UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southwest Region
501 West Ocean Boulevard, Suite 4200
Long Beach, California 90802-4213

March 5, 2008 In response refer to:
2007/05512

Mr. Scott Hamelberg
Project Leader
U.S. Fish and Wildlife Service
Coleman National Fish Hatchery Complex
24411 Coleman Fish Hatchery Road
Anderson, CA 96007

Dear Mr. Hamelberg:

This document transmits NOAA's National Marine Fisheries Service's (NMFS) biological opinion, based upon our analysis of the proposed U.S. Fish and Wildlife Service's (USFWS) Coleman National Fish Hatchery (Coleman NFH) Water Intakes Rehabilitation Project (project) located in upper Battle Creek, 30°N 2°W and 29°N 2°W, in the Tuscan Buttes and Balls Ferry USGS quadrangles, in Shasta and Tehama Counties, California; and the project effects on endangered Sacramento River winter-run Chinook salmon (*Oncorhynchus tshawytscha*), threatened Central Valley spring-run Chinook salmon (*O. tshawytscha*), and threatened Central Valley steelhead (*O. mykiss*), and the designated critical habitat of Central Valley spring-run Chinook salmon and Central Valley steelhead, in accordance with section 7 of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531 *et seq.*; Enclosure 1). Your August 21, 2007, request for formal consultation was received on August 25, 2007 and accepted for initiation on October 29, 2007.

This biological opinion is based on information provided in the August 2007 Action Specific Implementation Plan for the proposed project; several meetings and telephone conversations between NMFS staff and representatives of the USFWS, Bureau of Reclamation (Reclamation), and California Department of Fish and Game (CDFG); and other sources of information, including site visits. A complete administrative record of this consultation is on file at the NMFS Sacramento Area Office.

Based on the best available scientific and commercial information, the biological opinion concludes that the Coleman NFH Water Intakes Rehabilitation Project is not likely to jeopardize the continued existence of the listed species or adversely modify designated critical habitat. NMFS also has included an incidental take statement with reasonable and prudent measures and non-discretionary terms and conditions that are necessary and appropriate to minimize incidental take associated with the project.

Also enclosed are essential fish habitat (EFH) conservation recommendations for Pacific salmon as required by the Magnuson-Stevens Fishery Conservation and Management Act (MSA) as amended (16 U.S.C. 1801 *et seq.*; Enclosure 2). This document concludes that the Coleman

NFH Water Intakes Rehabilitation Project will temporarily adversely affect EFH for Pacific salmon in the action area. Therefore, NMFS has identified pertinent EFH conservation recommendations as addressed in Appendix A of Amendment 14 to the Pacific Coast Salmon Plan.

Section 305(b)4(B) of the MSA requires USFWS to provide NMFS with a detailed written response within thirty days, and ten days in advance of any action, to the EFH conservation recommendations, including a description of measures adopted by USFWS for avoiding, minimizing, or mitigating the impact of the project on EFH (50 CFR 600.920[j]). In the case of a response that is inconsistent with our recommendations, USFWS must explain its reasons for not following the recommendations, including the scientific justification for any disagreements with NMFS over the anticipated effects of the proposed action and the measures needed to avoid, minimize, or mitigate such effects.

If you have any questions regarding this document, please contact Ms. Shirley Witalis in our Sacramento Area Office, 650 Capitol Mall, Suite 8-300, Sacramento, CA 95814. Ms. Witalis may be reached by telephone at (916) 930-3606, or by Fax at (916) 930-3629.

Sincerely,

for Rodney R. McInnis
Regional Administrator

Enclosures (2)

Enclosure 1

BIOLOGICAL OPINION

ACTION AGENCY: United States Fish and Wildlife Service, Sacramento District

ACTIVITIES: Coleman National Fish Hatchery Water Intakes Rehabilitation Project

CONSULTATION CONDUCTED BY: National Marine Fisheries Service, Southwest Region

DATE ISSUED: March 7, 2008

I. CONSULTATION HISTORY

History of the Proposed Project

The screening of Coleman National Fish Hatchery (Coleman NFH) intakes is identified as an action in the Anadromous Fish Restoration Program (AFRP) under the Central Valley Project Improvement Act (CVPIA 2000) and is recognized by the CALFED Bay-Delta Program (CALFED) as a priority action associated with the Battle Creek Restoration Project.

To this end, the U.S. Fish and Wildlife Service (USFWS) carried out interim upgrades to Intakes 2 and 3, in 1998, to reduce fish entrainment. A check valve was placed on Intake 2 to prevent escapement of water prior to reaching the Coleman Canal and an emergency perforated-plate fish screen was added to Intake 3 which was later removed when proven to be unmanageable.

In response to a condition in a biological opinion issued by NOAA's National Marine Fisheries Service (NMFS) to USFWS on February 18, 1999, USFWS developed a protocol to salvage fish entrained into the Coleman NFH complex water delivery system due to screening deficiencies of Intakes 2 and 3. Additionally, USFWS organized a multi-agency/stakeholder technical team to develop a design for accommodating the goals stated under AFRP. Coleman NFH intake screening and modification proposals were developed and submitted to CALFED for funding in 2001, and 2002.

On February 28, 2007, NMFS participated in a meeting held at the U.S. Bureau of Reclamation's (Reclamation) Mid Pacific Construction Office in Willows, CA, also attended by representatives from Reclamation, USFWS, and California Department of Fish and Game (CDFG), for the purposes of reviewing a presentation, and discussion of project alternatives, in preparation for the public introduction to the project's *Environmental Assessment/Initial Study* (EA/IS) on March 19, 2007.

