

Implementation of the Central Valley Project Improvement Act

Annual Report for Fiscal Year 2006



**U.S. Department of the Interior
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Central Valley Project Improvement Act

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INTRODUCTION

The Central Valley Project (CVP) is one of the world's largest water storage and conveyance systems, comprising 20 dams and reservoirs (capable of storing 9 million acre-feet of water), 11 powerplants, 500 miles of major canals and aqueducts, 3 fish hatcheries, and numerous related facilities such as pumping plants and power lines. Annually, the CVP conveys about seven-million acre-feet (AF) of water, primarily from northern California southward, from the Sacramento, Trinity, American, Stanislaus, and San Joaquin Rivers to agricultural and municipal water users and wildlife refuges in the Sacramento and San Joaquin Valleys and the San Francisco Bay Area. For almost 70 years, California has depended on the CVP for meeting a large part of its water needs.

Due to the way that water is captured, moved, and co-mingled with other water supplies such as those of the State Water Project (SWP), the CVP affects sensitive ecosystems of the Central Valley, Delta estuary, San Francisco Bay, and Trinity River, particularly in drought years. Many complex, and often unresolved, water issues revolve around finding an economically viable balance between an increasing urban and agricultural demand for water and the health and well-being of California's river and Delta estuary ecosystems.

On October 30, 1992, Title 34 of Public Law 102-575, the Central Valley Project Improvement Act (CVPIA), was signed into law by the President. This landmark piece of legislation mandates changes in the purposes and management of the Bureau of Reclamation's (Reclamation) Central Valley Project (CVP). The legislation specifically directed the Secretary of the Department of the Interior (Interior) "to protect, restore, and enhance fish, wildlife, and associated habitats in the Central Valley and Trinity River basins of California" while also achieving "a reasonable balance among competing demands for use of the Central Valley Project water..."

Reclamation and the U.S. Fish and Wildlife Service (Service) have primary responsibility for implementing CVPIA's many provisions. Reclamation has the primary responsibility for all budget submissions supporting both agencies including all associated duties for appropriations, finance and accounting from an overall perspective. Reclamation also has responsibility for engineering, CVP operations, design, and construction of specific project features. The Service has primary responsibility for decisions on biological resource issues, studies on fish and wildlife populations and their habitat requirements, fishery restoration program direction, and for the planning, design, and decisions on the administration of fish and wildlife facilities.

This report is a summary of the actions taken by Reclamation and the Service, working with other Federal agencies, the State of California (State), and numerous partners and stakeholders during fiscal year (FY) 2006.

IMPLEMENTING THE CVPIA

The purposes of the CVPIA are provided in Section 3402 of the Act. To achieve these purposes, a large number of provisions were incorporated into the statute. The provisions include, but are not limited to, water contracts, improved water management, restoration of anadromous fish populations, water supplies for State and Federal refuges and wildlife habitat areas, mitigation for other CVP-impacted fish and wildlife, and retirement of drainage-impaired agricultural lands. The provisions also provide for system-wide modeling, numerous investigations and studies, and monitoring to assess the biological results and effectiveness of CVPIA actions. To help implement these measures, section 3407 of the Act established a Restoration Fund from sources and revenues provided for under other sections of the Act.

Any action undertaken to implement the CVPIA is designed to the maximum extent practicable to contribute to the attainment of CVPIA goals. Several factors are considered in establishing priorities for CVPIA actions including, the importance of the action in achieving CVPIA program goals, biological benefits, geographic area, amount of planning needed to implement the action, technical feasibility, cost effectiveness, and the availability of partners and funding. Actions proposed for implementation under the CVPIA are prioritized on an annual basis with stakeholder and public involvement.

Upon the CVPIA's passage, Reclamation and the Service immediately focused on developing and implementing three main programs for fish and wildlife restoration, as identified in the provisions of the Act. The most ambitious of these three programs is the Anadromous Fish Restoration Program (AFRP). The second program for fish and wildlife restoration was to supply "firm water supplies of suitable quality to maintain and improve wetland habitat areas" on Federal and State refuges and other migratory waterfowl habitats in the Central Valley. The third was "to address other identified adverse environmental impacts of the Central Valley Project..." - impacts not specifically enumerated in other provisions of the Act.

[The Anadromous Fish Restoration Program](#)

Section 3406(b)(1) of the Act states “... 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 process to identify reasonable actions for anadromous fish restoration was vetted in a public forum with stakeholders, partners, and other interested parties and was eventually described in the *Final Restoration Plan for the Anadromous Fish Restoration Program (AFRP)* (USFWS 2001) (AFRP Restoration Plan). Many of the other measures and programs in Section 3406 were intended to contribute to the effort of doubling anadromous fish.

The Delta has been one of the highest priority geographic areas for anadromous fish. All species and races of anadromous fish must pass through the Delta, both as in-migrating adults moving upstream and as out-migrating juveniles moving to the ocean. The opportunity for implementing measures in the Delta with widespread beneficial effects for all anadromous fish is tremendous. Emphasis has been on providing adequate flows to improve migration and reproductive success and on reducing water diversions during peak periods when out-migrating juvenile anadromous salmonids and other threatened or endangered species, such as the delta smelt, are in the vicinity of the diversion pumps. Other operational changes and structural measures to enhance conditions are also being employed as part of normal operations of the CVP.

The east-side tributaries of the Sacramento River are another major focus area for anadromous fish. These streams support the last significant runs of the threatened spring-run Chinook salmon. Once the most numerous race in the valley, the spring-run had dwindled to less than 2,000 fish in 1991. Dams have blocked access to the headwater areas of streams that once constituted their natural habitats, and flows needed to provide pools of cool water for them to survive over the summer (they migrate into the streams in spring and delay spawning until the fall) have been diverted. Restoration actions on these streams have emphasized the acquisition of water for in-stream flow, laddering or removal of dams and other impediments to migration, screening or removal of water diversion infrastructure, maintenance of spawning habitat, and acquisition and restoration of riparian habitats that shade the stream channel from solar heating and provide woody debris and nutrients to the aquatic ecosystem.



Other Sacramento River tributaries, most notably Battle Creek, Clear Creek, Antelope Creek, and the Yuba River, also have been targeted for restoration efforts. Along with Deer, Mill, and Butte creeks, these streams support naturally spawning populations of steelhead, another listed threatened species. Juveniles of this species generally spend a year or more in their natal streams. Consequently, they are subject to many of the same limiting factors as the spring-run Chinook salmon, most notably the need to access the cooler upper reaches of streams and adequate supplies of water during the summer. Restoration efforts on these streams have focused on the same types of measures as for the spring-run Chinook salmon.

The Refuge Water Supply Program

With the decline of natural wetlands in the Central Valley, wildlife specialists have been forced to intensively manage the remaining 300-400 thousand acres of wetlands to accommodate the millions of wintering waterfowl, shorebirds, and other wildlife that depend on wetlands for their survival. This has entailed careful management of limited and uncertain water supplies to provide for only the most critical of needs for a limited number of species. Some very difficult trade-offs of one species for another has been the rule rather than the exception.

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| <p><u>Central Valley Refuge Areas</u>
 <u>Receiving CVPIA Water</u></p> <ul style="list-style-type: none"> • Sacramento National Wildlife Refuge • Delevan National Wildlife Refuge • Colusa National Wildlife Refuge • Sutter National Wildlife Refuge • Gray Lodge Wildlife Area • North Grasslands Wildlife Area • San Luis National Wildlife Refuge • Volta Wildlife Area • Merced National Wildlife Refuge • Los Banos Wildlife Area • Grassland Resource Conservation District • Mendota Wildlife Area • Pixley National Wildlife Refuge • Kern National Wildlife Refuge |
|--|

With the CVPIA’s passage, we were directed to make available the water supply needed for full habitat development at specific Central Valley State and Federal refuges and private wetland areas. A base level of supply (referred to as Level 2 supplies) was made available immediately; the remaining portions of their full supply (referred to as Level 4 supplies) were to be made available in 10 percent increments over 10 years. The total amount of water to be supplied annually to the 14 refuge units is approximately 560,000 acre-feet (af), with limited reductions under certain hydrologic circumstances. CVPIA’s increased refuge water supplies will enable managers to enhance existing habitats, expand their wetland base, and provide increased benefits to a greater number of wetland-dependent species.

The amounts of water to be supplied and the schedule for delivery were prescribed in the Act. In several instances, however, facilities to convey the requisite water supplies to the various wetland units were not in place. Consequently, the primary focus in the Refuge Water Supply Program has been to develop the necessary conveyance capacity,

independently or through agreements with other parties, and to acquire the water to meet the prescribed needs.



In addition, a program was implemented to provide incentives to farmers to keep agricultural fields flooded during the winter months to provide greater amounts of habitat and increased food availability. Dubbed the Agricultural Waterfowl Incentives Program, it provided tremendous benefits at relatively low costs per acre by providing supplemental habitat and an expanded food base, helping to reduce disease by spreading birds out over a wider area. The primary focus was on fields with crops leaving waste grain, primarily in the Sacramento Valley. Unfortunately, this program, with its conjunctive use of lands for agriculture and waterfowl, has expired.

The (b)(1) "Other: Habitat Restoration Program"

The CVPIA directs us to make all reasonable efforts to address the environmental impacts of the CVP that are not specifically dealt with in other provisions of the Act.



However, identifying the impacts of the CVP some 50 years after it was initiated is problematic at best, especially for those indirect effects that were realized in the CVP service area. Our approach has been to initiate a habitat trends analysis to be used as one of several tools to determine what habitats, and consequently what species, experienced the greatest reductions over the last half-century in areas affected by CVP operations or water service. In the interim, while the data are gathered and analyzed, the focus of our efforts has been on habitat protection and restoration for those species in the CVP operations and service area that are in greatest need of assistance, primarily species listed as threatened or endangered that are not addressed in other provisions of the CVPIA, some of which are on the verge of extinction. Emphasis has been on habitat acquisition for protection and restoration of species such as the riparian brush rabbit, giant garter snake, vernal pool invertebrates, and San Joaquin Valley floor species like the San Joaquin kit fox, blunt-nosed leopard lizard, and several listed species of kangaroo rats. Concurrently, the CVPIA Land Retirement Program-3408(h) is acquiring land which, when retired from irrigated agriculture and restored or allowed to revert to natural conditions, will provide habitat for many of these same species.

Coordination

Cooperation through partnerships with others is essential to the CVPIA's success. We have developed many partnerships and extensive coordination linkages with local, State, and Federal agencies and private groups. These partnerships are with many previously existing programs, as well as with programs and groups formed specifically to carry out CVPIA mandates. CVPIA implementation is closely coordinated with existing and ongoing restoration efforts such as the State of California's efforts to restore salmon and steelhead populations, the State Water Resources Control Board's (SWRCB) Water Quality Control Plan for the Delta, and the CALFED Bay-Delta Program's (CALFED) Ecosystem Restoration Program (ERP). In addition, most CVPIA restoration actions are developed and/or implemented in conjunction with local interest groups, many formed specifically for this purpose.

Coordination with the ERP is particularly important. Many of their actions have the same or similar objectives and address the same natural resource and water management problems as the CVPIA. Close coordination and a focus on functional integration of both programs have helped us to achieve common goals and avoid duplication. An example of this coordination is Interior's willingness and effort to have ERP scientists provide "expert level" review and comment on proposed CVPIA programs and actions. This review is expected to lead to a more broad-based ecosystem management strategy that more effectively addresses fish and wildlife mitigation, restoration, and enhancement, and assists in the selection of creditable projects

We have also encouraged the ERP and other potential partners to enter into cooperative relationships to implement appropriate CVPIA measures or to help achieve CVPIA goals and objectives through their own programs. Frequently, Interior will provide funds and services to these partners for them to undertake pre-approved restoration actions that help to attain CVPIA goals. At other times, funds from these other programs or partners are used to implement measures identified by CVPIA. Regardless of who implements which measures, Interior first assures that CVPIA funds are used to meet CVPIA goals and objectives. Additionally, implementation of the CVPIA has routinely involved the CVP water and power users and other interested parties, including the discussion of priorities and efficient use of funds.

Funding Sources

Implementation of the prescribed actions and programs of the CVPIA through the first 14 years (1993–2006) has cost approximately \$831.2 million. Many of the measures implemented pursuant to CVPIA were already being planned or in progress at the time the Act was passed and a large portion of these expenditures would have occurred even in the absence of the CVPIA. These include the Shasta Temperature Control Device (\$84 million to implement, but saving \$5 million per year in lost power generation), Glenn-Colusa Irrigation District Fish Screen Project (\$43 million), rehabilitation of Coleman National Fish Hatchery (\$22 million), and fixing the fish passage problems at Red Bluff Diversion Dam (RBDD) (\$42 million) and Tracy and Contra Costa Canal Pumping plants (\$22 million). Other efforts, however, such as the AFRP, Clear Creek Restoration Program, Spawning Gravel Replenishment Program, Anadromous Fish Screen Program (AFSP), Refuge Water Supply Program, and the Comprehensive Assessment and Monitoring Program (CAMP) became realities only because of CVPIA-provided funding.

Most of the \$831.2 million spent thus far has come from the Restoration Fund that was established in accordance with CVPIA Section 3407. These funds are derived from fees paid by the beneficiaries of the CVP's water and power supplies. The rest of the monies came from Reclamation's Water and Related Resources appropriations, from contributions provided by the State of California, and from donated funds.

For FY 2006, \$54.6 million was appropriated in the Restoration Fund for the various CVPIA programs and actions.

Since its inception more than nine years ago, the ERP facilitated funding for a variety of projects contributing to ecosystem restoration within its geographic scope. The ERP is designed to maintain, improve, and increase aquatic and terrestrial habitats and improve ecological functions in the San Francisco Bay and Sacramento-San Joaquin Delta (Bay-Delta) to support sustainable populations of diverse and valuable plant and animal species. Most of the ERP's goals and geographic scope overlap with CVPIA goals. Thus, CALFED agencies have established a "Single Blueprint" for restoration and species recovery within the geographic scope of the ERP.

The Single Blueprint requires CALFED to integrate with numerous programs. With respect to CVPIA, there is much coordination between the Anadromous Fish Restoration Program, Anadromous Fish Screen Program, Dedicated CVP Water for Environmental Purposes, Clear Creek Program, Gravel Replenishment Program, and to a lesser extent, the Habitat Restoration Program. The Single Blueprint approach helps ensure coordination and integration, not only within the Bay-Delta Program, but between all resource management, conservation, and regulatory activities affecting the Bay-Delta system. As a result, many CVPIA projects receive leverage funding from the ERP program.

Figures 1 and 2 show the obligations by fund source; Figure 1 for FY 2006 and Figure 2 for the 14-year period since FY 1993. The largest portion of the monies obligated since 1993 have been spent on anadromous fish restoration-related structural measures, such as the Shasta Temperature Control Device and the Glenn-Colusa Irrigation District Fish Screen Project. These projects benefit the water and power users as well as anadromous fish. Large amounts were also obligated to habitat restoration measures for anadromous fish, measures believed necessary to help achieve our anadromous fish doubling goal, and on acquiring and providing water for refuges. Figures 3 and 4, respectively, show the total distribution of these obligations among action categories for FY 2006 and the entire FY 1993-2006 period.

