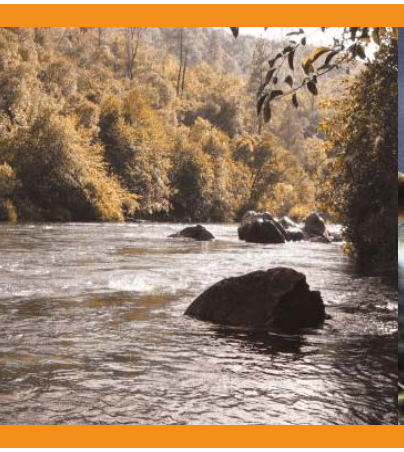
Central Valley Project Improvement Act

Public Law 102-575

ANNUAL REPORT

Fiscal Year 2007




Department of the Interior
U.S. Bureau of Reclamation
U.S. Fish and Wildlife Service

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Acronyms

ACID	Anderson-Cottonwood Irrigation District
AEAM	Adaptive Environmental Assessment and Management Program
AF	acre-feet
AFRP	Anadromous Fish Restoration Program
AFSP	Anadromous Fish Screen Program
AWP	Annual Work Plan
BA	Biological Assessment
BLM	Bureau of Land Management
BO	Biological Opinion
BWGWD	Biggs West Gridley Water District
C2VSIM	California Central Valley Simulation Model
CAMP	Comprehensive Assessment and Monitoring Program
CALFED ISI	CALFED Integrated Storage Investigations
CBDA	California Bay-Delta Authority
CCWD	Contra Costa Water District
CDWR	California Department of Water Resources
CFDG	California Department of Fish and Game
CFM	Constant Fractional Marking
CFS	Cubic Feet per Second
CVHJV	Central Valley Habitat Joint Venture
CVJV	Central Valley Joint Venture
CVP	Central Valley Project
CVPIA	Central Valley Project Improvement Act
DCC	Delta Cross Channel
DOI (Interior)	Department of the Interior
DSM	Decision Support Model
DWR	California Department of Water Resources
ECOSIM	Ecologically Cogent Operations Suite of Integrated Models
EIR	Environmental Impact Report
EIS	Environmental Impact Statement
ERP	Ecosystem Restoration Plan
ES	Environmental Statement
ESA	Endangered Species Act
FEIS	Final Environmental Impact Report
FERC	Federal Energy Regulatory Commission

FY	Fiscal year
GCID	Glenn-Colusa Irrigation District
GLWA	Gray Lodge Wildlife Area
GPM	Gallons per Minute
GWD	Grassland Water District
HGS	HydroGeoSphere
HRP	Habitat Restoration Plan
IEP	Interagency Ecological Program
IFIM	Instream Flow Incremental Methodology
ISI	Integrated Storage Investigations
IWFM	Integrated Water Flow Model
IRWMT	Interagency Refuge Water Management Team
LAWS	Land Atmosphere Water Simulator
LTRC	Long-Term Renewal Contracts
MOU	Memorandum of Understanding
NFH	National Fish Hatchery
NMFS	National Marine Fisheries Service
NOAA	National Oceanic Atmosphere Administration
NRDC	Natural Resources Defense Council
NWR	National Wildlife Refuge
OCAP	Operations Criteria and Plan
OMB	Office of Management and Budget, (Executive Office of the President, Washington, DC)
PEIS	Programmatic Environmental Impact Statement
POD	Pelagic Organism Decline
RBDD	Red Bluff Diversion Dam
RBRPP	Red Bluff Research Pumping Plant
RHEM	Riparian Habitat Establishment Model
ROD	Record of Decision
SDFF	South Delta Fish Facility Forum
SDIP	South Delta Improvement Program
SJBAP	San Joaquin Basin Action Plan
SJRA	San Joaquin River Agreement
SJRGA	San Joaquin River Group Authority
SMWC	Sutter Mutual Water Company
SRSC	Sacramento River Settlement Contracts
TAF	Thousand acre-feet
TFCF	Tracy Fish Collection Facility
TFFIP	Tracy Fish Facility Improvement Program
TRRP	Trinity River Restoration Plan
USDA	U.S. Department of Agriculture
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
WY	Water Year

I. Introduction

Sunset at Kern National Wildlife Refuge

For the past 15 years, the Central Valley Project Improvement Act (CVPIA or Act) has guided the implementation of projects supporting the protection, restoration and enhancement of fish and wildlife associated with the Central Valley Project (CVP). 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, more than $957.4 million 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 and have also allowed California's population to grow beyond that of any other state. 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 economy of the state. The CVPIA has afforded the Department of the Interior (Interior) a prime opportunity to help restore conditions favorable for fish and wildlife in the Central Valley, while providing for the continuation of its rich agricultural heritage and service to municipal and industrial users throughout the state.

This annual report summarizes the actions taken by Bureau of Reclamation (Reclamation) and Fish and Wildlife Service (Service) personnel, working with other federal agencies, the State of California and numerous partners and stakeholders during fiscal year (FY) 2007 (October 1-September 30). Wherever possible, this report includes quantified goals and targets to more efficiently measure progress within each individual provision of the Act.

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 either Reclamation or the Service, or the individual CVPIA project and program managers.

BACKGROUND

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

For 72 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

Figure 1. Central Valley Project System

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 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 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 greatly changed 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 one of its last actions of the session, the 102nd Congress in 1992 passed, and the President signed, the multi-purpose water legislation known as the Central Valley Project Improvement Act. Officially designated Title 34 of Public Law 102-575, this landmark piece of legislation mandates changes in the purposes and management of Reclamation's Central Valley Project. 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 operational flexibility of the CVP

(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 provisions of the CVPIA were implemented beginning in 1993, most were not initiated until after the signing of the ROD 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 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 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 annually (adjusted for inflation) in Restoration and Mitigation Payments from the CVP water and power users. A maximum of $50 million in annual appropriations from the Restoration Fund is allowed in any year under the CVPIA.

While there were no cost estimates associated with CVPIA in 1992, Congress has provided substantial annual appropriations of Restoration Funds and Water and Related Resources funds. As of 2007, a total of $957.4 million has been obligated to CVPIA since its implementation in 1993. For FY 2007, $63 million was obligated from the Restoration Fund and Water and Related Resources Account for the purposes of 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 Anadromous Fish Restoration Program (AFRP), Dedicated Yield and the Comprehensive Assessment and Monitoring Program (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, 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:

- Achieving the anadromous fish doubling goal
- Providing adequate water to wildlife refuges
- Mitigating terrestrial and other CVP-related impacts

In addition to these fish and wildlife initiatives, the program focuses on improving operational flexibility and modeling.

The CVPIA also includes specific provisions to guide restoration in the Trinity River basin. The Trinity River is the largest tributary of the Klamath River, 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.

Anadromous Fish Doubling Goal

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 and 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 Anadromous Fish Restoration Program (AFRP Restoration Plan). Actions contained within the AFRP 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, (b)(17) Anderson Cottonwood Irrigation District, (b)(20) Glenn-Colusa Irrigation District Program, and (b)(21)

Figure 2. Central Valley Refuges Receiving CVPIA Water Supplies

Anadromous Fish Screen Program; restoration activities such as (b)(12) Clear Creek Restoration Program and (b)(13) Spawning Gravel 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 3406 (g) Ecological/Water Systems Operations Model.

Wildlife Refuges

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 (page 69 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 2.)

Other Resources

The third focus of the CVPIA 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 construction and operation of the CVP, 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.

FUNDING FOR ACTIVE PROVISIONS

Several of the CVPIA provisions are now complete and/or otherwise not funded in the FY 2007 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 and Georgiana Slough (Inactive)
- 3406 (b)(17) ACID 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)

The remaining provisions have all received appropriations to support FY 2007 program activities. Table 1 lists each active provision and the amount of funding provided.

CONTRACTS AND WATER TRANSFERS

In addition to the work funded through the Restoration Fund and the Water and Related Resources Account as outlined in the previous section, Reclamation also provides funding to administer contract renewals and water transfers to support the ongoing operations of the CVP.

Contract Renewals

Since passage of CVPIA, Reclamation completed the renewals for the Sacramento River Settlement Contracts (SRSC) on March 31, 2006. Of the 141 contracts to be renewed, 12 contractors elected not to renew and one contractor will renew upon resolution of an estate proceeding. There are 128 SRSC renewal contracts signed to date.

Eighty-three out of 109 Long-Term Renewal Contracts (LTRC) have been signed, representing 60.3 percent of the water (3,177,450 of 5,264,031 acre-feet). Sixteen additional contracts have been negotiated and are awaiting environmental documentation before signing and two contracts remain to be negotiated. The eight Cross Valley Canal contracts will now be renegotiated as two-party agreements and conveyance agreements for wheeling this CVP water through state facilities will be negotiated.

No renewal contracts were executed in FY 2007 due to litigation concerning the Operations Criteria and Plan (OCAP) and a resulting decision to reinitiate Endangered Species Act (ESA) consultations for the individual contracts with the Service and National Oceanic and Atmospheric Administration (NOAA) Fisheries. Negotiations for a new contract with the El Dorado County Water Agency pursuant to Pub. Law 101-514 (Fazio contract) were completed in 2007. This

Table 1. FY 2007 Funding Obligations by Provision

Provision		Water & Related Funds*	Restoration Funds*	
3406(b)(1)	Anadromous Fish Restoration Program	0	$5,511,100	
3406(b)(1)	"other" – Habitat Restoration Program	0	$1,516,000	
3406(b)(1)	"other" – Trinity River Restoration Program	$6,595,000	$1,001,000	
3406(b)(1)(B)	Modified CVP Operations	0	0	
3406(b)(2)	Dedicated 800,000 acre-feet Project Yield	0	$904,500	(VAMP)
3406(b)(3)	Water Acquisition Program - Instream Water (includes 3406+(g) [VAMP])	0	$6,468,000 $1,640,900 $1,332,000 $8,580,900	(state) Level 4 (state)
3406(b)(4)	Tracy (Jones) Pumping Plant Program	$1,821,400	($10,200)	
3406(b)(5)	Contra Costa Canal Pumping Plant	$76,100	0	
3406(b)(9)	Flow Fluctuations	$80	$52,000	
3406(b)(10)	Red Bluff Diversion Dam	$880,300	0	
3406(b)(11)	Coleman National Fish Hatchery	$(6,050)	$44,700	
3406(b)(12):	Clear Creek Restoration Program	$135,200	$813,900	(state)
3406(b)(13):	Spawning Gravel Program	0	$918,200 $1,900	
3406(b)(15)	Head of Old River Barrier	$94,200	$80,000	
3406(b)(16)	Comprehensive Assessment and Monitoring Program	0	$398,800	
3406 (b)(19)	Reservoir Storage	0	0	
3406(b)(20)	Glenn-Colusa Irrigation District Program	$19,900	0	
3406(b)(21)	Anadromous Fish Screen Program	0	$7,451,400	
3406(b)(23)	Trinity River Restoration Program	$947,900	$0	
3406(c)(1)	San Joaquin River Comprehensive Plan	0	$3,001,900	
3406(d)(1)	Refuge Water Supply	Level 2 conveyance included in (d)(5)	Level 2 conveyance included in (d)(5)	
3406(d)(2)	Refuge Water Supply	Level 4 acquisition included in (b)(3)	Level 4 acquisition included in (b)(3)	(construction)
3406(d)(5)	Refuge Facilities Construction Program	$210	$182,300) $10,544,000	(wheeling)
3406 (d)(5)	San Joaquin Basin Action Plan Lands	$153,900	$1,123,200	
3406(g)	Ecological/Water Systems Operations Models	$209,200	$428,100	
3408 (h)	Land Retirement Program	0	$1,485,900	
TOTAL FUNDING OBLIGATED		**$10,927,340**	**$53,470,500**	

*Rounded for presentation purposes.

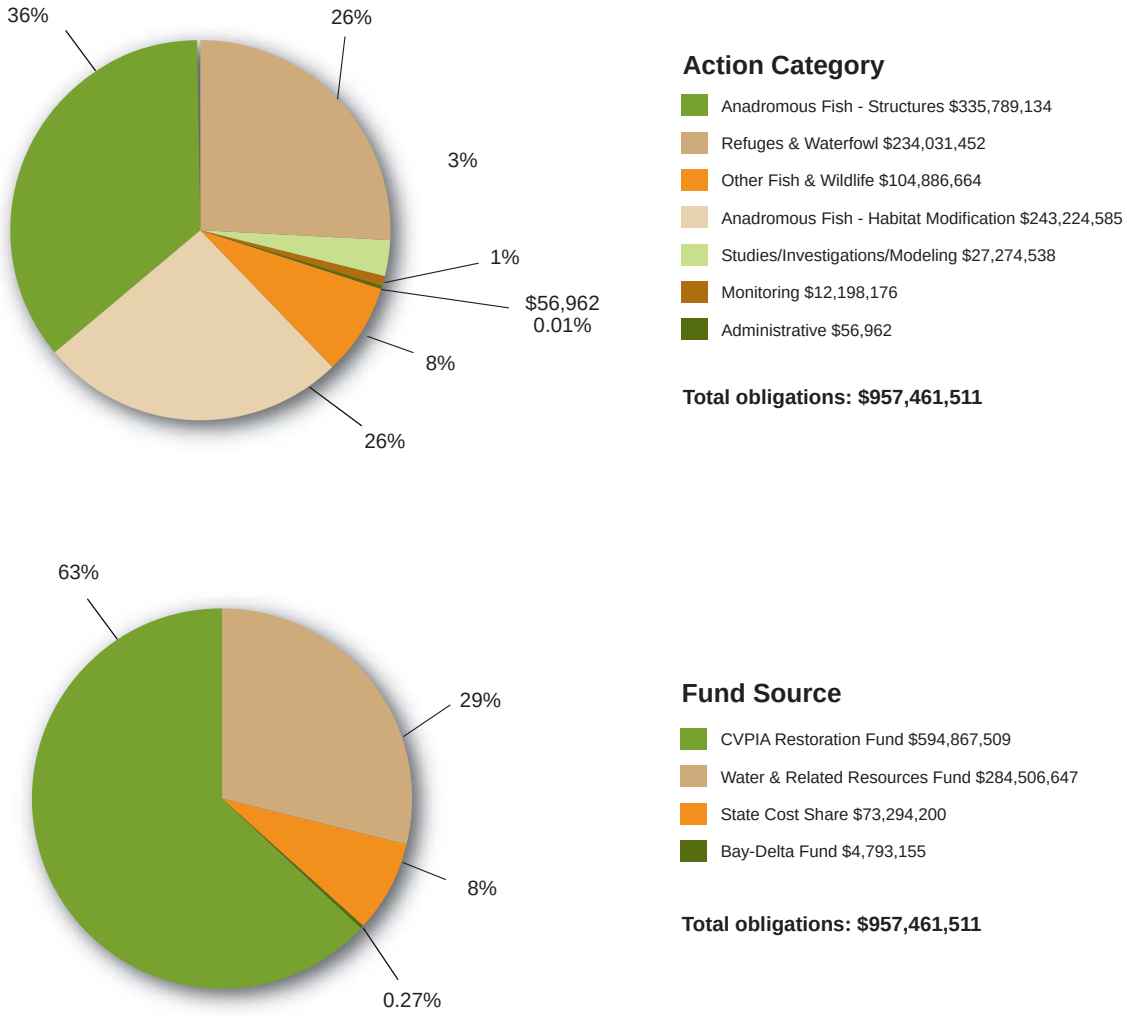


Figure 3. Total CVPIA Obligations by Action Category and Fund Source (1993-2007)

contract is a specific exception to the CVPIA prohibition against new contracts pending completion of the actions required by CVPIA Sections 3406 (b)-(d).

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.

During the 2007 water year, Reclamation approved the transfer of CVP water in the following categories:

- 216,300 acre-feet of CVP of agricultural water was transferred for agricultural purposes
- 1,100 acre-feet of CVP of agricultural water was transferred for municipal and Industrial purposes
- 4,200 acre-feet of CVP municipal and industrial water was transferred for agricultural purposes
- 46,000 acre-feet of agricultural water transferred to Reclamation's Refuge Water Acquisition Program

RECENT DEVELOPMENTS

Several developments occurred in FY 2007 or are planned for FY 2008 that will have a direct effect on the implementation of CVPIA actions, including the Pelagic Organism Decline (POD), litigation of biological opinions (BO), the Operations Criteria and Plan (OCAP) BO, and the Office of Management and Budget (OMB) Performance Assessment Rating Tool (PART) process.

Pelagic Organism Decline

Abundance indices calculated by the Interagency Ecological Program (IEP) through 2007 suggest recent marked declines in four pelagic fishes in the upper San Francisco Estuary (the delta and Suisun Bay). These fishes include delta smelt, which are listed under state and federal Endangered Species acts and the longfin smelt, which has been proposed for protection under those acts. Although several species show evidence of long-term declines, the recent low levels were unexpected given the relatively moderate winter-spring flows of the past several years.

In response to this situation, in May 2007, the director of the California Department of Fish and Game (DFG) asked the director of the Department of Water resources (DWR) to "cease pumping water at the Harvey O. Banks facility, to the maximum feasible extent consistent with health and safety and maintain agricultural barriers in the South Delta in an open position." DWR was asked to work with Reclamation to accomplish the same goals for the CVP. DFG also notified other delta diverters, including agricultural users, Contra Costa intake facilities, and energy diverters to "voluntarily cease or substantially reduce your diversions from the South Delta channels, as your operations allow." IEP also directed that all "non-essential" projects must cease fish sampling upstream of the Carquinez Bridge and downstream of Sacramento on the Sacramento River and downstream of Vernalis on the San Joaquin River."