On March 15, 2007, NMFS downloaded the *Coleman National Fish Hatchery Water Intakes Rehabilitation Project Public Draft Environmental Assessment/Initial Study* (EA/IS) from Reclamation's Mid-Pacific Internet Webpage (http://www.usbr.gov/mp).

On May 2, 2007, Mr. Steve Thomas, NMFS-Habitat Conservation Division, submitted comments from the Southwest-NMFS hydraulic engineering staff on the proposed design for Coleman NFH Intake 3, to the Reclamation-Denver engineering design team. Additional follow-up comments from Mr. Thomas were submitted to Reclamation-Denver on November 7, 2007.

On August 27, 2007, NMFS received a letter from the USFWS, dated August 21, 2007, requesting formal consultation with NMFS for the USFWS' Coleman NFH Water Intakes Rehabilitation Project (project), pursuant to section 7 of the Endangered Species Act (ESA), as amended, and the Magnuson-Stevens Fishery Conservation and Management Act, as amended. The consultation package included a complete Action Specific Implementation Plan (ASIP) containing all the required elements of a biological assessment, and requests from USFWS for confirmation on its submitted list of species under NMFS jurisdiction having potential to be affect by the project; identification of the NMFS designated point of contact for the consultation; and for a review of the draft biological opinion prior to completion of section 7 consultation.

On October 24, 2007, NMFS participated in a teleconference call with Reclamation and USFWS, chaired by Reclamation biologist, Mr. James De Staso III. The purpose of the teleconference was to discuss and resolve the issue on the screening of Coleman NFH Intake 2. An accord was reached by Reclamation and NMFS on the screening of Intake 2 (Phase 2), and a commitment to secure funding for Phase 2 during the 2-year implementation of Phase 1 of the project. NMFS received final confirmation on the project description on October 29, 2007.

On October 29, NMFS-Long Beach received documentation in support of a Letter of Permission (LOP) application for the project, provided by Tetra Tech consultants, at the request of Mr. Matt Rabbe of the U.S. Army Corps of Engineers, Redding Regulatory Office.

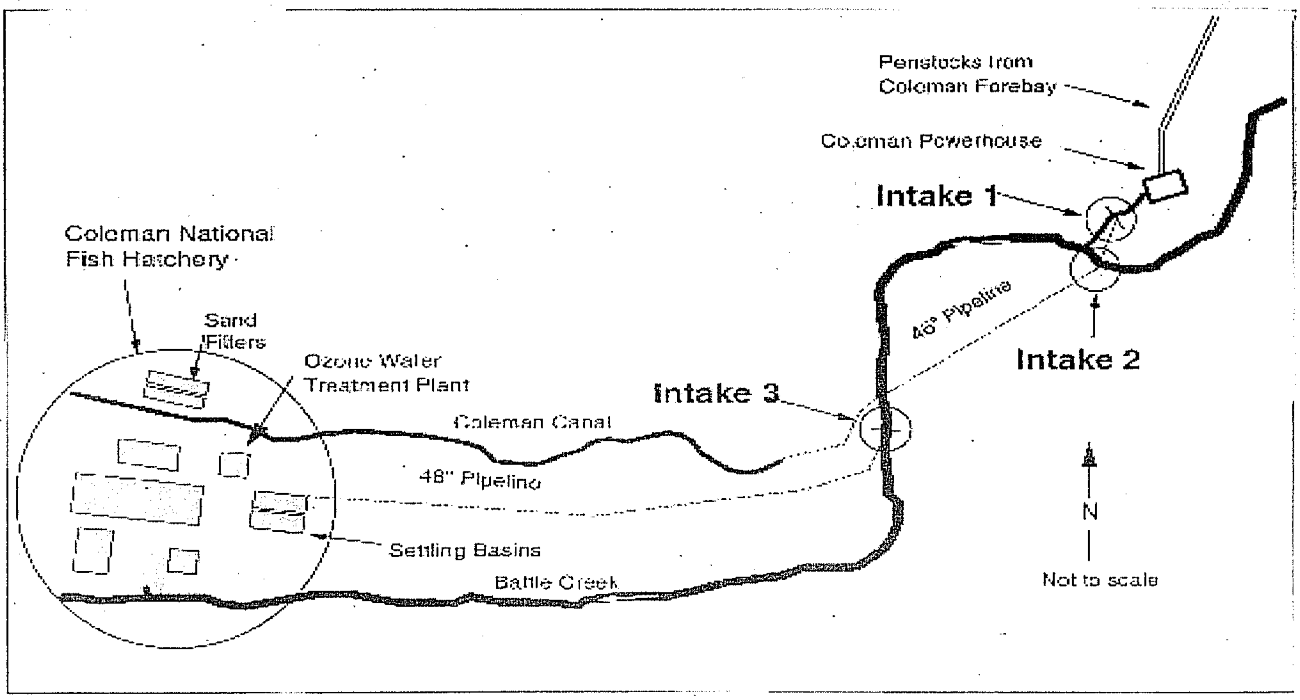
II. DESCRIPTION OF THE PROPOSED ACTION

A. Action Area

The action area is defined as all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR 402.02). For the purposes of this biological opinion, the action area for the proposed project includes the mainstem of Battle Creek, from its confluence at RM 271.5 of the Sacramento River, upstream to the barrier structure of Eagle Canyon Diversion Dam on North Fork Battle Creek, and the barrier structure of Coleman Diversion Dam on South Fork Battle Creek. This area comprises the downstream extent of potential water quality impacts from construction activities, and the upstream extent to which listed salmonids may occur, thus affecting spawner abundance and competition in the reaches of upper Battle Creek.

