DRAFT 9-7-05

Appendix B- FY 2006 AFRP Restoration and Research Gap Analysis

Upper mainstem Sacramento River and tributaries

Upper mainstem Sacramento River

Objective 1: Acquire and restore anadromous fish habitat.
Project gap: Repair erosion problems and restore available floodplain habitat in the upper Sacramento River meander corridor.
Project target: Remove levees and restore floodplain function and restore pits and mounds resulting from past gravel mining operation (AFRP).

Objective 2: Reduce passage impediments including stranding, entrainment, and predation.
Project gap: Reduce loss of Chinook and steelhead juveniles due to unscreened diversions.
Project target: 1) **Develop a strategic plan to restore fish habitat and passage in the northern Yolo Bypass**, 2) Screen City of Redding water supply pumps to prevent endangered winter-run Chinook entrainment.

Objective 3: Conduct watershed management planning.
Project gap: Lack of collated, comprehensive watershed information.
Project target: Develop upper mainstem Sacramento River baseline of knowledge with regards to small tributaries' role: (e.g., Churn and Stillwater Creeks, Shasta West watersheds, Bear Creek); complete watershed assessments and/or initiate watershed management planning; gather baseline fisheries information.

Objective 4: Improve understanding of life history requirements.
Project gap: Develop an understanding of salmon and steelhead life history and population structures in Mill, Deer, Cottonwood, and Cow creeks.
Project target: Continue escapement evaluations in Mill, Deer, Cottonwood and Cow Creeks.

Cow Creek

Objective 1: Enhance and ensure adequate flow.
Project gap: Monitor stream flow and temperature to relate to abundance and migration timing of anadromous salmonids.
Project target: 1) Install water temperature recorders at select locations (CBDA); 2) monitor adult salmon and steelhead abundance; 3) collect flow data from existing gages or install new real-time flow gages; and 4) develop recommendations for minimum instream flow based on temperature needs and timing of salmon and

steelhead migrations.

Objective 2: Reduce passage impediments including stranding, entrainment, and predation.
Project gap: Construct fish screens and ladders, and conduct feasibility analyses for screening and laddering other agriculture water diversions. Map location and type of all diversions in watershed and prioritize them in terms of impact.
Project target: conduct feasibility analyses for screening and laddering five agriculture water diversions (pilot projects). Conduct a mapping effort of diversions in the Cow Creek watershed, in order to move forward with prioritized screening and/or passage improvement projects **(Cow Creek Diversion Mapping)**.

Objective 3: Conduct watershed management planning.
Project gap: Watershed management plan.
Project target: Cow Creek Watershed Management Plan (AFRP).

Objective 4: Improve understanding of life history requirements.
Project gap: Conduct fish population investigations.
Project target: Monitor fish populations. Investigate extent of anadromy and fish movement into the watershed **(Cottonwood and Cow Creeks Fish Distribution Study and Barrier Assessment**).

Battle Creek

Objective 1: Reduce passage impediments including stranding, entrainment, and predation.
Project gap: Reduce entrainment by screening diversions and prevent entrainment of anadromous fish.
Project target: 1) Work with the Orwick Diversion owner to prevent ESA take of juvenile spring Chinook salmon and steelhead (e.g. fund a headgate structure that will help DFG's fish screen to work properly while insuring the diverter is able to receive his needed flows).
and 2) Provide the environmental documentation to screen water intakes to Coleman National Fish Hatchery to protect naturally produced juvenile spring Chinook and steelhead.

Objective 2: Improve understanding of life history requirements.
Project gap: Conduct fish population, health, and habitat evaluations.
Project target: 1) Evaluate juvenile Chinook and steelhead life history; 2) conduct spawner surveys for steelhead; 3) continue rotary screw trapping for juvenile life history, estimate spawner success, and estimate steelhead population abundance; and 4) integrate restoration efforts with hatchery and harvest management (CBDA).

Objective 3: Conduct watershed management planning.
Project gap: Watershed management Assessment.
Project target: Battle Creek Watershed Assessment (MWD).

Cottonwood Creek

Objective 1: Enhance and ensure adequate flow.
Project gap: Monitor stream flow and temperature and relate to abundance and timing of anadromous salmonids.
Project target: 1) Collect flow and temperature data from existing gages or newly installed real-time gages; 2) determine upstream geographic distribution and timing of adult Chinook salmon; 3) determine timing and abundance of downstream migrating juvenile salmonids; 4) develop recommendations for minimum instream flow based on temperature needs and timing of salmon and steelhead migrations (CBDA—Strategic Plan), and 5) develop a floodplain feasibility study and design to improve instream conditions **(Cottonwood Creek floodplain feasibility design and construction)**.

