Joaquin Delta Estuary

f) Achieve a reasonable balance among competing demands for use of Central Valley Project water, including the requirements of fish and wildlife, agricultural, municipal and industrial and power contractors

Central Valley Habitat Joint Venture (CVHJV): The association of federal and state agencies and private parties established for the purpose of developing and implementing the North American Waterfowl Management Plan as it pertains to the Central Valley of California

Constant Fractional Marking Program (CFM): When fish are counted for CVPIA monitoring, program managers differentiate between wild and hatchery fish; hatcheries mark a percentage of juveniles before they are released and when fish come back to spawn, the mark will indicate which were hatchery-born

Diversion: Area where river water is rerouted in a direction other than its natural course

Entrainment: When fish are diverted from their natural spawning course (e.g., caught in a water pump or diverted from the river into a canal)

Environmental Impact Statement (EIS): An analysis required by the National Environmental Policy Act (NEPA) for all major federal actions, which evaluates the environmental risks of alternative actions

Escapement: Measurement of adult spawning anadromous fish (e.g., salmon) that manage to return to their spawning stream

Firm water supplies: Non-interruptible water supplies guaranteed by the supplier to be available at all times except for reasons of uncontrollable forces or continuity of service provisions

Flow: The volume of water passing a given point per unit of time, usually measured in cubic feet per second (cfs)

Habitat: Area where a plant or animal lives

Level 2: A term used to refer to refuge water supply deliveries; the 1989 and 1992 Refuge Water Supply Studies define Level 2 refuge water supplies as the average amount of water the refuges received between 1974 and 1983

Level 4: A term used to refer to refuge water supply deliveries; Level 4 refuge water supplies are defined in the 1989 and 1992 Refuge Water Supply Studies as the amount of water for full development of the refuges based upon management goals developed in the 1980s

Measure: A type of program activity defined by CVPIA provisions that includes specific physical or structural actions

Metric: The defined quantifiable measurement of outputs or outcomes

Mitigation: One or all of the following: (1) Avoiding an impact by not taking a certain action or parts of an action; (2) minimizing impacts by limiting the degree or magnitude of an action and its implementation; (3) rectifying an impact by repairing, rehabilitating, or restoring the affected environment; (4) reducing or eliminating an impact over time by preservation and maintenance operations during the life of an action; and (5) compensating for an impact by replacing or providing substitute resources or environments

Natural Production: As defined by Section 3403(H) of the CVPIA, “fish produced to adulthood without direct human intervention in the spawning, rearing, or migration processes”

Outcome: The intended results or consequences to be achieved through implementing measures and programs described in the CVPIA

Output: The specific actions, measures, programs and services produced by Reclamation and the Service and provided to the public or others; outputs are the activities of the CVPIA Program to achieve the outcomes defined by the Act or developed by Reclamation and the Service to achieve the environmental restoration purposes

Pelagic Organism Decline: A recent decline in both abundance and species richness of pelagic (living in water above the bottom) organisms within the Sacramento-San Joaquin Delta; pelagic organisms include, most notably, the delta smelt and longfin smelt, federally-listed endangered species of fish

Program: The overall effort to implement the provisions of CVPIA

Program Activity: The individual provisions of CVPIA that are being implemented by “program managers” at Reclamation and the Service

Program Manager: The staff at Reclamation and the Service that oversees implementation of the CVPIA program activities; each active program activity has a program manager from its respective agency

Redd Dewatering: Occurs when redds (fish egg “nests”) are left exposed by receding water levels

Restoration Fund: The fund established by Section 3407 of the CVPIA to contribute resources for the environmental restoration provisions of the Act; revenue comes into the fund primarily through surcharges on water and power contract rates

Restoration Fund Roundtable: A collective of stakeholders representing environmental organizations, federal and state resource agencies, water and power contractors, and other interested parties who meet as needed to discuss issues, news and activities related to the CVPIA and provide information to Reclamation and the Service

Riparian: Of or relating to or located on the banks of a river or stream

South Delta: Sacramento-San Joaquin Delta

Stranding: A term used to describe fish that are trapped in pools of water that have no connectivity to the larger stream because of insufficient flow

Target: The quantifiable or otherwise measurable characteristics that tell how well a program must accomplish a performance measure

Taxa: Designating an organism or group of organisms

Timeframe: The period of time when program activities occur (e.g. annual or long-term) that combine with a performance measure and target, establish a performance goal

Water Acquisition: The purchase of water from willing sellers

Weir: Type of fish ladder that utilizes a series of small dams and pools to create a long channel and allow spawning fish to get around an obstruction, like a dam