The USFWS, working cooperatively with Reclamation, proposes to modify water intakes and conveyance systems at the Coleman NFH to improve operational efficiency and reliability. Intake 3 is currently screened but does not meet NMFS and CDFG screening criteria; both Intakes 2 and 3 require proper screening to prevent the entrainment of salmonids in the Coleman NFH water delivery system (Figure 1). The proposed action is intended to accomplish three objectives, while remaining within the confines of the historic 122 cubic feet per second (cfs) of water allotment: (1) meet Federal and State regulatory requirements to reduce take of listed and non-listed anadromous salmonids through application of appropriate screening criteria; (2) provide a reliable, high quality water supply in sufficient quantity to meet hatchery operational needs; and (3) provide sufficient access and response time to intake structures to assure proper operation and maintenance of the intake structures and water delivery system. Intake modifications would allow the USFWS to meet criteria for fish screening required by NMFS and CDFG, and would offer operational redundancy to ensure stable and reliable water deliveries within the confines of Coleman NFH's existing water rights. By allowing for greater reliability of water deliveries to fish-rearing ponds, and by allowing for more inflow of colder water from Intake 1, the proposed project would contribute significantly to healthy salmonid populations in Battle Creek and the Sacramento River.

Figure 1. Existing Coleman NFH Water Supply System.



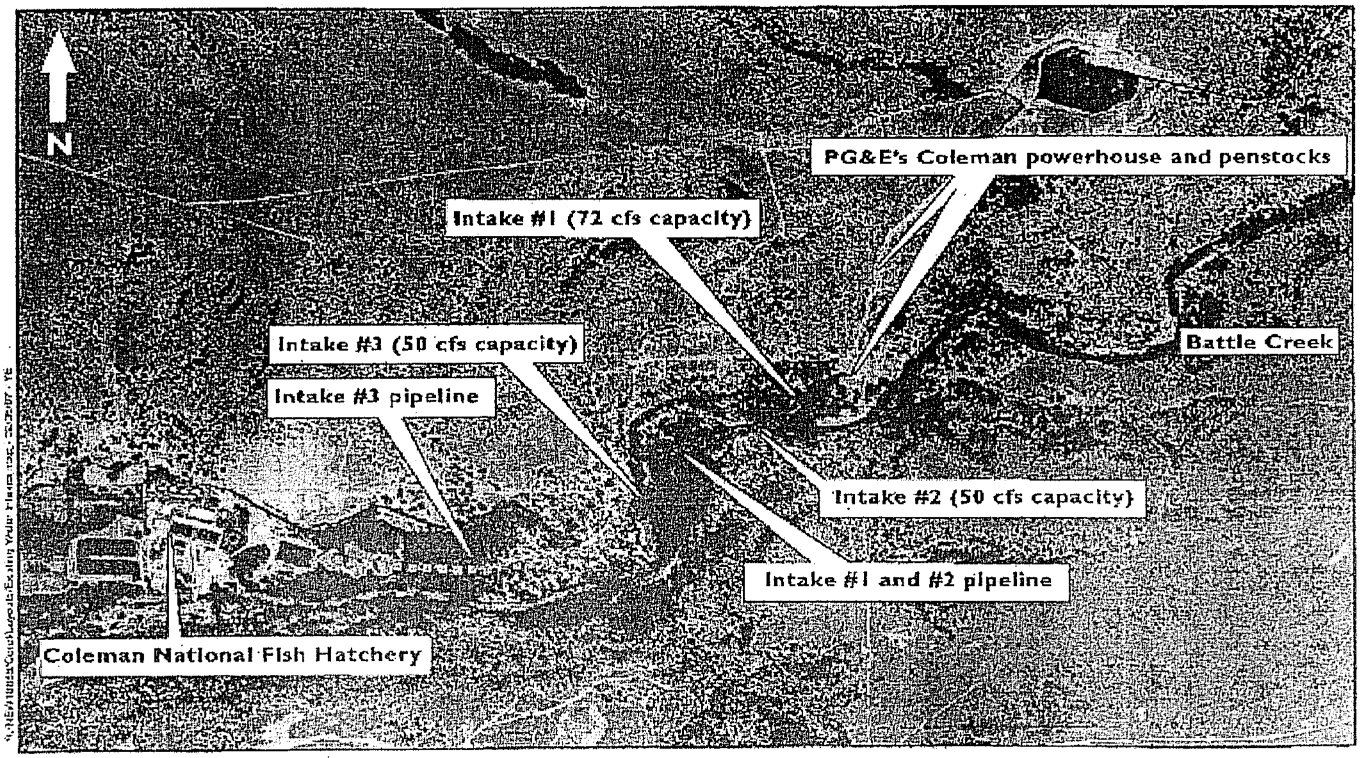
The diversions through modified intake structures would be limited to 122 cfs as per state water right permits, and there would be no net change in flow. Coleman NFH would continue to monitor flow rates and make them available to the public. The proposed action is compatible with the goal of the Battle Creek Salmon and Steelhead Restoration Project to restore runs of

Sacramento River winter Chinook salmon (*Oncorhynchus tshawytscha*), Central Valley spring Chinook salmon (*O. tshawytscha*), and Central Valley steelhead (*O. mykiss*), on 42 miles of prime salmonid habitat on Battle Creek, plus an additional 6 miles of habitat on its tributaries. The restoration project will breach or remove several dams on Battle Creek tributaries, in order to remove impediments to anadromous fish passage in the upper watershed. USFWS proposes that the rehabilitation of Intakes 1 and 3 be completed prior to the initial dam breaching projected to occur in 2009 to 2010. Modification of Intake 2 will be implemented in a second phase of the project.