FIGURE 1
CVPIA OBLIGATIONS BY FUND SOURCE
Fiscal Year 2006

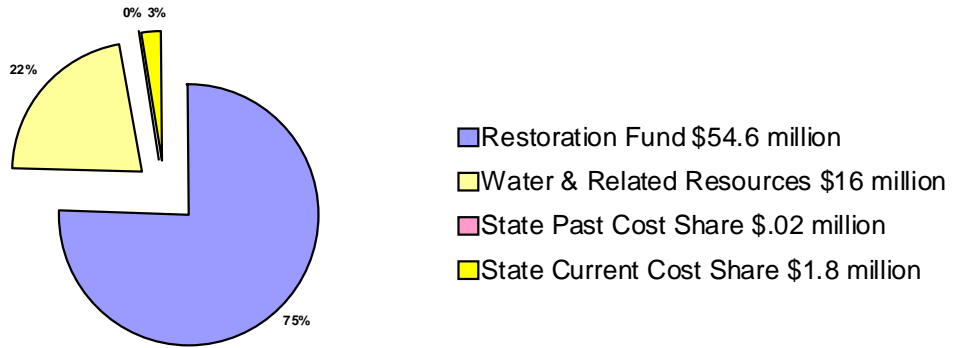
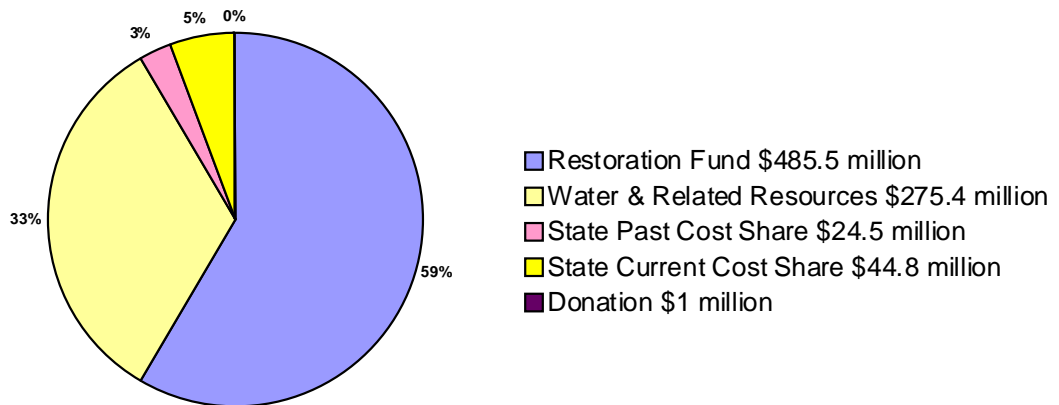
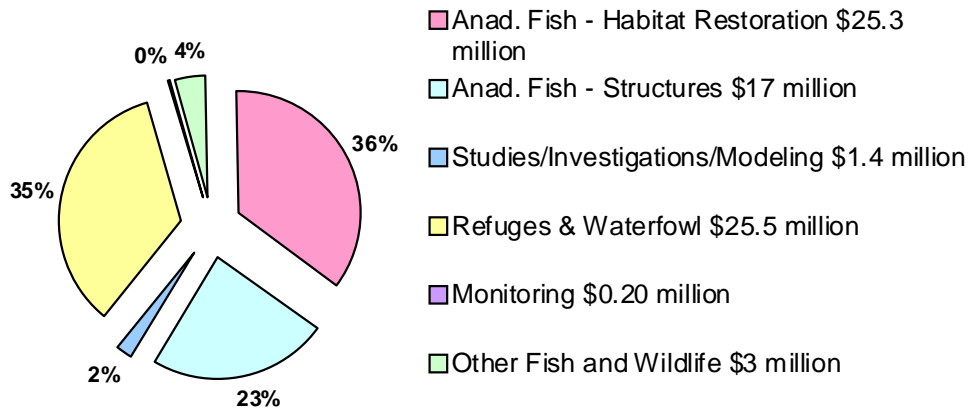


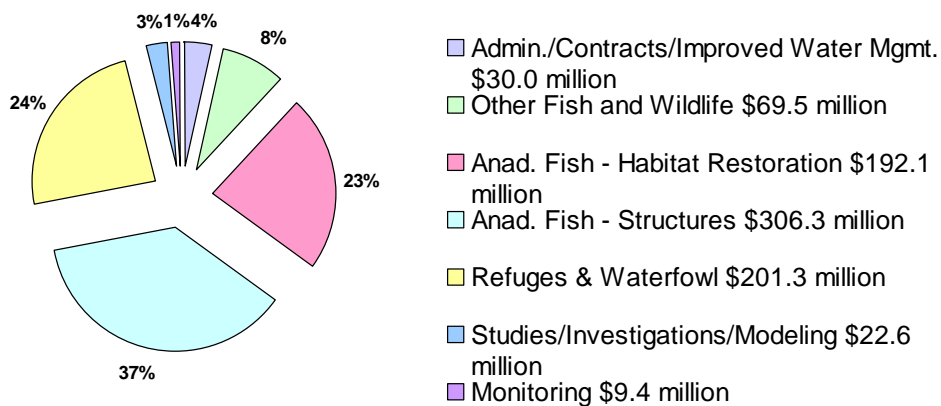
FIGURE 2
CVPIA OBLIGATIONS BY FUND SOURCE
Fiscal Years 1993-2006



**FIGURE 3
CVPIA OBLIGATIONS BY ACTION CATEGORY
Fiscal Year 2006**



**FIGURE 4
TOTAL CVPIA OBLIGATIONS BY ACTION CATEGORY
Fiscal Years 1993-2006**



FISCAL YEAR 2006 ACCOMPLISHMENTS AND RESTORATION FUND DOLLARS OBLIGATED

Since passage of the CVPIA, Reclamation and the Service, with assistance of the State and the cooperation of many partners, have completed many of the provisions of the Act, including many of the administrative requirements, water management and operational changes, and contracting and water conservation measures. Many studies and investigations have been undertaken and completed, and hundreds of measures to benefit fish and wildlife resources and improve water project operations have been implemented. The following provides a brief discussion of the status of CVPIA programs and a general overview of our activities and accomplishments specifically in FY 2006.

Project Title: **Anadromous Fish Restoration Program**
CVPIA Section 3406(b)(1)
FY 2006 Funding: **\$ 3,722,303**
FY 2006 Accomplishments (AFRP Program Overview):

Passage of the CVPIA led to establishment of the Anadromous Fish Restoration Program (AFRP) and directed Interior to include all reasonable efforts to at least double the natural production, on a sustainable long-term basis, of six species of anadromous fish in Central Valley rivers and streams over levels that existed during the 1967-1991 period. Anadromous fish are those species that are born in freshwater but migrate to the ocean as juveniles, where they spend a large portion of their lives before returning to freshwater as adults to spawn. The six species targeted by the CVPIA are Chinook salmon (four distinct races or runs), steelhead, striped bass, American shad, white sturgeon, and green sturgeon.

All actions to achieve the anadromous fish doubling goal were guided by the Final Restoration Plan developed by AFRP staff in coordination with experts from many agencies and stakeholder groups. The Final Restoration Plan, released in 2001 after extensive input and public review, identified six general objectives necessary to achieve the anadromous fish doubling goal:

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; and
6. Involve partners in the implementation and evaluation of restoration actions.

The Final Restoration Plan was completed in 2001 to guide the long-term development of the AFRP. The Final Restoration Plan provides a programmatic-level description of the AFRP and, is used to guide the implementation of all of the provisions of the CVPIA that contribute to the goal of making all reasonable efforts to at least double natural production of anadromous fish (AFRP doubling-goal). The following provisions contribute to accomplishing the goal of the AFRP (b)(1) program: b1B, b2, b3, b12, b13, b16, and b21. The Final Restoration Plan presents a list of reasonable actions and evaluations and a process by which actions and evaluations were determined to be reasonable. The Restoration Plan identifies the need for partners, local involvement, public support, adaptive management, and flexibility as key attributes of the AFRP approach.

To implement this plan, in 1995 the USFWS established federal Habitat Restoration Coordinator (HRC) positions assigned to specific geographic areas from the upper Sacramento River and its major tributaries south to the San Joaquin River and its major tributaries. In 1998, the AFRP added three more HRCs from the California Department of Fish and Game (DFG) to this effort. These state HRCs provide assistance to the USFWS and ensure close coordination with the DFG the state agency with trust authority for managing anadromous fish populations in California. In their assigned areas, HRCs represent the AFRP, develop and nurture partnerships, develop projects with partners that contribute to the AFRP doubling-goal, and oversee all aspects of implementation of projects in which the AFRP invests funds. Together, the USFWS and DFG HRCs form an interagency team to coordinate, develop and implement restoration projects consistent with the goal, objectives, strategies, processes and priorities described in the Restoration Plan.

The AFRP is one of five Central Valley Project Improvement Act (CVPIA) programs that has been integrated with the California Bay-Delta Authority (CBDA) Ecosystem Restoration Program (ERP) (Record of Decision, 2000). To facilitate this integration, the above objectives are included in the CBDA ERP Draft Stage 1 Implementation Plan. These objectives are also complementary to other goals and objectives listed in the Draft Stage 1 Implementation Plan and would help address the objectives of the CBDA's Multi-Species Conservation Strategy and the Biological Opinion for the CVPIA. The AFRP shares CBDA's vision of the Single Blueprint concept which provides a unified and cooperative approach to restoration. The AFRP is committed to integrating its activities with the Ecosystem Restoration Program's actions and evaluations and using a scientifically-based adaptive management approach to achieve AFRP objectives.

Summary of AFRP Biological Benefits Since 1995

Environmental limiting factors

AFRP projects implemented since 1995 have addressed eight major categories of limiting factors, as identified in AFRP's *Working Paper on Restoration Needs, Habitat Restoration Actions to Double Natural Production of Anadromous Fish in the Central Valley of California* (AFRP Working Paper) (USFWS 1995a). The projects were defined in the Final Restoration Plan as reasonable (USFWS 2001:11-12) restoration actions and evaluations necessary to address limiting factors associated with anadromous fish restoration in Central Valley watersheds.

Table 1 shows the eight major categories of limiting factors, numbers and percentages of Central Valley watersheds where actions were taken, and which AFRP objectives were addressed. Insufficient flow (Objective 1) is a limiting factor category associated with all Central Valley watersheds (26 CVPIA identified watersheds) (USFWS 2001) and has been partially addressed in about 41 percent of the watersheds. Adult and juvenile salmon and steelhead entrainment and passage, and stream habitat restoration are also important limiting factor categories, and were partially addressed in at least 22 percent of the Central Valley watersheds. Measures that addressed the adult and juvenile entrainment limiting factor category are helping to meet Objective 2. All measures that addressed the fish passage limiting factor category are helping to meet Objective 3. Measures that evaluate or improve survival, assess effects of hatchery fish on natural production, and involve partners in watershed planning are helping meet Objectives 4-6.

Table 1. Numbers and percentages of Central Valley watersheds in which AFRP limiting factors have been addressed with AFRP funding, and AFRP Objectives (1-6) that were supported by the projects, since 1995.^a

AFRP limiting factor categories	Number (and percent) of watersheds where actions were taken	AFRP objectives addressed (1-6)
Insufficient flow	11 (41)	1
Adult and juvenile entrainment	7 (26)	2
Stream habitat restoration	6 (22)	1
Fish passage	6 (22)	3
Predation	4 (15)	4
Spawning habitat	4 (15)	1
Effects of hatchery fish on natural stocks	3 (11)	5
Erosion and sediment control	2 (7)	1

Overall progress toward salmon production goals in Central Valley watersheds

Progress toward addressing environmental limiting factors identified in the AFRP Working Paper and implementation of restoration actions in the Final Restoration Plan are summarized in Table 2. About 34 percent of all limiting factors identified in the AFRP Working Paper were addressed, and about 27 percent of the Final Restoration Plan actions and evaluations were implemented during 1995-2005. Several restoration actions will continue in perpetuity and must be renewed seasonally (e.g., instream flows and spawning gravel), due to such things as geomorphological impediments, including high dams that intercept natural gravel recruitment.

The total estimated natural production of Central Valley Chinook salmon increased about 5 percent from the 1967-1991 baseline period (Table 2), well below the doubling goal established by CVPIA. Central Valley streams where most environmental limiting factors have been improved and restoration actions implemented, salmon production has increased about two, or more, times beyond the CVPIA doubling goal (e.g., Butte and Clear creeks). Uncertainty remains, however, whether this short-term increase is sustainable in either creek.

Table 2. Percent of AFRP watershed limiting factors addressed and AFRP projects implemented, related to Chinook salmon production during the 1967-1991 and 1992-2005 periods.

AFRP Central Valley Watersheds	Percent Limiting Factors Addressed (a)	Percent AFRP Projects Implemented (b)	Salmon Natural Production Doubling Goal (c,d)	1967-1991 Average Natural Salmon Production (e)	1992-2005 Average Natural Salmon Production (e)	Percent Natural Production Relative To 1967-1991 Baseline (f)
All AFRP Central Valley watersheds, fall-, late-fall-, spring-, winter-run (g)	34	27	990,000	497,241	514,128	3
All AFRP Central Valley watersheds, fall -run (g)			750,000	374,217	469,871	25
All AFRP Central Valley watersheds, late-fall -run (g)			68,000	34,182	20,054	- 41
All AFRP Central Valley watersheds, spring -run (g)			68,000	34,425	16,908	- 51
All AFRP Central Valley watersheds, winter-run (g)			110,000	54,417	7,296	- 87

AFRP Central Valley Watersheds	Percent Limiting Factors Addressed (a)	Percent AFRP Projects Implemented (b)	Salmon Natural Production Doubling Goal (c,d)	1967-1991 Average Natural Salmon Production (e)	1992-2005 Average Natural Salmon Production (e)	Percent Natural Production Relative To 1967-1991 Baseline (f)
Upper Mainstem Sacramento River and Tributaries						
Upper mainstem Sacramento River, fall-run	67	41	230,000	115,338	95,128	-18
Upper mainstem Sacramento River, late-fall-run			69,000	33,931	20,878	-38
Upper mainstem Sacramento River, spring-run			59,000	29,402	1,006	-97
Upper mainstem Sacramento River, winter-run			110,000	54,294	7,296	-87
Clear Creek, fall-run	100	100	7,100	3,574	12,500	250

AFRP Central Valley Watersheds	Percent Limiting Factors Addressed (a)	Percent AFRP Projects Implemented (b)	Salmon Natural Production Doubling Goal (c,d)	1967-1991 Average Natural Salmon Production (e)	1992-2005 Average Natural Salmon Production (e)	Percent Natural Production Relative To 1967-1991 Baseline (f)
Battle Creek, fall-run (g)	40	25	10,000	5,012	22,825	355
Battle Creek, late-fall-run (g)			550	273	667	144
Antelope Creek, fall-run	100	100	720	361	0	-100
Bear Creek included in Miscellaneous small tributaries, fall-run	0	0	Data n.a.	Data n.a.	Data n.a.	
Paynes Creek, fall-run	0	0	330	170	Data n.a.	
Stoney Creek, fall-run	0	0	Not set	Data n.a.	Data n.a.	

AFRP Central Valley Watersheds	Percent Limiting Factors Addressed ^(a)	Percent AFRP Projects Implemented ^(b)	Salmon Natural Production Doubling Goal ^(c,d)	1967-1991 Average Natural Salmon Production ^(e)	1992-2005 Average Natural Salmon Production ^(e)	Percent Natural Production Relative To 1967-1991 Baseline ^(f)
Cottonwood Creek, fall-run	0	0	5,900	2,962	3,582	21
Thomes Creek, fall-run	0	0	Not set	Data n.a.	Data n.a.	
Elder Creek, fall-run	0	0	Not set	Data n.a.	Data n.a.	
Miscellaneous small tributaries, fall-run ^(h)	0	100	1,100	550	Data n.a.	
Lower Sacramento River and Delta Tributaries						
Feather River, fall-run ^(g)	0	0	170,000	86,007	113,857	32
Yuba River, fall-run	43	36	66,000	33,254	40,976	23
Bear River, fall-run	0	0	450	636	Data n.a.	
American River, fall-run ^(g)	29	15	160,000	80,846	144,837	79
Cosumnes River, fall-run	50	33	3,300	1,659	624	-62

AFRP Central Valley Watersheds	Percent Limiting Factors Addressed (a)	Percent AFRP Projects Implemented (b)	Salmon Natural Production Doubling Goal (c,d)	1967-1991 Average Natural Salmon Production (e)	1992-2005 Average Natural Salmon Production (e)	Percent Natural Production Relative To 1967-1991 Baseline (f)
Mokelumne River, fall-run (g)	42	23	9,300	4,679	9,888	111
Calaveras River, winter-run	40	33	2,200	770	0	-100
San Joaquin River and Tributaries						
San Joaquin River, fall-run (h)	10	15	Not set	38,818	25,286	-35
Stanislaus River, fall-run	60	33	22,000	10,868	6,754	-38
Tuolumne River, fall-run	55	40	38,000	18,946	9,534	-50
Merced River, fall-run (g)	58	38	18,000	9,004	8,998	-1

- a Limiting factors identified in USFWS (1995). This column includes limiting factors partially addressed; does not consider relative significance of actions or limiting factors.
- b Projects identified in USFWS (2001). Percentages represent restoration actions implemented and does not imply that all actions to address the limiting factors are completed; e.g., actions such as replenishing gravel or restoring riparian habitat are general in nature and, as stated in the AFRP Restoration Plan, these types of actions must be repeated in perpetuity (gravel replenishment) for that watershed, or repeated for different sections of the watershed (riparian restoration).
- c Chinook salmon doubling goals from USFWS (2001).
- d Targets for each of the races of Chinook salmon may not add up to the target for all races combined due to rounding.

- e Escapement numbers used for calculating natural production estimates for 1967-1991 are from Mills and Fisher (1994) and 1992-2005 from California Department of Fish and Game, Grand Tab (CDFG - 2007). May vary from half the USFWS, 2001, numeric goals due to subsequent recalculations and corrections. Methods to calculate natural production from USFWS (1995a:2-IX-5-18).
- f Percent change in natural production calculated by subtracting natural production for 1967-1991 from natural production for 1992-2005, and dividing by natural production for 1967-1991.
- g Hatchery supported Chinook salmon production.
- h Miscellaneous streams include production estimates of fall-run Chinook salmon in Spring Gulch, China Gulch, Olney, Ash, Stillwater, Inks, and Bear creeks above RBDD.
- i San Joaquin River is the sum of the Stanislaus, Tuolumne, and Merced rivers.

FY 2006 Funded Projects

During FY 2006, the AFRP was limited to funding mostly ongoing projects due to a limited budget.

Accomplishments for FY 2006 in the Sacramento Basin

The upper Sacramento Basin tributaries where accomplishments occurred in FY 2006 include Cow, Mill, Deer, Cottonwood, Battle, Bear, Antelope, and Big Chico creeks. Accomplishments included developing restoration projects with partners, overseeing implementation of AFRP funded projects, and representing the goals of the Anadromous Fish Restoration Program. Worked with local landowners of the Cow, Mill, Deer, Cottonwood, Battle, Bear, Antelope, and Big Chico watershed groups, to develop restoration projects and provided technical expertise. The replacement of the fish bypass pipe at the Orwick Diversion site was completed (AFRP Action 4 - Fish passage at Orwick Diversion).