Objective 2: Acquire and restore anadromous fish habitat.
Project gap: Lack of information on the extent and quality of riparian habitat in the watershed.
Project target: 1) **Cottonwood Creek riparian habitat inventory, ph1**, and 2) Develop riparian easements, changes in land management, and/or acquisitions in partnership with local watershed groups, landowners, stakeholders and state and federal conservation agencies.

Objective 3: Conduct watershed management planning.
Project gap: Support development of a watershed management plan.
Project target: 1) **Cottonwood Creek geomorphological analysis, Phase 1**; 2) Complete a Cottonwood Creek Watershed Management Strategy (CBDA), and 3) Develop Cottonwood Creek Watershed Management Plan.

Objective 4: Improve understanding of life history requirements.
Project gap: Estimate juvenile salmonid production, including distribution and movement of fish into the watershed.
Project target: Monitor fish populations (**Cottonwood and Cow Creeks Fish Distribution Study and Barrier Assessment**).

Objective 5: Provide education and outreach.
Project gap: Promote community support for the local Cottonwood Creek Watershed Group.
Project target: Watershed group educational outreach and support.

Bear Creek

Objective 1: Provide education and outreach.
Project gap: Promote community support for a local Bear Creek watershed group.
Project target: 1) Conduct a water quality and fish population evaluation program; 2) conduct training session for residents involved in surveys; 3) conduct fall 2006 redd survey; and 4) provide educational workshops for kids and adults to address watershed issues.

Objective 2: Conduct watershed management planning.
Project gap: Support development of a watershed assessment.
Project target: Complete a Bear Creek Watershed Assessment (CBDA/SWRCB); Develop a **Bear Creek Watershed Management Plan**.

Antelope Creek

Objective 1: Reduce passage impediments including stranding, entrainment, and predation.
Project gap: Improve spring-run Chinook salmon and steelhead passage.
Project target: **Antelope Creek fish passage project-** Implement the Edwards Dam Ladder construction project. (AFRP).

Objective 2: Conduct watershed management planning.
Project gap: Support development of a watershed assessment.
Project target: Develop a Antelope Creeks Watershed Assessment.

Mill Creek

Objective 1: Acquire and restore anadromous fish habitat.
Project gap: Assess quality of riparian habitat and acquire and preserve riparian conservation easements and fee properties.
Project target: 1**) Mill Creek riparian habitat identification and mapping, ph 1**; and 2) Develop riparian easements, changes in land management, and/or acquisitions in partnership with local watershed groups, landowners, stakeholders and state and federal conservation agencies.

Objective 2: Reduce passage impediments including stranding, entrainment, and predation.
Project gap: Acquire additional instream water supplies for enhanced anadromous fish habitat and life history requirements.
Project target: Work with state and federal water acquisition programs to develop dedicated instream water, and 2) participate in the Lower Mill Creek Watershed Restoration Project (restoring passage, fish monitoring, irrigation system

assessment, and studying groundwater) .

Objective 3: Reduce adverse impacts to anadromous fish production from fine sediments.
Project gap: Develop engineering solutions to erosion problems in the Mill Creek watershed.
Project target: 1) Reduce stream down-cutting and bank erosion; 2) build sediment retention structures; and 3) transplant native vegetation to fortify stream banks.

Objective 4: Reduce passage impediments including stranding, entrainment, and predation.
Project gap: Develop spring-run Chinook salmon and steelhead passage information in Mill Creek.
Project target: Implement the **Mill Creek Anadromous Fish Passage Study** (AFRP).
1) Implement the **Mill Creek Fish Passage Improvement Project with FY05 funding to pilot test the use of hydroacoustics to monitor upstream** passage of spring Chinook

Objective 5: Provide education and outreach.
Project gap: Support the Mill Creek Conservancy (MCC).
Project target: Continue educational outreach and support and assist MCC in watershed management planning activities.

Deer Creek

Objective 1: Acquire and restore anadromous fish habitat.
Project gap: Assess where to install bank stabilizing devices and revegetate eroding banks.
Project target: 1) Lower Deer Creek Restoration and Flood Management Feasibility Study and Conceptual Design (CBDA); reduce bank sloughing and stream down-cutting; 4) build sediment retention structures; and 5) transplant native vegetation to fortify stream banks. 6) Participate in development of Deer Creek Water Exchange Program/Flow Enhancement Program.

Objective 2: Reduce passage impediments including stranding, entrainment, and predation.
Project gap: Improve spring-run Chinook salmon and steelhead passage information in Deer Creek.
Project target: 1) Carryout a **Deer Creek (upper) erosion reduction** project, 2) Permit and construct a fish ladder and new apron on the Cone-Kimball Diversion (AFRP). 3) Jump pool enhancement and rock installation, Stanford -Vina Dam Fish Ladder (AFRP); 4) Design and implement a Deer Creek Anadromous Fish passage study.

Objective 3: Provide education and outreach.