Project Area

The project area encompasses 33 acres over a 1.6-mile-long stretch of Battle Creek and includes three intake structures and associated water delivery pipelines associated with the water supply system to the Coleman NFH complex (Figure 2).

Figure 2. Existing Coleman NFH Water Supply System.



Project Design

Alternative "C" described in the *Coleman National Fish Hatchery Intake Alternatives Analysis* (Tetra Tech 2007) was chosen as the preferred alternative for the project, to be implemented in two phases (Figure 3).

(1) Phase 1 - Intake 3 would be modified to meet current NMFS screening criteria without any change to its diversion capacity of 50 cfs, as required by Coleman NFH water rights. Intake 1 would be expanded to increase its diversion capacity to 122 cfs by extending a new pipeline having a maximum diameter of 36 inches downstream to discharge into the existing 48-inch diameter steel pipeline from Intake 3. Intake 3 would be operated when Intakes 1 and 2 are not operational. Phase 1 is expected to be carried out in years 2008 and 2009.

(2) Phase 2 - Intake 2 would be abandoned in place and a new, screened Intake 2 with a diversion capacity of up to 122 cfs would be constructed 2,000 feet upstream on the right bank to replace Intake 2. A new 36-inch pipeline with a maximum diameter of 66 inches would extend downstream to discharge into the existing 46-inch diameter concrete pipeline and the new pipeline from Intake 1. The original Intake 2 would be capped. The new Intake 2 would be used as an emergency water source whenever Intake 1 is offline. Phase 2 is expected to be implemented after Phase 1 is completed (D. Reck, Reclamation, pers. comm.).

The project proponent will conduct monitoring during and after project implementation to ensure that conservation measures are effectively implemented, including project site restoration and mitigation actions. Approximately 0.33 acres of riparian wetlands will be temporarily impacted by project implementation, and restored upon completion of Phase 1. Approximately 1.35 acres, or 60,000 square feet of construction corridor and stream width, will be temporarily dewatered over the course of the project. A total of 2.37 acres (2,050 linear feet) of vegetated stream corridor, and another 2.82 acres (1,150 linear feet) of non-vegetated stream corridor, will be temporarily impacted by Phase 1 of the project. Permanent impacts include 0.14 acres (495 linear feet) of vegetated riparian stream corridor, and 0.01 acres (20 linear feet) of non-vegetated stream corridor.

Project Construction

All materials used for construction of in-channel structures must meet applicable state and federal water quality criteria. Work equipment expected to be utilized in various stages for the project includes: a compressor, vibratory compactor, steel wheel roller, grader, backhoe, front-end loader, excavator, gas generator, crane, gas pump, gas welder, highway dump truck, highway water truck, dozer, miscellaneous trucks, and a light plant.

In-stream Work Window

The established seasonal in-stream work window is May 1 to September 1. It was chosen in consideration of salmonid life history and likely presence in the action area, and of the seasonal flow regime of Battle Creek. Average monthly flow ranges from a low of 332 cfs during September (average annual low 250 cfs) to a high of 825 cfs during January (KRIS Battle Creek 1962-2001). Flows in Battle Creek are less than 500 cfs more than 90 percent of the time but the stream experiences flashy winter floods in excess of 6,000 cfs an average of once every two years.

Staging Areas

Staging areas would be cleared of vegetation as needed and could be temporarily fenced with chain link fencing to provide security for the equipment and material inside. Crushed gravel surfacing will be applied to a portion of each area for dust and erosion control. Temporary office and storage trailers will be set up at the Coleman Powerhouse and/or the Intake 3 staging area for use by the construction contractor and government personnel.

Construction Activity

Excavation of pipeline trenches will occur between May and September. Battle Creek will be diverted to one half of its present channel with temporary cofferdams constructed with large sand-filled bags, *i.e.*, "super sacks," or porta-dams, to allow portions of the stream to be dewatered. The use of a bypass channel or cofferdams will reduce the flow of water during instream work. All water removed from the work site during dewatering would be returned to the creek either by subsurface flow following discharge to uplands or by direct release to the creek following permit requirements from the Central Valley Regional Water Quality Control Board (RWQCB). Plastic sheeting will be employed to reduce sedimentation from the cofferdams.