APPENDIX B: ACRONYMS

ACID	Anderson-Cottonwood Irrigation District
ADA	Americans with Disabilities Act
AF	acre-feet
AFRP	Anadromous Fish Restoration Program
AFSP	Anadromous Fish Screen Program
AIWD	Atwell Island Water District
ALC	American Land Conservancy
ARRA	American Recovery and Reinvestment Act
ASD	Appraisal Services Directorate
BA	Biological Assessment
BDCP	Bay-Delta Conservation Plan
BLM	Bureau of Land Management
BMP	Best Management Practices
BO	Biological Opinion
BWGWD	Biggs West Gridley Water District
CAMP	Comprehensive Assessment and Monitoring Program
CCWD	Contra Costa Water District
CCASMP	Clear Creek Anadromous Salmonid Monitoring Program
CDFG	California Department of Fish and Game
CEQA	California Environmental Quality Act
CFAMP	Comprehensive Fisheries Assessment and Monitoring Program
CFS	Cubic Feet per Second
CPAR	CVPIA Program Activity Review
CVO	Central Valley Operations Office
CVP	Central Valley Project
CVPIA (Act)	Central Valley Project Improvement Act
CY	Contract Year
DIDSON	Dual-frequency Identification Sonar
DMC	Delta Mendota Canal
DOI (Interior)	Department of the Interior
DWR	California Department of Water Resources
EA	Environmental Assessment
EBMUD	East Bay Municipal Utility District
EC	Electrical Conductivity
ECOSIM	Ecologically Cogent Operations Suite of Integrated Models
EIR	Environmental Impact Report
EIS	Environmental Impact Statement
EPA	US Environmental Protection Agency
ERP	Ecosystem Restoration Program

ESA	Endangered Species Act
EWA	Environmental Water Account
EWSOMP	Ecosystems and Water Systems Operations Models Program
FERC	Federal Energy Regulatory Commission
FFC	Fisheries Foundation of California
FMP	Fisheries Management Plan
FY	Fiscal Year
GCID	Glenn-Colusa Irrigation District
GIS	Geographic Information System
GPM	Gallons per Minute
GWD	Grassland Water District
GGS	Giant Garter Snake
GUI	Graphic Users Interface
HGS	HydroGeoSphere
HRP	Habitat Restoration Program
ID	Irrigation District
IEP	Interagency Ecological Program
IFIM	Instream Flow Incremental Methodology
inSALMO	Individual-Based Salmon Life-Cycle Framework
IP	Implementation Plan
IRWMT	Interagency Refuge Water Management Team
ISI	Integrated Storage Investigation
JPP	Jones Pumping Plant
LAWS	Land Atmosphere Water Simulation
LED	Light-Emitting Diode
LRDP	Land Retirement Demonstration Project
LRP	Land Retirement Program
NEPA	National Environmental Policy Act
NFH	National Fish Hatchery
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NPS	National Parks Service
NODOS	North of Delta Offstream Storage
NRCS	Natural Resources Conservation Service
NWR	National Wildlife Refuge
OCAP	Operations Criteria and Plan
OMB	Office of Management and Budget
PART	Program Assessment Rating Tool
PEIS	Programmatic Environmental Impact Statement
PEIS/R	Programmatic Environmental Impact Statement/Report
PIMS	Performance Information Management System
POD	Pelagic Organism Decline
QA	Quality Assurance
QC	Quality Control
RBDD	Red Bluff Diversion Dam
RBRPP	Red Bluff Research Pumping Plant
RD	Reclamation District
RHEM	Riparian Habitat Establishment Model
ROD	Record of Decision
RPA	Reasonable and Prudent Alternatives

RWSP	Refuge Water Supply Program
SDFF	South Delta Fish Facility Forum
SDIP	South Delta Improvement Program
SDP	Station Development Plan
SHIRA	Spawning Habitat Integrated Rehabilitation Approach
SJBAPL	San Joaquin Basin Action Plan Lands
SJRA	San Joaquin River Agreement
SJRGA	San Joaquin River Group Authority
SJRRP	San Joaquin River Restoration Program
SJVDP	San Joaquin Valley Drainage Program
SLDMWA	San Luis & Delta Mendota Water Authority
SLT	Shasta Land Trust
SNWR	Sacramento National Wildlife Refuge
SWP	State Water Project
SYRCL	South Yuba River Citizens League
TCRCD	Tehama County Resource Conservation District
T&E	Threatened and Endangered
TFCF	Tracy Fish Collection Facility
TFFIP	Tracy Fish Facility Improvement Program
TRRP	Trinity River Restoration Program
USBR (Reclamation)	Bureau of Reclamation
USFWS (Service)	US Fish and Wildlife Service
USGS	US Geological Survey
USRWQM	Upper Sacramento River Water Quality Model
VAMP	Vernalis Adaptive Management Plan
WA	Wildlife Area
WAP	Water Acquisition Program
WQCP	Water Quality Control Plan
WSRCD	Western Shasta Resource Conservation District
WTP	Water Treatment Plant
WY	Water Year
YOY	Young-of-the-Year