Several CVPIA provisions including (b)(15) Head of Old River Barrier and (b)(5) Contra Costa Canal Intake Fish Screening Project have been affected as diverters reduced pumping in response to the POD; this direct effect on CVP operations will continue until such time as the POD is adequately addressed.

Litigation of Biological Opinions

On December 14, 2007, a federal judge (U.S. District Court Judge Oliver Wanger) ordered state and federal water project managers to reduce the amount of water pumped from the Sacramento-San Joaquin River Delta to protect the threatened delta smelt from extinction in the Service BO.

Judge Wanger ruled in an Interim Remedial Order that caused the projects to restrict water deliveries from the California delta's export pumps to the Bay Area, Central Valley and Southern California to protect the fish. The ruling ordered a reduction in pumping from the end of December (when the fish are ready to spawn) until June (when the fish can move into Suisun Bay beyond the reach of the pumps).

On April 16, 2008, Judge Wanger determined that the National Marine Fisheries Service (NMFS) 2004 BO (see following section) was incomplete and did not analyze the recovery of winter-run and spring-run Chinook salmon and steelhead species, or the effect global climate change may have over the next 25 years. Reclamation has not been ordered to follow interim restrictions.

Several CVPIA provisions including (b)(4) Tracy (Jones) Pumping Plant Program, (b)(15) Head of Old River Barrier, and (b)(5) Contra Costa Canal Pumping Plant are affected by the decision and pumping will be reduced as ordered. This direct effect on CVP operations will continue until such time as the POD is adequately addressed.

Operations Criteria and Plan Biological Opinions

The Operations Criteria and Plan (OCAP) Biological Assessment (BA) provides a detailed project description of the CVP system as a whole, including operations, modeling and forecasting. The OCAP BA also 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. The Service and NMFS must issue a BO stating its conclusions about the potential effects of the OCAP and presenting mitigation requirements that will be applied to specific CVPIA programs.

The current NMFS BO was issued in October 2004 and the Service BO was issued in February 2005. A revised OCAP Service BO is currently being prepared and is expected to be issued in December 2008. The court has directed NMFS to issue its BO March 2009. The ESA consultation for the operation of the proposed new pumping plant at Red Bluff (b)(10) and the planned Barrier at Old River (b)(15) will follow the issuance of the revised OCAP BO to ensure that future program activities comply with OCAP mitigation requirements.

Performance 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 some which will extend into FY 2008. The major actions include the completion of an independent review of the program by a panel of experts and completion of a long-term plan to guide CVPIA actions over the next 10 years (2009 through 2019) – these reports are due in FY 2008 and FY 2009.

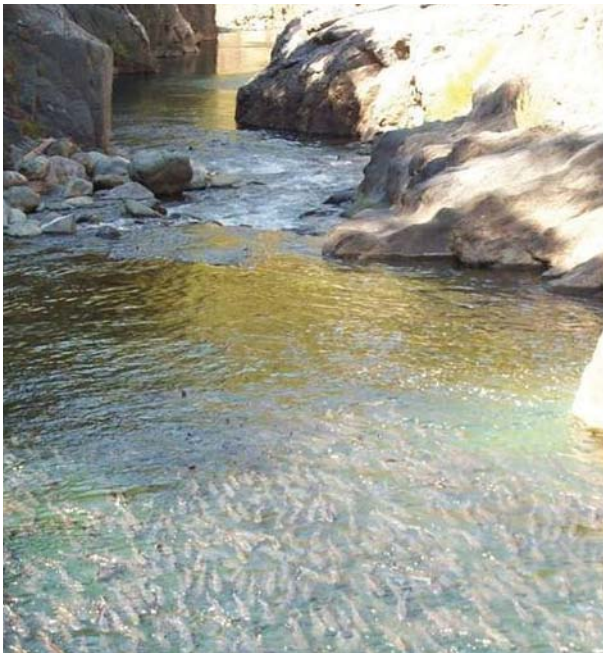
The independent review panelists were chosen in 2007 and the panel will meet throughout 2008 to evaluate the fish doubling activities with the program and prepare specific recommendations for improvement. Final panel reports will be completed in FY 2008. CVPIA also drafted an efficiency measure and continued to refine this measure in consultation with the OMB. CVPIA also completed a programmatic cost estimate in compliance with the recommendations of the PART.

LOOKING AHEAD

Quantification of 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 (ROI). In the case of this portion of CVPIA, currently funded through the Restoration Fund and focused on Restoration efforts, ROI 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. Closer coordination between the programs is seen as critical to the success of the long-term goals of the CVPIA.

II. Executive Summary



Spring-run Chinook salmon in Butte Creek

Since 1992, Reclamation and the Service have worked cooperatively to implement the CVPIA, 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 program continues to build upon the knowledge gained from ongoing studies and modeling, and adapts future actions to reflect current data.

The enormity and complexity of the central valley ecosystem requires a comprehensive approach with participation at all levels. Continued progress towards the restoration goals of the program will be based on the ongoing partnerships with stakeholders and more closely coordinated implementation of activities. The CVPIA program managers convened a series of meetings in FY 2007 to discuss the effectiveness of past actions and to identify priority watersheds and opportunities for coordinated action that will maximize the effectiveness of program dollars. The outcome of these discussions will form the basis of an implementation plan that will guide the program over the next 10 years.

PROGRESS TOWARDS GOALS

The following paragraphs summarize progress toward the broad goals of the CVPIA program.

Doubling Goal

As of 2006, the average natural production for all races of Chinook salmon is 498,863, or approximately 50 percent of the doubling target. 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. Indeed, the greatest success in watersheds has occurred 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 exceeded.

Overall production trends are mixed:

- Winter-run production numbers have been trending upward since 1996, but showed a sharp decline in 2007
- Spring-run numbers have generally improved since 1991, but are still well below the target
- Fall-run production was increasing but declined precipitously in 2007
- Late fall-run production has increased from extremely low levels in the early 1990s, but is still well below the target

The Anadromous Fish Restoration Program 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.

Habitat restoration

The Habitat Restoration Program has acquired and protected nearly 100,000 acres since program inception (1,603 acres in 2007), while the Land Retirement Program has retired more than half of the 15,000 acres targeted as part of the pilot project. Of the 8,596 acres retired, the Land Retirement Program has restored more than 4,000 acres towards sustainable uplands habitat.

Refuge water

CVPIA has created Full Level 4 capacity at 14 of the 19 identified refuges, paving the way for all 19 refuges to receive their Full Level 4 water supply. Capacity at the remaining five refuges will be addressed through construction projects planned and prioritized for the next 10 years. The high cost of water continues to limit acquisition of Full Level 4 water. Purchase of permanent or long-term water, rather than spot market purchases, provides the most reliable source for refuge water, but these supplies are not readily available on the market and are very expensive when they can be found.

2007 ACCOMPLISHMENTS

The following section summarizes the specific FY 2007 accomplishments within the following categories: Anadromous Fish – Habitat Restoration, Anadromous Fish – Structural Actions, Refuges and Waterfowl, Other Fish and Wildlife, and Studies, Investigations, and Modeling.

Anadromous Fish – Habitat Restoration

- The Anadromous Fish Restoration Program (AFRP) has completed 17 percent of all 289 Restoration Plan actions and evaluations identified in support of fish doubling goals and 41 percent are in progress towards completion [(b)(1)]
- Allocated the full 800,000 acre-feet per year of Dedicated Yield water, plus 195,000 acre-feet of banked water from 2006 [(b)(2)]
- Purchased 92,145 acre-feet of water (46 percent of the 200,000 acre-feet target) to improve instream flows and habitat restoration [(b)(3)]
- The (b)(9) Flow Fluctuation Program used (b)(2) water and re-operations pursuant to (b)(1)(B) to augment flows on CVP streams to prevent fluctuations during critical periods
- The Clear Creek Restoration Program successfully met flow objectives related to controlling water temperature during critical seasons: 60°F from June 1 through September 15, and 56°F from September 15 through October 31 and completed Phase 3B of the channel restoration project [(b)(12)]
- The Spawning Gravel Replenishment Program completed environmental permitting for the addition of gravel at eight sites in the Stanislaus River (at Knights Ferry) and completed studies in the American River to prioritize gravel placement for FY 2008 [(b)(13)]

Anadromous Fish – Structural Actions

- The Tracy (Jones) Pumping Plant program continued progress on the 23 total identified actions that make up the program target (10 actions have been completed as of 2006) [(b)(4)]
- The Contra Costa Canal Pumping Plant program provided $50,000 in mitigation payments to the Service for the Pelagic Organism Decline effort to address the recent decline in delta smelt [(b)(5)]
- The Red Bluff Diversion Dam program implemented operational changes to avoid further impacts to green sturgeon holding below the dam; a Final EIR/EIS on the proposed new pumping plant is expected in FY 2008; the plant will increase pumping capacity fourfold, providing a more reliable water supply [(b)(10)]
- The Head of Old River Barrier program continued design of the barrier; the Final EIR/EIS was issued in FY 2006 and the design phase is expected to continue through FY 2008 [(b)(15)]
- The Glenn-Colusa Irrigation District Program completed the biological and hydraulic testing and monitoring that was begun in 2001; the results indicate that fish survival in the vicinity of the screens is not impaired [(b)(20)]
- The Anadromous Fish Screen Program completed the Tisdale Positive Fish Barrier in Sutter County, screening the largest (960 cfs) unscreened diversion remaining on the Sacramento River; the program also initiated a three-year monitoring program of screens on the Sacramento River watershed system and delta; the program will collect fish loss data to assess the biological benefits of screening and help prioritize future actions [(b)(21)]
- The Trinity River Restoration Program demonstrated that steelhead numbers have increased substantially, with 2007 recording the largest numbers in recent years (more than 50,000 fish); the program completed construction of three mechanical channel rehabilitation projects and 21 infrastructure improvements, supporting the increase in peak flow releases of up to 11,000 cfs in compliance with the ROD; the program has achieved full ROD flows since 2005 and has identified nine priority watershed projects for future implementation [(b)(23)]

Pintails flying over Sacramento National Wildlife Refuge

Refuges and Waterfowl

- In 2007, the refuge water supply program acquired and conveyed 92 percent of Level 2 and 35 percent of Incremental Level 4 water. The program also negotiated a third amendment to the groundwater pumping reimbursement agreement with the California Department of Fish and Game (DFG) to supplement Level 2 water at Gray Lodge Wildlife Area up to the full Level 2 allocation. [(d) (1), (2), and (5)]
- To date, the refuge facilities construction program has completed 31 of the 46 actions or projects identified in the environmental documents and related design and specification documents (the 31st completed in 2007). The remaining 15 construction actions will be implemented over the next 10 years. [(d) (1), (2) and (5)]

Other Fish and Wildlife

- The Habitat Restoration Program protected an additional 1,603 acres of new habitat and restored 117 acres of habitat [(b)(1)Other]
- The San Joaquin River Comprehensive Plan Program initiated organization and management actions to prepare for the long-term structure of the San Joaquin River Restoration Program (SJRRP); a Stipulation of Settlement reached in 2006 led to the San Joaquin River Restoration Act that is now being considered by the House and Senate and will set terms and conditions for the implementation of the SJRRP Plan [(c)(1)]
- The Land Retirement Program acquired 213 acres in the Atwell Island site, and restored 475 acres of former agricultural lands [3408(h)]

Studies, Investigations, and Modeling

- The Comprehensive Assessment and Monitoring Program completed an annual report that synthesizes and analyzes data from 1992 through 2006 on 13 watersheds and acquired 82 reports providing rotary screw trap data; data will be assessed in FY 2008 to provide information on relative effectiveness; obligated $96,000 to monitor production of juvenile Chinook salmon on the Stanislaus River to assess the success of restoration activities such as gravel placement and modification of river flow regimes [(b)(16)]
- The Modified CVP Operations program reoperated the system several times to provide benefits to anadromous fish on Clear Creek without impacting other CVP obligations or authorized purposes; the program completed a number of essential macroinvertebrate flow-habitat studies on CVP streams, and also completed monitoring for spring- and fall-run Chinook salmon and steelhead fry and juvenile rearing, as well as for redd dewatering and juvenile Chinook and steelhead stranding [(b)(1)(B)]
- The Ecological/ Water Systems Operations Models program currently operates the integrated CVP/SWP model and six other models – two more are currently under development; developed new datasets in 2007 for CalSim III and completed initial program activities to support the Riparian Habitat Establishment Model (RHEM) parameter study [3406(g)]

III. 2007 Programmed Activities and Accomplishments

Anadromous Fish Restoration Program

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 language in the Act, Interior developed the Anadromous Fish Restoration Program (AFRP) as the overarching program to address anadromous fish doubling in the Central Valley. The CVPIA 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 passage of the Act, the AFRP developed a series of planning reports that culminated in the Final AFRP Restoration Plan (Plan) in 2001. As acknowledged in the CVPIA Record of Decision (ROD), the Plan guides the implementation of the actions and evaluations which were developed to address the doubling goal. The 289 actions and evaluations in the Plan are categorized by six programmatic-level objectives:

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

AFRP projects implemented from actions and evaluations in the Restoration Plan since 1995 have addressed environmental limiting factor categories that were derived from Central Valley watershed limiting factors listed in the AFRP Working Paper. The Working Paper was developed under the direction of a scientific core group composed of experts from state and federal agencies, private industry, and academia with specific knowledge of anadromous fish species in Central Valley rivers and streams. It lists potential factors or stressors that may limit natural production of anadromous fish and the ideal type and number of restoration actions that, if implemented in their entirety, would address these factors and likely result in at least doubling natural production of anadromous fish.

Measuring Success

Actions and Evaluations

The Restoration Plan determined the process by which Working Paper actions could be evaluated for reasonableness and includes lists of these actions specific to each watershed in the Central Valley. Watersheds, or parts of watersheds, are prioritized based on a combination of biological and nonbiological factors. Watersheds that support, or have the potential to support species or races of special status are assigned priority over those watersheds that do not. To date, 17 percent of all 289 Restoration Plan actions and evaluations have been completed and 41 percent are in progress towards completion. Table 2 shows progress made towards addressing implementation/completion of the restoration actions and evaluations in each watershed.

Table 2. Summary of Final Restoration Plan Actions and Evaluations Addressed (1995-2007)

Final Restoration Plan				
Watershed	Number of actions & evaluations addressed in FY07	Number of actions & evaluations addressed to date	Total number of actions & evaluations listed in Plan	Percentage actions & evaluations addressed
American River		2	13	15%
Antelope Creek		0	2	0%
Battle Creek	1	11	12	92%
Bear Creek		0	2	0%
Bear River		0	8	0%
Big Chico Creek	2	6	10	60%
Butte Creek	1	35	39	90%
Calaveras River	1	2	6	33%
Central-Valley Wide		11	15	73%
Clear Creek		7	7	100%
Colusa Basin Drain		1	2	50%

Table 2, Continued

Final Restoration Plan				
Watershed	Number of actions & evaluations addressed in FY07	Number of actions & evaluations addressed to date	Total number of actions & evaluations listed in Plan	Percentage actions & evaluations addressed
Cosumnes River	3	5	9	56%
Cottonwood Creek		4	5	80%
Cow Creek		2	4	50%
Deer Creek		4	5	80%
Elder Creek		0	2	0%
Feather River		0	12	0%
Merced River		3	8	38%
Mill Creek		4	5	80%
Miscellaneous Stream Tributaries		1	1	100%
Mokelumne River	2	5	13	38%
Ocean		0	3	0%
Paynes Creek		0	2	0%
Upper Mainstem Sacramento River		17	22	77%
Sacramento-San Joaquin Delta		3	29	10%
Mainstem San Joaquin River		2	13	15%
Stanislaus River	1	3	9	33%
Stoney Creek		0	1	0%
Thomes Creek		0	6	0%
Tuolumne River		4	10	40%
Yuba River	3	1	14	7%
All Watersheds	14	133	289	46%

[1] Service, 1995. Working paper on restoration needs, habitat restoration actions to double natural production of anadromous fish in the Central Valley of California, Volume 3, AFRP. [http://www.delta.dfg.ca.gov/afrp/workingpaper.asp].

Key actions and evaluations undertaken or completed in 2007, as indicated in Table 2, 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

Mokelumne River–In partnership with East Bay Municipal Utility District, AFRP provided spawning gravel materials for an ongoing project to increase spawning gravel quantity and improve gravel quality at known spawning sites for fall-run Chinook salmon and steelhead downstream of Camanche Dam.

Restoration at MJ Ruddy, Tuolumne River, Summer 2006

Cosumnes River–Permitting and final phases of project planning were completed for the Cosumnes River Gravel Augmentation Project. This project will enhance fall-run Chinook salmon spawning habitat at two contiguous sites by: 1) placing appropriately sized gravel in a riffle that has historically supported one of the highest density of spawners in the lower Cosumnes River, and 2) providing additional gravel in a pool located immediately upstream of this riffle to be redistributed downstream. Project construction is scheduled for the summer of 2008.

Stanislaus River–Instream spawning habitat was created using 25,000 tons of material to enhance habitat. This is the largest instream project ever conducted on the Stanislaus River and will provide additional spawning habitat, improved rearing habitat and reduced predator habitat.

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

Battle Creek–The fish bypass pipe was replaced at the Orwick Diversion site, increasing survival of outmigrating juvenile salmonids.

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

Big Chico Creek–Funds were provided to complete the permitting and environmental documentation required to begin construction of the Iron Canyon Fish Ladder, which will provide more consistent access to quality spring-run Chinook salmon habitat. The final phases (phases 3 and 4) are expected to be completed in 2009.

Butte Creek–Completed construction of the White Mallard Dam and fish ladder, facilitating fish passage and reducing entrainment. Preliminary engineering and environmental assessment of the Five Points/Behring Ranch Diversion Canal were completed.