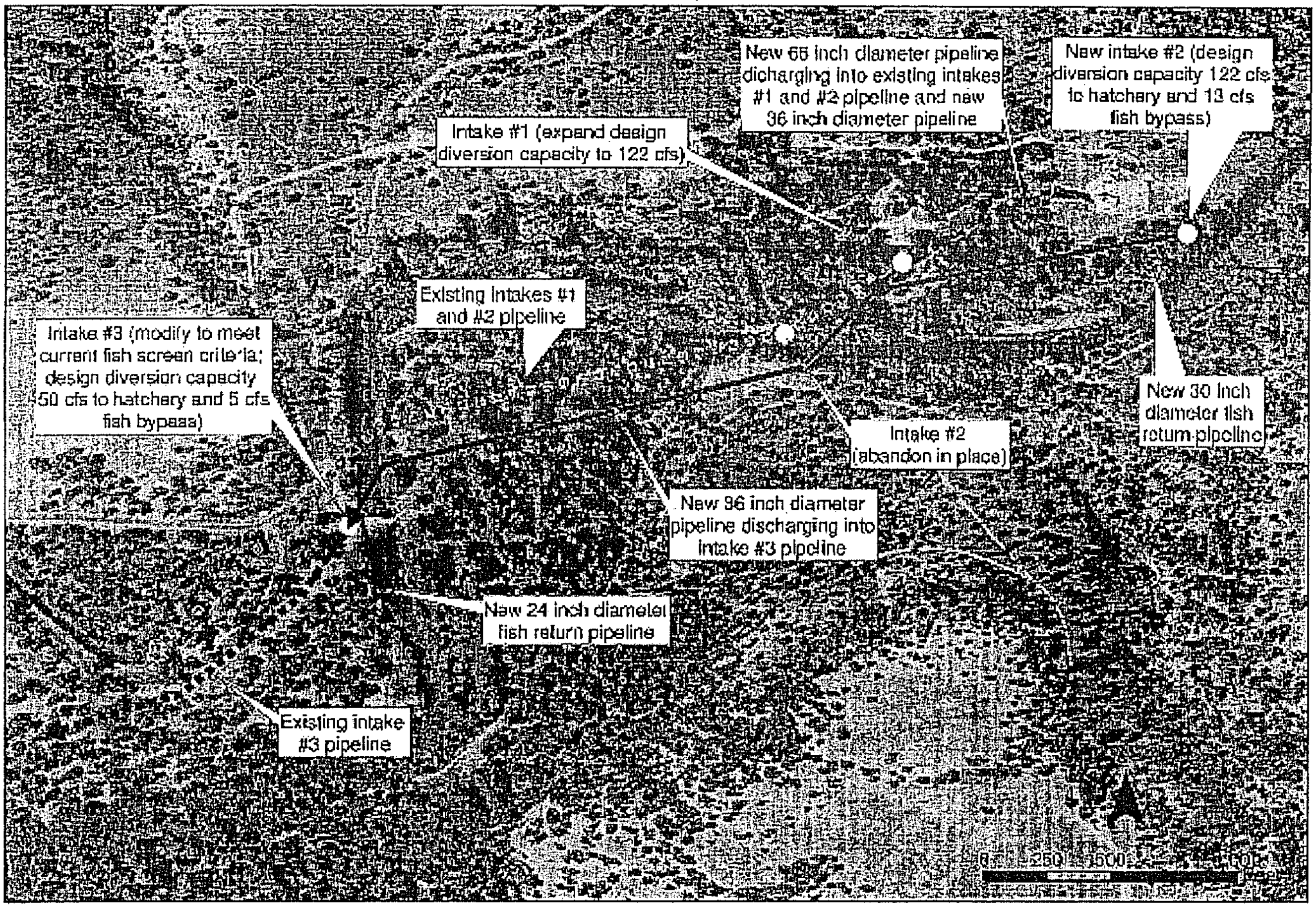
Each trench will be excavated so that the top of a placed pipe is five feet below the creek bed; bedding material placed, pipe installed, embedment materials placed and compacted, and the pipe covered with excavated material. The upper 2 to 3 feet of backfill over the pipe will be coarse gravel and cobbles. The pipe will be placed under the first half of the creek, the sandbag cofferdam and/or porta-dam will be removed and the process will be repeated for the other half of the channel. Creek banks will be restored to their original shape and revegetated. Two-acre staging areas (200-feet by 400-feet) will be established near each intake, and temporary office and storage trailers will be set up at the PG&E Coleman Powerhouse and/or at the Intake 3 staging area. Staging areas and construction corridors will be restored upon project completion.

Intake 1

The staging area will be located about 200 feet north of Intake 1. An expansion cast-in-place intake will be constructed alongside the existing intake. Work will be conducted during low water demand time and water needs will be served by Intakes 2 or 3. The 400-foot canal will be excavated for laying the (400 foot) pipeline between Intakes 1 and 2 and will include a stream crossing. A 300-foot by 100-foot stretch of the stream will be dewatered in two phases, with half the stream (300-foot by 50-foot) dewatered at any given time. This phase of the proposed project will take approximately 6 months to complete.

A staging area at Old Intake 2 will be set up to accommodate construction activities for the 1,500-foot corridor from the new Intake 1 to Intake 3. This phase of the proposed project will take approximately 3 months to complete.

Figure 3. Coleman NFH Water Intakes Rehabilitation Project Chosen Alternative "C."



Project Features Under Alternative C

Water Intakes Rehabilitation Project
Coleman National Fish Hatchery
Anderson, CA

New Intake 2

The new Intake 2 staging area will occur on vacant land approximately 200 feet north of the site. Construction will include installing a cofferdam to construct a cast-in-place concrete intake at the bank of Battle Creek. Reclamation will construct a fish screen structure and a 60-inch conveyance pipeline between the new Intake 2 and the pipeline from Intake 1. Excavation for the conveyance pipeline from the new Intake 2 to the tie-in with the pipeline from Intake 1 will take approximately twelve months, over a two-year period.

Intake 3

Two staging areas may be required for the construction of Intake 3; respectively, one northwest and one southwest, of the intake. Construction activity will include the installation of a near-stream fish screen over the mouth of the intake, to be completed in 12 months over a two year period.

Description of Fill Material

Fill, primarily composed of topsoil, would be deposited in the riparian zone where riparian wetland and vegetated riparian waters are located as a result of earth moving activities associated with project construction.

Riprap and concrete would be placed on the banks near each of the intakes. A total of 2,838 cubic years of new fill would be placed within jurisdictional waters, and would be a permanent effect of the proposed project.

Proposed Discharge Sites

Proposed discharge sites for the project are composed of three types of waters:

- *Riparian Wetland*: defined by a preponderance of wetland vegetation such as willows and sedges and having standing water during the growing season, off the main channel of Battle Creek;

- *Vegetated Riparian Other Waters*: vegetation primarily composed of various species of willow, blackberry, and sedges at the edge of Battle Creek; areas inundated during 1-3 year storms; and,

- *Unvegetated Other Waters*: streambed habitat with little or no vegetation and a generally unconsolidated floor; area found within Battle Creek, the Coleman Tailrace, and the Orwick Diversion canal.