The lower Sacramento Basin tributaries where accomplishments occurred in FY 2006 include Big Chico and Butte Creek, and the Yuba River. On Big Chico Creek funds were provided to complete the permitting and environmental documentation required to begin the construction of Iron Canyon Fish Ladder. Funds were also provided to support efforts to identify, apply for, and acquire the funds to complete the construction of the ladder including final engineering design and cost estimates. For the White Mallard Dam and fish ladder Phase III construction on Butte Creek, management, on-site management/facilitation, engineering, environmental assistance, construction and post construction monitoring were provided. Also, preliminary engineering and environmental assessment for the Five Points/Behring Ranch Diversion Canal were provided. A salmon life history study was completed for both Butte and Big Chico Creek. Yuba River accomplishments included characterizing the fluvial geomorphology, sediment transport dynamics, and in-stream hydraulics of key spawning reaches to build a predictive model for adult spawning locations. Gravel movement was monitored with tracer rocks and redd surveys for a 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. This information will help improve management of these species in the Lower Yuba River, including actions such as salmonid habitat restoration projects and providing appropriate in-stream flow regimes. Activities included synthesizing collected information to improve management of these species through actions such as aquatic habitat restoration projects and regulating in-stream flow regimes. The project will be closed this year.

Accomplishments for FY 2006 in the San Joaquin Basin

The San Joaquin Basin tributaries where accomplishments occurred in FY 2006 include the Cosumnes, Calaveras, Mokelumne, Stanislaus, and Merced rivers. For the Cosumnes River Passage and Habitat Improvement Project, permitting and final phases of project planning was completed as well as extraction of gravel to be used and stored on-site in preparation of gravel placement. For the Calaveras River Salmonid Life History Limiting Factor Analysis, data was collected on steelhead and fall-run Chinook salmon passage and stranding. The data collected will be used to manage flows and assist in prioritization and evaluation of structural repairs. On the Mokelumne River, second year funding was used to complete the analysis of fall-run Chinook salmon otoliths to determine the ratio of hatchery to wild fish. Data will be used to

update the production calculations which the AFRP program goals are based. Funds were also provided to purchase spawning gravel materials used 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. The initial microstructure and microchemistry analysis for the first 100 otolith samples for an evaluation of Mokelumne River Chinook salmon of hatchery and natural origin was completed. Stanislaus River accomplishments included the collection of data, initiation of an additional pilot project to coded-wire tag emigrating juvenile salmonids, construction of a trailer, efficiency tests and passage estimates for the year, and an evaluation of environmental variables effecting fish passage for a juvenile Chinook salmon rotary screw trap monitoring and outmigration study. Other completions included conceptual models for each race of Chinook and steelhead, and a summary table highlighting top priorities for anadromous fish restoration on the Stanislaus River. Also, progress was made towards completing a decision support system to provide capacity for identifying the effects of identified restoration activities. The Merced River screw trap was operated and collected data January 23rd to June 1st. Efficiency tests were conducted and passage estimates were made. Progress was also made towards a report on the natural and hatchery juvenile Chinook salmon movement.

Another accomplishment was the test and demonstration of a portable Alaskan weir to count and characterize runs of anadromous fish where data was collected over a period of time to measure spring-run Chinook salmon escapement. The data was summarized and an annual report was produced. This work is being done for a five year comprehensive report.

Project Title: [Evaluation of Anadromous Fish Instream Flow Needs](#)
[CVPIA Sections 3406\(b\)\(1\) and 3406\(b\)\(1\)\(B\)](#)
FY 2006 Funding: \$544,125
FY 2006 Accomplishments:

In directing Interior to make all reasonable efforts to at least double the natural production of anadromous fish, Congress recognized the need for flows of suitable quality, quantity, and timing in those streams that support these species. It specifically directed that the instream flow necessary to protect all life stages of anadromous fish on CVP-controlled streams be determined by the Service after consultation with CDFG. However, to achieve the goal of doubling the natural production of anadromous fish throughout the Central Valley, the flow needs of these species on other Central Valley streams and rivers must also be ascertained so that actions may be taken to provide for those needs. Instream flow studies had already been conducted on several streams. With the passage of the CVPIA, those previous evaluations are being reviewed and additional studies conducted. These efforts have been under way for several years and will continue for several more.

Biological benefits of activities since 1992 include identifying flow-habitat relationships for anadromous salmonids in the following: Merced, American, and Sacramento rivers, and Butte Creek. Notably in 2004 to 2006, the flow-habitat relationship for spring-run Chinook salmon spawning in Butte Creek was used to increase the spawning flows in the bypass reach of Butte Creek, resulting in reduced redd superposition and greater survival of eggs and larvae. Monitoring of these results includes screw-trapping in Butte Creek. Also, in 2005, the results of

our flow-habitat relationships for the American River were used to develop a new flow regime for the American River, which will result in improved conditions for anadromous salmonids.

FY 2006 accomplishments were documented (<http://www.fws.gov/sacramento/>) in the annual status report entitled "Identification of the Instream Flow Requirements for Anadromous Fish in the Streams within the Central Valley of California" for seven tasks. Task 1 addressed Chinook salmon and steelhead rearing in Clear Creek; Tasks 2 and 3 addressed Chinook salmon and steelhead spawning and rearing in Clear Creek; Task 4 addressed Chinook salmon and steelhead rearing in the Yuba River, and Chinook salmon and steelhead spawning and rearing in Clear Creek; and Tasks 5 and 6 addressed Chinook salmon spawning and rearing in the Yuba River and Clear Creek, and Chinook salmon and steelhead redd dewatering and juvenile stranding in the Sacramento River between Keswick Dam and Battle Creek.

1. Habitat Suitability Criteria (HSC) Development - Started collection of Clear Creek rearing HSC data for fry and juvenile spring run Chinook salmon and steelhead/rainbow trout. Clear Creek rearing HSC data collection is 50 percent complete.
2. Habitat Mapping - Habitat mapping for the lower alluvial segment of Clear Creek will be conducted in FY 2008. Habitat mapping is 67 percent complete.
3. Field Reconnaissance and Study Site Selection - Established five study sites for fall-run Chinook salmon and steelhead/rainbow trout spawning in the lower alluvial segment of Clear Creek. The above activities are 100 percent complete.
4. Hydraulic Data Collection - Continued hydraulic data collection for Chinook salmon and steelhead/rainbow trout fry and juvenile rearing sites on the Yuba River and Clear Creek, and started hydraulic data collection for fall-run Chinook salmon and steelhead/rainbow trout spawning sites in the lower alluvial segment of Clear Creek. All of the above hydraulic data collection should be completed in early FY 2008. Hydraulic data collection is 95 percent complete for Yuba River and Clear Creek rearing, and 20 percent complete for Clear Creek spawning in the lower alluvial segment.
5. Modeling of Spawning and Rearing Habitat in Study Streams - Draft reports were completed for modeling of spring and fall-run Chinook salmon and steelhead/rainbow trout spawning habitat in the Yuba River and modeling of spring and fall-run Chinook salmon and steelhead/rainbow trout spawning habitat in Clear Creek between Whiskeytown Dam and Clear Creek Road Bridge in FY 2006. These tasks are 90 percent completed. These studies resulted in the establishment of flow-habitat relationships for spawning and rearing salmonids.
6. Peer Review - The reports for macroinvertebrate habitat and for redd dewatering and juvenile stranding in the Sacramento River between Keswick Dam and Battle Creek, for spring and fall-run Chinook salmon and steelhead/rainbow trout spawning habitat in the Yuba River, and for spring and fall-run Chinook salmon and steelhead/rainbow trout spawning habitat in Clear Creek between Whiskeytown Dam and Clear Creek Road Bridge were peer reviewed in FY 2006. These tasks are 100 percent complete.

7. Program Management - Project coordination meetings were held and a project progress report was prepared in FY 2006. This activity is 80 percent complete.

Project Title: Habitat Restoration Program
CVPIA Section 3406(b)(1) "Other"
FY 2006 Funding: \$1,590,238
FY 2006 Accomplishments:

The Habitat Restoration Program (HRP) was established to protect and restore habitats impacted by the CVP that were not specifically addressed elsewhere in the CVPIA, and to stabilize and improve populations of native species that relied on those habitats. The program's initial focus was on those habitats known to have experienced the greatest decline in habitat quantity and quality and on species that were listed, proposed, or candidates for listing under the Endangered Species Act (ESA) or were non-listed State or Federal species of special concern.

The program began in FY 1996 and has funded 77 new projects located throughout the Central Valley. Almost 99,000 acres of habitat for listed, proposed, and candidate species and species of special concern have been protected, often through partnerships with others in fee title acquisitions or conservation easements. Habitats protected include serpentine soils and associated habitats, vernal pool, aquatic, alkali sink and alkali scrub, foothill chaparral, valley-foothill hardwood, riparian woodland, and grassland.

In FY 2006, 12 conservation actions were funded. Two of these actions provided additional funding to continue projects that were initiated in previous years:

1. Continuation of planning phase for restoration of floodplain and vernal pool habitat on the 1,905-acre Sno-Bird Ranch, owned and managed by the Merced National Wildlife Refuge in Merced County. Species that would benefit include the vernal pool tadpole shrimp, vernal pool fairy shrimp, and Colusa grass.
2. Continuation of a study by the University of California, Davis, to complete a characterization of vernal pool vegetation in relation to habitats; documentation of the affiliation of special status species to particular plant communities; and creation of guidelines for the conservation and restoration of vernal pool diversity. Various vernal pool species throughout the Sacramento Valley benefit from this project.

The 10 new actions for FY 2006 are the following:

1. Funds were provided to California State University, Sonoma, to study the reproductive success of five vernal pool plant species located throughout the Sacramento Valley. The study focused on how reproductive success can be improved, which will ultimately help prevent the extinction/decline of these species due to threats from invasive grasses. Species benefited include hairy orcutt grass, Sacramento orcutt grass, Solano grass, Greene's tuctoria, and Colusa grass.

2. Funds were provided to Point Reyes Bird Observatory to conduct a study on the least Bell's vireo in Stanislaus County. The study involved four main tasks: (1) developing a map of suitable least Bell's vireo habitat; (2) monitoring the presence and abundance of the least Bell's vireo; (3) monitoring least Bell's vireo productivity; and (4) assessing brown-headed cowbird impacts in restored areas.
3. Funds were provided to Eric Hansen Associates to conduct a study on the potential presence of giant garter snakes 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 in Merced County. A goal of the study was to provide an elementary foundation for long-term monitoring of giant garter snake populations in the San Joaquin Valley. Additionally, tissue samples were provided for a parallel genetic study conducted by Dr. Tag Engstrom, California State University, Chico (see #4).
4. Funds were provided to Dr. Tag Engstrom, California State University, Chico, to conduct a study that explored the genealogical relationships of giant garter snake populations across the range of the species and, if appropriate, delineate genetically, based on distinct population segments.
5. Funds were provided to the Tulare Basin Wildlife Partners to write the Southern San Joaquin Valley Conceptual Area Protection Plan (CAPP), for the Tulare Lake - Sand Ridge Project Unit (CAPP Unit 2), and the Buena Vista Lake Project Unit (CAPP Unit 3) for Tulare County. Species benefited include vernal pool fairy shrimp, blunt-nosed leopard lizard, Tipton kangaroo rat, and San Joaquin kit fox.
6. Funds were provided to the Sequoia Riverlands Trust to complete a long-term Management Plan for the 324-acre Kaweah Oaks Preserve in Tulare County. Species benefited include the Valley elderberry longhorn beetle and willow flycatcher.
7. Funds were provided to Ducks Unlimited to restore the natural hydrology to support vernal pool and vernal pool-alkali meadow complex habitats on 431 acres on Tracts G & H of the Sacramento River National Wildlife Refuge in Glenn County. Species benefited include palmate-bracted bird's beak, hairy orcutt grass, Greene's tuctoria, Hoover's spurge, vernal pool tadpole shrimp, conservancy fairy shrimp, vernal pool fairy shrimp, and Swainson's hawk.
8. Funds were provided to River Partners to assist with riparian habitat restoration on 300 acres of fallow floodplain lands on the San Joaquin River National Wildlife Refuge in Stanislaus County. Species benefited include Valley elderberry longhorn beetle, riparian brush rabbit, riparian woodrat, least Bell's vireo, western yellow-billed cuckoo, and Swainson's hawk.
9. Funds were provided to Environmental Science Associates to conduct baseline research, GIS mapping, and predictive modeling to aid recovery of gabbro soils/

Pine Hill listed plant species in El Dorado County. Species benefited include Pine Hill ceanothus, El Dorado mule ears, Stebbins morning glory, and Pine Hill flannelbush.

10. Funds were provided to the Bureau of Land Management for fee title acquisition of 192 acres of grassland/alkali scrub habitat on Atwell Island in Tulare County. Species benefited include Tipton kangaroo rat and San Joaquin kit fox.

Project Title: Management of Dedicated CVP Water for Environmental Purposes

CVPIA Section 3406(b)(2)

FY 2006 Funding: \$1,000,000

FY 2006 Accomplishments:

On May 9, 2003, Interior released its "Final Decision on Implementation of Section 3406 (b)(2)" (Final Decision), in response to a ruling in March, 2002, by the Federal District Court. The Final Decision provided a calculation of CVP water, identified the method of accounting for use of the dedicated CVP yield [(b)(2) water] pursuant to the CVPIA, set out procedures for management of the water, and listed potential measures that may be prescribed by the Service for use of the dedicated water. The Final Decision was implemented beginning October, 2003, and was further clarified by a Department of the Interior memorandum, "Guidance for Implementation of Section 3406(b)(2) of the CVPIA," dated December 17, 2003.

Reclamation, Service, NOAA Fisheries Service, CDWR, and CDFG established an Environmental Water Account (EWA) to provide protection (supplemental to a baseline level of protection) to the fish of the Bay-Delta estuary. The management of (b)(2) water is part of that baseline and is closely coordinated with management of the EWA.

Both (b)(2) water and the EWA contribute to the anadromous fish doubling goal, and provide concurrent benefits to other fish and wildlife, including threatened and endangered species. Monitoring and evaluation to assess the effectiveness of implemented environmental measures under section 3406 (b)(2) of the CVPIA continues.

FY 2006 accomplishments include the following:

Prepared annual operations forecast representing 1992 baseline conditions and 1995 Water Quality Control Plan (WQCP) conditions. An annual fishery action plan was prepared based upon the operations forecast and consultation with other Federal and State agencies. A final operations forecast was then developed, and the forecast was updated on a monthly basis.

Developed a preliminary accounting of (b)(2) water on the 15th day of each month, showing the current accounting for the accounting year, as of the end of the previous month. Final accounting for all (b)(2) water actions for the entire water year was calculated by October 31.

Included stakeholders and public input on the annual fishery action plan and how the plan was integrated into the operations forecast.

Continued monitoring and evaluation of the effectiveness of (b)(2) water actions.

Augmented base flows in Clear Creek throughout the year to improve habitat conditions for anadromous fish; including benefits to Chinook salmon and steelhead upstream migration, spawning, egg incubation, rearing, and downstream migration.

It should be noted that water year 2006 was classified as a wet year type in both the Sacramento and San Joaquin Basins, and with the exception of Clear Creek, the need for instream (b)(2) actions was relatively small. (b)(2) water was used to augment base flows in the Sacramento and Stanislaus Rivers in December 2005 to improve habitat conditions for Chinook salmon and steelhead upstream migration, spawning, egg incubation, and rearing. Flood control operations on the Stanislaus River in the spring of 2006 precluded the need for additional (b)(2) water for spring outmigration flows for salmonids.

Closed Delta cross channel gates December 3, 2005, to protect emigrating juvenile salmonids from the Sacramento basin, including listed Chinook salmon and steelhead.

Reduced Delta exports April 26-May 3, 2006, to protect delta smelt (prior to the VAMP implementation period), and San Joaquin River emigrating salmonids.

Reduced Delta exports May 3-June 2 to protect emigrating salmonids, delta smelt, and to facilitate VAMP in San Joaquin basin streams.

In response to relatively high salvage of juvenile salmon in the post-VAMP period, reduced Delta exports from June 6-June 22 to protect San Joaquin basin salmon and steelhead.

Due to the wet hydrology in 2006 and the limited amount of water needed for protective fish actions, approximately 195,000 AF of (b)(2) water was banked in Shasta Reservoir for potential use in Water Year 2007, and 183,000 AF of (b)(2) water was made available for other project purposes.

Since 1993, (b)(2) water has been dedicated and managed annually for fish, wildlife, and habitat restoration purposes; 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 post-1992 ESA requirements.

In general, (b)(2) water actions have included: (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 Delta WQCP requirements for San Joaquin River flows at Vernalis; (3) increased releases from Shasta and/or Folsom reservoirs to help meet outflow requirements for the Delta WQCP; and (4) export reductions at the Central Valley Project's Tracy Pumping plant to protect at-risk fish species (notably salmon, steelhead, and delta smelt).