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

Yuba River–Fluvial geomorphology, sediment transport dynamics, and in-stream hydraulics of key spawning reaches were characterized to build a predictive model for adult spawning locations. Gravel movement was monitored with tracer rocks and redd surveys for a future pilot gravel injection for spring-run Chinook directly below Engelbright Dam. Data was collected from fish passage events 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.

Calaveras River–Data was 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.

Merced River–Administered an agreement to operate a rotary screw trap and collect data January 23 to June 1. A draft report on the natural and hatchery juvenile Chinook salmon movement was completed. Monitoring of juvenile outmigration allows evaluation of the effectiveness of previous restoration actions.

Stanislaus River–Initiated a pilot project to coded-wire tag emigrating juvenile salmonids as well as an evaluation of environmental variables effecting juvenile Chinook salmon outmigration at a rotary screw trap monitoring location. Information will also be used to evaluate effectiveness of restoration actions.

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

Mokelumne River–Conducted analyses of fall-run Chinook salmon otoliths to determine the ratio of hatchery to wild fish. Data will be used to inform calculations of natural production by better identifying the hatchery contribution to escapement estimates. Pilot study to conclude FY09.

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 Stanislaus River Fish Work Group on development of a draft fisheries restoration plan, and a salmon life history model was completed for Big Chico Creek in cooperation with California Department of Fish and Game.

Natural Production Doubling

In addition to assessing progress by implementation of 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 3 summarizes the status of Central Valley-wide natural production of Chinook salmon in relation to the doubling goals and the baseline period.

The Final Restoration Plan also provides doubling goals for specific rivers and creeks. Doubling production by implementing a reasonable set of actions (i.e., a subset of the Working Paper actions) is less certain than if all the actions were implemented; however, AFRP has been able to make progress towards doubling production of some Chinook salmon runs on some streams. As an example, substantial gains to date are seen in watersheds where sufficient investment has been made in flow and passage (Butte and Clear creeks) and habitat restoration (Clear Creek). Average Chinook salmon production for the period of 1992-2006 has exceeded the doubling goal target on Battle, Butte, and Clear creeks, and on the Mokelumne River, as seen in Table 4.

In order to more accurately assess natural production doubling efforts, AFRP is demonstrating new escapement counting technologies, Alaskan weir (Stanislaus River), Vaki-infra-red counting systems (Stanislaus and Yuba rivers) 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 (S32:S34) ratios in otoliths taken from natural spawning Chinook salmon from the Mokelumne River and compare these to ratios in observed in hatchery produced stocks. This information will provide methods to derive more accurate estimates of natural production. This two year pilot study began in 2007 and should conclude at the end of 2008.

Table 3. Chinook salmon AFRP production, Central Valley, (1992-2006)

Chinook Salmon Species and Watershed[1]	AFRP annual doubling goals[2]	Average baselines (1967-91)[3]	Average natural production (1992-06)[4]	Average % natural production difference from baseline[5]
All Chinook runs, all Central Valley streams	990,000	497,240	498,863	0.3%
Fall-run, all Central Valley watersheds	750,000	374,217	453,800	21%
Winter-run, all Central Valley streams	110,000	54,417	8,328	-85%
Spring-run, all Central Valley streams	68,000	34,425	16,567	-52%
Late fall-run, all Central Valley streams	68,000	34,182	20,141	-41%

[1]Only streams and rivers with complete salmon production data sets (1992-2006) 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.delta.dfg.ca.gov/afrp/restplan_final.asp]."
[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 2006.
[5]The percent of increased natural production over baseline for each watershed was calculated by subtracting baseline natural production (1967-1991) from natural production (1992-2006) and dividing the result by baseline natural production (1967-1991).

Table 4. Chinook salmon AFRP production, in Battle, Butte and Clear creeks, and Mokelumne River (1992-2006)

Chinook Salmon Species and Watershed[1]	AFRP annual doubling goals[2]	Average baselines (1967-91)[3]	Average natural production (1992-06)[4]	Average % natural production difference from baseline[5]
Battle Creek fall-run	10,000	5,012	22,052	340%
Battle Creek late-fall-run	550	273	677	148%
Butte Creek fall-fun	1,500	763	3,266	328%
Butte Creek spring-run	2,000	1,017	11,504	1,031%
Clear Creek fall-run	7,100	3,574	12,317	245%
Mokelumne River fall-run	9,300	4,679	9,567	104%

Habitat Restoration Program

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 operation and construction of the CVP and are not specifically addressed in the Fish and Wildlife Restoration section of the CVPIA. Habitat loss and fragmentation due to urbanization and agriculture conversion occurred on an estimated 2.7 million acres as a result of CVP construction.

The HRP's priority actions, considered most effective and critical to species' protection 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 public outreach/education/planning/management. These actions support the program's output goal of contributing to restoring the 2.7 million acres impacted by construction and operation of the CVP.

To help direct conservation actions into high-priority areas and assist applicants in developing competitive proposals, in 2006 the program developed a GIS-based "Project Area Map," that defines the program's geographic focus area. The program 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).

Measuring Success

Species Protection

To date, the HRP has allocated more than $23 million to fund 89 projects supporting the recovery of 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 4 maps the HRP project locations from 1996-2007.

Habitat Protection

HRP funds have been used to acquire and protect approximately 100,000 acres of the 2.7-million-acre goal

Figure 4. Habitat Restoration Program Project Locations (1996-2007)

(nearly 4 percent) of related habitat for these species, including vernal pool, riparian, alkali scrub, foothill chaparral, valley-foothill hardwood and grassland.

In addition, the HRP has funded eight riparian restoration projects, contributing more than 1,000 restored acres. Riparian vegetation at several locations (e.g., Llano Seco) has experienced an approximately 80 percent survival rate. Table 5 lists the number of acres acquired and restored by year since 1996. (Acquisition only covers the purchase of the land; further effort is required to restore the desired habitat.) As shown, the bulk of the acreage was acquired in 1998 as part of the Wells Fargo (Simon Newman and Romero Ranches) project.

Recipients of 2007 HRP funds ($1,147,636) were projects that focused on high-priority species and habitats impacted by the CVP (Table 6). Progress reports are available for all projects and may be requested from the HRP program managers. Table 6 summarizes the FY 2007 projects.

Table 5. Acres of Habitat Protected & Restored per Year (1996-2007)

	Habitat Protection (acres protected via fee title acquisition and conservation easements)	Habitat Restoration (acres restored)
1996	4,356	0
1997	284	708
1998	74,360	0
1999	1,340	0
2000	1,426	206
2001	2,831	100
2002	2,211	0
2003	2,866	0
2004	719	432
2005	2,520	1,480
2006	192	731
2007	1,603	117
TOTAL	**94,708**	**3,774**

Table 6. Recipients of FY 2007 HRP Funds

Project	Status	Significance
Antioch Dunes National Wildlife Refuge - Captive propagation of the Lange's metalmark butterfly and restoration of dune habitat for the Lange's metalmark butterfly, Contra Costa wallflower and Antioch Dunes evening primrose in Contra Costa County	**Ongoing** Captive propagation is taking place at two locations and dunes restoration has begun; providing funding in FY 2008 to continue the study	Supports habitat and species protection: The Lange's metalmark butterfly is on the verge of extinction and found only at Antioch Dunes NWR; restoration of dunes habitat will enhance; native buckwheat host plant survivability and enhance recovery of the wallflower and evening primrose, two federally endangered plants
Tulare Basin Wildlife Partners - Preparation of conservation and outreach plans for a riparian wildlife corridor for several counties	**Ongoing** Completed three Conservation Plan Summaries and a listing of Priority Conservation Projects for distribution and review; project will continue until July 2009	Supports habitat protection: Helps provide essential public support, gauge issues critical to implementation of four Conservation Plans, and lay the basis for obtaining funds needed for future project implementation
UC Davis – Research on importance of soil biota in vernal pool restoration and success of vernal pool plant species in several counties	**Ongoing** Seed has been collected, germination protocols have been refined and the large pot experiment has been set up in a greenhouse; project will continue until July 2009	Supports habitat and species protection: examines role of soil biota in plant growth and establishment, compares effects from natural and artificial or restored pools, etc.; benefits numerous federally listed vernal pool plant species
River Partners – Restoration of riparian habitat on the San Joaquin River at the Hagemann Unit of the San Joaquin River NWR in Stanislaus County	**Ongoing** Soil testing, seed collection, mapping, hydrology and planning have been completed; planting will begin in fall 2008	Supports habitat protection to benefit endangered species: riparian bush rabbit, riparian woodrat, least Bell's vireo (bird), valley elderberry longhorn beetle
Tuolumne River Trust – Acquisition of 1,603-acre Dos Rios Ranch in Stanislaus County	**Ongoing** Appraisal, land and environmental surveys complete; efforts to secure needed additional funding is underway	Supports habitat protection: Acquisition of property will benefit the least Bell's vireo, valley elderberry longhorn beetle, and riparian brush rabbit
Endangered Species Recovery Program – Assessment of the success of a relocation effort in Tulare County for the Tipton kangaroo rat	**Ongoing** Preliminary study design complete; ready for field work phase	Supports species protection: Long-term monitoring to evaluate success of relocation effort

Table 6, Continued

Project	Status	Significance
Eric Hansen, Private Consultant – Continuation of assessment of the current status and distribution of the giant garter snake (GGS) in Merced and northern Fresno counties	**Ongoing** For the second year, potential presence of GGSs north and east of the San Joaquin River and the current status of declining historical populations south and east of the San Joaquin River in the Grassland Ecological Area, Merced County, California, were investigated; historical populations at Mendota Wildlife Area, Fresno County, were also sampled; trapping done May-September 8, 2007; 64 traplines established with 48,762 trap days accrued; final report due April 15, 2008	Supports species protection: Assesses current status and distribution of the GGS, a species that is disappearing in the San Joaquin Valley
CSU Chico - Continuation of a genetic analysis of giant garter snake (GGS) populations in the San Joaquin and Sacramento Valleys.	**Ongoing** Study continues to analyze genetics of Central Valley GGS populations; project will continue until December 2008	Supports species protection: Continues work on the range-wide population genetic structure of the GGS, to help determine if the nearly extirpated San Joaquin Valley populations represent distinct population segments worthy of special protection

Trinity River Restoration Program

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

"…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;" 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…"

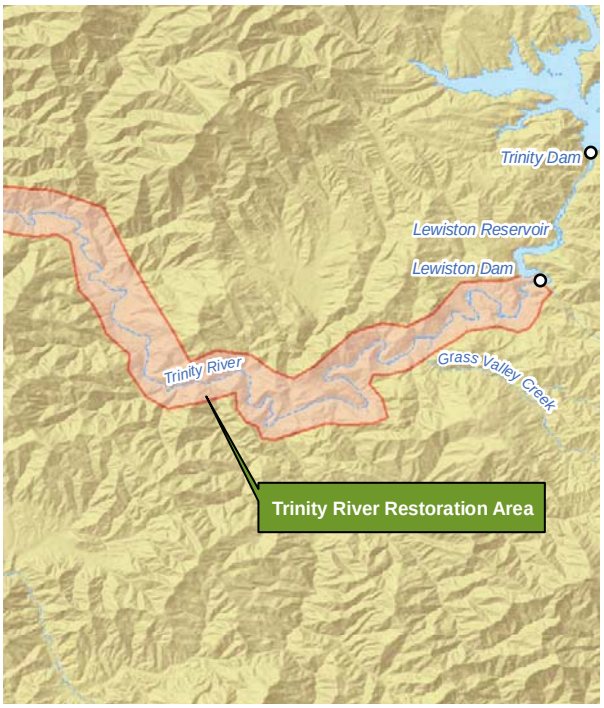


Figure 5. Trinity River Restoration Program Map

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. The Trinity River Mainstem Fishery Restoration EIR/EIS and its accompanying Record of Decision (ROD) was completed and signed by the 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.

Reclamation plans and implements restoration activities and adaptively manages the program based on

Table 7. Target Natural Escapement, Trinity River

Target Trinity River Natural 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

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.

The outcome-based goal is indicated by natural and hatchery-produced adult spawner escapement to the Trinity River, as indicated in Table 14.

The output-based goals are indicated by four criteria:

1) Increasing minimum flow releases – Measured by annual acre-feet of instream flow releases to meet tribal trust responsibilities and fishery restoration goals

a. Target: Between 369,000 and 815,000 acre-feet per year (varies by water year type), with peak flows to 11,000 cfs by 2008 and annually thereafter

2) Implementing construction projects–Measured by progress toward completion of 47 mechanical channel rehabilitation projects and all necessary infrastructure improvements

a. Channel rehabilitation target: Complete 24 channel rehabilitation projects by the end of 2008, with the remainder by 2012

b. Infrastructure improvements target: Completion of infrastructure improvements to allow fishery flow releases of up to 11,000 cfs by 2008

3) Sediment management–Measured by progress in placing cubic yards of coarse sediment (gravel) in, and removing cubic yards of fine sediment from, the mainstem Trinity River to provide adequate spawning habitat and other geomorphic benefits

a. Target: Placement of up to 10,000 cubic yards of gravel per year, as determined by monitoring data

b. Target: Removal of up to 20,000 cubic yards of fine sediment per year, depending on existing conditions

4) Watershed restoration–Measured by the cubic yards of sediment reduced annually from the tributaries compared to baselines

a. Target : 240,000 to 480,000 cubic yards annually based on water year conditions and monitoring data

Measuring Results

Outcome-based Target – Escapement Increases

Monitoring suggests there has generally been an improvement in health and vigor of outmigrating juveniles as well as returning adult spawners of all species since 2000. Preliminary data suggest an upward trend in coho salmon run size, along with decreased prevalence of disease and improved egg/sperm viability of spawners of all species.

Based on weir counts (adult runs), steelhead numbers have increased significantly, with 2006 and 2007 recording the largest runs in recent years. In 2006, total run size of adult steelhead was 41,488 fish, and a preliminary estimate for 2007 is more than 50,000 fish. The DFG responded to this increase in steelhead numbers by proposing a larger take limit for hatchery steelhead for recreational anglers in the Trinity River during the 2008 fishing season. While much of the increased population consists of hatchery-produced fish, this suggests a response to system-wide improvements in temperatures and reduced fine sediment that likely is beneficial to all species.

Output-based Targets

1) Increasing minimum flow releases

Reclamation has achieved 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 Normal, Extremely Wet, and Dry, with volumes ranging from 453,000 acre-feet to 815,000 acre-feet. Water Year 2007 was classified as a dry year, with 452,600 acre-feet–meeting the minimum flow release–and a peak flow of 4,500 cfs as required by the ROD. Full implementation of ROD releases are now possible based on water year type. Approximately 1.5 million acre-feet more water has been released to the river over the past seven years than would have occurred without the ROD.

2) Implementing construction projects

Since 2001, the CVPIA Restoration Fund has allocated $7.1 million to the TRRP. The program has implemented eight 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, such as:

- Construction of eight channel rehabilitation projects (Hocker Flat, four sites near Canyon Creek and three sites near Indian Creek)
- Construction of three replacement bridges and upgrade of an approach road/culvert
- 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 37 domestic water or sewer systems

In FY 2007, three mechanical channel rehabilitation projects and 21 infrastructure improvements were completed. Environmental documentation and designs were prepared to allow a construction contract award for eight additional channel rehabilitation projects in the summer of 2008.

3) Sediment Management

In 2007, the program placed 4,500 cubic yards of gravel adjacent to the Trinity River Fish Hatchery in the mainstem of the Trinity River to improve spawning and rearing habitat, as well as facilitate the creation of needed geomorphic features further downstream. A total of 2,500 cubic yards also was stockpiled at two locations along the river in the Lewiston area for injection during peak fishery restoration flows in May 2008. To date, the program has added 8,000 cubic yards of coarse sediment (spawning/rearing gravel) to the river.

As part of the program's routine maintenance of settling ponds at the mouth of Grass Valley Creek, TRRP partners implemented a contract in 2007 to excavate 16,000 cubic yards of material from the lower pond, thus restoring it to its full holding capacity. This action helps ensure that fine sediment (decomposed granite) from the Grass Valley Creek drainage will not enter the mainstem Trinity River and degrade spawning and rearing habitat.

4) Watershed Restoration

In 2007, TRRP partners collaborated with the TRRP to identify nine priority watershed projects for implementation, and worked to obtain over $300,000 in matching funds. Analyses are currently underway to better refine the calculation of sediment entering the mainstem Trinity River from the tributaries and construction is expected to begin in 2008.

While some short-term habitat benefits will probably be achieved, most of the program's projects focus on longer-term objectives; therefore, is difficult to draw definitive cause and effect relationships at this point in the program. The first of the eight channel rehabilitation projects completed to date was just finished in 2005; it will likely take several more years before preliminary results can be inferred about beneficial effects of the increased rearing habitat for Chinook salmon within their life cycle. One positive short-term indicator was data recently provided by the DFG indicating that more than 39,000 natural Chinook spawners returned to the Trinity River in 2007 despite concern over low 2005-2006 Chinook fall-run numbers. Program biologists from several agencies continue to evaluate these data.

Modified CVP Operations

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 that 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.

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. Reoperating the system 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.

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, although no time period is specified for this goal. Studies funded under section (b)(1)(B) focus on CVP streams (Sacramento, American, Stanislaus, 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 and Butte creeks.

The Service uses the IFIM program 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 Sacramento, American, Merced rivers and Butte Creek, and 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 cubic feet per second (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 Pacific Gas & Electric (PG&E) during development of the annual operating plan. Establishment of these flow-habitat relationships was critical to the development of the annual operating plan for Butte Creek.