Materials would be placed at the fill site by mechanical means using standard earthmoving construction equipment.

Construction Schedule and Sequence

The contractor for the proposed project will develop a schedule for the various construction events based on the project work windows and avoidance requirements. Construction is expected to commence in the summer of 2008 and be completed within a 2-year time period.

B. Proposed Conservation Measures

The following conservation measures are incorporated into the project and will be implemented before during and after the project construction activities to avoid or minimize impacts to listed fish species. Resource monitors will conduct surveys as appropriate for threatened, endangered and special-status species. All contracted parties will coordinate construction actions with

Coleman NFH operations, and they will be given a list of agency contacts for referral and notification items.

1. Develop and Implement a Worker Environmental Education Program

Construction contractors and subcontractors for the project will be required to participate in and comply with an awareness training regarding federal, state, and local environmental laws and permits; penalties for non-compliance with environmental requirements and conditions; endangered, threatened, and special status species, and their habitats; awareness and avoidance of environmentally sensitive areas (exclusion zones); protection of cultural resources; and environmental protection measures, mitigation, compensation, and restoration. In addition, a member of the contractor's management staff will be required to participate in the training session to discuss the contractor's environmental protection plans.

2. Implement Environmental Conditions as Specified in Project Permits

Project applicants are responsible for obtaining all applicable federal and state permits, and complying with all conditions, including environmental conditions, in all permits relating to the project, including the ESA; the California Endangered Species Act; the Natural Community Conservation Plan; the Clean Water Act, Sections 401 and 404; and the RWQCB Construction Stormwater and Dewatering Permits.

3. Designate Work and Exclusion Zones

Construction equipment and activities will be confined to designated work zones and designated access roads. Designated work and exclusion zones, as well as designated access roads and sensitive areas that are to be avoided, will be clearly flagged and staked, or fenced. Exclusion zones for environmentally sensitive habitat or near special-status species will be mapped and delineated in the field.

During construction, job inspectors and resource monitors will ensure that construction equipment and ancillary activities avoid any disturbance of sensitive resources outside the designated work zones. Resource monitors will conduct surveys as appropriate for threatened, endangered, and special-status species. The following measures will be implemented:

a. *Work Zones*

- Use and storage of construction equipment will be confined to designated work zones.

- Staging areas, borrow material sites, parking locations, stockpile areas, disposal sites for excess earth materials resulting from construction, and storage areas will be located outside of Environmentally Sensitive Areas and will be clearly marked and monitored.

- The PG&E Coleman Powerhouse tailrace will be dewatered. A downstream picket weir and an upstream barrier weir will prohibit movement of fish into the in-stream work area.

b. *Exclusion Zones*

- Environmentally-sensitive habitat of special-status species will be delineated in the field. Exclusion zones will be demarcated by brightly colored construction fencing or flagged ropes, with signage identifying environmentally sensitive areas.

- Fencing will be installed prior to construction and will be maintained throughout the construction season.

- The following paragraph will be included in the construction specifications for environmentally sensitive areas:

  The contractor's attention is directed to the areas designated as "Environmentally Sensitive Areas." These areas are protected, and no entry by the contractor for any purpose will be allowed unless specifically authorized. The contractor shall take measures to ensure that the contractor's employees do not enter or disturb these areas, by issuing written notice to employees and subcontractors regarding compliance with restrictions for environmentally sensitive areas.

4. Implement a Fish Rescue Operation

Approximately 1.35 acres (600 linear feet) of Battle Creek will be dewatered in various phases during a series of work windows beginning May 1 and ending on September 1. The potential feasibility of net-blocking Battle Creek to prevent fish movement into the dewatered section of the creek prior to cofferdam construction will be evaluated prior to dewatering activities. Reclamation and USFWS, in consultation and coordination with NMFS and CDFG, will ensure that fish biologists are on site to monitor dewatering actions and snorkel or dive in the affected area to observe for possible fish stranding and carry out fish rescue operations, as necessary.

Up to two fish rescue teams may be used to facilitate efficient fish removal, reduce handling time, lower physiological stress, and reduce potential mortality rates. Each fish rescue team will consist of a qualified fishery biologist experienced in the use of seines and electroshockers, and two to four persons to facilitate efficient removal and rapid transport of fish from the dewatered area.

Seining will be considered first as the appropriate fish rescue method of choice, and electrofishing second. If electrofishing is chosen for efficient and successful removal of fish, the NMFS electroshocking guidelines (NMFS 2000) will be strictly followed. A minimum of 3 passes with an electroshocker though each stranding location will be conducted until all fish are removed.

a. *Rescue of Juvenile Fish*

- after each pass, captured juvenile fish will be transferred into aerated, 5-gallon buckets or held in-river in perforated buckets; and,

- upon recovery from the effects of capture, fish will be transported downstream of the project area and released back to Battle Creek.

b. *Rescue of Adult Fish*

- after each pass, captured fish will be placed into appropriate-sized containers and immediately transported and released upstream of the project area.

All rescued fish will be counted and measured, and recorded by species. The number and run-type of Chinook salmon and steelhead captured, and the number of fish accidentally killed prior to release, will be reported to NMFS and CDFG.

5. <u>In-stream Work Window</u>

The seasonal in-stream construction work window established for the project is May 1 to September 1. This window is based on the time of year considered optimal for minimizing construction-related impacts to the environment, habitat, and special-status species.