Project gap: Support the Deer Creek Watershed Conservancy (DCWC).
Project target: Continue educational outreach and support and assist DCWC in watershed management planning activities.

Paynes Creek

Objective 1: Conduct watershed management planning.
Project gap: Support development of a watershed assessment.
Project target: **Develop a Paynes Creek Watershed Assessment**

Thomes, Stony, and Elder creeks

Objective 1: Conduct watershed management planning.
Project gap: Support development of a watershed assessment.
Project target: **Thomes, Stony and Elder creeks riparian and flood plain conditions inventory**.

Thomes and Elder creeks

Objective 1: Conduct watershed management planning.
Project gap: Support development of a watershed assessment.
Project target: **West Tehama (Thomes and Elder creeks) riparian and flood plain conditions inventory.**

Miscellaneous small tributaries

Objective 1: Expand the usable rearing habitat and provide habitat diversity, cover from predators, and shade to retain lower water temperatures in late spring.
Project gap: Support development of watershed assessments and plan that identifies
1. Current and potential habitat on small tributaries. Identify projects on streams with projects to improve habitat conditions, particularly on urban stream.
Project target: Work with cooperators on planning in small tributaries, particularly Anderson Creeks, Shasta West, Redbank Creek, Reeds Creek, Churn Creek, and Stillwater Creek.

Objective 2: Remove hazards and potential hazards such as car batteries, oil filters, and animal carcasses from streams. Prevent further use of streams for dumps.
Project gap: Knowledge of urban streams location and access points for dumping.
Project target: Work with cooperators on projects to minimize access to streams for dumping. Work with city and county governments on adequate setbacks for new development projects.

Objective 3: Expand the usable habitat.
Project gap: Support development of watershed assessments and plan that identifies
2. Current and potential habitat on small tributaries. Identify projects on streams with projects to improve habitat conditions, particularly on urban stream.
Project target: Work with cooperators on planning in small tributaries, particularly Anderson Creeks, Shasta West, Redbank Creek, Reeds Creek, Churn Creek, and Stillwater Creek.

Butte Creek

Objective 1: Reduce passage impediments including stranding, entrainment, and predation.
Project gap: Construct fish passage and protection facilities.
Project target: 1) Construct White Mallard Dam and associated diversion- phase III (CBDA); 2) Design & Construct Five Points/RD 1004 diversion facility; and, 3) Preliminary Engineering Investigation of Lower Butte Creek Project/Sutter Bypass: Willow Slough Fish Ladder Project.

Objective 2: Improve understanding of life history requirements.
Project gap: Understand anadromous fish salmonid life history characteristics.
Project target: Continue to evaluate the juvenile life history of spring-run Chinook salmon in Butte Creek (AFRP and CBDA).

Objective 3: Enhance and ensure adequate flow.
Project gap: Develop flow recommendations and obtain additional flows for anadromous fish passage.
Project target: 1) Facilitate finalizing the change in use of the Upper Butte Basin Wildlife Area water right from agriculture to in stream use; and 2) Purchase of the Giusti water right for in stream use in the Sutter Bypass; and, 3) Purchase of additional permanent water rights from willing sellers for in stream use in the Lower Butte Creek Project area.

Objective 4: Enhance and ensure adequate flow.
Project gap: Install and maintain real-time flow metering; monitor minimum 45 cfs of dedicated instream fish water throughout Butte Creek.
Project target: Add or change locations of certain flow gages in Sutter Bypass (AFRP).

Objective 5: Acquire and restore anadromous fish habitat.
Project gap: Conduct riparian restoration and repair erosion problems.
Project target: Acquire riparian properties from willing sellers.

Big Chico Creek

Objective 1: Reduce passage impediments including stranding, entrainment, and predation.
Project gap: Construct fish passage and protection facilities.
Project target: 1) Implement the Iron Canyon Fish Passage Project (AFRP).

Objective 2: Acquire and restore anadromous fish habitat.
Project gap: Habitat restoration.
Project target: Conduct Big Chico Creek habitat restoration and conservation easements.

Objective 3: Acquire and restore anadromous fish habitat.
Project gap: Spawning gravel addition.
Project target: 1**) One-mile Dam modification and gravel supplementation project- City of Chico**, and 2) add spawning gravels at Five-Mile Diversion.

Objective 4: Acquire and restore anadromous fish habitat.
Project gap: Conduct riparian restoration and repair erosion problems.
Project target: Develop riparian easements, changes in land management, and/or acquisitions in partnership with local watershed groups, landowners, stakeholders and state and federal conservation agencies.

Objective 5: Improve understanding of life history requirements.
Project gap: Conduct anadromous salmonid life history study.
Project target**:** Increase numbers of CWT juveniles, compensate for State funding cuts, and fund through 2005.