Collecting IFIM field data in Clear Creek

Based on these data, in FY 2008 the Service will recommend 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 Sacramento River IFIM study (2006) which demonstrated that substantial juvenile stranding and redd dewatering could be avoided by keeping flows above 3,750 cfs. "Stranding" is 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. Similarly, redd dewatering occurs when redds (fish egg "nests") are left exposed by receding water levels. In 2007, the data from this IFIM study were used to justify operational changes in the allocation of (b)(2) water in the Sacramento River and flows were maintained above the 3,750 cfs level to minimize juvenile stranding and redd dewatering.

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, in 2001 to 2007 the Service added the Yuba and Tuolumne rivers and Clear Creek to the priority list of rivers to be modeled over the next five years.

Measuring Success

In 2007, the CVP reoperated the system several times to provide benefits to anadromous fish on Clear Creek without impacting other CVP obligations or authorized purposes. As an example, in November 2007, base condition releases from Keswick Dam on the Sacramento River were decreased by 100 cfs while base condition releases from Whiskeytown Dam into Clear Creek were increased by 100 cfs for approximately three weeks. This reoperation improved conditions on Clear Creek without changing the total amount of CVP water being released. Similar reoperations took place for short periods in April and June between releases from Nimbus Dam on the American River and Whiskeytown Dam into Clear Creek.

Since 1995, the program has completed 11 IFIM studies. Table 7 illustrates progress on the studies that were active in 2007. (Dates indicate completion of an activity.)

As shown in Table 7, the major accomplishments for 2007 include the following:

Sacramento River - Completion of final reports for macroinvertebrate flow-habitat and redd dewatering and juvenile Chinook and steelhead stranding.

Yuba River – Completion of monitoring for spring- and fall-run Chinook salmon and steelhead fry and juvenile rearing; and completion of monitoring for redd dewatering and juvenile Chinook and steelhead stranding.

Clear Creek – Completion of final report for spring-run Chinook salmon and steelhead upper reach spawning.

Tuolumne River – Completion of modeling for floodplain inundation as a function of flow.

Table 8. IFIM Studies Completed and Planned as of 2007

River	IFIM Modeling Project	Monitoring	Modeling	Peer Review	Final Report
Sacramento	Macroinvertebrate flow-habitat complete	FY 2001	FY 2005	FY 2006	**FY 2007**
	Redd dewatering and juvenile Chinook and steelhead stranding	FY 2004	FY 2005	FY 2006	**FY 2007**
Yuba	Spring- and fall-run Chinook salmon and steelhead fry and juvenile rearing	**FY 2007**	FY 2008	Expected FY 2008	Expected FY 2008
	Redd dewatering and juvenile Chinook and steelhead stranding	**FY 2007**	FY 2008	Expected FY 2008	Expected FY 2008
	Spring- and fall-run Chinook salmon and steelhead spawning	FY 2004	FY 2006	FY 2006	Expected FY 2008
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	**Started in FY 2007**	Expected FY 2008	Expected FY 2009-10	Expected FY 2009-10
	Juvenile spring-run Chinook salmon and steelhead upper reach rearing	**Started in FY 2007**	FY 2008	Expected FY 2009-10	Expected FY 2009-10
	Juvenile spring-run and fall-run Chinook salmon and steelhead lower reach rearing	**Started in FY 2007**	Expected FY 2009	Expected FY 2009-10	Expected FY 2009-10
Tuolumne	Floodplain inundation as a function of flow (La Grange Dam and river mile 22)	N/A	**FY 2007**	FY 2008	Expected FY 2008

Dedicated 800,000 acre-feet Project Yield

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…"

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 provided per increased CVP releases and decreased CVP export pumping, relative to a hypothetical pre-CVPIA baseline operation. The accounting of the water is obtained from 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 (see Figure 1 for location map).

Water Management

The 2000 CALFED Programmatic Record of Decision established an Environmental Water Account (EWA) program with the purpose of providing protection (supplemental to a hypothetical pre-EWA baseline level of protection) to the fish of the Bay-Delta Estuary. Although accounted differently, the management of (b)(2) water is closely coordinated with the management of CALFED's EWA, since both (b)(2) and the EWA contribute to the CVPIA's goal of doubling natural production of anadromous fish and provide concurrent

Figure 6. Average Annual (b)(2) Water Use in thousand acre-feet (TAF) (2002-2005)

benefits to other fish and wildlife, including endangered fish species. The program includes monitoring and evaluation to assess the effectiveness of the use of the (b)(2) water.

In 2003 and 2004, the U.S. Court of Appeals for the Ninth Circuit stated that the "primary purpose" to which the 800,000 acre-feet should be dedicated is the implementation of "fish, wildlife and habitat restoration purposes authorized by (CPVIA)…" The statute gives Interior discretion to allocate the 800,000 acre-feet among fish and wildlife, state water quality control plan fishery requirements and endangered species obligations, as long as Interior's allocation accounts for the hierarchy of purposes established in Section 3406 (b)(2).

Due to legal decisions by the Federal District Court, Interior released a revised Final Decision on implementation of Section 3406 (b)(2) on May 9, 2003 which set out a calculation of CVP water use (the method for accounting for use of the dedicated 800,000 acre-feet of water and procedures for management of the water).

In general, (b)(2) fish actions include CVP pumping reductions and additional flow releases relative to pumping and releases the CVP would make given current demands and hydrologic conditions, but under pre-CVPIA regulatory requirements. Generally, the objective for these actions are as described below:

(1) Instream flow augmentations on CVP-controlled streams to protect salmon and steelhead and contribute toward meeting AFRP flow objectives

(2) Increased releases from New Melones Reservoir to help meet the 1995 Water Quality Control Plan (WQCP) requirements for San Joaquin River flows at Vernalis

(3) Increased releases from Shasta and/or Folsom reservoirs to help meet the WQCP delta outflow requirements

(4) Export reductions at the CVP Tracy pumps to protect at-risk fish species (notably salmon, steelhead and delta smelt)

Monitoring and Evaluation

Real-time fish monitoring helps inform (b)(2) decisions on when and where 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 the U.S. Bureau of Reclamation, Mid-Pacific Region, Central Valley Operations Office home page at www.usbr.gov/mp/cvo.

Table 9. Allocation vs. Use of (b)(2) Water (2001-2007)

	Use of Dedicated Water (approximate)			
Year	(b)(2) Allocated (acre-feet)	Fisheries (acre-feet)	Other CVP Project Purposes* (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	198,000
2007	800,000	798,000		

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

Measuring Success

The 800,000 acre-feet annual allocation has been fully utilized each water year since 2000 when the (b)(2) accounting began, except for water year 2006. As shown in the Table 8, in wetter precipitation years (2005 and 2006) a portion of the dedicated water was banked pursuant to Section 3408(d) for use in the subsequent year.

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.

In 2007, Reclamation dedicated 800,000 acre-feet of 2007 water and used approximately 195,000 acre-feet of banked 2006 water through the (b)(2) program. Uses of (b)(2) water in 2007 are listed in Table 9.

Table 10. FY 2007 Use of (b)(2) Water

River	Action	Date	Results
American	Augmented low base flows to maintain 1,500-2,000 cfs	Late October 2006–mid-April 2007	Improved instream conditions for fall-run Chinook and steelhead during spawning, incubation and rearing periods
Sacramento	Augmented low base flows with Water Year (WY) 2007 and 2006 (b)(2) water and banked WY 2006 water in Shasta Reservoir to maintain 4,500-5,500 cfs; unused WY 2006 banked water made available to other CVP purposes	November 2006-March 2007	Improved instream conditions for fall-run and late-fall-run Chinook and steelhead during spawning, incubation and rearing periods
Clear Creek	Augmented low base flows throughout 2007	FY 2007	Improved habitat conditions for anadromous fish, including Chinook salmon and steelhead and their upstream migration, spawning, egg incubation, rearing and downstream migration
Stanislaus	Augmented low base spring pulse flow for outmigrating fall-run Chinook smolts	April 20-May 20; coordinated with 2007 Vernalis Adaptive Management Program (VAMP)	Assisted outmigrating fall-run Chinook smolts; needed due to low base flows
CVP Jones Pumping Plant	Reduced higher base CVP exports prior to VAMP	March 22-April 21	Assisted in meeting WQCP requirements
	Reduced higher base CVP exports to approximately 850 cfs during VAMP period	April 22-May 22*	Protected outmigrating salmon smolts as well as larval and juvenile delta smelt

* In the post-VAMP period, higher base CVP exports were reduced using EWA wate to approximately 850 cfs and then ramped up gradually (May 22-June 18).

Water Acquisition Program – Instream Water

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 for fisheries. The target for acquisitions is approximately 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 (d)(2) Water Acquisition Program-Refuge Water.

The WAP is designed to meet two primary objectives in support of the Anadromous Fish Restoration Plan:

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

In support of the second goal, 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.

Managing flows pursuant to SJRA and VAMP

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 includes VAMP and governs the operation of water on the 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.

WAP acquires, and with the Central Valley Operations Office (CVO), in cooperation with the member agencies of the San Joaquin River Group Authority (SJRGA) 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

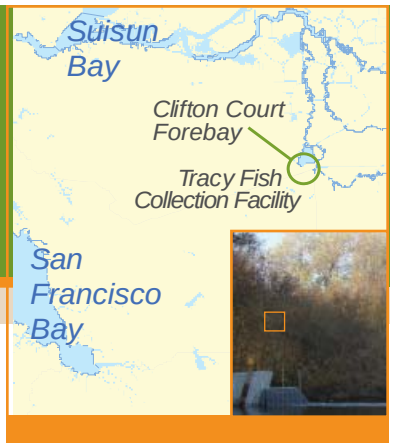
Since 2001, the program has acquired an average of approximately one half of the 200,000 acre-feet annual target. The actual volume of water acquired each year fluctuates based on the basin hydrology, reservoir storage and the water supplies available to WAP pursuant to the SJRA. The costs for the water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

Reclamation has yet to acquire the full 200,000 acre-feet of target flows, due to a lack of willing sellers as well as 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 by entering into one-year transfers with local water agencies that have transferable water to sell. Table 10 shows the volume of water purchased for the years 1994 through 2007. The 2007 water includes 35,000 acre-feet purchased for flows to protect the federally listed delta smelt.

Table 11. Annual (b)(3) Instream Water Acquisitions (1994-2007)

Year	Annual Water Acquisitions in acre feet (percentage of 200,000 area 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%)

Tracy (Jones) Pumping Plant Program



CVPIA Section 3406(b)(4)

"Develop and implement a program to mitigate for fishery impacts associated with operations of the Tracy Pumping Plan. 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). The facility provides multi-use water from the Sacramento-San Joaquin Delta (Delta) to the Central Valley of California. The primary purpose of the program is to mitigate for south Delta fishery impacts at the federal JPP. The current primary objective of the program is to develop and implement new, modern day cost-effective fish collection, holding, transport and release technology and operational procedures that will significantly 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 the 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 at the Denver Technical Service Center. Research planning and execution is enhanced through coordination, review and assistance from

Figure 7. Tracy (Jones) Pumping Plant

other agencies including the DFG, DWR, the Service, and the National Marine Fisheries Service (NMFS). Universities, private consultants and the San Luis Delta Mendota Water Authority also provide assistance.

Due primarily to budgetary constraints, Reclamation and DWR decided in 2005 not to proceed with construction of new full-scale testing/fish screen facilities in the south Delta, instead opting to develop and implement actions at the existing TFCF and Skinner (including improved technology and operational

procedures) to reduce fish losses and improve fish salvage success while meeting the goal of the CVPIA. This 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. Many of the regulatory requirements were also contained in the 2004 NOAA Fisheries and Service CVP Operating Criteria and Plan (OCAP) biological opinions.

To date, Reclamation has identified 23 "actions" related to improving fish protection at the existing TFCF. Implementation of these actions has been ongoing since 1992 at 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 fish loss reduction targets; rather, the program's present goal is to implement and complete the 23 identified actions.

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 Tracy by a few feet and increased primary channel velocities
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, resulting in a higher level of fish stress and mortality and causing 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

Measuring Success

Program Actions

To date, the program has completed 10 of 23 actions, or 43 percent of the program's present goal. Actions in 2007 included continued study efforts to determine the TFCF's present-day fish salvage efficiency, assessment of above-ground holding tanks in the Denver lab, reassessment of the outdated Bates Table used for establishing fish hauling densities during transport, improvement to debris and predator management as well as hydraulic control of the facility, collection of water quality data at the entrance to the DMC, distribution of various Tracy Research Volume Series and publications, and updating of the Tracy Research Web site. Also, Reclamation proceeded with replacement of fish transfer buckets and new fish haul trucks and tanks, and began construction of a new onsite research building.

Since the program was implemented, physical and operational changes have already significantly shown 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. However, since the decision to focus on improving existing South Delta fish screens instead of moving forward on construction of new fish screens in the South Delta was made in 2005, Reclamation estimates that it will take approximately another seven to 10 years to fully assess the existing TFCF and implement and evaluate all remaining physical and operational improvements presently identified at TFCF.

Program Research

The program has produced 23 volumes of research-related activities to date. The information from the Tracy Research Volume Series 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 2007, the program completed distribution of Tracy Research Volume Series Nos. 31-33, 35, 36, 38 and 40 and distribution of Tracy Technical Bulletin 2006-1, and facilitated ongoing development of the Tracy Research technical Web site and enhanced data accessibility.

The information contained on the Web site is used by many scientists and engineers studying the Sacramento-San Joaquin Delta region for fishery and water quality affects and concerns.

In 2008, 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

Contra Costa Canal Pumping Plant

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."

Part of the Contra Costa Canal is the backbone 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, after which gravity propels the water to its terminus in Martinez.

Operation of the pumps without adequate screening or alternative mitigation results in fish mortality. In addition to the CVPIA mandate, the 2004 Los Vaqueros biological opinion (BO) extension, requires that a fish screen be built at Rock Slough. This program is focused on improving the operation of the Rock Slough Intake to minimize the loss of fish through three main activities:

- Designing and constructing a fish screen for CCWD's Pump #1 and one or more new intake structures

Figure 8. Contra Costa Canal Pumping Plant

- Working with CCWD to modify operations (change the pumping schedule)
- Making interim annual mitigation payments to compensate for presumed losses of delta smelt during continued operation of the Contra Costa Pumping Plant 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 underway, 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 agencies, including the Tracy Fish Collection Facility (b)(4), the Anadromous Fish Screen Program (b)(21), and other Central Valley actions for endangered species.

These studies have the potential to significantly alter the currently designed fish screen facility at Rock Slough or to eliminate the need for a screened diversion altogether. As a result of these developments, alternative short-term, lower-cost fisheries mitigation measures are being investigated and developed, including short-term operational flexibility, alternative exclusionary measures, and/or monitoring and salvage procedures.

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, reviewing preliminary designs and recommending 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 an interim Cumulative Impacts Assessment for the Contra Costa Canal Mitigation Program, which will serve as the basis for future NEPA documentation. This document presents the potential effects of the currently identified potential fish screen alternatives.

Modifying Operations

In 1997, water supply through Rock Slough was reduced to approximately 17 percent of the CCWD total. This reduction was made possible by the Los Vaqueros Project, which constructed a new screened intake at Old River, allowing a greater amount of water to be pumped from that location.

With the 1997 reduction in water intake at Rock Slough, the Service agreed to extend the deadline date for construction of a fish screen until 2008. The program is currently consulting with the Service on the Los Vaqueros biological opinion as it relates to the environmental commitment of the Rock Slough Fish Screen.

Mitigation Payments

In 2007, the program provided $50,000 to the Service for the Sacramento-San Joaquin Delta Pelagic Organism Decline effort to address the dramatic recent decline of species such as the delta smelt.

[1]The Team is made up of representatives from California Department of Fish and Game (CDFG), Department of Water Resources (DWR), U.S. Fish and Wildlife Service (Service), U.S. Bureau of Reclamation (Reclamation), NOAA Fisheries, and the Contra Costa Water District (CCWD)

Flow Fluctuations and Reservoir Storage

CVPIA Sections 3406(b)(9) and 3406(b)(19)

"(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…"

"(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 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). To date, a specific performance goal has not been established for this program.

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. To date, a specific performance goal has not been established for this program.

Measuring Success

Clear Creek: Outside of flood control periods or large precipitation events, there typically are no extreme flow fluctuations on Clear Creek. In 2007, 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. Using this information, Reclamation and the Service convened weekly interagency (b)(2) team meetings in 2007 to determine how to minimize damaging flow fluctuations on the Sacramento River to the extent possible. In 2007, Sacramento River flows were augmented using a combination of (b)(2) water and (b)(1)(B) reoperation. Severe flow fluctuations during critical fish periods did not occur.

American River: On December 11, 2001, a 1997-2000 flow fluctuation study was published by the DFG that documented the optimal flow rates and flow timing to support fisheries restoration for salmon and Steelhead in the lower American River. In 2007, the data and conclusions from this study were used as guidance in discussions about the operation of Folsom Reservoir (the major contributor to flows in the lower American) at monthly American River Group meetings with stakeholders as well as for weekly (b)(2) interagency team meetings. American River 2007 flows were augmented using a combination of (b)(2) water and (b)(1)(B) reoperation. Large flow fluctuations during critical fish periods did not occur.

Stanislaus River: In July 2004, the DFG completed an early draft report on the Stanislaus River flow fluctuation study, which will be completed in 2008. Data and conclusions from this study will be used in future years to facilitate discussion and decision-making regarding the operation of flows on the Stanislaus River, including the operation of Goodwin, Tulloch and New Melones dams, which are the primary generators of flows. In the winter and spring of 2007, flows were higher than normal (due to high carryover storage) and damaging flow fluctuations during critical fish periods did not occur.