Many factors have contributed to the decline of anadromous fish in Central Valley rivers and streams. Pursuant to CVPIA and AFRP numerous restoration efforts have been implemented that are intended to positively affect more than one stressor, including the use of (b)(2) water to

help meet AFRP flow objectives. Consequently, assessing the biological benefits of (b)(2) water actions in isolation from other restoration activities is very difficult. However, the Service believes increased instream flows, in particular, have helped maintain or improve salmon and steelhead habitat and populations in CVP-controlled streams. The Service also believes that export reductions at critical times have helped protect delta smelt as well as salmon and steelhead in the Delta.

The (b)(2) water is just one of the environmental tools created by the CVPIA to achieve the AFRP anadromous fish doubling goal. The AFRP Restoration Plan establishes Chinook salmon doubling targets for each of the main rivers and streams in the Central Valley. On the CVP-controlled streams, where (b)(2) water is available, only Clear Creek appears to be meeting the doubling goal for fall run Chinook. The Service is still evaluating whether the doubling of natural production will be sustainable on a long-term basis. Table 4 describes recent adult salmonid escapement trends on CVP-controlled streams relative to the anadromous fish doubling goal.

Real-time fish monitoring helps inform (b)(2) water decisions on when and where actions should be taken. On a weekly basis, biologists from the Sacramento, San Joaquin, and Delta update the Data Assessment Team on fish movements. The sites sampled include the mainstem Sacramento and San Joaquin rivers, their major tributaries, and various locations in the Delta, including the export facilities.

Table 3. Recent salmon and steelhead escapement trends in CVP-controlled streams, relative to the anadromous fish doubling goal. A “Yes” indicates that recent escapement trends meet or exceed the numeric doubling goal; however, sustainability of these escapement numbers is yet unknown. A blank field indicates that a specific goal has not been established. Note that striped bass, green sturgeon, white sturgeon, and American shad estimates are not included, and non-CVP controlled streams are not included.

Table 3. Adult Salmonid Escapement Trends on CVP-Controlled Streams (anadromous fish doubling goal)

	Fall-Run Chinook Salmon	Late Fall-Run Chinook Salmon	Winter-Run Chinook Salmon	Spring-Run Chinook Salmon	Steelhead
Clear Creek	Yes				unknown
Sacramento River	No	No	No, but population increasing	No	unknown
American River	No				
Stanislaus River	No				

Project Title: Water Acquisition Program
CVPIA Sections 3406(b)(3) and 3406(g)

FY 2006 Funding: \$17,005,171

FY 2006 Accomplishments:

The CVPIA Water Acquisition Program is charged with the responsibility of obtaining, by various means, water to supplement the 800,000 acre feet (af) of dedicated CVP water and to assist in meeting the CVPIA requirements for refuge water needs (approximately 159,000 af for Level 4 refuge water supplies). In FY 2006, the Water Acquisition Program continued efforts to:

1. Provide supplemental water supplies for refuges, referred to as Incremental Level 4, for critical wetland habitat supporting resident and migratory waterfowl, threatened and endangered species, and wetland dependent aquatic biota.
2. Investigate the potential of using groundwater resources, including conjunctive use, to augment Incremental Level 4 supplies.
3. Acquire instream flows in support of the Vernalis Adaptive Management Program and the San Joaquin River Agreement (SJRA).
4. Acquire water to improve spawning and rearing habitat and increase migration flows for fall-, winter- and spring-run Chinook Salmon and steelhead, in support of the AFRP Restoration Plan and in coordination with the CALFED Environmental Water Program and Environmental Water Account

Outstanding issues that need to be addressed include financial constraints on the acquisition of 100 percent of Incremental Level 4 supplies, because of the increasing price of water and inadequate funding limits of the Restoration Fund. A summary of water purchases and executed agreements for FY 2006 is provided in Table 4.

Table 4. Summary of water purchases and executed agreements for the Water Acquisition Program in FY 2006. Total cost for Fiscal Year 2006 includes funds obligated in FY 2005.

Delivery Period	Seller	Quantity (AF)	Cost	Cost per AF	Purpose
Oct 05	SJR Group Authority/ Merced I.D.	12,500	\$212,375	\$17	Fall attraction flows and habitat improvement in Merced River and lower San Joaquin River (SJR) per SJRA. (FY04 and FY05 Funds)
May-Jun 06	SJR Group Authority	110,000	\$4,683,487	N/A	Pulse Flows per SJRA/VAMP (FY05 and FY06 funds and state cost share)
Apr-Sep 06	SJR Group Authority/ Oakdale I.D.	15,000	\$900,000	\$60	Flow for habitat improvement in Stanislaus and lower San Joaquin Rivers
Jun - Sep 06	SJR Group	11,000	\$660,000	\$60	Oakdale I.D. difference water

Table 4. Summary of water purchases and executed agreements for the Water Acquisition Program in FY 2006. Total cost for Fiscal Year 2006 includes funds obligated in FY 2005.

Delivery Period	Seller	Quantity (AF)	Cost	Cost per AF	Purpose
	Authority/ Oakdale I.D				from VAMP 2005 (per SJRA).
May - Jun 06	N/A	N/A	\$302,307	N/A	VAMP monitoring
May 06 - Feb 07	Banta Carbona Water District	5,000	\$675,000	\$135	Level 4 refuge water, contract year 2006
Jan 06 - Apr06	KernTulare and Panoche Water District	20,239	\$2,833,460	\$140	Level 4 refuge water, contract year 2006. Acquired the water from Panoche and Kern Tulare conveyed, stored and exchanged the Panoche water for SWP water for delivery to Kern refuge.
May 06-Feb 07	Patterson Irrigation District	9,000	\$1,215,000	\$135	Level 4 refuge water, contract year 2006
-Feb 06	San Joaquin River Exchange Contractors Water Authority	49,583	\$5,291,220	\$107	Level 4 refuge water, contract year 2006
TOTALS		232,322	16,772,849		

FY2006 accomplishments also include the following:

1. Worked with the Interagency Refuge Water Management Team to develop water delivery schedules for Level 2 and incremental Level 4.
2. Coordinated the refuges' water needs and delivery schedules with Reclamation's Central Valley Operations Office to ensure the refuges' water needs are met.

Refuge Benefits

Prior to CVPIA, refuge management priority was fall flood-up and maintenance of adequate pond levels throughout the winter. Since 1992, supplemental refuge water supplies acquired by the Water Acquisition Program have provided a more consistent, reliable year round water supply to certain Central Valley refuges. Some of the benefits include:

1. Increased frequency and acreage of irrigated moist soil food plants. The result has been a doubling in desirable plant biomass, which equates to more high-quality, high energy food available to waterfowl.
2. Improved maintenance water flows through refuge ponds to improve water quality and reduce avian disease.

3. Increased critical deepwater habitat within existing riparian zones. An example of biological benefits is establishment of a great blue heron rookery at Kern National Wildlife Refuge (NWR) in 1998. By 2001 there were 53 nests counted, inhabited by numerous nesting herons, egrets, cormorants and night-herons.
4. Increased spring and summer habitat to benefit water dependent wildlife such as the giant garter snake. An example of habitat improvements occurred within Grassland Resource Conservation District (GRCD) consisting of 14,000 acres of additional spring habitat between 1991 and 2003 and 2,400 acres of additional summer habitat between 1991 and 1998.
5. Increased critical spring and summer breeding habitat for the white-faced ibis which is a "species of special concern." At Sutter NWR the population of this species has increased from 50 in 1992 to over 15,000 in 2004, and at Kern NWR the population increased from 50 in 1992 to over 8,000 in 2005.
6. Increased early fall habitat for over-wintering migrants. Between GRCD, Kern NWR and Pixley NWR, there has been an increase in overall early fall habitat of 2,300 acres in 2003 for the benefit of the northern pintail and other early migrants which arrive in August to over-winter.

Groundwater Investigations

Groundwater investigations are being conducted by the Water Acquisition Program to lower the costs of providing supplemental refuge water supplies and to increase the reliability of these water supplies. In 2006, the Water Acquisition Program continued to conduct groundwater studies at Pixley NWR, East Bear NWR and Los Banos Wildlife Area to determine the potential for sustained use of groundwater resources on these refuges to meet Incremental Level 4 needs. Additional groundwater investigations will be conducted over the next several years at other refuges receiving water supplies pursuant to CVPIA.

Instream Flows for SJRA and VAMP

The Water Acquisition Program has acquired water from the San Joaquin River Group Authority (SJRSA) and its member agencies to provide additional spring and fall fishery flows on the Stanislaus, Tuolumne, Merced, and lower San Joaquin rivers. This water is acquired in support of the SJRA and VAMP, which is a scientifically based fishery management plan to determine the relationships between flows, exports, and other factors on fish survival in the Sacramento-San Joaquin Delta. The increased flows benefit numerous resident and anadromous fish species but are acquired primarily to benefit Chinook salmon. Central Valley Chinook salmon constitute the majority of salmon produced in California, and at times have accounted for 70 percent or more of the statewide commercial harvest. The SJRA and VAMP will continue as an on-going requirement until at least 2009.

Instream Flows for AFRP

The AFRP identified the need to augment stream flows on some tributaries to the Sacramento and San Joaquin rivers to help meet a doubling goal of Central Valley anadromous fish identified in Section 3406 (b)(1) of CVPIA. In recent years, the Service has led a planning effort to determine which tributaries should receive priority for instream acquisition efforts. A key

product of this effort is a Decision Support Model (DSM). The DSM evaluates key factors including potential biological benefits, availability of water rights, cost of water, and impacts, in order to assess water acquisition priorities. A monitoring component will be built into future instream acquisitions to assure flow requirements are met and biological benefits are quantified. A specific timeline for implementation of instream acquisitions in support of AFRP has not yet been established.

Project Title: Tracy Pumping Plant Mitigation Program
CVPIA Section 3406(b)(4)

FY 2006 Funding: \$2,243,795

FY 2006 Accomplishments:

The purpose of the Tracy Pumping Plant Mitigation Program (TPPMP) is to mitigate for impacts associated with the operation of the Federal Tracy ("Jones") Pumping Plant located in the south Delta. Included within the scope of the TPPMP are research activities to determine improved methods of salvaging and handling fish at the Tracy Fish Collection Facility (TFCF) and implementation of operational and maintenance changes at the TFCF to provide improvements in salvage effectiveness.

The current focus of the mitigation program is to improve fish protection and fish salvage at the existing TFCF facility as per federal ESA OCAP Biological Opinions and CALFED South Delta Fish Facility Forum (SDFF) recommendations.

The SDFF recommended to hold off on construction of a large scale test facility (TFTF) to be located at Tracy and to, instead, focus on improving existing fish salvaging facilities in the south Delta, while implementing other less costly alternatives to fish protection.

FY 2006 accomplishments include the following:

1. Continuation of whole facility evaluations utilizing Delta smelt.
2. Continued evaluation of the Tracy mitten crab traveling screen as a potential device for continuous woody and leafy debris removal while adequately passing fish.
3. Continuation of studies on tracking predator fish movements inside fish salvage facilities using remote telemetry.
4. Continuation of swirl tests to assess stress levels of salvaged fish held in recessed collections tanks.
5. Evaluation of stress on winter-run Chinook salmon associated with fish holding.
6. Evaluation of above ground holding tank in the lab in Denver.
7. Completed assessment of the historical 10-minute count screen used for estimating fish salvage.

8. Continued development of fish taxonomic keys for various delta fish species.
9. Maintenance and updating of a technical web site. Added technical guide for recently listed green sturgeon.

FY 2006 improvement activities were:

1. Completed rehabilitation of the Collection Tank Building and Northside Utilities.
2. Completed evaluation and design of improved trash rack cleaning device for award in 2007.
3. Continued conceptual evaluation and design of improved primary and secondary louver cleaning system.

It is difficult to summarize biological benefits of the TPPMP since 1992 due to uncertainty about how best to proceed in the south Delta to improve fish protection at both the Federal TFCF and State J.F. Skinner Fish Facility. Originally the plan was to construct a full scale (i.e. 2,500 cfs) TTF as one-half of the eventual replacement of the existing TFCF and phase in construction of several 2,500 cfs modules at the Skinner facility also. However, due primarily to exorbitant construction costs, the CALFED SDFP recommended focusing more on improving the existing fish facilities to bring them back into original design compliance, as best as possible, while implementing other less costly fish protection and restoration measures elsewhere within the state.

The research activities conducted as part of the TPPMP provide valuable information towards future improvements in fish protection at the South Delta fish facilities (both the CVP and SWP).

Once present research efforts are completed, or as they are being completed, physical and/or operational changes will be made at the existing facilities to improve efficiency of the fish salvage process. Additionally, field tests will be conducted after implementation to assess the effectiveness of these changes.

It is anticipated that at least three to five more years of intensive field and lab testing is required to determine best methods of salvaging fish at the TFCF under the current conditions. Some improvements can be implemented sooner than others.

Since the overall efficiency of the federal TFCF has lessened by as much as 60 percent over the past 40+ years, it is anticipated that the improvements will result in substantial fish savings although exact numbers are difficult to quantify due the rather large and complex design of the TFCF.

Project Title: Contra Costa Canal Pumping Plant Fish Screen Project
CVPIA Section 3406(b)(5)

FY 2006 Funding: \$214,303

FY 2006 Accomplishments:

This Program provides for construction and operation of new fish screen and recovery facilities and for modification of operations and practices at the Contra Costa Canal Pumping Plant. This directive is consistent with and supports the Service's biological opinion for the delta smelt that was issued for the Los Vaqueros Project.

With the development of alternative short-term fishery mitigation measures, Reclamation presented these measures to the Service, Fisheries Service, and CDFG, with a request for an amendment to the Los Vaqueros biological opinion for delta smelt. The amendment extended the date for completion of the Rock Slough fish screen project through December, 2008. There is also the possibility of re-initiating formal consultation and adding mitigation requirements.

Final design and construction of a major project at the Contra Costa Canal Pumping Plant will await the results of further studies by the Contra Costa Water District and responses from the fishery and regulatory agencies on an amendment to the biological opinion.

A Fish Monitoring

1. With the assistance of State of California Department of Fish and Game (CDFG) drafted an improved monitoring program. Implementation of the plan began in FY2004 and will continue indefinitely. Regular sampling through FY 2006.
2. Entered into a new agreement with Contra Costa Water District contracted for the monitoring of the Rock Slough.

B. Regulatory Process

1. The US Fish and Wildlife Service (USFWS) drafted a letter permitting our operation through the year 2008 in the absence of a screening facility. This includes mitigation for each year that Reclamation extends./survey actions related to listed species impacted by the CVP.
2. Completed first mitigation action through the Contra Costa County HCP and entered into an agreement for FY2005.

C. Design

No new design activities in this fiscal year beyond the ad hoc design team formation and a search of literature.

D. Secured a determination from the Solicitors related to CVPIA 3406(b)(5); summarized here:

Section 3406(b)(5) clearly and unequivocally states that "[t]he Secretary . . . is authorized and directed to . . . develop and implement a program to mitigate for fishery impacts resulting from operation of the Contra Costa Canal Pumping Plant No. 1. Such program shall provide for construction and operation of fish screening and recovery facilities . . ." Failure to construct or failure to take reasonable actions toward completion of the fish screen required under CVPIA 3406(b)(5) may expose the Secretary to a lawsuit for injunctive relief. Administrative Procedures Act, section 701(1) of title 5 of the United States Code, provides that a federal court may "compel agency action unlawfully withheld or unreasonably delayed."

Project Title: Flow Fluctuation/Reservoir Storage Management Program

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

FY 2006 Funding: \$ 50,000

FY 2006 Accomplishments:

CVPIA Section 3406(b)(9) requires development and implementation of a program to eliminate, to the extent possible, losses of anadromous fish due to flow fluctuations caused by operation of any CVP storage or re-regulating facility. This program is to be patterned, where appropriate, after the agreement between CDFG and CDWR on the operation of the SWP's Oroville Dam complex. Closely related to this charge to reduce the impacts of flow fluctuations, CVPIA Section 3406(b)(19) calls for the re-evaluation of reservoir storage criteria in order to maintain minimum carryover storage in Shasta and Trinity Reservoirs to benefit anadromous fish, with full regard to the Secretary's responsibility to fulfill all project purposes, including agricultural water delivery. Interior's efforts on both of these directives are generally handled as a single program. Although no funding specifically allocated for section (b)(19), reservoir storage was studied under 3406(b)(2) in FY 2006.

The American River Operations Work Group met monthly throughout FY 2006 to discuss American River operations and to determine threshold flows and ramping rates required to protect Lower American River fishery resources. In addition, Reclamation conducted monthly temperature modeling of the flows of the American River.

The Stanislaus River flow fluctuation study was started in 1999 and is still ongoing. An early draft report of that study was released in July, 2004. More regular discussions of the Operations Group are held in the April/May period when the pulse flows for VAMP are being planned and implemented. These pulse flows include releases from New Melones Reservoir on the Stanislaus River.

Project Title: Red Bluff Diversion Dam Fish Passage Program

CVPIA Section 3406(b)(10)

FY 2006 Funding: \$1,082,000

FY 2006 Accomplishments:

CVPIA Section 3406(b)(10) requires the development and implementation of measures to minimize fish passage problems for adult and juvenile anadromous fish at the Red Bluff Diversion Dam (RBDD) in a manner that provides for the use of associated CVP conveyance facilities for delivery of water to the Sacramento National Wildlife Refuge Complex (SNWR).