Lower Sacramento River, Delta Tributaries, and Delta

Feather River

Objective 1: Enhance and ensure adequate flow.
Project gap: Develop flow recommendations and obtain additional flows for anadromous salmonid passage.
Project target: 1) Develop through the Oroville Dam Federal Energy Regulatory Commission (FERC) negotiated re-licensing study plan; and 2) evaluate and implement corrective actions to avoid juvenile and adult stranding in side pools.

Objective 2: Enhance and ensure adequate water temperature.
Project gap: Develop a temperature model to understand the impacts of temperature on anadromous fishes.
Project target: Develop through the Oroville Dam FERC negotiated relicensing study plan.

Objective 3: Ensure genetic integrity.
Project gap: Develop a plan to promote isolation of spring- and fall-run Chinook salmon spawners.
Project target: 1) Develop through the Oroville Dam FERC negotiated relicensing study plan; and 2) implement spring-and fall-run genetic analysis study

Objective 4: Enhance and ensure adequate flow.
Project gap: Develop flow recommendations and obtain additional flows for sturgeon and American shad passage.
Project target: Develop through the Oroville Dam FERC negotiated relicensing study plan.

Objective 5: Restore floodplain and riparian habitat
Project gap: Develop and evaluate corrective measures to address to restore floodplain and riparian habitat for juvenile rearing and adult spring-run holding.
Project target: 1) Develop feasibility plan through the Oroville Dam FERC negotiated relicensing study plan; and 2) implement riparian and floodplain habitat modeling and restoration.

Objective 6: Improve spawning habitat to increase salmonid natural production.
Project gap: Implement gravel additions in the Feather River below Oroville Dam.
Project target: 1) Identify gravel starved areas in the Lower Feather River and implement gravel additions.

Yuba River

Objective 1: Reduce passage impediments including stranding, entrainment, and predation.
Project gap: Modify and maintain appropriate flows through the Daguerre Point Dam fish ladders.
Project target: 1) Collaboratively design the Daguerre Point Dam fish ladder passage engineering and design of preferred alternative; 2) Implement the redd dewatering and fry stranding study required by Revised Water Rights Decision 1644.

Objective 2: Reduce passage impediments including stranding, entrainment, and predation.
Project gap: Construct and improve screen and bypass at South Yuba-Brophy Headworks.
Project target: Develop fish screen feasibility and interim fish protection measures for diversion facilities in collaboration with Yuba County Water Agency (YCWA) and South Yuba and Brophy Water Districts.

Objective 3: Enhance and ensure adequate water flow and temperature.
Project gap: Acquire and maintain flows to provide proper flow regime and temperature for all life stages of salmonids.
Project target: 1) Carry out Yuba River RD-1644 settlement process; and 2) establish environmental Water Accounts (CBDA and CVPIA).

Objective 4: Improve spawning habitat to increase salmonid natural production.
Project gap: Implement gravel additions in upper reaches of the Yuba River.
Project target: 1) Conduct gravel additions above and below Narrows Pool (US Army Corps of Engineers mitigation) as required by NOAA Biological Opinion; and 2) SHIRA-based River Analysis, Phases II and III (AFRP).

Objective 5: Acquire and or restore habitat.
Project gap: Acquire and preserve riparian conservation easements and fee properties.
Project target: 1) Develop projects from the Yuba River Technical Working Group Implementation Plan; 2) spring-run Chinook salmon habitat feasibility study; and 3) riparian and floodplain habitat restoration feasibility study.

Objective 6: Enhance and ensure adequate water flow and temperature.
Project gap: Develop a temperature model for the loThe AFRPr Yuba River and associated tributaries below Englebright Dam.
Project target: Install flow/temperature gauges in deer and Dry creeks and waterways associated with inflow or outflow in the Yuba (e.g., Goldfields waterways and diversion returns).

Bear River

Objective 1: Enhance and ensure adequate flow.
Project gap: Develop flow recommendations and obtain additional flows in coordination with the Nevada County Resource Conservation District and area stakeholders in order to improve anadromous fish passage.
Project target: Develop a Bear River Watershed Plan (CBDA).

Objective 2: Provide education and outreach.
Project gap: Promote community support for a local Bear River watershed group.
Project target: 1) Lower Bear River existing conditions study, 2) Develop a LoThe AFRPr Bear River Watershed Plan with stakeholders (CBDA).

Objective 3: Reduce passage impediments including stranding, entrainment, and predation.

Project gap: Conduct fish barrier evaluation studies and recommend solutions for improvement, and screen water diversions.
Project target: Conduct a SHIRA Analysis of the Lower Bear River.