The American River from Guy West Bridge

Red Bluff Diversion Dam

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 four kilometers southeast of the city of Red Bluff. The dam diverts 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.

As recently as 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, and the program saw a resultant change in spawning distribution with less spawning below the RBDD and more spawning in colder water above the dam. However, the improved passage still delayed or blocked many adult winter- and spring-run Chinook and continued to cause spawning in downstream waters too warm for successful egg incubation. Adult green (ESA-listed) sturgeon and white sturgeon also were blocked and losses of out-migrating juvenile salmon also were measured at up to 50 percent. Increased feeding and ambush settings created a dysfunctional predator-prey relationship between the out-migrating salmonids and the native Sacramento pikeminnow.

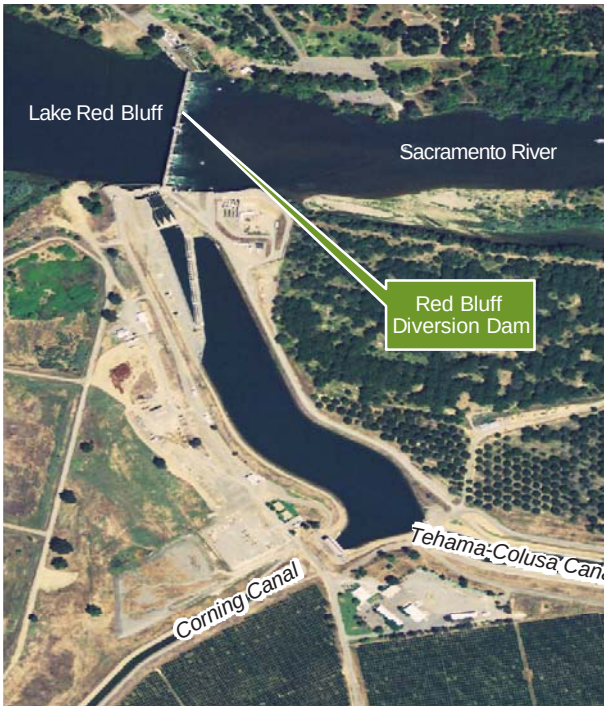


Figure 9. Red Bluff Diversion Dam

The purpose of the Red Bluff Fish Passage Improvement Project 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 focuses on 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 100 percent of adult green sturgeon
- Output target: complete RBDD infrastructure improvements as necessary to achieve annual fish passage targets
- Output target: Supply Full Level 4 water to the SNWR

Reclamation's stated preference to help achieve fish passage targets is for a two-month gate closure and construction of a new pumping plant, which will provide a more reliable supply of water while also protecting fish through the use of screens. However, operations of a new pumping plant would be determined as part of the Operations Criteria and Plan (OCAP) ESA consultation and the biological opinion (BO) which is expected to be issued in 2008. Operational performance goals related to passage of migrating salmonids and green sturgeon would be developed following issuance of the BO. Also, funding has not yet been secured. Therefore, a specific timeframe for achieving the infrastructure improvements and the fish passage targets has not been determined.

Measuring Success

Fish Passage

Achievements 1993 to Date

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); as a result the population index dramatically increased and juvenile predation dropped.

Based on the current operation of the facility (four-month closure of the gates), approximately 20 percent of the adult spring-run Chinook and approximately 50 percent of the green sturgeon achieve passage. However, winter-run Chinook spawning returns showed a significant population increase from nearly 700 to 17,000 after 1998 through 2006, and both the fall- and winter-run spawning distributions changed significantly before and after the raised gates period–after gates were raised, fish spawned further upriver (see figure 9).

2007 Operational Changes Address Loss of Green Sturgeon

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 the observation that an unusually large number of green sturgeon were "holding" in the vicinity of the dam, and the inference 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 kept "open" or raised a minimum of one foot from the river floor. No further fatalities were observed in 2007 following implementation of this operational change.

Refuge Water Conveyance Capacity

The mandated goal to supply Full Level 4 water to the Sacramento National Wildlife Refuges mandated in 3406(b)(10) has been met. The goal was met after evaluation of eight options 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.

Infrastructure Improvements

Reclamation and the Service issued a draft EIS/EIR in 2002 to evaluate six combinations of a new pumping plant, gravity diversions, fish ladders and gates' open/close timing. Delays resulted from the listing of the green sturgeon as a threatened and endangered species; it was decided to recirculate the EIS/EIR in 2006 to include discussion of OCAP and its requirements as well as potential impacts to the green sturgeon. Alternative 2b was identified as the preferred alternative, and 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-cubic-feet-per-second (cfs) pumping plant that would increase the existing pumping capacity fourfold, providing a more reliable water supply. (Subsequent ESA consultations have assumed construction of a 2,500 cfs facility, forgoing any reliance on the existing pumping plant.)

A final EIS/EIR and Record of Decision is anticipated in summer 2008 following completion of ESA consultation

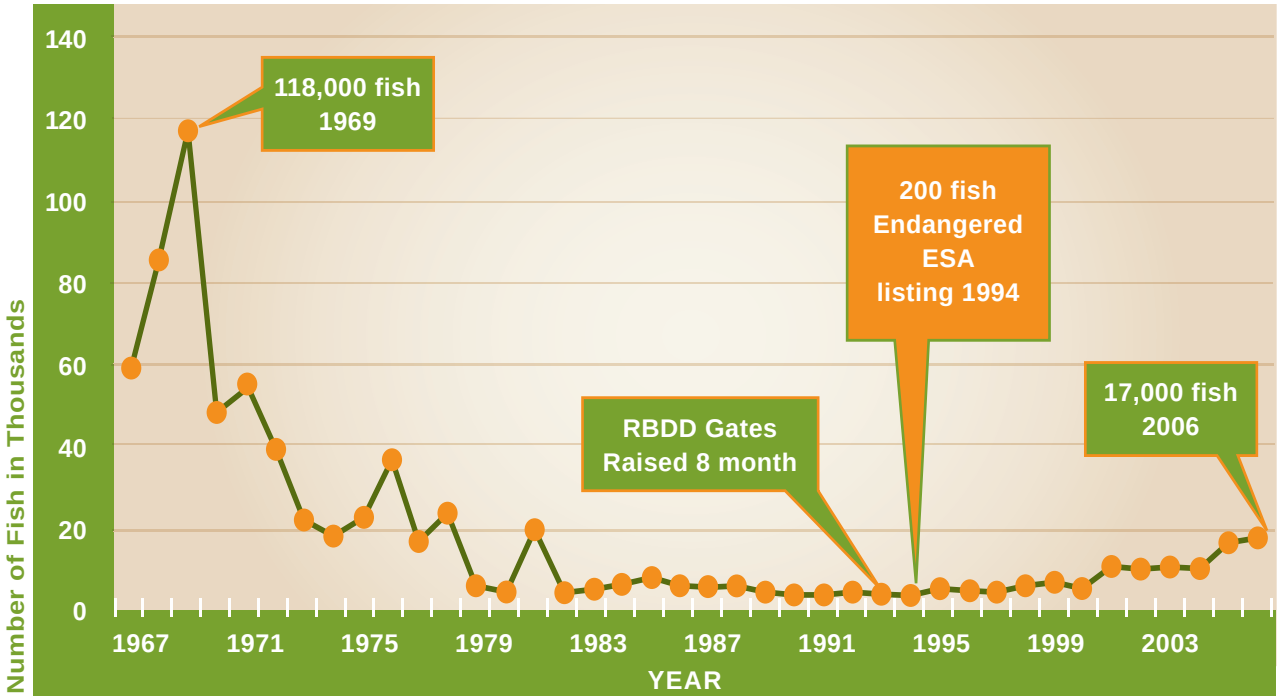


Figure 10. Spawning Returns, Winter-Run Chinook, Sacramento River (1967-2006)

on the planned construction. Decisions concerning operation will be deferred until completion of the OCAP consultation, which involves ESA consultation for the CVP as a whole and will likely include specific requirements for the pumping plant related to the listing of green sturgeon as a threatened species.

Open gates at Red Bluff Diversion Dam

Coleman National Fish Hatchery

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.

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

Figure 11. Coleman Fish Hatchery

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 20 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 the construction of 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
- 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 11, 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) 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. The two phases that remain to be implemented are expected to be completed by 2010.

Table 12. Coleman NFH Facility Rehabilitation Phases (1991-2007)

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 and 45,000 gpm capacities, respectively; No plans to further build out ozone facility to full capacity as prescribed by Phase 6 of the SDP	Reclamation for completed portion
7. Construction of 20 additional 15-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

Fish Production Targets

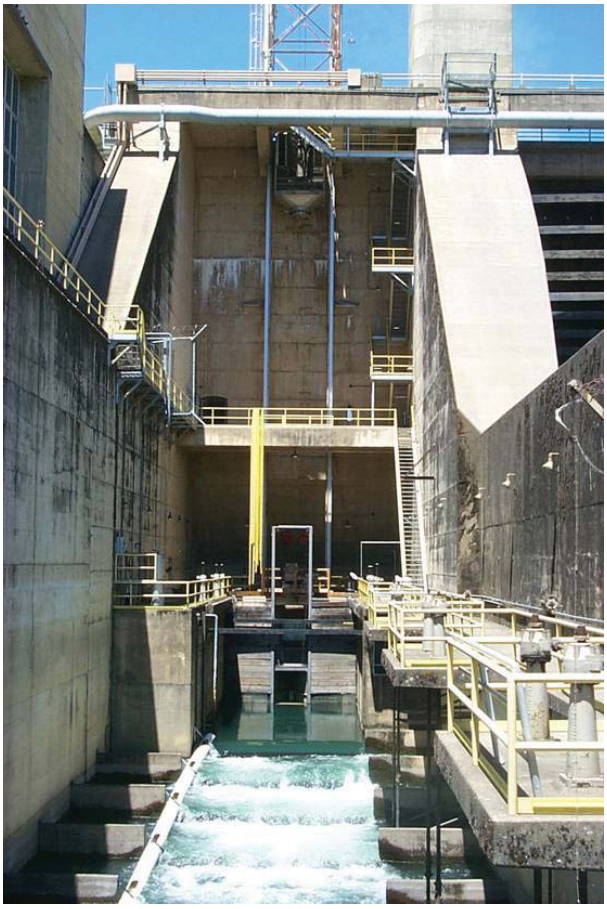
Fish production targets have essentially been met since the 1998 construction of Livingston Stone NFH. Actual annual production may vary around the target depending on factors such as numbers of available brood stock and egg survival rates.

Ozone Water Treatment Facility

Since the ozone water treatment facility reached full ozone production capacity of 30,000 gallons per minute (gpm) in 2000 (full water filtration capacity of 45,000 gpm reached in 2002), juvenile fall-run Chinook from brood years 1999-2006 were 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/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, 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. The program did not receive any funding in FY 2007 and therefore no specific objectives for the year were identified. However, in 2006, the program began design of a visitor kiosk and informational panels at the Coleman NFH and construction is expected to be complete in 2008.



Modifications to Keswick fish trap

Clear Creek Restoration Program

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…"

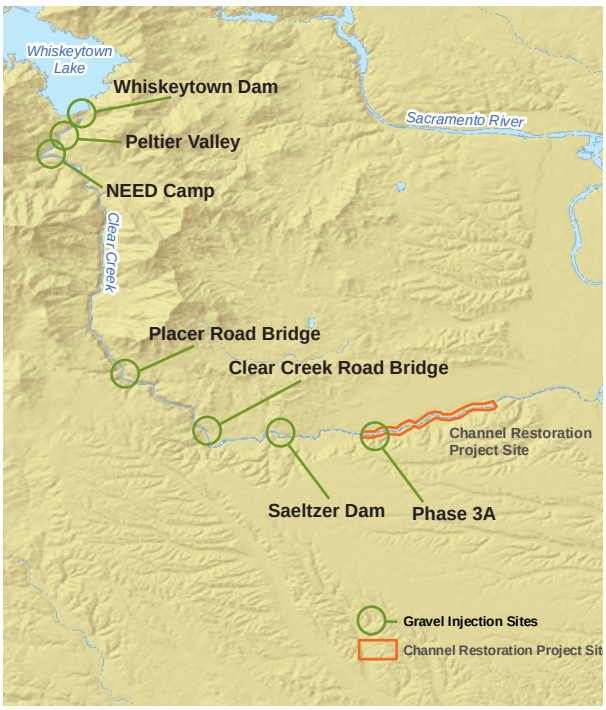


Figure 12. Gravel Injection and Channel Restoration Sites

The original construction of McCormick-Saeltzer Dam in 1903 with modifications in 1912 and its continued operation, in addition to the construction of Whiskeytown Dam in the 1960s and aggregate and gold mining in the Clear Creek, caused widespread degradation of the creek habitat and led to precipitous drops in Chinook and Steelhead salmon spawning and juvenile development. 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: Approximately 80,000 acre-feet of (b)(2) water dedicated annually; variable target dependant on hydrology and biological conditions, allowing provision of at least 90 percent of the maximum possible habitat; temperature targets met at least 98 percent of days with no more than two consecutive temperature exceedence days
2) Fish passage: Unimpeded fish passage provided past McCormick-Saeltzer Dam site through its removal
3) Gravel placement: 347,288 square feet of usable spawning habitat that existed before construction of Whiskeytown Dam recreated by 2020 by adding 17,000 tons of gravel annually
4) Channel restoration: Two stream miles restored by 2010
5) Erosion control: Highest priority and cost effective erosion control projects implemented by 2003

Measuring Success

Progress against the five program goals is summarized in the following section.

Instream Flow

An average of approximately 70,000 acre-feet of (b)(2) water is used annually to meet flow requirements, and the temperature objectives are being met. 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 approximately 70 to 90 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 100 percent of the time in 2006 and 99 percent of the time in 2007. Lastly, the program has met the instream habitat goal of 90 percent weighted useable area for the last five years.

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.

Gravel Placement

Since 1995, an estimated 103,371 tons of gravel have been injected at specific locations on the creek, resulting in a steady increase in spawning habitat. This added gravel has recharged spawning gravel within approximately three miles of creek.

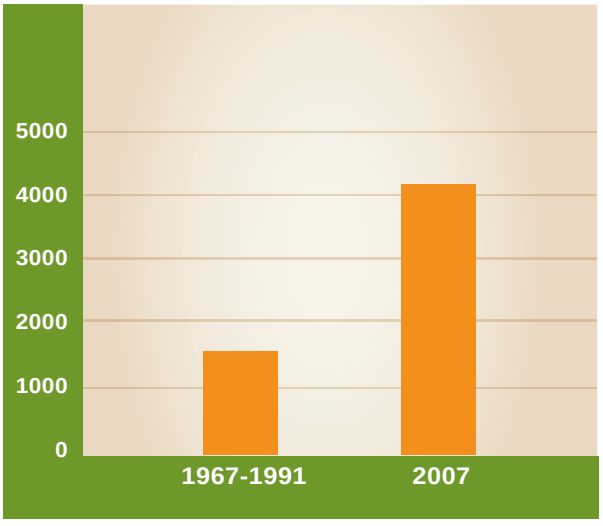


Figure 13. Fall–Run Chinook Salmon Escapement, Clear Creek (2007)

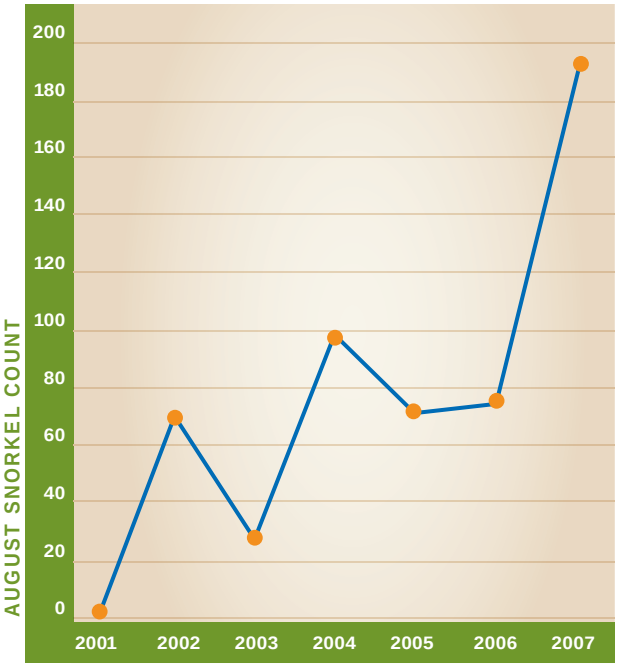


Figure 14. Adult Spring-Run Chinook Salmon Population, Clear Creek (2001-2007)

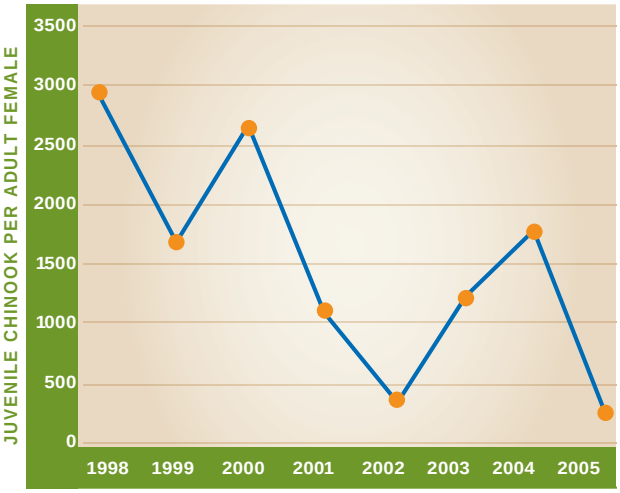


Figure 15. Juvenile Fall-Run Chinook Salmon Produced/Adult Female, Clear Creek (1998-2005)

Channel Restoration

The two-mile stream channel is 80 percent restored (Figure 15). Phases 1, 2A, 2B, and 3A are complete. Phase 3B channel relocation and floodplain reconstruction was completed November 2007. Phase 3B floodplain revegetation began in September 2007 and will continue through March 2008. Phase 3C is not complete.