Substantial improvements in both matters occurred independently of the CVPIA in the early to mid 1990's. Installation of a siphon under Stony Creek, made the Glenn Colusa Irrigation District's Canal a reliable means of conveyance of water to the SNWR and NOAA Fisheries Service's 1993 biological opinion for the winter-run Chinook salmon, which required a lifting of the RBDD gates between September 15 and May 15, eliminated most of the fish passage problems.

Further improvements are possible since about 80% of the adult Spring run Chinook salmon population at RBDD and approximately 50% of the adults of the southern population of the

green sturgeon are delayed or blocked when attempting to move upstream of RBDD. However, the magnitudes of the benefits are unclear. On the one hand, only 8% of the overall spring-run population is affected, as is roughly half of the green sturgeon population. However, the spawning conditions downstream of RBDD appear to be suitable for green sturgeon, and it is unclear how significant either fish passage problem is relative to other fishery needs.

Further improvements would require major changes in infrastructure to prevent violation of water service contracts and disruption of agricultural production, given the high demand for water in late May. Meeting that demand upon further raising the gates would require so much pumping capacity that a pumping plant meeting the demand in late May would be large enough to meet water demands any time in the year. Anything less, would devastate agriculture. Building a new, large pumping plant would cost an estimated 130 million dollars in 2006 dollars, given the recent increases in the costs of concrete and steel.

Formal decisions are still pending completion of an Environmental Impact Statement/Environmental Impact Report (EIS/EIR) and Record of Decision for the RBDD Fish Passage Program Improvement Project. The draft EIS/EIR, which focused on structural alternatives to resolve fish passage problems at RBDD, was made available for public review in 2002. Work was then suspended pending, first, completion of ESA section 7 consultation for the Central Valley Project Operations Criteria and Plan (OCAP) and, second, completion of the Long Term Water Contract Renewal process. Consequently, little was done on fish passage improvements pending completion of the Endangered Species Act consultations for the CVP as a whole, although installation of a fourth pump in the Research Pumping Facility at RBDD was completed to help alleviate water delivery problems associated with current gate operations, and the fish monitoring equipment in the RBDD fish ladders was upgraded.

Project Title: Coleman National Fish Hatchery
CVPIA Section 3406(b)(11)

FY 2006 Funding: \$270,000

FY 2006 Accomplishments:

Section 3406(b)(11) of the CVPIA states that the Secretary is authorized and directed to rehabilitate and expand the Coleman National Fish Hatchery (NFH) by implementing the Service's Coleman National Fish Hatchery Station 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. Coleman NFH was originally constructed in 1942 to offset fish habitat losses resulting from the construction of Shasta and Keswick dams (the cornerstone of the CVP).

In FY 2006 CVPIA funding was received from Reclamation for the design and construction of a visitor kiosk and informational panels at the Coleman National Fish Hatchery. This work is consistent with requirements of Phase 9 of the Coleman National Fish Hatchery Station Development Plan. Contract specifics for this project include;

1. Construct one informational/educational kiosk. The kiosk should have an area of approximately 500 square feet. The kiosk should be constructed of wood, metal, or a combination of each. The kiosk should comply with all necessary building and safety codes.

2. Construct educational/signs and display boards for the kiosk covering topics such as:
 - a. Welcome and Orientation. This includes a brief history of the hatchery, a welcoming statement, and a map of the area and the hatchery.
 - b. What We Do. The purpose of the hatchery, why it is operated and brief descriptions of what is done.
 - c. Upper Sacramento River Salmonids. History and biology of Central Valley salmon and steelhead, measures taken through the Central Valley Project Improvement Act, CALFED and other programs to improve salmon and steelhead populations.

3. Other educational signs/placards located throughout the hatchery grounds to interpret various facilities, buildings, operations or topics.

Reclamation executed the funding document with final signature on July 17, 2006. In FY 06 these funds were transferred to the Service's Visitor's Services Program in Portland for contract execution. Project reconnaissance will begin in FY 2007, with project completion expected by December 2008.

Project Title: Clear Creek Restoration Program
FY 2006 Funding: CVPIA Section 3406(b)(12)
 \$833,101 (\$125,000 WRR; \$708,101 restoration fund of which \$408,101 came from AFRP to conduct IFIM study)
FY 2006 Accomplishments:

This section of the Act requires restoration of Clear Creek, construction of a new fish ladder at the McCormick-Saeltzer Dam, and the development and implementation of a comprehensive program to provide flows from Whiskeytown Dam to allow sufficient spawning, incubation, rearing, and outmigration for salmon and steelhead.

Since the removal of McCormick-Saeltzer Dam and its diversion from Clear Creek in 2000, efforts on Clear Creek have focused on improving instream habitat conditions for anadromous salmonids.

FY 2006 accomplishments include the following:

Monitoring showed a more than 400 percent average increase in spawning density in Phase 3A of the stream channel restoration project.

Designs and proposal for stream channel restoration project 3B submitted to CALFED were accepted for funding for Phase 3B of the stream channel restoration project.

Point Reyes Bird Observatory monitoring indicated that migratory songbird diversity and population sizes were increasing in the restoration area.

IFIM data collection for rearing habitat was completed in the upper half of the anadromous reach below Whiskeytown Dam.

Flows were provided suitable for all life stages of anadromous salmonids.
Fall-run Chinook salmon escapement was approximately 8,422.

Threatened spring-run Chinook salmon continued to repopulate upstream reaches.

Threatened steelhead spawning continues to concentrate in injected spawning gravel.

Completed the Clear Creek Decision Analysis Model to estimate the amount of annual gravel additions needed to maintain spawning gravel supply after the creek has been recharged to eliminate 43 years of accumulated gravel deficit.

Constructed temporary barrier weir to prevent fall-run Chinook salmon from hybridizing with spring-run Chinook salmon.

Added 2,700 tons of spawning gravel to the National Environmental Education (NEED) Camp site, and developed designs for Dog Gulch and Peltier Valley Road Bridge.

Monitoring indicated that temperature criteria for spring-run Chinook salmon spawning were exceeded for the majority of the spawning period but only by a biologically minor increment.

Completed "Mercury Synthesis and Data Summary Report for Lower Clear Creek: Shasta County, CA."

Project Title: **Spawning Gravel Replenishment Program**
CVPIA Section 3406(b)(13)

FY 2006 Funding: **\$500,000**

FY 2006 Accomplishments:

The Central Valley Project Improvement Act (CVPIA) directs that a program be established to replenish anadromous fish spawning gravel that has been lost as a result of the construction and operation of the Central Valley Project, bank protection projects, and other activities on the Sacramento, American, and Stanislaus rivers. Since 1997, the gravel replenishment program mandated in section 3406(b)(13) of the CVPIA has implemented actions that placed approximately 170,000 tons of spawning gravel in these rivers to increase the availability of spawning and rearing habitat for Chinook salmon and steelhead. In addition, existing gravel substrates on the American River have been ripped and manipulated to make them more usable for these purposes.

Approximately 154,000 tons of spawning gravel has been placed in the upper Sacramento River since 1997. A total of 34,000 tons of gravel has been placed at a site on the west bank, immediately downriver from Keswick Dam, during the years 1997, 1998, 2000, 2004, 2005, and 2006; 96,300 tons at a site on the west bank, immediately downstream from the confluence with Salt Creek, during the years 1997, 1998, 1999, 2002, 2003, 2004, and 2005; and 23,000 tons on the east bank on the Tobiasson property toward the southern extent of the Redding city limits in 2000. These introductions have occurred in anticipation that subsequent high river flows will disperse the gravel downriver. In every case the gravel has been dispersed.

The substrate at three riffles on the lower American River was manipulated and 6,000 tons of spawning gravel was subsequently placed at these sites according to specifications in 1999.

A total of 10,000 tons of spawning gravel has been placed in the Stanislaus River since 1997 at several sites immediately downriver from Goodwin Dam. On two occasions, helicopters were used to deposit the gravel directly into the channel. Gravel was also delivered by truck to areas adjacent to the channel, and pushed into the river channel. Gravel was deposited into the river channel in 2004 by means of a sluice delivery system. The introduced gravel was subsequently dispersed downriver by streamflow.

Selected cobble at the Upper Sacramento River placement site in the vicinity of Salt Creek was implanted with electronic monitors to follow the downriver movement of gravel. Monitoring was conducted for one season. Field observations indicated the cobble moved varying distances downriver, with the farthest movement reaching to just above Anderson Cottonwood Irrigation District Diversion Dam at the City of Redding. Visual anecdotal observations have similarly been reported for adult salmon spawning in the vicinity of the gravel and for large numbers of juvenile salmon adjacent to the gravel placement sites. Aerial redd surveys unrelated to this program have indicated that winter-run Chinook salmon spawning distribution has shifted upstream since gravel introductions began in the upper river near Keswick Dam. A high proportion of winter run Chinook spawn on the placed gravel.

Gravel placement in the American River occurred in 1999, and monitoring has been conducted since then as a part of the 1999 plan to evaluate the project before designing new gravel enhancement projects in the river. The monitoring has shown that Chinook salmon spawning has occurred each year on the gravel placement sites at Sailor Bar and Sacramento Bar. Spawning at the Sunrise site occurs primarily during higher flows than are typical during the Chinook salmon spawning period; however, steelhead have spawned on the gravel at Sunrise during higher flow periods. The average Chinook salmon escapement from 2001 through 2005 (148,000) was more than triple the average escapement prior to that period (42,000). Although the increase in escapement has been substantial following the project, the increase cannot be attributed to the gravel project. The hatchery contributes a large, unknown portion of Chinook salmon production, and favorable ocean conditions enhanced marine survival over the period since gravel placement. Monitoring of adult Chinook salmon spawning activity during 2005 showed that fish densities during the peak spawning period in the upper river are higher than needed to fully utilize the existing spawning habitat. Many of the 'extra' salmon died prior to spawning, likely due to competition with fish that successfully defended favorable spawning sites and spawned. New gravel replenishment projects are currently being pursued in the American River.

Prior to gravel placement in Goodwin Canyon, spawning habitat was extremely limited in the upper four miles of the Stanislaus River, and little spawning occurred there. Since gravel placement began, approximately 150 female Chinook have spawned in Goodwin Canyon each year on the new gravel. This number of Chinook salmon spawners should produce about 745,000 eggs, which in turn should produce about 400 adult Chinook salmon, annually in the Stanislaus River. The area of the Stanislaus River near Goodwin Canyon contains the best water quality year-round for salmonids because the water is cooler than that farther downstream. In

addition, steep sections of river prevent predatory fish from migrating to Goodwin Canyon. Because of the cooler temperatures and lack of predation, salmonids that spawn in the upper river, where the gravel enhancement has occurred, likely produce more outmigrating smolts per spawner than those that spawn lower in the river. In addition to spawning habitat values, gravel placement enhances rearing habitat conditions for salmonids. Juvenile rearing densities on the new gravel are roughly double that of other rearing habitat in close proximity.

FY 2006 accomplishments include the following:

1. A total of 6,000 tons of spawning gravel was delivered and placed in the river at the Keswick Dam site on the Sacramento River. Initiated a spawning gravel monitoring program to evaluate the effectiveness of augmentation projects. Completed an annotated bibliography of previous gravel restoration documents/studies. Mapped current and historic spawning gravel restoration sites and fluvial habitat. Surveyed the longitudinal channel profile. A high proportion of winter run Chinook spawn on the gravel injected in the upper river.
2. Continued the spawning gravel monitoring program. on the lower American River which included two items: (1) aerial photo documentation of Chinook spawning locations and redd densities relative to gravel placement sites on three dates throughout the spawning period; and (2) spawning gravel condition monitoring to assess suitability of spawning gravels in the gravel placement sites and in other high use spawning areas, compared to low use and unused habitats. Initiated a gravel budget for the Lower American River to determine what comes in versus what becomes unavailable regarding spawning gravel supply. Continued gravel permeability studies.
3. Placed 1,500 tons of spawning gravel at placement sites in Goodwin Canyon on the Stanislaus River. Pre-placement and post-project streambed topography was mapped through the reach of spawning gravel placement so physical characteristics of the habitat can be monitored over time. Redds were mapped at the gravel placement sites in Goodwin Canyon. Snorkel surveys were conducted at placement and reference sites to evaluate salmonid use of the restored sites. Underwater observations verified that fry emergence occurred from the placed gravels, and rearing densities were high.

The vision for this program is to replenish gravel in the three designated rivers to maintain sufficient salmon and steelhead spawning habitat in support of CVPIA goals. The dams on these rivers have created a permanent block to gravel recruitment downstream of the dams, and the remaining sources of gravel are limited to tributary inputs and side-bank erosion downstream of the dams, both of which cannot replenish these losses on their own. Consequently, it is anticipated that the gravel replenishment requirements of the Gravel Replenishment Program will remain in place into the future, for as long as gravel recruitment is curtailed.

Project Title: Comprehensive Assessment and Monitoring Program

CVPIA Section 3406(b)(16)

FY 2006 Funding: \$500,000

FY 2006 Accomplishments:

The Comprehensive Assessment and Monitoring Program (CAMP) was established pursuant to Section 3406(b)(16) of the CVPIA. The goal of the program is to monitor fish and wildlife resources in the Central Valley and to assess the biological results and effectiveness of actions pursuant to Section 3406(b) of the CVPIA. The CAMP has two objectives:

1. Assess the overall (cumulative) effectiveness of actions implemented pursuant to CVPIA Section 3406(b) in meeting fish production targets that have been quantified by the Anadromous Fish Restoration Program (AFRP), and
2. Assess the relative effectiveness of categories of Section 3406(b) actions (e.g., water management modifications, structural modifications, habitat restoration, and fish screens) toward meeting AFRP fish production targets.

In FY 2006, CAMP accomplished the following activities:

1. A new manager and technical assistant were hired to manage the program and develop more effective strategies for achieving the abovementioned objectives, and
2. The CAMP provided funding or partial funding and management for eight projects that were designed to monitor the abundance of anadromous fish. Funding for these projects was derived from CAMP and an Anadromous Fish Restoration Program (AFRP) accounts managed by the Sacramento Fish and Wildlife Office. These funds collectively totaled \$533,465. The eight projects and costs included:
 - a) Purchasing a digital video recorder (DVR) to assess salmonid escapement levels on Battle Creek (\$10,000). After the DVR was purchased, staff from the Red Bluff Fish and Wildlife Office (RBFWO) assessed the utility and cost effectiveness of using the device to estimate salmonid escapement levels. The study with the DVR suggests the device can be used to monitor salmonid escapement levels and provide an enhanced ability to archive and recover escapement data.
 - b) Collecting data to quantify habitat features that are important to juvenile steelhead and spring-run Chinook salmon in Clear Creek (\$75,000). These data will ultimately be used to develop habitat suitability indices for juvenile salmonids and predict which flow regimes promote increases in the production of young salmonids on Clear Creek.
 - c) Preparing a report quantifying production of juvenile salmonids from Battle Creek (\$35,000). RBFWO staff prepared a report quantifying the number of juvenile steelhead and Chinook salmon that emigrated from Battle Creek

between 1998 and 2001. The report was based on rotary screw trap data, and provides a basis for assessing the effectiveness of habitat restoration activities in that watershed.

- d) Conducting a winter-run Chinook salmon carcass survey on the Sacramento River (\$108,000). RBFWO staff conducted a carcass survey to assess the abundance, migration timing, spawning distribution, and life history characteristics of adult winter-run Chinook salmon on a portion of the Sacramento River during the 2006 spawning season. Data from this study provide a basis for determining if the AFRP's winter-run Chinook salmon production target was met in 2006.
- e) Collecting data and developing a report quantifying production of juvenile salmonids from the Stanislaus River (\$50,824). The Cramer Fish Sciences (CFS) consulting company was hired to operate two rotary screw traps on the Stanislaus River. These data were subsequently summarized in a report estimating the number of juvenile fall-run Chinook salmon and steelhead that were produced from the Stanislaus River in 2007. The rotary screw trap data will be used to assess effectiveness of habitat restoration activities on the Stanislaus River.
- f) Collecting data and developing a report quantifying production of juvenile Chinook salmon from the Merced River (\$160,060). CFS was hired to operate two rotary screw traps on the Merced River. These data were subsequently summarized in a report estimating the number of juvenile fall-run Chinook that were produced from the Merced River in 2007. The rotary screw trap data will be used to assess the effectiveness of habitat restoration activities on the Merced River.
- g) Maintaining a "Chinookprod.xls" spreadsheet quantifying production of adult Chinook salmon from the Central Valley. This activity is a CAMP responsibility that primarily was performed by AFRP staff in the Stockton Fish and Wildlife Office. This spreadsheet provides production estimates for adult Chinook salmon from 22 watersheds in the Central Valley. The spreadsheet is available on the Internet at: <http://www.delta.dfg.ca.gov/afrp/>.
- h) Collecting data quantifying habitat features that are important to juvenile Chinook salmon and steelhead on the lower American River, Sacramento River, and the Sacramento-San Joaquin River Delta (\$94,581). The data from this project provide a baseline for measuring the effects of future restoration activities.