Dry Creek (tributary to Bear River)

Objective 1: Reduce passage impediments including stranding, entrainment, and predation.
Project gap: Construct fish screens and ladders, and conduct feasibility analyses for screening and laddering other agriculture water diversions.
Project target: 1) Fish ladder improvements, Beale Air Force Base, 2) conduct feasibility analyses for screening and laddering five agriculture water diversions (pilot projects).
Objective 2: Enhance Chinook and steelhead spawning
Project gap: Evaluate gravel resources on Dry Creek and identify locations for gravel restoration.
Project target: 1)

American River

Objective 1: Enhance and ensure adequate flow.
Project gap: Evaluate, provide recommendations, and participate in interagency activities to develop proper flow regimes in the American River.
Project target: 1) Study *Oncorhynchus mykiss* (steelhead) movement in response to changes in flow.

Objective 2: Enhance steelhead spawning.
Project Gap: Support and cooperate in inter-agency efforts towards anadromous fish habitat improvement.
Project target: 1) Steelhead spawning side-channel improvements, and 2) American River steelhead life history

Dry Creek (tributary to American River)

Objective 1: Acquire and restore anadromous fish habitat.
Project gap: Habitat restoration.
Project target: 1) Stream habitat restoration on the Sierra College campus, and 2) Secret Ravine Channel Habitat Restoration

Calaveras River

Objective 1: Enhance and ensure adequate flow.

Project gap: Determine flow requirements to support anadromous runs of steelhead and Chinook salmon below New Hogan Dam.
Project target: 1) Implement the Calaveras River Salmonid Passage Study (AFRP); and 2) negotiate agreements with landowners, SEWD, CCWD, and federal and state agencies to provide additional instream flows or purchase water rights; and 3) Calaveras River steelhead migration PIT tag study.

Objective 2: Reduce passage impediments including stranding, entrainment, and predation.
Project gap: Determine the best salmonid upstream and downstream migration corridors for salmonids between the Delta and Bellota weir; restore adult upstream passage to spawning grounds above Bellota weir and downstream passage to the Delta for salmonids; assess existing fish screen design efficiency; and build screens compatible with fish rearing and upstream/downstream fish passage.
Project target: 1) Continue monitoring passage through the retrofitted Bellota weir fish ladder and monitor upstream and downstream salmonid passage and stranding; and 2) develop a feasibility study for a permanent upstream and downstream passage to salmonids between the Delta and Bellota weir.; 3) Calaveras River fish passage improvement project; and 4) screen unscreened diversions beginning with Bellota weir.

Objective 3: Improve understanding of life history requirements.
Project gap: Determine steelhead and Chinook salmon limiting factors and carrying capacity.
Project target: 1) Continue implementing the lower Calaveras River Salmonid Life History Limiting Factor Analysis (AFRP) to assess flow requirements for anadromous salmonids; and 2) Phase I restoration plan for anadromous fish in the Calaveras River. 3) Calaveras River steelhead migration PIT tag study

Mokelumne River

Objective 1: Enhance and ensure adequate flow.
Project gap: Acquire additional flows from willing sellers to enhance steelhead and salmon survival.
Project target: 1) Assess salmonid need by life history stage and identify deficits in optimal flow 2) negotiate water right purchases and/or increase flow releases from Camanche Dam.

Objective 2: Acquire and restore anadromous fish habitat.
Project gap: Determine optimal design for gravel replenishment in Central Valley rivers and continue enhancing spawning habitat and negotiate and acquire riparian easements and improve riparian habitats.
Project target: 1) Implement the Demonstration Project to Rehabilitating Salmonid Spawning Habitat (AFRP); and 2) Continuation of Mokelumne River Spawning Habitat

Improvement (AFRP).; 3) Mokelumne River side-channel restoration; 4) lower Mokelumne River salmonid rearing habitat restoration project; and 5) acquire easements to protect riparian habitat.

Objective 3: Enhance and ensure adequate water quality.
Project gap: Monitor flow releases from Camanche Dam to assess effects on downstream salmonid migrants.
Project target: 1) Determine juvenile steelhead and Chinook salmon survival for different flows and temperatures in several water-year types and recommend operational changes 2) assess existing flow and temperature conditions for adult and juvenile salmonids between Woodbridge Dam and the Delta

Cosumnes River

Objective 1: Enhance and ensure adequate flow.
Project gap: Assess upstream and downstream flow needs for fall-run Chinook salmon.
Project target: 1) Continuation of Flow Requirement and Water Acquisition Feasibility for Fall-
run Chinook Salmon in the Cosumnes River (AFRP); 2) improve flows for all life stages of fall-run Chinook salmon; and 3) negotiate agreements with landowners, state, local and federal agencies to control water diversions and groundwater pumping.

Objective 2: Acquire and restore anadromous fish habitat.
Project gap: Acquire easements and purchase land and restore riparian habitat and fluvial processes; monitor permit requests to modify riparian habitats.
Project target: 1) Restore riparian zones to improve salmonid spawning and rearing habitats; 2) acquire lands and easements to improve riparian habitat; and 3) prevent further use of rip-rap to stabilize river banks.