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 National Park Service (NPS), the Service, and the Bureau of Land Management (BLM). All feasible and cost-effective projects were finished by 2001 and no further work is expected.

Through addressing these five problem areas, the Clear Creek Restoration Program has increased fall-run Chinook escapement, and steelhead and spring-run Chinook populations. In 2007, fall-run Chinook escapement was 4,129 compared to the average baseline escapement of 1,689 between 1967 and 1991, as shown in Figure 12. Similarly, adult steelhead populations also continued to increase, as indicated by redd counts, increasing from approximately 38 in 2001 to 162 in 2007. Figure 13 depicts the increase of adult spring-run Chinook from a low of zero in 2001 to 194 in 2007.

Despite the increases in adult populations, juvenile 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 2,900 in 1998 to 375 in 2005, as shown in Figure 14. 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 (b)(3) Environmental Water Program to remove fine sediment from the stream channel.

Figure 16. Clear Creek Channel Restoration Project Phases

Spawning Gravel Program

CVPIA Section 3406(b)(13)

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

The construction and operation of CVP dams on the Sacramento, American and Stanislaus rivers and associated bank protection projects have significantly reduced the availability of spawning gravel and rearing habitat in downstream reaches. The gravel replacement program is an ongoing effort to restore and replenish spawning gravel, as needed, in the Upper Sacramento River from Keswick Dam to Red Bluff Diversion Dam, and in the American and Stanislaus Rivers downstream from the Nimbus and Goodwin dams, respectively.

The average annual gravel deficits on CVP streams are as follows:

- Sacramento River–50,000 cubic yards (current flow regime)
- Stanislaus River–20,000 cubic yards (pre-Goodwin Dam flow regime)
- American River–57,200 cubic yards (current flow regime)

With gravel deficits of this magnitude and considering the high cost of acquiring gravel, the program focuses on targeting high-priority sites to make the best use of available funds. Two criteria guide the identification of gravel placement sites: the need for spawning habitat and accessibility to the river by truck, helicopter or sluice

Figure 17. Gravel Placement Sites

to deliver the gravel. All gravel is placed according to criteria developed by the DFG and the NOAA's National Marine Fisheries Service (NMFS), which stipulates the size and relative proportion of the various gravel sizes, and also stipulates the timing for gravel placement.

Once the gravel is placed, Reclamation and the Service continue to monitor and document the spawning densities of the downstream reaches by salmonids to determine the efficacy of the program. The program uses two criteria to determine success:

- Percent of spawning salmonids within a specific area using placed gravel for building redds as opposed to non-placed gravel (this percentage indicates the suitability of placed gravel)
- Redds per square meter in areas of gravel placement

The goal for the Sacramento River gravel placement areas is 25 percent of spawning salmonids; the goal for the Stanislaus River gravel placement areas is 10 percent of spawning salmonids. The goal for the American River is 0.05 redds per square meter on emplaced gravel (Sailor Bar, Lower Sunrise, and Sacramento Bar sites) and less than 10 percent egg retention.[1]

Measuring Success

Gravel Placement

Since 1997, the program has placed more than 151,500 cubic yards of gravel, primarily on the Sacramento River (Table 12).

Permeability of Gravel

The permeability of the gravel—its ability to be used by spawning salmon—is an important indicator of success and is used to determine future gravel placement actions. Ongoing gravel permeability studies examine areas where gravel was placed in the past to determine the ongoing suitability of the placed gravel for egg survival.

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 studies compared man made riffles created with varying sizes of gravel and determined that survival (egg to fry) was best in the smaller sized gravel placement areas.

2007 studies in the American River identified existing areas of high-density spawning by salmonids. Reclamation has not yet replenished the gravel in these areas, and the observed low natural permeability of the gravel suggests that survival would not be high. The program used this data in FY 2007 to prioritize future gravel placement to improve these conditions.

Spawning Densities

Since the implementation of the program, monitoring has shown improvement 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.

Table 13. Total Gravel Placed (1997-2007)

River	Total gravel placed (cubic yards)	Gravel placed in 2007 (cubic yards)	Percent of target for 2007
Sacramento	123,077	4,615	9%
Stanislaus	10,769	3,077	15%
American	4,615	0*	N/A

* In 2007, the program purchased 5,385 cubic yards to be placed in FY 2008.

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

Sacramento River

The average percentage located upstream of Highway 44 from 1981 to 1992 (pre-CVPIA) was 6.9 percent. From 1993 through 2005 (period since CVPIA was enacted), the average percentage was 15.6 percent. River conditions were unsuitable for collecting spawning surveys in 2006 and 2007; therefore, redd survey data is not available. The average percentage of the total potential redds located upstream of Highway 44 on the Sacramento River from 1981 to 2005 (the entire period for which records of escapement and winter-run Chinook spawning are available) was 12.1 percent, versus the program target of 25 percent.

Stanislaus River

In 2007, environmental permitting was acquired for gravel addition at eight new sites in the Stanislaus River at Knights Ferry and 3,077 cubic yards of spawning gravel and boulders were added to create three riffles in Knights Ferry. (Riffles are faster, shallower sections of a river that provide spawning habitat and also provide habitat for invertebrate production which is the major food source for juvenile fish.) Surveys (compared to control sites) showed that spawning in the areas where gravel was placed has increased from eight percent in 2006 to nearly 14 percent of the total potential redds in the entire river. Chinook redds also were mapped on gravel addition areas and the mapping confirmed that more than 50 percent of the fish in the river spawned on the gravel addition sites. On average, since gravel placement began, approximately 150 female Chinook salmon have spawned in Goodwin Canyon each year on the new gravel. This number of Chinook spawners should produce about 745,000 eggs, which should produce about 400 adult Chinook annually in the Stanislaus River.

American River

On the American River, aerial photos were reviewed in 2007 to determine spawning densities back to 2002, showing that there are more anadromous fish than available spawning habitat. Gravel placements in 2008 will be based on the data from this survey.

Salmon and trout on a gravel placement project in the Stanislaus River

Head of Old River Barrier

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) is a joint federal and state program that covers a series of proposed actions to improve water levels and water quality in the southern part of the Sacramento-San Joaquin Delta, improving water supply reliability for south-of-delta contractors and environmental uses, while protecting salmon in the San Joaquin River.

In support of SDIP, to reduce the number of fall-/late fall-run Chinook salmon that enter the Old River and to reduce entrainment at the CVP and State Water Project (SWP) pumping facilities, 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 planned fish ladder at the head of Old River will give passage to those adult salmon entrained into delta channels to the spawning grounds in the San Joaquin River.

Temporary Head of Old River Barrier

The gates and limited dredging will 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 is improved during periods of poor San Joaquin River water quality by the circulation of water caused by the gates' operation. After structural improvements (new operable gates, dredging and agricultural intake modifications) are complete, a supplemental EIS/EIR would allow for an increased permitted limit in the diversion rate at Clifton Court Forebay. This would

increase the water deliveries to state and federal water contractors and for environmental uses south of the delta by improving the operational flexibility of the SWP Banks pumping plant.

The (b)(15) target was to have a permanent operable gate designed, constructed and operational by 2009. Unlike temporary gates, the permanent gate is expected to be 100 percent effective and can be in place and operable when San Joaquin River flows are high. 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 OCAP biological opinions (BOs) by the Service and the NMFS must occur prior to construction. As these BOs are delayed, the construction target is now yet to be determined.

In the absence of a permanent operable gate, the Head of Old River Barrier is closed with a temporary rock barrier from April 15 to May 15 to allow salmon smolts to stay in the San Joaquin River as they migrate out to the ocean. In October and November, the rock barrier is closed again to protect flows in the San Joaquin River, which helps to increase dissolved oxygen in the river and keep more of the returning adult salmon in the river.

Measuring Success

Fish Diversion

A seasonal, temporary rock barrier at the head of Old River has been installed for 11 of the 14 CVPIA years (1992-2007), helping to keep fish in the San Joaquin River. As the temporary barrier is not 100 percent effective, from 2001 to 2004, the most fish diverted into the Old River annually was 8,467, and the least was 1,805, with an annual average of 4,508. The temporary barrier was not installed in four years (1995, 1998, 1999, 2005) due to high flows. Until the permanent gates are constructed, temporary barriers will continue to be placed to reduce salmonid fish losses, unless there is a conflict with the in-delta habitat flow requirements for the delta smelt.

Program Stages

Success is measured based on completion of three key stages, namely (1) planning and environmental documentation, (2) design, and (3) construction. The project completed the first stage in 2006 with the issuance of the Final EIS/EIR; design is expected to continue through 2008.

However, final design and construction is tied to the issuance of BOs by the Service and the NMFS. The BOs will identify mitigation requirements related to the effects of the proposed construction, operation of gates and implementation of dredging operations. The SDIP BOs are on hold pending the resolution of the Section 7 consultation on OCAP. This broader consultation addresses the CVP as a whole and will include specific requirements for the SDIP gate operations.

Conceptual Model

In order to illustrate the benefits of the project's implementation, in 2007 Reclamation and the DWR developed a conceptual model that shows the relationships between Chinook salmon and environmental factors occurring in the delta. The conceptual model describes the hypotheses regarding Chinook salmon migration periods and pathways and how key habitat factors (e.g., flow, temperature) and operations (e.g., Head of Old River Barrier, CVP and SWP pumping rates, salvage facilities) influence the survival of Chinook salmon juveniles in the lower San Joaquin River and delta.

Comprehensive Assessment and Monitoring Program

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…."

The Comprehensive Assessment and Monitoring Program (CAMP) generates or facilitates access to data regarding the biological results and effectiveness of fish restoration actions implemented pursuant to CVPIA. 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 also assesses progress toward Anadromous Fish Restoration Program (AFRP) fish doubling goals by monitoring natural production of adult anadromous fish in the Central Valley and comparing these data to AFRP production targets.

CAMP primarily relies on other entities (e.g., the AFRP or DFG) 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.

The CAMP Implementation Plan describes how the program will monitor anadromous fish species in California's Central Valley and assess the biological results and effectiveness of different categories of restoration activities. The CAMP Implementation Plan also contains programmatic objectives and descriptions of how adult fish production should be calculated, a recommended juvenile salmonid monitoring program, data analysis methods, data management protocols, and a five-year budget and funding-needs estimate.

Benchmarks for assessing the success of the CAMP are reflected in three categories that include the production of annual reports, the collection of new monitoring data, and implementation of program planning and evaluation activities.

Weir installation for fish monitoring on the Stanislaus River

Measuring Success

Annual Reports

CAMP has produced five annual reports since program inception. These documents were finalized in 1998, 1999, 2001, 2002 and 2007. Each report monitors the production of anadromous fish and assesses progress toward the AFRP fish production targets during different periods.

The 2007 annual report synthesizes and analyzes anadromous fish monitoring data collected between 1992 and 2006 on 13 watersheds (Figure 17). Overall it concludes that the majority of the AFRP production targets have not been met on a regular basis, suggesting that a substantial increase in restoration efforts will be required to promote measurable increases in production of the above-mentioned nine anadromous fish taxa in order to achieve the AFRP production targets.

Collecting Monitoring Data

In 2007, CAMP acquired 82 reports that provide rotary screw trap data that were collected between 1994 and 2006. Analysis of these data may allow CAMP to assess the relative effectiveness of past restoration activities.

In addition, in an effort to collect data, CAMP obligated $96,000 in 2007 to monitor production of juvenile Chinook salmon on the Stanislaus River to assess the success of restoration activities such as gravel augmentation projects and modification of river flow regimes.

A new Web site (www.fws.gov/sacramento/CAMP/index.htm), implemented in 2007, functions as a resource for all reports and documents pertaining to CAMP, including the CAMP Implementation Plan, annual reports and data collected with CAMP funding.

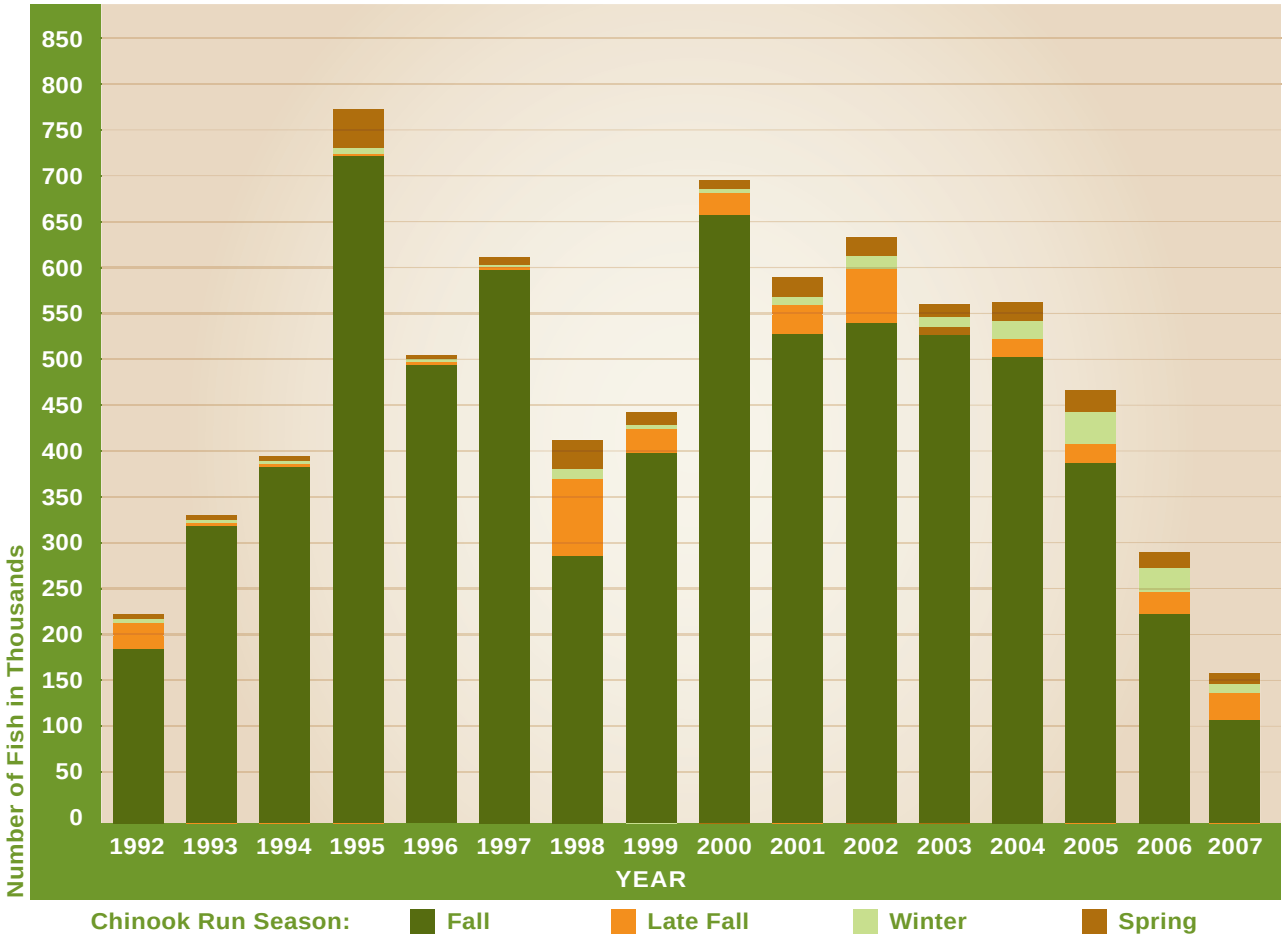


Figure 18. Estimated Total Natural Chinook Production, Central Valley (1992-2007)

Program Planning & Evaluation

With guidance from the CAMP Implementation Plan, the program developed the Final Hatchery Marking Program Report in 2000, which was an investigation of the feasibility, effectiveness and cost of a constant fractional marking (CFM) program at Central Valley fish hatcheries. (A CFM program includes marking a fixed percentage of hatchery juveniles before they are released in order to later more accurately count hatchery versus wild spawning adult salmon.) It concluded that a CFM program should be implemented to improve the accuracy of natural production estimates and assist in meeting CAMP monitoring and reporting goals. With implementation of the CFM program in 2007, many of the recommendations from the Final Hatchery Marking Program Report have been incorporated into the procedures that are part of the ongoing CFM program.

The 2004 *Statistical Procedures for Defining and Detecting the CVPIA Natural Chinook Salmon Production Doubling Goal Report* was an investigation of statistical procedures for assessing progress toward the fish doubling goal and determining sustainability of production increases. Recommendations in the document cite a need for better data, including watershed-specific escapement estimates for naturally spawned and hatchery fish; watershed-specific juvenile production; and ocean, mainstem and tributary catches. As appropriate, these recommendations are reflected in CAMP funding requests to obtain the funds needed to develop more accurate and precise population estimates and better determine if the AFRP fish production targets are being met.

In addition, CAMP currently is conducting an internal evaluation to determine the program's future scope, direction and costs. The assessment will include the following information:

- Review of past and ongoing monitoring projects to identify data gaps
- Quantification of the cost for completing critical monitoring activities between 2008 and 2012
- Identification of partnerships CAMP should pursue to cooperatively fund projects where a partner may share a common interest
- Identification of mechanisms for providing monitoring information to interested parties

The results from the assessment will be included in a programmatic document that updates the 1997 CAMP Implementation Plan. A completion deadline for the updated document has not yet been established.