Project Title: Anadromous Fish Screen Program
CVPIA Section 3406(b)(21)
FY 2006 Funding: \$ 9,979,879
FY 2006 Accomplishments:

The Anadromous Fish Screen Program (AFSP) serves two functions in its efforts to protect juvenile anadromous fish from the effects of unscreened water diversions. First, it is a potential source of cost-share funding for diverters to install fish screens or other protective devices at their facilities. As a matter of policy, cost-share funding is only provided for features of approved projects that are required for screening and protecting fish. Up to 50 percent of the funding for qualified features can be provided by the AFSP. The AFSP funds are expended on a biological priority basis that is closely coordinated with the CALFED Environmental Restoration Program (ERP), a potential source of additional funds for fish screen projects.

Second, the AFSP Technical Team, with screen experts from various Federal and State resource and regulatory agencies, provides fish screen development guidance to participating diverters throughout various phases of project planning and implementation.

The overall benefits of screening diversions as carried out by the AFSP include the following:

1. Prevents entrainment of important fish species including steelhead and Chinook salmon.
2. Compliments other fish habitat restoration efforts for anadromous fish.
3. Meets legal requirements under the Endangered Species Act (ESA) to avoid or limit take of listed fish.

The AFSP has funded fish screen projects at water diversions ranging from 17 to 1,000 cfs. Projects funded by the AFSP require a multi-year effort, with funds being provided for feasibility studies, engineering and design, construction, and start-up testing. Consequently, accomplishments reported in any given year may be the result of funding provided several years earlier. Through FY 2006, the AFSP has provided funding towards the construction of 22 completed fish screens. Approximately 3,300 cfs of diverted water in Central Valley streams is now fish-safe as a result.

FY 2006 accomplishments include the following:

1. Completed construction of a 100 cfs retractable cylindrical fish screen at Reclamation District 999 on the Sacramento River near Clarksburg.
2. Continued to support construction activities of the Sutter Mutual Water Company Tisdale Pumping Plant Fish Screen project in Sutter County to screen a 960 cfs on the Sacramento River.
3. Initiated construction of fish screen project at Reclamation District 108 to screen three diversions at a consolidated 300 cfs diversion on the Sacramento River in Colusa County.
4. Continued to support screen design and environmental compliance activities for the Natomas Mutual Water Company (NMWC) Fish Screen project located on the Sacramento River in Sacramento County, to consolidate and screen five diversions totaling approximately 630 cfs.

5. Continued to support screen design and environmental compliance activities for the Meridian Farms Water Company (MFWC) Fish Screen project in Sutter County to consolidate and screen three existing diversions totaling 165 cfs on the Sacramento River.
6. Continued to support screen design and environmental compliance activities for the Reclamation District 2035 Fish Screen project located north of the City of Sacramento to screen a 400 cfs diversion on the Sacramento River.
7. Continued to support screen design and environmental compliance activities for Patterson Irrigation District Fish Screen to screen a 190 cfs diversion on the San Joaquin River.
8. Provide support for screen design and environmental compliance activities for the City of Yuba City Fish Screen project in Yuba County to screen a 61 cfs municipal diversion on the Feather River.

Project Title: Trinity River Restoration Program
CVPIA Section 3406(b)(23)

FY 2006 Funding: \$10,786,000

FY 2006 Accomplishments:

The Trinity River Basin Fish and Wildlife Management Program was established by an act of Congress in 1984 to restore the fish and wildlife stocks in the Trinity River Basin that were adversely affected by the construction and operation of the CVP's Trinity River Division. This program was fully functional until 1998 when Federal authorization and funding to develop and construct restoration measures expired.

When the CVPIA was passed in 1992, section 3406(b)(23) directed Interior to complete the Trinity River Flow Evaluation Study mandated in 1981 and, under certain conditions, to implement the flows determined necessary for fishery restoration. The CVPIA, in Section 3406 (b)(1), also directed the Secretary to address other identified CVP adverse environmental impacts, which includes the Trinity River Division. A Solicitor's opinion in 1998 concluded that, absent reauthorization of the Trinity River Basin Fish and Wildlife Management Act of 1984, the CVPIA provided sufficient authorization in those two sections, subject to certain limitations, to implement the resulting recommendations of the Trinity River Flow Evaluation Study report.

The Trinity River Fishery Flow Evaluation Study report was completed in spring 1999 and an EIS/EIR was completed in October, 2000, which analyzed a range of alternatives for restoring and maintaining the natural production of anadromous fish populations of the mainstem Trinity River downstream of Lewiston Dam. A final Record of Decision (ROD) was signed in December, 2000. The decision called for a range of flows from 369,000 acre-feet in critically dry years to 815,000 acre-feet in wet years to be released down the Trinity River. It also called for physical channel rehabilitation and coarse sediment augmentation to work in concert with the increased flows to restore habitat. Litigation that constrained Lewiston Dam releases since the signing of the ROD has been resolved and full implementation of the program is now underway. Dam releases for fishery purposes have increased from 340,000 acre-feet when the ROD was signed in 2000, to 815,000 acre-feet in 2006.

In order to implement the increased dam releases, at risk manmade structures in the floodplain needed to be addressed. Modifications to four river crossings and the removal of at least one house were identified. In FY 2004 construction contracts were awarded for all four bridge projects with the new crossings opened to traffic early in Calendar Year 2005. The home at risk was purchased in March 2005 to allow for the largest fishery release (7,000 cfs) since construction of the Trinity River Division.

FY 2006 accomplishments include the following:

1. Contract award for construction of four channel rehabilitation projects downstream of Canyon Creek. Over 90,000 cubic yards of material was excavated along a 5-mile section of the Trinity River near Junction City, California. This will provide increased geomorphic and hydraulic complexity to this area of the river and provide greater diversity of fish habitats supporting a wide range of life history stages.
2. Initiation of environmental documentation and preliminary designs for construction of eight other channel rehabilitation sites downstream of Lewiston Dam. Research shows that a four-fold increase in rearing habitat is required to obtain a doubling in fish populations. In all, 47 separate channel rehabilitation projects are scheduled for construction by 2012.
3. Revegetation of native riparian habitat associated with the Hocker Flat Channel Rehabilitation Project constructed in 2005 to fulfill mitigation requirements and improve plant diversity.
4. Construction of a channel rehabilitation site adjacent to the Trinity River Fish Hatchery, including the placement of 2,500 tons of spawning gravel.
5. Removal of a private residence in fishery flow inundation zones.
6. Initiation of a water and sewer system landowner assistance program to address facilities impacted by higher fishery flows.

In general, program activities have resulted in improvements in juvenile and adult fish health since 1992. Increasing summer baseflows from 300 cfs to 450 cfs has improved temperature characteristics for juvenile steelhead, increasing overall health and reducing mortality as evidenced by data from outmigrant traps and estuary seining. Coho salmon populations in the Klamath/Trinity system have remained steady, as compared to other river systems along the California/Oregon coast that have experienced declines. Adult steelhead populations increased dramatically in 2006 and as large or larger of a run is predicted in 2007.

Project Title: San Joaquin River Comprehensive Plan
CVPIA Section 3406(c)(1)

FY 2006 Funding: \$2,000,000

FY 2006 Accomplishments:

In November 1989, Reclamation was directed by the Secretary of the Interior to explore opportunities for environmental restoration in the San Joaquin River Basin, as described in the San Joaquin River Basin Resource Management Initiative (Initiative). In November 13, 1991, Reclamation and the State of California's Resource Agency (Agency) entered into a Memorandum of Agreement for "Sharing of the Cost of the San Joaquin River Basin Resource Management Initiative." Among other things, the study activities described in the MOU stated "Reclamation and the Agency shall develop a mutually acceptable plan of study for the Initiative which is consistent with the work activities underway in the California Department of Water Resources' San Joaquin River Management Program (SJRMP) effort." It also stated the Initiative "...shall focus primarily on Chinook salmon, water quality conditions, wetlands for waterfowl, wildlife, reservoir fishery, and recreation..."

Subsequently, in 1992, section 3406(c)(1) of the CVPIA mandated the preparation of a "reasonable, prudent, and feasible" comprehensive plan (Comprehensive Plan) 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 naturally reproducing anadromous fisheries from Friant Dam to its confluence with the San Francisco Bay/Sacramento-San Joaquin Delta Estuary." Work under the scope of the Initiative was halted and efforts to develop a plan of action to develop the Comprehensive Plan were initiated by Reclamation and the Service. The CVPIA requires that "...Such plan shall be developed in cooperation with the California Department of Fish and Game and in coordination with the San Joaquin River Management Program [SJRMP] under development by the State of California; shall comply with and contain any documents required by the National Environmental Policy Act and contain findings setting forth the basis for the Secretary's decision to adopt and implement the plan as recommendations concerning the need for subsequent Congressional action, if any..."

In 1998, the Natural Resources Defense Council (NRDC) sued Reclamation (NRDC v. Rodgers, *No. CIV. S-88-1658 LKK/GGH*) over the renewals of long-term water service contracts in the Friant Division of the CVP. The Friant Water Users Authority (FWUA) intervened in the suit. In an effort to settle this litigation, on October 25, 1999, in response to a jointly signed letter from the NRDC and FWUA, CVPIA Restoration Funds were provided to assist NRDC and the FWUA in their San Joaquin River restoration planning activities. Thus, the Reclamation and Service led effort to develop a Comprehensive Plan was re-focused to support the FWUA/NRDC approach. Their efforts were funded in a large part from CVPIA Restoration funds and California Proposition 13 funds. Restoration funds were provided for this purpose since the information developed would assist Interior in the development of the required Comprehensive Plan.

Although the San Joaquin River Riparian Habitat Restoration Program (SJRRHRP) was established in 1997 and functioned as a six-party, consensus-based management team directing short-term projects that would provide useful baseline data for Interior's overall efforts to gather existing conditions data on the San Joaquin River, it became a complimentary program

for specifically defined demonstration efforts, programs, and studies the FWUA and NRDC restoration planning also requested.

When FWUA and NRDC ended their restoration planning efforts in 2004, the approach to develop a Comprehensive Plan was re-directed again to have Reclamation and the Service lead the effort in FY 2005. To administratively reflect the continuing Interior focus to develop a Comprehensive Plan, \$1 million of the \$1.5 million provided under Section 3406(b)(1) was provided to Section 3406(c)(1) to clearly convey that all San Joaquin River restoration planning efforts are for the Comprehensive Plan development process in FY05 and in FY06, \$1 million was provided.

In FY 2006, the 18-year lawsuit settlement was reached in September 2006, by the U.S. Departments of the Interior and Commerce, NRDC, and FWUA. The Settlement received Federal court approval in October 2006. The Settlement is based on two goals; 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 and 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. As a result the Settlement, a multi-agency State and Federal program, entitled the San Joaquin River Restoration Program, was established to carry out the terms of the agreement that would meet the requirements of 3406(c)1.

FY 2006 accomplishments for the San Joaquin River include the following:

- **Integrated Information Management System (IIMS) Development** - An interdisciplinary training workshop was held to present the work completed to date on the river restoration information management system proposed for the San Joaquin River and other river restoration activities in the MP-Region. Following the update, additional efforts to analyze, customize, and implement an IIMS for the SJRRP prior to 2009 were initiated.
- **The Milburn-Hansen Project** - DWR continued their work on sediment transport through the study reach for the gravel pit restoration analysis. DWR made further progress on comparing and contrasting transport under current conditions and design conditions so that planners would have more information to help select the best alternative to construct the berm to re-isolate the Milburn gravel pit from the main stem San Joaquin River.
- **The Endangered Species Recovery Program (ESRP)** - ESRP completed a pilot study to develop methodology to survey the San Joaquin River for blue elderberries (*Sambucus mexicanus*), host plant of the valley elderberry longhorn beetle (VELB; *Desmocerus californicus dimorphus*), a federally listed threatened species. For 2006, a final report was initiated to document the results.
- **San Joaquin River Aquatic Inventory** - Through an agreement with the California Department of Fish and Game (DFG), an inventory of the existing aquatic fauna and flora within the San Joaquin River between Friant Dam and the Merced River was

conducted. In 2006, DFG completed their review of the major animals and plants within the study reaches and the water condition information that was pertinent to the interpretation of the inventory results.

- **San Joaquin River Water Quality Monitoring** - New water temperature data was acquired along certain reaches of the restoration study area at the six recently installed monitoring sites. The 2006 data collected was incorporated into the draft 2005 Data Summary and a 2005 and 2006 Data Summary was completed and distributed to the involved participants and interested public.
- **Point Reyes Bird Observatory (PRBO)** - PRBO Conservation Science completed a three-year monitoring effort of birds and associated vegetation in riparian habitat between Friant Dam and the Merced River. A final report was prepared documenting the results, management recommendations, and included a long-term monitoring plan to evaluate bird communities along the river.
- **San Joaquin River 2005 and 2006 Data Collection and Study Model Development and Calibration** - Additional San Joaquin River temperature monitoring was conducted at ten locations from April 2006 through July 2006. This data was used to further calibrate the HEC-RAS and HEC-5Q models and a summary of each process was completed and transmitted to the participants involved.
- **San Joaquin River Restoration Settlement Technical Support** - This was the main effort conducted for 3406(c)1 in FY06. To assist Reclamation and Interior policy makers in the Settlement discussions, a technical team was established to respond to questions and issues related to planning, project management, contracting services, engineering and design, environmental compliance, and land management. The team prepared various scenarios (i.e. schedules/timelines) for the infrastructure improvements proposed for the Settlement; provided technical support on site-specific analyses; and developed a recommendation on how the Settlement terms could be initiated upon approval (i.e. appoint an interim Program Manager to establish an interdisciplinary team to develop the Program Management Plan for Settlement implementation).

Project Title: [Refuge Water Supply Program - Refuge Water Conveyance Program Component](#)
[CVPIA Section 3406\(d\)\(1-5\)](#)

FY 2006 Funding: \$8,016,077

FY 2006 Accomplishments:

The CVPIA directs Interior to provide long-term, reliable water supplies to 19 specific wetland habitat areas in the Central Valley comprised of State wildlife areas, Federal wildlife refuges, and one private refuge (hereinafter referred to as refuges). The CVPIA authorized such water to be provided from CVP supplies and from water acquired through the Water Acquisition Program established pursuant to section 3406(b)(3). The CVPIA also authorized Interior to construct or acquire from non-federal entities water conveyance facilities and conveyance capacity as necessary for the delivery of water to the refuges.

The Refuge Water Supply Program consists of four separate, but highly coordinated, components to provide and deliver water supplies to the identified refuges. These components are: 1) the Refuge Water Conveyance “Wheeling” Program component, which provides for the delivery of Central Valley Project water and water acquired on the open market to the refuges; 2) the Facilities Construction Program component (a subset to the Refuge Water Conveyance Program), which constructs conveyance facilities necessary to obtain the needed capacity for delivery of water to the refuges; 3) the San Joaquin Basin Action Plan Construction Program component (a subset to the Refuge Water Conveyance Program), which constructs conveyance facilities necessary for obtaining needed capacity for delivery of water to those refuges within the San Joaquin Basin Action Plan lands; and 4) the Water Acquisition Program (WAP) component, which acquires Incremental Level 4 water on the open market from willing sellers for the purpose of delivery to the refuges.

The Refuge Water Conveyance Program conveys prescribed quantities of water to the boundaries of the refuges through contracts and cooperative agreements with wheeling entities utilizing their conveyance systems. As of the end of FY 2006, ten long-term (7-50 years) conveyance agreements were in place and being used to deliver water to certain refuges. These long-term agreements are with San Luis Canal Company, aka Henry Miller Reclamation District (two agreements), Biggs-West Gridley Water District, Central California Irrigation District, Grassland Water District, San Luis & Delta- Mendota Water Authority, Buena Vista Water Storage District, Tehama-Colusa Canal Authority, Glenn-Colusa Irrigation District, and the California Department of Water Resources (CDWR).

FY 2006 funds were primarily expended for the conveyance of water to those CVPIA Central Valley identified refuges, including administration of conveyance agreements, and coordination for the overall Refuge Water Conveyance Program.

Numerous biological benefits that have resulted from having a reliable, year-round water supply 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 is particularly limiting.

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.

Finally, 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.

FY 2006 accomplishments include the following:

1. Coordination with the Interagency Refuge Water Management Team (IRWMT) to develop Level 2 and Incremental Level 4 water delivery schedule scenarios, expedite refuge monthly water delivery schedules, and prioritize limited Incremental Level 4 water supplies
2. Delivery of Level 2 and Incremental Level 4 quantities of water per the refuge water supply contracts according to the delivery schedules provided by Grassland Water District, U.S. Fish and Wildlife Service (FWS), and California Department of Fish and Game (CDFG). Based on Water Year 2005 (March 1, 2005, thru February 28, 2006), approximately 374,671 AF Level 2 water and approximately 81,711 AF Incremental Level 4 water were delivered to refuge boundaries.
3. Negotiation of a second amendment to the groundwater pumping reimbursement agreement with CDFG for the purpose of supplementing Level 2 surface water supplies up to full Level 2 allocation for the Gray Lodge Wildlife Area (GLWA). This agreement is expected to be extended until the Reclamation-contracted facilities construction project for Biggs-West Gridley Water District (BWGWD) is completed, after which BWGWD will have capacity to convey full Level 4 water supplies to the boundary of GLWA.
4. Continued development of an integrated database for refuge water supply accounting, delivery scheduling, tracking and invoicing. Contract awarded on August 23, 2006, for Oracle programmer for purpose of completing database design. Completion of Phase I of database project expected by end of FY 2007.
5. Continued support for the Load Reduction Monitoring Study at Grassland Wetlands. Involves wildlife studies of modified water management of Grassland Resource Conservation District wetlands to minimize water quality impacts to the San Joaquin River. These efforts have potential application for development of water quality Best Management Practices (BMPs) for various wildlife refuges in the San Joaquin River Basin.
6. Participation with the WAP in the investigation for potential use of groundwater resources, including conjunctive use, to augment Incremental Level 4 supplies.
7. Initiation of 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 construction, and water deliveries costs. This process covers the last five fiscal years, and efforts are coordinated with FWS, CDFG, and California Department of Water Resources (CDWR).