Objective 3: Reduce passage impediments including stranding, entrainment, and predation.
Project gap: Remove fish barriers and assess relations between flow and egg-juvenile survival and fry-juvenile mortality due to predation
Project target: 1) Continue improving passage of salmonids at diversion dams and barriers (AFRP and USBR); 2) determine the need for a predator control plan to reduce fry and juvenile salmon mortality by non-native fishes (AFRP); and 3) determine survival of juvenile Chinook salmon in different water-year types.

Objective 4: Acquire and restore anadromous fish habitat.

Project gap: Assess the quality of salmonid spawning and rearing habitats below and above Granlees diversion dam.

Project target: 1) Determine the carrying capacity of current and potential spawning and rearing habitat for Chinook salmon and steelhead; 2) restore spawning and rearing habitat for Chinook salmon; and 3) assess the feasibility to reintroduce steelhead trout

San Joaquin Basin

Objective 1: Improve understanding of life history requirements.

Project gap: Evaluation and distribution of salmonid population data.

Project target: For each San Joaquin Basin tributary: 1) Conduct accurate escapement surveys using either VAKI counting weirs or improved mark-recapture surveys for both Chinook salmon and Central Valley steelhead (unfunded for Tuolumne and Merced rivers); 2) conduct juvenile production estimates using calibrated screw traps at the downstream boundary of the spawning reach and at the confluence with the San Joaquin River (partially funded); 3) conduct detailed surveys of steelhead redds and juvenile distribution (partially funded); 4) resume health monitoring of juvenile salmonids to determine the relationship between flow, restoration, disease infestation rates, and physiological condition (e.g., lipid content) (unfunded).

Objective 2: Reduce mortality to outmigrating juvenile salmonids.

Project gap: Identify sources and magnitude of mortality to outmigrating juvenile salmonids.

Project target: 1) cumulative assessment of basin-wide rotary screw trapping data to estimate survival of naturally produced fish for a comparison with CWT studies (unfunded); and 2) estimate survival relative to streamflow, water temperature, predation, and State and Federal Delta pumping facility related entrainment (CBDA).

Objective 3 Acquire and restore anadromous fish habitat.

Project gap: Evaluate potential project sites and aggregate sources for restoration.

Project target: 1) develop a long-term aggregate source for San Joaquin tributary projects (CBDA Merced River Ranch, but none for Stanislaus and Tuolumne rivers); 2) continue to evaluate the potential use of dredger tailings for gravel augmentation projects (CBDA Merced River studies); 3) continue to evaluate mercury contamination impacts from restoring floodplain habitats at dredge sites (CBDA Merced River studies); 4) evaluate egg survival to emergence in sites restored with dredge tailings which are abnormally porous (AFRP Stanislaus River studies); and 5) complete the Atlas of Spawning Riffles Within the San Joaquin Tributaries (AFRP).

Objective 4: Enhance and ensure adequate flow and water quality.

Project gap: Develop the San Joaquin Basin water supply plan.
Project target: Develop a San Joaquin Basin water supply plan.

Stanislaus River

Objective 1: Enhance and ensure adequate flow.
Project gap: Identify and provide appropriate water flow for critical salmonid life history stages.
Project target: 1) Evaluate fall pulse flow benefits for salmonid attraction and passage; and 2) evaluate flows for out-migration, passage and rearing of salmonids (AFRP); and 3) continue to monitor juvenile production and outmigration via rotary screw trapping.

Objective 2: Reduce passage impediments including stranding, entrainment, and predation.
Project gap: Identify causes of juvenile salmonid mortality. Construct diversion intake screens, isolate ponded sections of the river and conduct studies to determine the magnitude and distribution of the predation problem.
Project target: 1) Identify all diversions in need of screens and any migration impediments; 2) isolate ponded areas; 3) encourage other programs associated with fish passage improvement projects; 4) conduct a comprehensive study of predation on juvenile salmonids; and 5) implement Oakdale Recreation Ponds restoration.

Objective 3: Acquire and restore anadromous fish habitat.
Project gap: Develop geomorphic and restoration assessments and implement sediment restoration actions and acquire riparian easements and acquisitions and restore floodplain connectivity and riparian and shaded riverine aquatic habitat.
Project target: 1) Identify sediment problems and create a management plan with potential solutions; 2) implement Oakdale Recreation Ponds restoration; and 3) implement the Spawning Gravel Augmentation Program (USBR); and 4) restore in channel, side channel and floodplain habitat in the Lover's Leap reach; 5) augment spawning gravel in suitable locations upstream of Oakdale; 6) acquire riparian land and easements from willing sellers as available; 7) restore the Floodplain at Knight's Ferry; 8) study spatial and temporal distribution of food for rearing juvenile salmonids; 9) conduct Knights Ferry Floodplain and side channel restoration and monitoring; and 10) acquire riparian land and easements from willing sellers as available.