In 2008, the program will launch a pilot program to develop watershed-specific documents that describe the potential relationship between restoration activities and the production of adult and juvenile Chinook salmon.

Glenn-Colusa Irrigation District Program

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. 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 spring 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 the spring of 2001; to determine if the facility is operating per the design criteria, biological and hydraulic testing has been ongoing.

Figure 19. Glenn-Colusa Irrigation District Pumping Plant

Measuring Success

Mitigating Project Impacts

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

The primary impact on terrestrial species involved the federally–listed valley elderberry longhorn beetle, which existed adjacent to the pumping plant and would likely be 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 is providing 10 years of maintenance and monitoring on the adjacent site to ensure survival of all species. The Service has accepted the mitigation areas and will incorporate them into an existing refuge.

2007 Accomplishments

The principal effort in 2007 was the completion of the biological and hydraulic testing and monitoring program that began in 2001. Challenges to completing the program included problems with designing, building and operating a facility to capture a sufficient amount of test fish; obtaining suitable small Chinook fry during the important summer test times; tagging salmon fry from Coleman Fish Hatchery; and measuring the approach velocity at the screen face. FY 2007 was the fourth year that salmon fry were able to be used for the biological testing, constituting an acceptable data set. Biological testing was completed in 2007; fish survival tests at the fish screens showed that survival of fish in the vicinity of the screens is not impaired due to the design of the screens.

As of FY 2007, the funding for the project is 99 percent complete, and the project and related testing and monitoring is 99 percent complete for the total project. Hydraulic testing is expected to be completed in 2008. 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

Anadromous Fish Screen Program

CVPIA Section 3406 (b)(21)

"Assist the State of California in efforts to develop and implement measures to avoid losses of juvenile anadromous fish...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 Anadromous Fish Screen Program (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 and green and white sturgeon from entrainment at priority diversions throughout the Central Valley and delta.

The NOAA Fisheries has estimated that up to 10 million anadromous salmonid fish fry are lost annually to diversions from the Sacramento River alone. Currently, there are many unscreened diversions in the Central Valley, including:

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

A process is underway with the State of California to identify high-priority diversions; therefore the exact number of screens to be constructed in the future has not yet been defined. As such, a deadline has not been identified for program actions.

The AFSP also provides assistance to irrigation districts and water companies with fish screening in two main areas:

Design: The AFSP, comprised of experts from federal and state agencies, provides fish screen design review and technical guidance to the diverter and their consultants throughout a project.

Construction: The AFSP has provided significant funding and technical resources that are essential in implementing fish screen projects. The AFSP can provide up to 50 percent of the cost of a fish screen project. Thus far, the CALFED Ecosystem Restoration Program (ERP) has provided the majority of the required non-federal cost-share funds.

Measuring Success

Since 1994, the AFSP has assisted irrigation districts and water companies with fish screening at 23 diversions ranging from 17 cfs to 960 cfs. Cumulatively, the AFSP has supported/funded the screening of more than 4,200 cfs (Table 13).

In 2007, Sutter Mutual Water Company (SMWC) completed construction of their Tisdale Positive Barrier Fish Screen Project in Sutter County, which is designed

Table 14. AFSP Projects and cfs Screened, Central Valley (1992-2007)

Cumulative Results		
Year	**Number of Projects**	**CFS Screened**
1992-1996	0	0
1996	2	80
1997	9	420
1998	10	420
1999	15	1,637
2000	17	2,489
2001	17	2,489
2002	17	2,489
2003	19	2,489
2004	20	2,959
2005	21	3,204
2006	22	3,304
2007	23	4,264

to screen the largest unscreened diversion (960 cfs) on the Sacramento River. Significant funding assistance ($10 million) was received from the AFSP over the life of the project. 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. In addition, AFSP continued to fund construction of the RD 108 Fish Screen project to screen three diversions at a new, consolidated 300-cfs diversion on the Sacramento River in Sutter County.

The AFSP is currently providing technical assistance (design, environmental and permitting) for several large fish screen projects which have not yet secured needed construction funding from other federal and non-federal funding sources as necessary per cost share requirements in the Act, including:

- Natomas Mutual: Project to consolidate five diversions totaling 630 cfs into two screened diversions on the Sacramento River
- Meridian Farms: Project to consolidate three existing diversions totaling 165 cfs on the Sacramento River in Sutter County; partial construction funding provided
- Pleasant Grove-Verona: Project to screen existing diversions totaling 175 cfs on the Natomas Cross Channel, which is a tributary to the Sacramento River
- Patterson Irrigation: Project to screen a 190 cfs diversion on the San Joaquin River
- RD 2035: Project to screen a 400 cfs diversion on the Sacramento River
- City of Yuba City Fish Screen: Project to screen a 61 cfs municipal diversion on the Feather River; funding was provided to Yuba County Water Agency to complete a fish screen feasibility study for a south diversion at Daguerre Point Dam on the Yuba River

The AFSP also funds research to assess the biological benefits of fish screening and to help prioritize future fish screening efforts. In 2007, the program completed a federal funding agreement to initiate a three-year screening and monitoring program in partnership with the Family Water Alliance in the Sacramento River watershed system and delta. This program includes collection of fish loss data prior to installation of fish screens, in order to assess the biological benefits of fish screening and to help prioritize future fish screening efforts. Also, the AFSP continues support of a literature search and data analysis of fisheries losses at unscreened diversions within California and the Pacific Northwest. This effort will be completed in 2008.

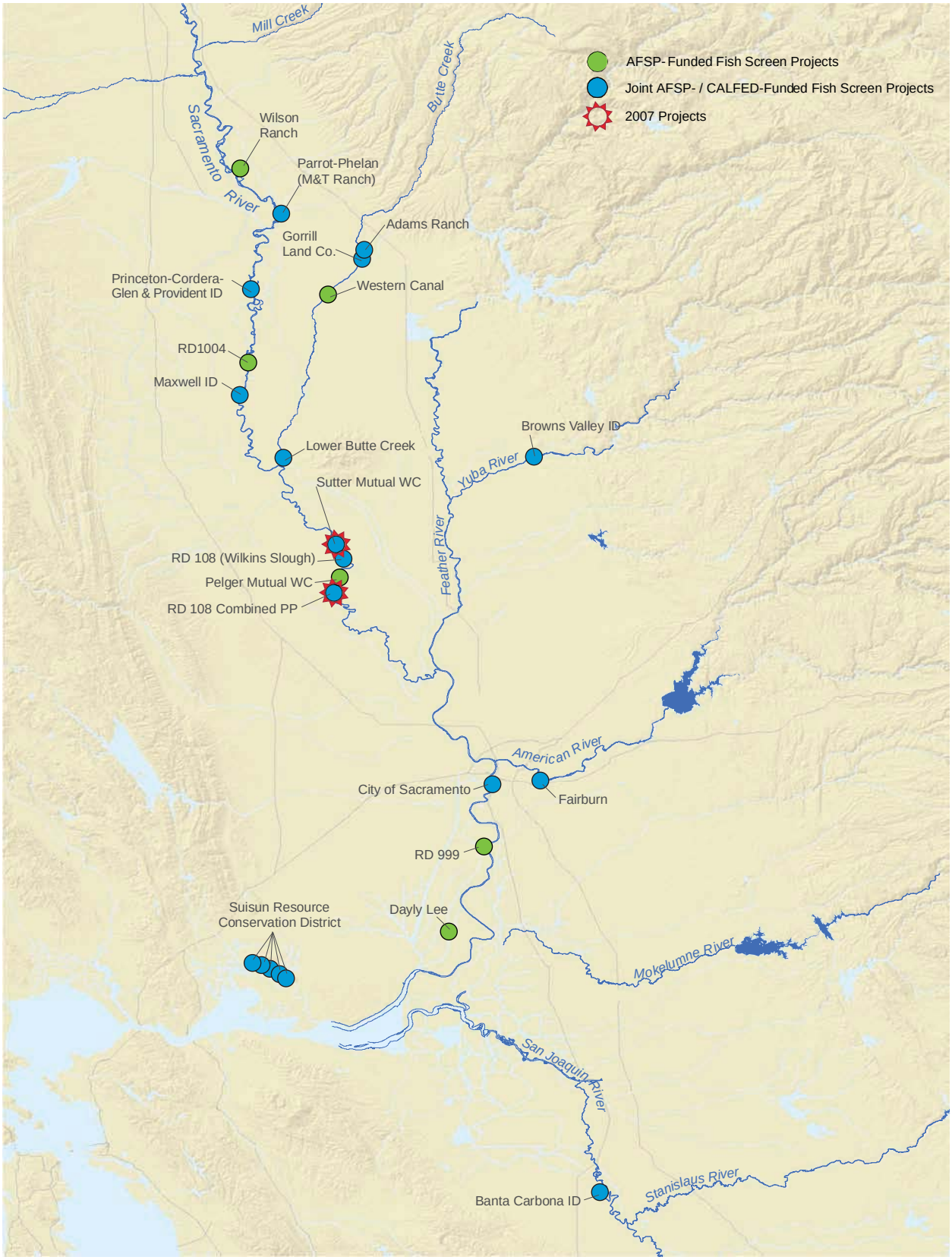


Figure 20. CVPIA Fish Screens Constructed (1992-2007)

San Joaquin River Comprehensive Plan

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.

San Joaquin River

Legal Challenges

The flow of water in the San Joaquin River has been the subject of an 18-year legal challenge, known as *NRDC, et al., v. Kirk Rodgers, et al.* whereby the Natural Resources Defense Council (NRDC)-led coalition of 13 conservation and fishing groups sued Reclamation, Interior, U.S. Department of Commerce, NMFS and the Service over its operation of Friant Dam and the renewal of water supply contracts for the Friant Water Users Authority. This lawsuit has effectively delayed development of a comprehensive plan. A Stipulation of Settlement (Settlement) was reached on September 13, 2006. The settling parties (Natural Resources Defense Council, Friant Water Users Authority, and the U.S. Departments of the Interior and Commerce) reached agreement on the terms and conditions of the Settlement, which was subsequently approved by Federal Court on October 23, 2006.

The Settlement's two primary goals are:

- Restoration–To restore and maintain fish populations in "good condition" in the main stem of the San Joaquin River below Friant Dam to the confluence of the Merced River, including naturally reproducing and self-sustaining populations of salmon and other fish
- Water Management–To reduce or avoid adverse water supply impacts to all of the Friant Division long-term contractors that may result from the interim flows and restoration flows provided for in the Settlement

The San Joaquin River Restoration Program

The Settlement states that the Secretary of the Interior will implement the terms and conditions of the Settlement. The San Joaquin River Restoration Program (SJRRP) is currently authorized under the CVPIA and the agencies responsible for the management of the program include Reclamation, the Service, NMFS, DWR, and DFG.

Additional funding and amended authorization is pending passage of federal legislation that would approve terms and conditions of the Settlement. The San Joaquin River Restoration Act (House Resolution 4074) passed out of the House Committee on Natural Resources in November 2007 and further action by the House and the Senate is anticipated in 2008. Once terms and conditions are approved, the program will continue to move forward with the development of a plan to reestablish salmon in the San Joaquin River.

Other Activities

Although development of the comprehensive plan has been delayed by the lawsuit, several key activities have been completed since 1992 in support of the future plan's goals. For example, physical improvements to 1.5 miles of the San Joaquin River (Milburn-Hansen Project); efforts to enhance the recovery of the federally listed valley elderberry longhorn beetle (the Endangered Species Recovery Program (ESRP)); data collection and study model development and calibration to benefit the ongoing development of temperature, hydraulic, and operational models for Millerton Reservoir and the San Joaquin River downstream to the confluence with the Merced River; San Joaquin River water quality monitoring; inventory and documentation of the current status, distribution and condition of the aquatic fauna and flora within the San Joaquin River between Friant Dam and the mouth of the Merced River; bird monitoring and development of a long-term monitoring plan to evaluate bird communities along the river; and development of an SJRRP-focused integrated information management system (IIMS) for centralizing the data required to support the management of river systems.

Measuring Success

In 2007, the program initiated organizational and management actions in order to move towards a long-term structure for the SJRRP, including creation of a program management structure for the coordinated involvement of all agencies and parties.

Using CVPIA authority and funding, the program completed the following actions towards the development of the San Joaquin River Comprehensive Plan: preparation of a Program Management Plan (PMP), establishment of dedicated technical work groups comprised of implementing agencies, development of a structured process for coordination with the settling parties, development of a comprehensive public involvement and outreach program, and development of a process for preparation and publication of the technical documents in support of development of the PEIS/R.

Introduction to the Refuge Water Supply Program

CVPIA Section 3406(d)(1), (2) & (5)

"(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…"

"(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..."

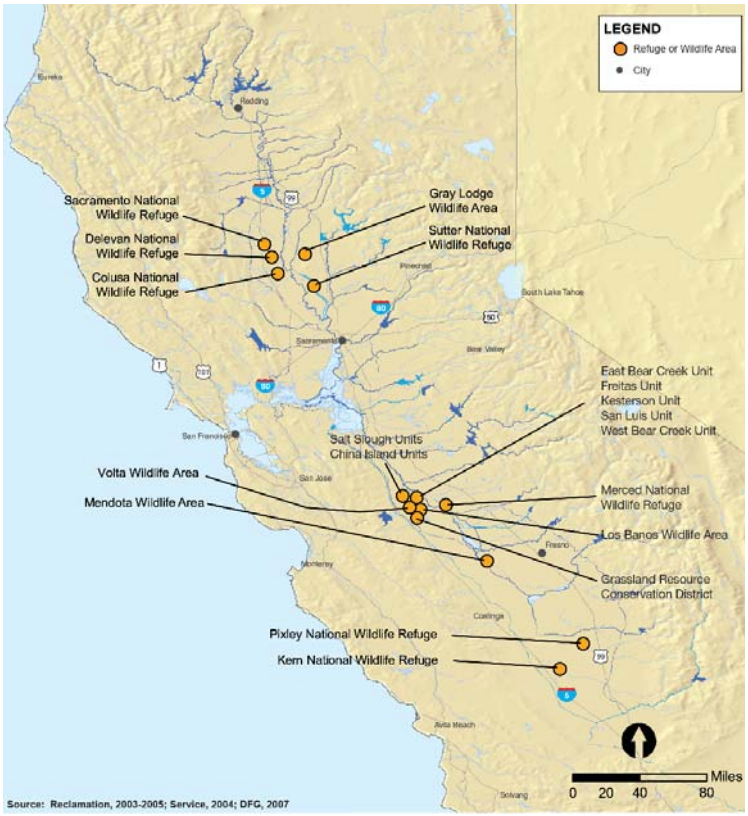


Figure 21. Central Valley Refuges Receiving CVPIA Water Supplies

"(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) encompasses several CVPIA provisions:

Water Acquisition

- (b)(3) Water Acquisition Program (WAP) for acquisition of Incremental Level 4 quantities specified in (d)(2); and
- (d)(1) Provide Level 2 Water

Conveyance

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

Construction

- (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
- (d)(5) San Joaquin Basin Action Plan–specific facilities construction to support delivery of water to the lands specified in the *San Joaquin Basin Action Plan Lands/Kesterston Mitigation Plan December 1989* report

The goal of the RWSP is to ensure that all wetland habitat areas, hereinafter referred to as refuges, annually receive water of specified quantity and suitable flow rate and quality to support their wetland and aquatic environments. The program serves 19 refuges as shown in Figure 21. The RWSP provisions (acquisition, conveyance and construction) work together to implement these CVPIA provisions.

The specified water quantities are defined as Level 2 water, Incremental Level 4 water, and Full Level 4 water (Table 15).

Level 2 is a specified amount of water required for minimum wetlands and wildlife habitat management, based on historic annual deliveries prior to 1989. Reclamation is required to provide full Level 2 water annually, either from the yield of the CVP or from other sources based on preexisting contracts or similar arrangements. Most Level 2 water is provided from the yield of CVP water. Some Level 2 water is provided from other non-CVP 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 (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. This term was not used in the Act.

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 Plan December 1989"* published by Interior and incorporated into CVPIA by reference. These studies collated all existing information on current and desired water use, power needs, surface water delivery systems, groundwater availability, recreation and wildlife resources, and habitat management objectives for all of the refuges. Based on this information, alternative plans were formulated for each refuge to provide dependable water supplies, utilizing several water delivery "options," including Level 2 and Level 4.

Table 16 shows the Level 2 and Incremental Level 4 amounts of water allocated to each refuge according to

Table 15. Refuge Water Type and Mandated Target

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

Table 16. Water Allocations by Refuge from 1989 Reports

Refuge Name - Region	Full Lavel 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 Wildife 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.

the 1989 reports. Allocations under the refuge water supply contracts between Reclamation and refuge management agencies vary somewhat between Level 2 and Incremental Level 4 amounts, and this is footnoted in Table 16. However, the total Level 4 allocations for each refuge remains the same.

Long-term supply contracts provide stability for refuge operators

To ensure reliability for refuge operators, Reclamation entered into long-term water supply contracts with the three refuge managing agencies: California Department of Fish and Game (DFG), U.S. Fish and Wildlife Service (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, Reclamation's Central Valley Operations Office announces the water supply available to the CVP contractors for the current year, including the amount of Level 2 water available out of the yield of the CVP for the refuges. The Interagency Refuge Water Management Team then establishes the water delivery schedule for both Level 2 water and Incremental Level 4 water for each refuge. This team is comprised of representatives from Reclamation, the Service, DFG, and GWD. The creation of this team was established through a provision in the long-term water supply contracts.