8. Initiation of formal negotiations on a reimbursement agreement between Reclamation and CDFG for reimbursement of water conveyance costs to CDFG for water deliveries to Mendota Wildlife Area. Agreement is expected to be executed by December 2006.
9. Participation in the CVPIA Program Activity Report (CPAR) process, which consists of a review of agency implementation of CVPIA.
10. Participation in development of the latest draft of the Mendota Wildlife Area Environmental Assessment/Impact Statement, which analyzes alternatives to provide firm year round water supplies to Mendota Wildlife Area.

Project Title: **Refuge Water Supply Program - Facilities Construction Program Component**
CVPIA Section 3406(d)(1-5)

FY 2006 Funding: **\$664,764**

FY 2006 Accomplishments:

The Refuge Facilities Construction Program (RFC Program) is one of four components of the Refuge Water Supply Program, and is a subset to the Refuge Water Conveyance Program component. The RFC Program was developed to provide for the construction of new and/or improvements to existing external conveyance systems to obtain needed conveyance capacity to provide for the long-term reliable delivery of firm full Level 4 water supplies to the boundary of eight specific Federal and State wetland habitat areas (refuges) in the Central Valley. These refuges are the Sacramento, Delevan, Colusa, Sutter, Kern, and Pixley National Wildlife Refuges, and the Mendota and Gray Lodge Wildlife Areas of the State of California.

FY 2006 accomplishments include the following:

1. Continued development of the draft environmental assessment/initial study (EA/IS) documentation for conveyance of water supplies to the Mendota Wildlife Area. The final EA/IS is expected to be completed in FY 2008.
2. Continued progress on the development of the Design Data Report based on data collection of water flows, water levels, and seepage issues of the Biggs-West Gridley Water District conveyance facilities. Upon completion of the Design Data Report, the RFC Program will move forward on design and construction of improvements to the facilities at Biggs-West Gridley Water District. This project will result in increasing the capacity of these facilities to provide for long-term reliable delivery of full Level 4 water supplies to the Gray Lodge Wildlife Area. The Design Data Report is expected to be completed in FY 2008.

Project Title: **Refuge Water Supply Program - San Joaquin Basin Action Plan Program Component**
CVPIA Section 3406(d)(1-5)

FY 2006 Funding: **\$2,530,000**

FY 2006 Accomplishments:

The San Joaquin Basin Action Plan Construction Program (SJBAPC Program) is one of the four components of the Refuge Water Supply Program, and is a subset to the Refuge Water Conveyance Program component. The purpose of the SJBAPC Program is to modify existing conveyance facilities and/or construct new conveyance facilities to provide internal wetland habitats (refuges) infrastructure capacities for conveyance of full Level 4 water within those CVPIA refuges identified in the San Joaquin Basin Action Plan/Kesterson Mitigation Plan lands. The SJBAPC Program also provides for the construction of new and/or improvements to existing external conveyance systems to obtain needed conveyance capacity for the long-term reliable delivery of firm full Level 4 water supplies to the boundary of these refuges. The refuges served by this program are the San Luis, West Bear Creek, East Bear Creek, Kesterson, and Freitas Units of the San Luis National Wildlife Refuge Complex; Salt Slough and China Island Units of the North Grasslands Wildlife Area; Los Banos Wildlife Area; and the Grassland Resource Conservation District.

FY 2006 accomplishments include the following:

1. Continued progress on capacity and efficiency improvements to the O'Banion Bypass of the Central California Irrigation District facilities which takes water from the Outside Canal to the Main Canal to increase flow capacity. Project is expected to be completed in FY 2007.
2. The issuance of Section 401 Water Quality Certification from the California Regional Water Quality Control Board and a 404 Nationwide Permit from the Corps of engineers for construction of Phase I of the East Bear Creek Unit of the San Luis National Wildlife Refuge Complex located in Los Banos, California.
3. Continued progress on the construction of the Phase I East Bear Creek Unit conveyance facilities.
4. Completed a substantial level of design and specifications for the Phase II East Bear Creek Unit construction project, consisting of Island C Canal Pumping Plant and San Joaquin River crossing.

Project Title: Ecosystem/Water System Operations Models
CVPIA Section 3406(g)

FY 2006 Funding: \$550,000

FY 2006 Accomplishments:

The objective of the Ecosystem/Water System Operations Models program is to develop readily usable and broadly available models and supporting data to evaluate the ecologic and hydrologic effects of existing and alternative management strategies of public and private water facilities and systems in the Sacramento, San Joaquin, and Trinity watersheds. Specific to FY 2006 are:

- A. CalSim III Development
- B. Completion of CalSim II San Joaquin Review & Documentation
- C. Reservoir & River Water Quality, Temperature, and Habitat Model Developments

- D. Training of agency and private sector staff in use of models
- E. Membership and Participation in Professional Organizations

The Ecological/Water Systems Operations Models, CVPIA Section 3406(g) program is a continuing program that started in 1994.

In previous years the program has supported the Ecosystem Modeling Consensus Project, review and update of the Central Valley Ground-Surface water model (CVGSM); development of graphical user interfaces (GUI) for PROSIM and SANJASM and their successor, ECOSIM-W ; development of the 3-D temperature model for Whiskeytown Reservoir, development of CalSim II logic and hydrologic input.

Since 1998 this program has supported a steadily increasing level of support for CalSim II development and application. The California Department of Water Resources (DWR) and Reclamation have made a large investment in CalSim and it is essential for Interior to participate in and guide its development and application. CalSim II is now available for public use and is used in most, if not all, current water supply improvement studies.

This program also supports the new development of reservoir and river management models including water quality and biologic models used by the Division of Planning, U.S. Fish and Wildlife Service (USFWS) and private contractors for modeling support for operations and planning.

This program supports training conducted by Reclamation and the California Department of Water Resources. The Mid-Pacific Region Division of Planning, the U.S. Fish and Wildlife Service, the California Department of Water Resources (DWR), and other stakeholders have been trained under funding from this program.

This program also provides Reclamation with the opportunity to leverage the funds by participating in cost-sharing of development and applications of CalSim and other models.

The primary benefit of this funding has been the development of CalSim into the reservoir system model of choice for investigations of managing and modifying the Central Valley Project and the State Water Project. CalSim was the model applied to develop the most recent Central Valley Project Operations Criteria and Plan (CVP OCAP).

FY 2006 accomplishments include the following:

1. The staff of the River Systems Analysis Branch (MP-710), Reclamation's Technical Service Center, Derek Hilts (USFWS), and private contractors developed code and data, reviewed CalSim II, and participated in CalSim III development.
2. Support of a comprehensive review of the CalSim II simulation of salinity at Vernalis on the San Joaquin River; and improved simulation of the east side reservoir operations and irrigations demands. This review has received an additional \$80,000 of support from the California Water and Environmental Modeling Forum, Calfed Science and water districts. This activity is unprecedented in that Reclamation simultaneously publicly

introduced these model enhancements and initiated an outside review in a meeting in Modesto (August 2005). Reclamation will release the results of the peer review and its responses to issues raised in early 2007.

3. In cooperation with California DWR, Reclamation has begun significant improvements for the new CalSim III model including improved methods for evaluating hydrologic inputs based on DWR's Integrated Flow Model (IWF), groundwater simulation capability based on the new California Central Valley Simulation model (C2VSIM), and a revised water quality simulation for the San Joaquin River. CalSim III will include a consistent implementation of hydrology and groundwater in both the Sacramento and San Joaquin Valley. These activities will be completed during FY 2007.

Project Title: Land Retirement Program
CVPIA Section 3408(h)

FY 2005 Funding: \$1,494,552

FY 2005 Accomplishments:

The CVPIA authorizes Interior to acquire irrigated agricultural lands that are drainage-impaired and receive CVP water. These lands are then retired from agricultural production. The CVPIA Land Retirement Program was established to implement this provision. The main goals of the CVPIA Land Retirement Program are to:

1. Improve water conservation by district, or improve the quality of an irrigation district's agricultural wastewater.
2. Reduce drainage and improve water quality in the San Joaquin River, and to use retired lands to create additional wildlife habitat in the San Joaquin Valley.

FY 2005 accomplishments include the following:

Acquisition

Land acquisition at Atwell Island is focused on the inclusions within the already acquired acres. Letters were sent to all landowners of record for parcels within the Atwell Island Water District in either Tulare or Kings Counties. Approximately 38 acres have accepted offers and 20 acres have offers pending. An appraisal has been requested for a 193-acre parcel. Land acquisitions at both the Tranquillity and Atwell Island Project Sites have to date resulted in 9,055 acres being acquired. Of those lands, 8,345 acres are retired from irrigated agriculture or have reduced drainage.

Monitoring and Reporting

Groundwater and soil monitoring continued at the Tranquillity and Atwell Island Demonstration Project sites. Performance Standards for the biological opinion were met for physical parameters, with the exception of groundwater quality, which was highly saline with high concentrations of selenium. The bio-availability of the selenium was extremely low, however, due to the increased depth from surface to groundwater. At Atwell Island site were assessed by BLM for vegetation structure and small mammal populations.

Complete restoration to upland habitats found in the San Joaquin Valley could take many years to achieve, but the program's work has restored portions of the land and continues to adapt techniques to achieve desired habitat values. Selenium toxicity to wildlife was a concern on drainage impaired farmlands retired from irrigated agriculture in the San Joaquin Valley. Water, soil, and biota are being monitored on LRDP lands to comply with the Fish & Wildlife Service Biological Opinion requirements.

The website contains ancillary trials results developed by ESRP. Links are provided to the annual reports and the 5-year report from Tranquillity. Monitoring results are used to inform decisions regarding large scale land retirement, as a means to address agricultural drainage problems in the San Joaquin Valley.

Restoration

In FY 2006 at Atwell Island, BLM performed restoration activities on 431 acres. Restoration actions included: 225 acres burned and seeded with natives; 2 acres of sacaton grass plugs; 40 acres wildlife crops; 50 acres interplanting with *Isocoma*; 14 acres of seeding on a sump with iodine bush and suaeda seed; 20 acres shrub seeding; 10 acres of disking and native seed; and 70 acres of agricultural flaming and seeding. Sites are currently being monitored by BLM to determine the long-term success of these and previous years' plantings. The prolonged rainy season in 2006 produced prominent floral displays.

Evaluation of upland habitat restoration techniques is ongoing at both sites. No one "recipe" will fit all soil types or be successful in a given rainfall year. Many variables are being evaluated and recommendations being formulated. Successes at the Atwell Island site are being adapted to future plantings. Monitoring of these efforts contributes to this adaptability.

During Atwell Island wildlife surveys of sensitive plants and animals BLM observers found: a population of the endangered Tipton's Kangaroo Rat; a breeding population of sensitive Burrowing Owls; a breeding population of sensitive Coast Horned Lizards; a population of the sensitive San Joaquin Valley Coachwhips; a breeding population of Swainson's Hawks; and a population of a sensitive plant, Hoover's Woolstar. The wildlife sighting database now contains over 9500 observations. BLM developed plant and animal lists and a photo-illustrated flora for the Atwell Island project area. The plant list now contains 135 species from 43 families. The animal list includes 185 bird, 22 mammal, 9 reptile, 4 amphibian, and 23 butterfly species. A photo-illustrated flora of Atwell Island was developed by BLM.

Site management at Tranquillity by ESRP focused on maintenance of the 100 native plant nursery facility. Site preparation, pre-planting weed control, planting; construction of exclosures and ongoing weeding, seed collection, and mowing were activities performed. The seed cleaning for 2005 harvest was completed. The 2006 harvest is being dried and stored. A series of illustrated "manuals" regarding proper use of the equipment and seed cleaning protocols for different native plant species continues to be developed. ESRP provided 1,750 pounds of native seed from the facility that were planted in two wildlife units in partnership with the Westside RCD. Sheep grazing continued as a way to control weeds and reduce fire damage. Two restoration trials/demonstrations were installed at Tranquillity in collaboration with Dr. Ken Lair of TSC.

Partnerships and Outreach

Critical to the success of the restoration activities at Atwell Island is the partnership BLM has with cooperating farmers to. Other efforts by BLM and FWS centered on the continued efforts with the Tulare Lake Basin Working Group and the continued help provided to develop the Tulare Basin Wildlife Partners as an NGO. This NGO began to operate as a “Friends Group” to the Atwell Island Project. BLM continued coordination via partnerships with other NGOs and agencies that included the Tulare County Audubon Society; Alpaugh School District; Citizens for a Better Alpaugh; State Park Service - Allensworth SHM; USDA NRCS; USDA Forest Service (Trails Unlimited); and the Kern NWR.

DISCUSSION OF CVPIA IMPLEMENTATION AND RESULTS

Reclamation and the Service have attempted to implement, in a purposeful, proactive manner, the fish and wildlife provisions of the Act believed to be the most important, most urgent, or that would result in the greatest or most immediate contribution to attainment of its three primary fish and wildlife restoration goals: (1) sustainable doubling the natural production of anadromous fish, (2) providing water to refuges, and (3) mitigating for other CVP impacts.

Measuring progress towards attaining the goals and objectives of CVPIA has been a challenging task. The long-term, system-wide results of implementing individual actions, or of multiple actions within any single year, may not be seen for many years, and when apparent, may not be directly attributable to any particular action, but rather to a suite of actions taken by multiple programs over a long period of time. Consequently, reporting the response of the ecosystem to actions implemented in any particular year, and then separating that response from results of work done in previous years, is not practical. This is as true for FY 2006 as it has been for any of the prior 14 years of CVPIA implementation.

Nevertheless, we believe target fish and wildlife resources are responding to CVPIA measures. Implementation of long-term CVPIA programs and plans appears to be gradually realizing its goals and objectives: the number of salmon returning to the Central Valley is increasing, spawning in areas where they have not been seen for many years; hundreds of thousands of ducks, geese and other migratory birds are using wetland areas newly created or greatly enhanced under the Act; avian diseases are declining throughout the valley; tens of thousands of acres of habitat have been acquired to protect threatened and endangered species; and thousands of acres have been restored and/or enhanced to benefit species on the brink of extinction, increasing their chances for recovery.

To better identify progress towards meeting CVPIA goals, the Restoration Fund Roundtable tasked a subcommittee to engage with Reclamation and the Service in an effort to evaluate CVPIA programs. The resulting “Program Evaluation” process includes identifying objectives of CVPIA programs, clarifying measurable outcomes, and evaluating progress. Thus far, Reclamation and the Service have focused on four programs as a pilot to test this process: the Clear Creek Restoration Program, Spawning Gravel Replenishment Program, AFRP, and AFSP. For the Clear Creek Restoration and Spawning Gravel Replenishment programs, draft documents have been produced that detail objectives, outcomes, and progress. The Restoration

Fund Roundtable has provided feedback, and the documents are continually improving. Finally, to identify the extent that screening diversions is necessary in the Central Valley, the AFSP has convened a Fish Screen Program Evaluation Committee. This committee meets monthly, and is comprised of representatives from the Service, Reclamation, CDWR, CDFG, NOAA Fisheries Service, ERP, and the ERP Science Board. Through the use of models and monitoring of juvenile anadromous fish loss in diversions, this committee hopes to gain an understanding of the impact that diversions have on anadromous fish populations, and use the information to develop screening criteria to minimize diversion impacts.

Anadromous Fish - Biological Response

Chinook salmon continue to be a high priority for CVPIA restoration efforts. A majority of implemented measures and the \$498.4 million obligated over the past 14 years has been focused on this species. While the overall number of salmon along the West coast has declined, adult returns to the Central Valley and catch off the California coast have increased, correlating well with implementation of the CVPIA, which began in 1993. While other factors such as hydrology, ocean conditions, and fishing regulations have undoubtedly contributed to these increases, the declining West coast salmon fishery has also been subject to these factors and shows a different population trend.

Clear Creek provides a good example of positive biological gains correlating closely with CVPIA-related efforts. On Clear Creek, streamflows were increased during critical periods for fall-run Chinook salmon; spawning gravel was added to the stream; degraded portions of the stream channel, floodplain, and adjacent riparian habitats were restored; and erosion and sedimentation from sources within the watershed were controlled. McCormick-Saeltzer Dam, a major impediment to upstream passage of salmon and steelhead, and an associated unscreened diversion that reduced flows in the lower portions of the creek, have been removed.