Objective 4: Improve understanding of life history requirements.
Project gap: Evaluate limiting factors for salmon and steelhead in the Stanislaus River.
Project target: 1) Conduct a predation study, 2) conduct habitat mapping study the contribution of fry, parr and smolt emigrants to adult recruitment using otolith microchemistry and or microstructure; 3) continue rotary screw trapping; and 4) conduct limiting

factors analysis for salmonids.

Objective 5: Watershed management.
Project gap: Establish and develop a restoration plan.
Project target: 1) Conduct an adaptive management forum on the Stanislaus River; and 2) create a comprehensive restoration plan (AFRP).

Tuolumne River

Objective 1: Enhance and ensure adequate flow.
Project gap: Acquire additional flows and maintain flows at levels needed by anadromous salmonids.
Project target: 1) Complete Infiltration Gallery at Special Run Pool 9 (unfunded); 2) apply the CBDA Environmental Water Program (unfunded); and 3) continue to evaluate Up-migration and Straying of Tuolumne River Salmonids in Response to Fall Attraction Flows and Environmental Factors (AFRP).

Objective 2: Enhance and ensure adequate water temperature.
Project gap: Monitor and ensure a water temperature of 56°F between October 15 to February 15 and 65°F from April 1 to October 1 in the salmonid spawning reach.
Project target: 1) Apply the CBDA Environmental Water Program (unfunded); 2) construct Infiltration Gallery (unfunded); and 3) continue to participate in the Tuolumne River FERC Settlement Agreement process.

Objective 3: Improve understanding of life history requirements.
Project gap: Determine egg-fry survival rates, rearing habitat preferences, and growth rates of Chinook salmon and steelhead.
Project target: Study juvenile Chinook salmon and steelhead trout abundance and distribution (Tuolumne River Technical Advisory Committee, CBDA).
Objective 4: Acquire and restore anadromous fish habitat.
Project gap: Replenish spawning gravel and reduce sedimentation; and acquire instream and riparian habitat for salmonid use.
Project target: 1) Restore the Warner-Deardorff segment (CBDA and AFRP); 2) implement MJ Ruddy Restoration Project (CBDA and AFRP); 3) restore instream and floodplain habitat at Bobcat Flat RM 43 Phase I (CBDA) and future phases including RM 43 Phase II, SRP 3, and RM 44 (unfunded); 4) restore SRP 5, 6 and 7 to provide spawning and rearing habitat (unfunded); 5) implement the Spawning Gravel Transfusion Project Phase I (CBDA); 6) implement the Fine Sediment Management Project (CBDA); and 7) implement the Spawning Gravel Transfusion Project Phase II (unfunded).

Objective 5: Reduce passage impediments including stranding, entrainment, and predation.

Project gap: Determine predation rates of juvenile salmonids by largemouth bass, smallmouth bass, striped bass, and Sacramento pikeminnow in degraded habitats. Evaluate the effects of flow and restoration on predation rates.

Project target: Continue monitoring predation at SRP 9, SRP 10, and smaller special run pools (partially funded).

Objective 6: Provide education and outreach.

Project gap: Establish a stream watch program to increase public participation in river management.

Project target: 1) Develop the CDFG and Stanislaus County partnerships (unfunded); and 2) develop the Interpretive Center in La Grange (unfunded)

Merced River

Objective 1: Enhance and ensure adequate flow.

Project gap: Acquire additional flows needed by anadromous salmonids.

Project target: 1) Support Merced River Water Temperature Modeling Studies (CBDA); and 2) apply the CBDA Environmental Water Program (unfunded).

Objective 2: Improve understanding of life history requirements.

Project gap: Determine egg-fry survival rates, rearing habitat preferences, and growth rates of Chinook salmon.

Project target: 1) Conduct biological and hydrological evaluations of the Robinson Ranch Project (CBDA); and 2) investigate the effects of elevated water temperature and high turbidity of base flow releases at Crocker-Huffman Dam on incubating Chinook salmon eggs (unfunded).

Objective 3: Acquire and restore anadromous fish habitat.

Project gap: Replenish spawning gravel and reduce sedimentation; acquire instream and riparian habitat for salmonid use; and investigate reintroduction of anadromous salmonids above existing fish barriers.

Project target: 1) Support the Dredger Tailings Reach Restoration Project Phase I (CBDA); 2) collaborate with Santa Fe Aggregates to restore the Dredger Tailings Reach Restoration Project Phase II near Snelling (unfunded); 3) continue to supply spawning-sized gravel to landowners for the construction of wing dam diversion structures (unfunded); 4) implement the Gravel Mining Reach Phase II projects (unfunded); 5) acquire and restore the upper Robinson Ranch Project (unfunded) and 6) continue the feasibility study to investigate the reintroduction of anadromous salmonids above the Crocker-Huffman Dam on the Merced River (AFRP).