6. <u>Environmental Planning</u>

Prior to implementation of the project, the following plans incorporating Best Management Practices (BMPs) will be obtained, developed, and adhered to, to avoid or minimize risks to listed fish and designated critical habitat:

Storm Water Pollution Prevention Plan

A Storm Water Pollution Prevention Plan (SWPPP) is part of the National Pollution Discharge Elimination System General Construction Activity Storm Water Permit. An SWPPP will be prepared, in coordination with the RWQBC and other regulatory agencies, and will include the following specific erosion control and site reclamation measures to minimize erosion and sediment transport to Battle Creek:

- BMPs such as sediment containment devices, protection of construction spoils, and proper installation of cofferdams.

- Temporary sediment control measures such as fiber rolls or silt fences would be located downstream of disturbed areas to prevent sediment from entering Battle Creek, and dept in place until disturbed areas were stabilized.

- Interim measures to control erosion and sedimentation over winter would include BMPs such as mulch, straw waddles, and silt fences.

- Settling ponds for dredge material would be constructed and decant waters from the ponds would meet RWQCB permit criteria before being discharged into Battle Creek. Excavated material would be stored as required.

- Concrete delivery and transfer equipment would be washed in containment areas protected from direct runoff.

- Post-construction site restoration.

- Contingency measures.

- Details about contractor responsibilities.

- A list of responsible parties.

- A list of agency contacts.

- Avoid or minimize work equipment operation in flowing water by constructing cofferdams and diverting all flow around the construction site.

- Diversion channel construction may include clean spawning-sized gravel, riprap placement, and geotechnical fabric to avoid erosion and downstream turbidity.

- Staging areas will be set at least 100 feet from the top of the bank.

- Conduct all construction work according to site-specific construction plans that avoid or minimize the potential for sediment input into aquatic systems.

- Use sedimentation fences, hay bales, sandbags, water bars, fiber rolls, and baffles.

- Minimize areas to be cleared, graded, or re-contoured.

- Place construction spoils above the ordinary high water mark and protect receiving waters from potential erosion sources with sedimentation fences or other effective sediment control/retention devices.

- Cover disturbed ground with mulch and re-vegetate all cleared areas with native and noninvasive vegetation.

Spill Prevention, Control, and Countermeasures Plan

A Spill Prevention and Countermeasure Plan (SPCCP) will be prepared to prevent contamination of soils and waterways from construction and hazardous materials. An SPCP for the project will be developed and implemented. In addition, the project will implement the following measures:

- Prevent contamination of soil and waterways from construction and hazardous materials.
- Clean spills immediately and notify the RWQCB, NMFS, and CDFG, of any spills and cleanup procedures.
- Minimize the volume of petroleum products stored onsite to the volume that can be addressed by measures in the SPCCP.
- Staging and storage areas will be outside the stream zone.
- Store hazardous materials in approved containers or chemical sheds and located in areas at least 100 feet from the creek in an area protected from runoff.
- Perform refueling and vehicle maintenance at least 100 feet from streams.
- Inspect equipment and machinery coming in contact with water daily and cleaned of grease, oil, petroleum products, or other nonnative materials; and ensure that seals prevent any fuel, engine oil, and other fluids from leaking.
- Soils contaminated with fuel or other chemicals would be disposed of in a suitable manner and location to prevent them from being discharged into flowing waters or groundwater, following acceptable disposal methods according to the SPCCP.

A Habitat Mitigation and Monitoring Plan

A Habitat Mitigation and Monitoring Plan (HMMP) will be prepared to compensate for project impacts to wetlands, riparian, and upland vegetation, or from other ground-disturbing activities. The HMMP must meet acceptance by the U.S. Army Corps of Engineers before issuance of the section 404 permit for the project. A revegetation and grading plan will then be prepared, and take into consideration the time lag between initial site restoration and mitigation and the re-establishment of function and value of habitat that was impacted or lost due to construction. To meet the goal of the mitigation effort to avoid and minimize adverse effects on wetland, riparian, and upland habitat, as well as to replace the acreage, function, and values of habitat affected by the project, the HMMP will meet the following objectives:

- To the extent practicable, provide mitigation such that restored habitats have equal or better function, value, and quality than habitat impacted by implementation of the project.

- Integrate concerns for special-status species into the mitigation design to the maximum degree practicable.

- Design the mitigation such that once established it will require no maintenance, *i.e.*, "self-sustaining."

Most areas will be restored in-kind and to as close to pre-project conditions as possible in regards to species and density. Trees within the 50-foot swath over the pipeline will be replaced with grasses and shrubs to prevent root intrusion into the pipeline. Monitoring will begin after plantings occur, and will continue for the first three years. If restoration is successful, monitoring will end, otherwise, remedial measures will be implemented and monitoring will occur annually for three additional years. Disturbed soil/topography will be restored to original grade using excavators, front-end loaders, backhoes, bulldozers, and/or hand tools. Disturbed soil will be stabilized using standard methods including, but not limited to, biodegradable mats and seeding with native erosion control species. Where possible, topsoil will be removed and set aside separately. When replacing soils, the topsoil will be placed last, in the top section of soil. Revegetation will be inspected once during the dry season and multiple times during the rainy season, focusing on erosion and weed control around plantings.

7. Monitoring

The proposed project will have three monitoring components including: (1) monitoring during project implementation to ensure that conservation measures and BMPs are implemented; (2) post-project monitoring of site restoration and mitigation including revegetation.