Clear Creek Removal of McCormick - Saeltzer Dam



Before



After

The fall-run Chinook salmon population in Clear Creek has increased greatly following implementation of these measures. Spawning production of fall-run Chinook salmon in Clear

Creek, which averaged 3,600 fish during 1967-1991, increased to an average of 12,313 fish during 1992-2006. Furthermore, the improvement in flows and removal of McCormick-Saeltzer Dam opened Clear Creek to use by steelhead and spring-run Chinook salmon, both threatened species. Adult returns over the next several years should indicate whether there will be sustained increases in numbers of these special status species, and whether the fall-run response is a long-term upward trend induced by CVPIA actions, or just a temporary or cyclical increase resulting from other factors.

Very positive biological gains have occurred on several other streams where CVPIA efforts have been focused. Notable among these is Butte Creek, where spring-run Chinook salmon returns have been steadily improving. Natural production of Butte Creek Chinook salmon, which averaged only 1,800 fish during 1967-1991, increased to an average of 14,000 fish during 1992-2005 (Table 2).

In some years, natural production of salmon on several Central Valley streams has reached or exceeded population *numbers* set by the Anadromous Fish Restoration Plan (USFWS 2001) (numeric doubling goals), but has not yet been determined to be *sustainable* as required by the CVPIA. To determine if increased natural production is sustainable on a long-term basis, several life cycles (three to five years per cycle) of continued monitoring is necessary under a variety of environmental conditions (USFWS 1995a:2-IX-5-18). A statistical process is being developed to assist in determining the sustainability of increased population levels. Conversely, there are many other streams where the production of salmon and other anadromous fish have declined (e.g., Table 2).

In Central Valley rivers and streams with sufficient data, Table 2 presents natural production of Chinook salmon for the period of CVPIA implementation (1992-2006), as a percentage relative to the 1967-1991 baseline.

For example, Table 2 shows natural production of Clear Creek fall-run Chinook salmon to be 248 percent greater than the baseline period. If Clear Creek fall-run Chinook salmon numbers were shown to be sustainable, the anadromous fish doubling goal for this run on Clear Creek could have been exceeded by 148 percent.

In contrast, production for Yuba River fall-run Chinook salmon in Table 2 is 22 percent above the baseline, or 78 percent below the numeric doubling goal and production for Tuolumne River fall-run is 50 percent below the baseline or 150 percent below the numeric doubling goal.

Several small streams and two rivers identified in the AFRP Restoration Plan (Cow, Paynes, and Antelope creeks; miscellaneous small creeks, and Bear and Calaveras rivers) have insufficient data to make a determination regarding their anadromous fish production status relative to the baseline period.

Four of the 27 Chinook salmon populations in Table 2 have exceeded their CVPIA numeric doubling goals, and 8 populations, including these 4, have exceeded baseline 1967-1991 production (Table 2). As stated earlier, to determine progress toward anadromous fish doubling goals (as opposed to just numeric doubling goals), will require continued monitoring to determine if these production levels are sustainable on a long-term basis.

Refuges and Waterfowl – Biological Response

With the passage of CVPIA, a firm and reliable water supply was made available to Central Valley State and Federal refuges and private wetland areas. Flooding agricultural fields containing waste grain during winter provided new seasonal habitats for waterfowl. Waterfowl, shorebirds, and other wetland-dependent wildlife benefited from expansion and enhancement of habitat. Central Valley refuges reported increases of thousands of acres of new wetland habitats and tens of thousands of acres of enhanced habitats as a result of CVPIA water supplies. These refuges provided habitat for longer periods during the year, and refuge managers with the ability to manage a much more diverse mix of habitat types that more fully satisfied year-round biological needs of many wildlife species. Prior to CVPIA, refuge managers had to concentrate the vast majority of water use in fall and early winter months, when Central Valley waterfowl numbers peaked. With passage of CVPIA, the habitat calendar was expanded to the full year. Under CVPIA programs, moist soil food plant irrigations are carried out, water is made available during August and September to satisfy needs of the first wintering ducks and geese that arrive in the Central Valley, maintenance flows are applied throughout the winter months to improve water quality and decrease the intensity of avian disease outbreaks, and spring and summer water provides critical nesting habitat for waterfowl and colonial birds.

Water availability also enhances refuge managers' ability to provide a food supply for winter migrants. Waterfowl food production increased tenfold in some refuge areas. The Grasslands Resource Conservation District (RCD) increased its acreage of enhanced seed production from 4,000 acres in 1991-1992 to an average of 26,000 acres during 1993-2006. In that same time period, per acre plant biomass doubled.

Waterfowl use increased nearly as much. With more wetland habitat available in August and September, early fall waterfowl use in the Grassland RCD increased by 300 percent. Other areas recorded increases of 800 percent, from 2 million to over 18 million waterfowl use-days per year. Not only has waterfowl use increased, but visits to these areas by the public have increased as well, drawn by the prospect of seeing hundreds of thousands of birds of many species at one time in a far more natural setting than was previously possible.

Additional refuge water supplies provided by CVPIA have helped alleviate waterfowl overcrowding, particularly in the Sacramento Valley. Waterfowl disease-related mortality, usually caused by overcrowding and stagnant water, decreased markedly in the Sacramento Valley, as birds took advantage of increased habitat and improved water quality. Cholera outbreaks, once frequent and widespread in the Sacramento Valley, have been reduced to only one major incident since passage of CVPIA. Similarly, the Sacramento NWR complex reported a nearly 89 percent decline in botulism since 1992, compared to the decade prior to availability of CVPIA water supplies and the year-around reliability they provide.

Species other than waterfowl also benefited from CVPIA water. Sacramento Valley refuges reported an increased presence of western pond turtles and colonial nesting birds, such as the tricolored blackbird. In fact, the largest tricolored blackbird colony documented in California in 2004 occurred at Delevan NWR, where a combined population of adults and young totalled an

astonishing 230,000 . In 2006, the tri-colored population at Delevan was a smaller, but still substantial and thriving colony of some 40,000 individuals. In addition, refuges in the San Joaquin Valley noted increases in populations of giant garter snakes; nesting western, Clark's, and eared grebes; black-crowned night herons; and tricolored blackbirds. Valley-wide, shorebird use on shallow wetlands increased by hundreds of thousands, as sandpipers, dunlins, yellowlegs, phalaropes, and dowitchers responded to the increased wetland availability and related blooms of invertebrate food supplies. More than 150 species of other birds, 20 species of butterflies, 15 species of dragonflies, 5 species of reptiles, 2 species of amphibians, and 10 species of mammals were reported using these enhanced habitat areas in the North Grasslands Wildlife Area alone.

White-faced ibis and sandhill cranes are excellent examples of how the availability of reliable, year-round water supplies enabled refuge managers to provide habitat for endemic species that had been in severe decline for decades. Improved water supplies first led to an increase in numbers of frogs, snails, aquatic insects, and small fish. This, in turn, provided ibis with habitat for late-spring and summer nesting, essential components for these species. Increased and improved breeding habitat resulted in a steady upswing in bird numbers. Sutter NWR, for example, hosted 100 white-faced ibis in 1991. That number increased to 1,000 birds in 2000, 7,000 in 2001, and a staggering 15,000 in 2005. Kern NWR had a similar experience, with 50 ibis in 1991, 5,000 in 2001, and over 5,700 in 2006. Pixley NWR supported 200 wintering sandhill cranes in 1992 when the CVPIA was passed. It received its first allocation of CVPIA water in 1993 and provided wintering habitat for more than 2,000 sandhill cranes that year. By 2001, the population rose to 5,100 sandhill cranes and has remained high ever since, totaling 5,800 in 2006.

Other Fish and Wildlife - Accomplishments

Efforts under the CVPIA to protect and provide habitat for fish and wildlife other than anadromous fish and wetland-dependent wildlife include fee title and conservation easement acquisition of almost 99,000 acres from willing sellers at fair market prices; restoration of over 1,100 acres of native habitat for special status species; and research, surveys, and planning activities that contribute to recovery of CVP impacted species. These actions were usually accomplished through partnerships with others, such as TNC and TPL. These lands are now protected from the adverse impacts that would have occurred if they had been developed.

Since 1993, 10,283 acres of drainage impaired agricultural lands have been retired from irrigated agriculture. Upland habitat restoration has occurred on over 2,700 acres. Desirable plant and animal habitats along the San Joaquin River, from Friant Dam to the river's confluence with the Merced River, are being enhanced. Over the next several years, we anticipate that populations of species associated with these habitats, and particularly those that are threatened or endangered, will increase substantially.

The CVPIA Land Retirement Program Demonstration Project is indicative of the benefits that we expect to achieve. Monitoring results from the Fresno County site indicate a decline in the shallow groundwater table in response to land retirement, which is important, as the highly

saline groundwater has high concentrations of selenium and boron. Restoration of these retired lands and their use by wildlife has not resulted in increased levels of bio-accumulated selenium in any of the plants, invertebrates or mammals measured. All selenium levels measured are considered below concentrations of concern to Environmental Protection Agency and the Service.

Treating these lands has increased abundance and diversity of wildlife. Increased numbers of invertebrate species and abundance include parasites and predators of agricultural pests, as well as beneficial pollinators. Bird species diversity and abundance increased across all treatments immediately following restoration efforts. Populations of small mammals increased substantially on retired lands. Special status mammalian species observed on restored land at Atwell Island, including the San Joaquin kit fox and Tipton's Kangaroo Rat, were observed using established hedgerows and retired lands. Adequate native seed supplies necessary for successful restoration are being propagated. Utilizing native plant species for upland habitat restoration has many challenges, primarily large weed load control. Irrigation in the first year has helped establish natives at Atwell Island. After one year, no further irrigation was necessary and the resulting vegetation was low maintenance. Knowledge of the sensitive species habitat needs enables proper planning and planting of required vegetation for their desired structure and density.

The five year results of the Land Retirement Demonstration Project can assist in implementation of any large-scale San Joaquin Valley land retirement. The restoration technology learned on the sites can be applied to other retired lands and assist in sensitive species recovery. The Native Plant Nursery needs to be maintained, as the plants grown there are limited in occurrence throughout the San Joaquin Valley. The partnerships developed during the life of the program will encourage the extension of monitoring and restoration accomplishments.

CONCLUSIONS

Quantifiable Progress in 2006

In the first decade since the CVPIA was enacted, a vast amount of "foundation work" has taken place. Foundation work is essential to the final outcome, but often not highly visible. It involves many activities, such as data collection, research, development of alternative actions, alternatives analysis, feasibility studies, permitting, and design work. Adequate foundation work is critical if the desired outcomes of the CVPIA's are to be achieved, including (1) fish and wildlife protection, habitat restoration and enhancement; (2) addressing CVP impacts; (3) improving CVP operational flexibility; (4) expanding water transfers; (5) protecting the Bay-Delta; and (6) achieving a reasonable balance of CVP water uses. Much of that work has been accomplished, although more must continue.

In 2006, some significant "on the ground" achievements were made toward the overall environmental goals of the CVPIA. A few examples of these achievements are the restoration of about 431 acres of vernal pool and vernal pool-alkali meadow complex habitats on the Sacramento National Wildlife Refuge, placement of 6,000 tons of spawning gravel below Keswick Dam for spring-run Chinook salmon and steelhead on the Sacramento River,

placement of 2,700 tons of spawning gravel on Clear Creek, and placement of 1,500 tons of spawning gravel in Goodwin canyon on the Stanislaus River to increase Chinook salmon spawning density. These achievements, and the promise for similar achievements in the future, create a level of optimism that the CVPIA can achieve its environmental goals within a reasonable period of time and with reasonable expenditures.

At the conclusion of 2006, significant progress has been made in meeting the CVPIA's fish and wildlife goals. To be sure, there is much more work to be accomplished. Challenges for anadromous fish restoration are particularly complex on rivers where the largest, most important dams prevent migration to historic headwater habitats. Even so, some improvements appear significant. One of the most significant events through 2006 has been the increase of anadromous fish populations in four different Central Valley tributary streams (Table 2). Most notable is Butte Creek Chinook salmon (all runs); whose population has increased to an astonishing 750 percent of its average 1967-1991 natural production (Table 2). Such increases need to be sustainable to meet the CVPIA's mandated Central Valley-wide anadromous fish doubling goal, and the outlook for meeting that mandate is very promising. In Battle Creek, a watershed where restoration efforts have been shared by both CALFED and CVPIA, natural production of all runs of Chinook salmon has increased to 342 percent of its average 1967-1991 natural production (Table 2). In Clear Creek, fall-run Chinook salmon natural production has increased to 248 percent of its average 1967-1991 production (Table 2). Chinook salmon populations in the American River (fall-run) and Mokelumne River (fall-run) also show promising trends.

Actions taken under the CVPIA and other restoration programs, such as CALFED, are believed to have greatly influenced the increasing population trends for anadromous fish in widely dispersed areas of the Central Valley. Actions have included removal of smaller old dams and barriers, reopening many miles of spawning habitat; carefully planned deposition of gravel, recreating lost spawning habitat; improvement of riparian and floodplain habitat; better management of available instream water supplies; addition of fish screens at many diversions, protecting both seaward-migrating smolt and adults returning to spawn; support for larger habitat restoration efforts in the watershed; and surveys and research work to help fishery biologists better understand workings of the Central Valley fishery and ways to re-invigorate its fish populations.

Spawning gravel replenishment has become an essential and highly effective tool to improve anadromous fish populations on many streams. Approximately 11,000 tons of gravel were placed in the Upper Sacramento and the Stanislaus rivers, and Clear Creek in 2006. Salmon use of the new spawning gravels is helping to increase fish numbers in those streams. In some streams, deeper pools that shelter predator species have been re-configured to eliminate this threat to anadromous salmonid fry.

Important achievements were also made as a result of the refuge water supply program, keystone in efforts to reinvigorate and expand imperiled bird, fish and animal populations in the Central Valley. Vital water supplies are provided to refuges in the Central Valley of California, known as Level 4, to meet optimum habitat management requirements. The Level 4 water supplies consist of "Level 2" water which is usually provided by CVP project yield, and "Incremental Level 4" water acquired through purchase from willing sellers.

In 2006, approximately 84,000 acre feet of Incremental Level 4 water supplies were acquired to allow optimum management on the refuges relating to increased habitat diversity, seasonal availability of habitat, and waterbird breeding, nesting and foraging areas. These water supplies provide critical wetland habitat supporting resident and migratory waterfowl, threatened and endangered species, and wetland dependent biota. The increased water supplies have expanded refuge wetland habitat and resulted in larger and healthier bird populations. The direct result of these acquisitions continues to be a much larger, healthier bird populations.

Other types of habitat restoration also achieved significant progress in 2006. The Habitat Conservation Program participated in the acquisition and/or restoration of nearly 7,000 acres of important Central Valley habitat. Restoration included areas along the Sacramento River in Tehama County, at Drumheller Slough in Glenn County, and at several sites in Santa Clara County. Additionally, habitat was acquired along a San Joaquin River tributary in Madera County and in the Carizzo Plain in Kern County.

[To Continue Progress in the Future](#)

Reclamation and the Service are actively assessing and rating CVPIA programs to better identify and improve our performance in achieving the results of the CVPIA. More specifically, Reclamation and the Service are assessing our overall program effectiveness, spanning from how well a program is designed to how well it is implemented and what results it has and will achieve. This review will help identify a program's strengths and weaknesses, and will assist in funding and management decisions to further improve program and overall CVPIA effectiveness. All factors that may affect and reflect program performance will be assessed; for example, program purpose and design, performance measurement, evaluations, strategic planning, program management, and program results. This effort will further Reclamation and the Service's goal of completing fish, wildlife, and habitat mitigation and restoration actions mandated by the Act.

Interior is proud of its many achievements in the protection, restoration, and enhancement of fish and wildlife associated with the CVPIA. There is still much to be done to accomplish the many provisions of the CVPIA; however, Interior remains resolute in its implementation effort and dedicated to the accomplishment of CVPIA mandates.

REFERENCES

CALFED. 2000. Programmatic Record of Decision (ROD). CALFED Ecosystem Restoration Program. August 28, 2000.

CALFED. 2000. Conservation Agreement Regarding Multi-Species Conservation Strategy. CALFED Ecosystem Restoration Program. August 28, 2000.

CDFG. 2005. Grand Tab. California Department of Fish and Game, Native Anadromous Fish and Watershed Branch, Stockton, CA. February 3, 2005.

USFWS. 1995a. Working paper on restoration needs habitat restoration actions to double natural production of anadromous fish in the Central Valley of California. Volume 2. U.S. Fish and Wildlife Service, Stockton, Anadromous Fish Restoration Program, CA.

USFWS. 1995b. Working paper on restoration needs, habitat restoration actions to double natural production of anadromous fish in the Central Valley of California. Volume 3. U.S. Fish and Wildlife Service, Stockton, Anadromous Fish Restoration Program, CA.

USFWS. 2000. Draft Biological Opinion on the Operation of the Central Valley Project and Implementation of the CVPIA. U.S. Fish and Wildlife Service, Sacramento Fish and Wildlife Office, Sacramento, CA.

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. Anadromous Fish Restoration Program, U.S. Fish and Wildlife Service, Stockton, CA.