Objective 4: Control and minimize effects of non-native invasive fish and plants.
Project Gap: Invasive species control.
Project Target: Manage invasive species in recently restored reaches (unfunded).

Objective 5: Reduce passage impediments including stranding, entrainment, and predation.
Project gap: Construct fish screens at diversion intakes on the Merced River.
Project target: Design and install Merced River diversion screens (4-Pumps).

Mainstem San Joaquin River

Objective 1: Enhance and ensure adequate flow and temperature.
Project gap: Identify and attempt to implement actions that will maintain sufficient flow and mean daily water temperatures between 61°F and 65°F for at least one month from April 1 to June 30.
Project target: 1) conduct a San Joaquin Basin integrated water temperature model and flow study.

Objective 2: Acquire and restore anadromous fish habitat.
Project gap: Acquire and enhance riparian easements for salmonids.
Project target: 1) Acquire riparian habitat parcels from willing sellers; and 2) implement the San Joaquin River National Wildlife Refuge Riparian Habitat Protection and Floodplain Restoration Project.

Objective 3: Reduce passage impediments including stranding, entrainment, and predation.
Project gap: Construct fish screens at diversion intakes on the lower San Joaquin River by implementing the Anadromous Fish Screen Program CVPIA 3406(b)(21) in conjunction with other programs.
Project target: 1) Implement the Patterson Irrigation District Positive Barrier Fish Screen (CBDA); and 2) support the design and construction of pump and diversion screens.

Sacramento-San Joaquin Delta

Objective 1: Enhance and ensure adequate environmental water quality.
Project gap: Maintain a 6 mg/l dissolved oxygen standard during September through November in the San Joaquin River between Turner Cut and Stockton.
Project target: 1) Conduct restoration planning for watersheds impacting low dissolved oxygen conditions in the lower San Joaquin River near Stockton; 2) implement Adaptive Real-Time Forecasting and Sustainable Management of Dissolved Oxygen in the San Joaquin River and Stockton Deep Water Ship Channel (CBDA); 3) implement lower San Joaquin River Flow Supplementation (VAMP and EWP); and 4) operate the Fall Head of Old River Barrier and DWR water quality testing.

Central Valley-wide

Objective 1:	Improve understanding of salmon and steelhead life history requirements.
Project gap:	Improve understanding of salmon and steelhead life history and population structures in Central Valley streams.
Project target:	1) **Hatchery Proportion Study,** 2) Central Valley Steelhead Population Structure Evaluation (AFRP); 3) assessment of Life-history Characteristics and Genetic Composition of *Oncorhynchus mykiss* project (CBDA); 4) Steelhead Workshop; 5) sonic tagging and tracking of yearling *Oncorhynchus mykiss;* and 6) Steelhead scale and otoliths analyses on the Yuba River
Objective 2:	Expand the distribution of steelhead in the Central Valley.
Project gap:	Survey Central Valley watersheds to identify additional steelhead habitat.
Project target:	Identify streams without steelhead targets to potentially support steelhead.
Objective 3:	Reduce passage impediments including stranding, entrainment, and predation.
Project gap:	Reduce loss of Chinook and steelhead juveniles due to unscreened diversions.
Project target:	1) Develop a strategic plan to restore fish habitat and passage in the northern Yolo Bypass, 2) Screen City of Redding water supply pumps to prevent endangered winter-run Chinook entrainment.
Objective 4:	Provide education and outreach.
Project gap:	Expand and support education of resource management professionals.
Project target:	1) Conduct the **Working at a Watershed Level training course** for project partners and stakeholders (CBDA); and 2) Adaptive Management Forum (AMF) Planning team response to AMF review panel reports.
Objective 5:	Acquire and restore anadromous fish habitat.
Project gap:	Evaluate the feasibility of actions to restore and improve small tributaries.
Project target:	Fund small tributary restoration projects as available.
Objective 6:	Reduce passage impediments including stranding, entrainment, and predation.
Project gap:	Evaluate effects of non-native species on anadromous fish.
Project target:	Study gut contents of non-native species to determine if they are competing with or predating upon anadromous fish.
Objective 7:	Provide education and outreach.
Project gap:	Report updated natural production estimates of anadromous fish to resource managers and stakeholders.
Project target:	1) Develop a database on natural production with graphic interface linked to the AFRP website ; 2) Draft CAMP report documenting flow, escapement and

production; 3) Analyze flow and production/escapement for Central Valley tributaries; and 4) Conduct a study to document actual hatchery contribution to natural production (escapement).