Use of groundwater for refuge water supplies

Availability of surface water supplies on the open market from willing sellers is limited in some years, leaving the RWSP unable to meet its Incremental Level 4 acquisition goals. The RWSP is attempting to expand its current diversification of sources of water to meet the needs of the refuges in the absence of 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 usually it 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 utilized groundwater in supplementing some of their Level 2 supplies, and will continue to use groundwater. Reclamation is carrying out and participating in several pilot studies that may result in further increases in groundwater usage as part of long-term refuge water supplies. For instance, recent studies at the East Bear Unit of the San Luis National Wildlife Refuge have indicated that salinity levels at some locations are not as high as previously thought, allowing Reclamation and the Service to consider conjunctive groundwater use at this refuge.

Improving quality of water supplies

In late 2007, Reclamation entered into an agreement for GWD to implement a water quality monitoring program on lands within the Grassland ecological area. GWD will be monitoring water quality on both GWD and DFG refuge lands. When implemented, the data generated will be used to manage wetlands more efficiently and monitor the quality of water leaving the refuges. In 2008, Reclamation expects to enter into a similar agreement with the Service for water quality monitoring on their refuge lands within the Grassland ecological area.

The RWSP has developed a draft Refuge Water Quality Best Management Practices (BMP) Plan, with the Service as project lead. The BMP Plan is consistent with the requirement in the 2005 CALFED legislation to reduce water quality impacts of refuge discharges that receive federal water and discharge into the San Joaquin River. A final report is expected in 2008 and the conclusions of this report will be put into practice in future years. One of the proposed practices is additional water quality monitoring to track flows and discharges from refuges to the San Joaquin River.

Water Acquisition Program – Refuge Water

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

Per the Act, 2002 is the date by which Full Level 4 was to be delivered to all CVPIA refuges on an annual basis. From 2002 to 2006, the Water Acquisition Program (WAP) has acquired between 68,000 and 85,000 acre-feet each year of Incremental Level 4 water (Table 17). These acquisitions rely primarily on transfers from the San Joaquin River Exchange Contractors, one-year transfers from other CVP contractors such as the Cross Valley Canal Contractors, and occasional groundwater purchases. The annual average of this volume represents approximately 57 percent of the mandated quantity (as represented in the Water Supply Contracts).

The water made available for the Exchange Contractors varies year by year based on inflow projection to the Shasta Reservoir in Northern California. The amount of water provided for transfer by the Exchange Contractors is allocated to agriculture, municipal and industrial contractors, and the CVPIA refuges, depending on the hydrology of the year. In dry years, the agricultural users generally are offered a larger portion of the available water. In wetter years, the refuges receive a larger portion of the available water.

Due to the dry hydrologic conditions in Water Year (WY) 2007, the WAP acquired only 41,111 acre-feet of Incremental Level 4 water. Specifically, the WAP was only able to purchase 30,000 acre-feet of water from the Exchange Contractors, and entered into a one-year acquisition with the Kern-Tulare/Rag Gulch Water Districts for 11,111 acre-feet for the year for a total of 41,111 acre-feet. The high cost of water acquisition and the lack of willing sellers made the WY 2007 market very difficult. The continuation of these conditions is expected into WY 2008 and is one of the primary reasons the full target of 133,264 acre-feet (see footnote in Table 17) has not been attained and probably will not be attained in the near future.

Table 17. Level 2 and Incremental Level 4 Water Deliveries by Water Year* (2002-2007)

Water Year*	Level 2 - Actual Deliveries and Percent of Target 422,251** (Acre-Feet)	Incremental Level 4 – Actual Deliveries and Percent of Target 133,264** (Acre-Feet)
2002	383,842 (91%)	80,970 (61%)
2003	391,635 (93%)	77,053 (58%)
2004	385,731 (91%)	68,262 (51%)
2005	388,803 (92%)	83,211 (62%)
2006	380,072 (90%)	90,545 (68%)
2007	388,521 (92%)	45,049 (34%)

* *Water Year* is defined as beginning on the first day of March through the last day of February of the following year.

** This table reflects deliveries starting with Water Year 2002, the beginning year that CVPIA mandated Full Level 4 deliveries for all refuges [Section 3406(d)(2)]. The target values used for total Level 2 and Incremental Level 4 water amounts (see column headers) are those identified from the Water Supply Contracts.

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

CVPIA Section 3406(d)(5)

As of 2007, 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 Construction Program identified 17 construction projects (with a total of 46 major structures/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/actions identified in the environmental documents and related design and specification documents. Table 18 lists all major structures/actions completed, with 1997 being the first year for completion.

Measuring Success

Refuge Facilities Construction Program – 2007 Accomplishments

Reclamation completed important revisions to the Conveyance of Refuge Water Supply South San Joaquin Valley Study Area Mendota Wildlife Area Pre-Public Draft Environmental Assessment/Impact Statement (EA/IS) with an emphasis on potential actions to provide annual reliable Full Level 4 water supplies to the Mendota Wildlife Area (WA) as required by CVPIA. The Conveyance of Refuge Water Supply South San Joaquin Valley Study Area Mendota Wildlife Area Public Draft EA/IS was released for comments in May 2007 and final comment period was closed in August 2007.

The program continued implementation on work to support completion of 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, covering canal water level study, flow measurement study, seepage study, proposed system improvements, and cost estimates.

A final draft Design Data Report is scheduled to be complete in Spring 2008, which will allow selection of the preferred alternative and cost estimates for construction.

San Joaquin Basin Action Plan - 2007 Accomplishments

Work in FY 2007 consisted of the continued construction of Phase I, Bear Creek Pumping Plant and Pipeline. The revised estimated completion for this project is March 2008.

Field data collection for the installation of a temporary pumping plant and delivery points on the San Joaquin River to supply water from Island C Canal

was completed. A cost estimate for the design and construction was given to MP-400 for their action.

The O'Banion Bypass within the Central California Irrigation District was completed.

Early in 2007, engineers laid pipeline that will distribute delivered water onto the East Bear Creek Unit in Merced County

Table 18. Cumulative Completed Construction Actions by Year (1997-2007)

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%)

Refuge Water Conveyance (Wheeling)

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

Reclamation delivered approximately 91 percent of the mandated Level 2 water on average, between Water Year (WY) 2002 and WY 2007. This includes water from sources other than Central Valley Project yield. In WY 2007, approximately 388,521 acre-feet of water was delivered to the refuges. This delivery number includes groundwater provided to the Pixley and Merced National Wildlife Refuges and the Gray Lodge Wildlife Area, and an estimated 8,100 acre-feet of water delivered to the Merced National Wildlife Refuge under an existing mitigation agreement pursuant to the Federal Energy Regulatory Commission license to Merced Irrigation District. In addition, approximately 45,049 acre-feet of Incremental Level 4 water was delivered to the refuges. The Incremental Level 4 deliveries include 38,194 acre-feet (after carriage losses) of water acquired by the WAP; 5,355 acre-feet of water from Reclamation's purchase of permanent partial water rights from four water districts in the Sacramento Valley; and 1,500 acre-feet of water provided through an existing mitigation agreement under a Federal Energy Regulatory Commission license with Merced Irrigation Distrct.

In order to deliver the water, Reclamation has entered into several conveyance agreements with water delivering entities throughout the Central Valley to utilize their existing conveyance systems. This approach was deemed more efficient and cost-effective than construction of a separate independent federal delivery system for exclusive delivery to refuges.

These agreements stipulate that the conveying entity will deliver up to a specified quantity of water through facilities that it owns or controls to a certain refuge or group of refuges.

In FY 2007, Reclamation negotiated a third amendment to the groundwater pumping reimbursement agreement with CDFG for the purpose of supplementing Level 2 surface water supplies at Gray Lodge Wildlife Area up to full Level 2 allocation. Reclamation also negotiated a reimbursement agreement between Reclamation and CDFG for reimbursement of Level 2 water conveyance costs to CDFG for Level 2 water deliveries to Mendota Wildlife Area.

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 is covering the last six federal fiscal years, and efforts are coordinated with the Service, DFG, and the California Department of Water Resources. A final task order resulting from this process is anticipated to be completed by December 2007.

Reclamation continued its funding support for the Grassland Wetlands Modified Hydrology Study. This project involves water quality monitoring and wildlife studies of modified water management in the Grassland ecological wetlands to determine if water management changes could minimize water quality impacts to the San Joaquin River and still meet wildlife

habitat management goals. These efforts have potential application for development of water quality BMPs for various wildlife refuges in the San Joaquin River Basin.

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 wildlife refuges. Habitat is now available during the months of August and early September which benefits early migrant waterfowl and shorebirds, and also provides habitat for resident wildlife and their young during a critical time of the year when wetland habitat can be particularly limited due 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 because this habitat type provides diversity in a landscape dominated by shallow wetland habitat.

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.

Another significant advantage is that the ability to battle avian disease outbreaks, such as botulism and cholera, is greatly assisted by applying additional water and creating a “flow through” system of water delivery and drainage. This “flow through” also helps deal with wetland areas high in salinity, which are often lower in productivity and diversity. CVPIA water allows wetland managers to “flush” salts from wetland basins and improve soil quality.

Ecological/Water Systems Operations Models

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 goal of the Ecological/Water Systems Operations Models Program (EWSOM) is to develop broadly available and readily accessible models and 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 has and will continue to support hydrologic and biologic data collection. Measures to determine the effectiveness of models and timeframes for this program have not yet been determined.

The program is an essential tool for Interior, and since 1998 has provided a high level of support for development of the integrated Central Valley Project/ State Water Project (CVP/SWP) model, CalSim II. The primary benefit of CalSim II has been for planning investigations, including the most recent CVP Operations Criteria and Plan (OCAP). CalSim II has been utilized in many other studies, including the ongoing CALFED storage and conveyance investigations. CalSim II is available for public use and a new version of the model (CalSim III) is currently being developed jointly by Reclamation and the California Department of Water Resources (DWR). This version, scheduled for release in the fall of 2008, will have substantially improved spatial resolution and hydrology and groundwater simulation capabilities.

In addition to CalSim, the program supports the development and application of other types of river management and ecological models including water quality, hydrology, groundwater, fish population and riparian habitat models used for support of operations and planning by Reclamation's Division of Planning, the Service, federal and state water contractors and public interest organizations.

This program also supports participation of Reclamation and Service staff in professional organizations as well as CalSim training conducted by Reclamation and the DWR.

Measuring Success

EWSOM continues to perform data collection activities to support modeling and improvement of scientific understanding of ecosystems in the Sacramento, San Joaquin and Trinity watersheds. To date, the program is operating the integrated CVP/SWP model (CalSim II) and six other models; two more are currently under development.

Table 19. Ecological and Water Systems Operations Models (1996-2007)

Model	Initiation/ Operational Date	Agencies Involved in Development	Description
CalSim II	1998/2002	Reclamation, DWR, Service, federal/state water contractors, Sacramento Valley Settlement contractors	Used for coordinated system-wide planning and operations of CVP and SWP water projects
CalSim III	2007	Reclamation, DWR, Service, San Joaquin Exchange contractors and their consultants	Used for coordinated system-wide planning and operations of CVP and SWP water projects
Upper Sacramento River Water Quality Model (USRWQM)	2001/2003	Reclamation, Service, NOAA, NMFS, CALFED Integrated Storage Investigations (ISI)	Used for planning and operations of reservoirs for water temperature management in anadromous fish spawning and rearing habitats
Riparian Habitat Establishment Model (RHEM)	2007	Reclamation, CALFED ISI	Used for planning and operations of reservoirs for the recruitment and survival of cottonwood and other riparian vegetation
InSalmo	1996/2005 Beta version; awaiting calibration and validation	Service	Evaluates andromous fish survival at various life stages and in a variety of aquatic environments
SALMOD	1996/2005	Developed by USGS and refined by USGS and Reclamation contractors; used by Reclamation, Service, CALFED ISI	Used in planning studies to evaluate effects of reservoir operations on anadromous fish spawning, incubation and rearing
Land Atmosphere Water Simulator (LAWS)	2002/2006	Reclamation	Used to develop hydrologic budgets and water demands for CalSim model
HydroGeoSphere (HGS)	2003/2005	Reclamation	Used for planning of surface and subsurface hydrologic interactions related to water supply, water quality and ecosystem restoration
Ecologically Cogent Operations Suite of Integrated Models (ECOSIM)	1998/1998	Service	Used for analyses of changes to the macroscopic water resources for CVP/ SWP operations

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

CalSim III San Joaquin QA/QC Review and Documentation
New hydrologic datasets for CalSim III in the Sacramento and San Joaquin valleys were developed jointly in 2007 by Reclamation's Reservoir Systems Analysis Branch staff, Reclamation's Technical Service Center, and private contractors. The group also completed a detailed Quality Assurance/Quality Control review of the Sacramento Valley water budgets in collaboration with DWR modelers to help improve the model's level of confidence.

Additionally, in cooperation with DWR, Reclamation staff completed significant improvements for the CalSim III model including enhanced methods for evaluating hydrologic inputs based on DWR's Integrated Flow model, groundwater simulation capability based on the new California Central Valley Simulation model, and more consistent implementation of hydrology and groundwater in both the Sacramento and San Joaquin valleys.

RHEM Model Developments
Reclamation staff completed initial model development and field data collection studies in 2007. Currently, a controlled field study of cottonwood seedling growth is being performed to develop parameters for the Riparian Habitat Establishment Model (RHEM) and additional development of a two-dimensional version of the RHEM is underway. The RHEM will support maintenance of healthy riparian ecosystems – including anadromous fish – in the Central Valley.

Hydrogeosphere/CalSim Linkage – Literature Review and Methodology Development; HGS Temperature Module Planning
HydroGeoSphere (HGS) is used for planning of surface and subsurface hydrologic interactions related to water supply, water quality and ecosystem restoration. Testing activities related to HGS subtiming/subgridding methodology (allowing for physically realistic simulations with shorter computation times) are currently ongoing. A conceptual model report including both Red Rock Ranch (small scale) and the San Joaquin Basin (large scale) has been written by HydroGeoLogic, Inc. and is under review by Reclamation and DWR staff. The report details the climate, topography, geology, hydrology and hydrogeology of the small and large scale systems, as well as a proposed approach to the accurate numerical modeling of the two systems and testing of the subtiming/subgridding implementation. HydroGeoLogic, Inc. is preparing the input files for the application, facilitated by means of GIS and visualization tools. Next steps will be to calibrate and test the baseline model and investigate appropriate applications.

Land Retirement Program

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, and protects and restores the retired land for wildlife habitat.

The long-term land retirement goal referenced in the Act is to retire 75,000 acres by 2040. The program 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 22. Land Retirement Program Sites

Retiring and Restoring Lands

Of the targeted 15,000 acres, Interior has acquired 9,306 acres and retired (or removed from irrigated agriculture) 8,596 acres from agricultural production. In 2007, the program acquired and retired 213 acres from agricultural production.

On average, the LRP has exceeded its land restoration performance goals of 400 acres per year. Since 1998, the LRP has restored 4,981 acres. Complete restoration to upland habitats found in the San Joaquin Valley can take many years to achieve, but the program has restored portions of upland habitat and continues to adapt techniques to achieve desired habitat values.

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 9,500 observations. Utilizing the database, BLM developed plant and animal lists and a photo-illustrated flora for the Atwell Island Project Area.

Table 20. Land Acquired, Retired & Restored by Year at Tranquillity and Atwell Island Sites (1992-2007)

	Annual Acres Acquired		Acres Retired from Agriculture (cumulative)	Acres Restored (annual)
	Atwell Island	Tranquillity		
1992	0	0	0	0
1993	0[a]	0	0	0
1994	0	0	0	0
1995	0	591	591	
1996	0	0	591	
1997	0	0	591	
1998	0	995	1,585	1,220
1999	0	60	1,646	100
2000	2,645[b]	0	4,291	777
2001	1,414	444	4,977	702
2002	1,510	0	6,675	373
2003	616	0	6,925	261
2004	155	0	7,495	308
2005	625	0	8,345	349
2006	38	0	8,383	416
2007	213	0	8,596	475
TOTAL	**7,216**	**2,090**	**8,596**	**4,981**

[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 AIWD was paid for by CVP Conservation Program.

At Atwell Island, BLM successes are being adapted to future plantings. In 2007, 475 acres were planted with three seed mixes in configurations that can be used for future kit fox artificial burrows.

At Tranquillity, the established San Joaquin Valley Native Plant Nursery worked to increase seed from more than 100 plants species collected within a 50-mile radius. The USDA Natural Resources Conservation Service Plant Materials Center helped research agricultural production techniques to help determine species for restoration strategies and methods for cost-efficient cultivation. Trials focusing on weed competition control, the major challenge in successful upland habitat restoration, were initiated in 2004 and continued through 2007.

Reducing Agricultural Drainage

Five years of groundwater monitoring at the LRDP site near Tranquillity shows a declining shallow water table in response to land retirement. The water table response observed at the Tranquillity site is representative of conditions present at a high percentage of lands that are targeted for retirement in the western San Joaquin Valley. The declining shallow water table observed beneath demonstration project lands indicates the success of land retirement as a drainage reduction strategy.

Total selenium concentrations, soluble selenium concentrations and salinity (EC) in the surface soil showed a decreasing trend over the five-year monitoring period, as high salinity and selenium concentrations in the shallow groundwater are a result of leaching from irrigated soils. As long as the water table continues to decline as expected, the high concentrations of 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 study despite dryer than average conditions. Selenium concentrations in biota have not changed significantly over the study period and are below concentrations of concern to EPA and the Service.

Annuals restoration at Atwell Island Land Retirement Site

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 watertable (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 watertable), 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 the provisions of CVPIA 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 Sacramanto-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: Stranding is 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