III. STATUS OF THE SPECIES AND CRITICAL HABITAT

The following Federally listed and proposed species (ESUs or DPSs) and designated critical habitat occur in the action area and may be affected by the Coleman NFH Water Intakes Rehabilitation project:

Sacramento River winter-run Chinook salmon ESU
endangered (June 28, 2005, 70 FR 37160)

Central Valley spring-run Chinook salmon ESU
threatened (June 28, 2005, 70 FR 37160)

Central Valley spring-run Chinook salmon designated critical habitat
(September 2, 2005, 70 FR 52488)

Central Valley steelhead DPS
threatened (January 5, 2006, 71 FR 834)

Central Valley steelhead designated critical habitat
(September 2, 2005, 70 FR 52488)

A. Species Life History, Population Dynamics, and Likelihood of Survival and Recovery

Pacific salmonids have diversified over time in response to: 1) geographic barriers to gene flow, (2) seasonal and long-term temporal stability, (3) connectivity to other regions permitting faunal interchange, and (4) regional ecologic interaction that sustain complex trophic structure and high diversity (Jacobs *et al.* 2004). Salmon have persisted amid catastrophic and cyclic environmental shifts (volcanic eruptions, tectonic rifts, monsoons, tsunamis, poor ocean productivity, El Nino and La Nina ocean currents, inland drought cycles, flooding, mudslides, *etc.*). Salmon and steelhead are keystone species in freshwater and marine food webs. Their eggs, alevin, and fry are important food items for other fish, birds, and aquatic insects (Willson and Halupka 1995). Adult salmonid returns sustain animal groups in various interconnected food chains, and serve as the primary source of prey for some groups, *e.g.*, bears, eagles, mink, otter, sea lions, and resident killer whale pods. Adult salmon and steelhead carcasses release accumulated nutrients to sustain productivity of riparian and lacustrine ecosystems for the next generation of salmonid juveniles (Willson and Halupka 1995).

1. Sacramento River Winter-Run Chinook Salmon

Sacramento River winter-run Chinook salmon originally were listed as threatened in November 1990 (55 FR 46515). NMFS designated critical habitat for winter-run Chinook salmon on June 16, 1993 (58 FR 33212). Critical habitat was delineated as the Sacramento River from Keswick Dam, RM 302 to Chipps Island (RM 0) at the westward margin of the Sacramento-San Joaquin Delta (Delta), including Kimball Island, Winter Island, and Brown's Island; all waters from Chipps island westward to the Carquinez Bridge, including Honker Bay, Grizzly Bay, Suisun Bay, and the Carquinez Strait; all waters of the San Pablo Bay westward of the Carquinez Bridge; and, all waters of San Francisco Bay north of the San Francisco-Oakland Bay Bridge. The critical habitat designation identifies those physical and biological features of the habitat that are essential to the conservation of the species and that may require special management consideration and protection. Within the Sacramento River this includes the river water, river bottom (including those areas and associated gravel used by winter-run Chinook salmon as spawning substrate), and adjacent riparian zone used by fry and juveniles for rearing. In the areas west of Chipps Island, including San Francisco Bay to the Golden Gate Bridge, this designation includes the estuarine water column and essential foraging habitat and food resources utilized by winter-run Chinook salmon as part of their juvenile outmigration or adult spawning migrations. Winter-run ESU status was reclassified as endangered in January 1994 (59 FR 440) due to continuing decline and increased variability of run sizes since their listing as a threatened species, expected weak returns as a result of two small year classes in 1991 and 1993, and continuing threats to the population. NMFS recognized that the population had dropped nearly 99 percent between 1966 and 1991, and despite conservation measures to improve habitat conditions, the population continued to decline (59 FR 440). The draft winter-run recovery plan (NMFS 1997) recommended the implementation and continuation of several conservation measures. Since then, the abundance of the winter-run population has increased significantly, prompting NMFS to include the Sacramento River winter-run ESU in the recent review of 27 West Coast salmonid ESUs (69 FR 33102). After its proposal for reclassification of its listed status to "threatened," there were several concerns expressed in public comment over the adequacy and benefits of protective efforts for the winter-run Chinook salmon population to warrant withdrawing the proposal. The Sacramento River winter-run ESU retains its "endangered" listing status (Good *et al.* 2005), as described in the final determinations (70 FR 37160). The ESU includes the naturally spawned population of winter-run Chinook salmon in the Sacramento River, and the hatchery and winter-run captive broodstock components at Livingston Stone NFH.

Historically, winter-run Chinook salmon spawned in the headwaters of the McCloud, Pit, and Little Sacramento Rivers, as well as Hat and Battle Creeks. Construction of Shasta Dam in 1943 and Keswick Dam in 1950 blocked access to all of these waters except Battle Creek, which is blocked annually from August 1 to mid-March, by a weir at the Coleman NFH. The reaches upstream of Coleman NFH are blocked year-round by other small hydroelectric facilities (Moyle *et al.* 1989, NMFS 1997). Implementation of the proposed Battle Creek Restoration Project is expected to provide access to 42 miles of salmonid habitat on Battle Creek and 6 more miles of habitat on its tributaries. Most of the current winter-run Chinook salmon spawning and rearing habitat exists between Keswick Dam and Red Bluff Diversion Dam (RBDD) in the Sacramento River.

Juvenile winter-run increase in size and development of osmoregulation ability as they migrate down to the Delta at the confluence of the Sacramento and San Joaquin Rivers. Peak winter-run emigration through the Delta generally occurs from January through April, but the range may extend from September until June (Messersmith 1966; CDFG 1989, 1993; USFWS 1992).

Adult winter-run Chinook salmon enter San Francisco Bay from November through June (Hallock and Fisher 1985) and migrate past RBDD from mid-December through early August (NMFS 1997). The majority of the run passes RBDD from January through May, and peaks in mid-March (Hallock and Fisher 1985). Generally, winter-run Chinook salmon spawn from near Keswick Dam, downstream to RM 243 (Red Bluff, CA). Spawning occurs from late April through mid-August with peak activity between May and June. Eggs and pre-emergent fry require water temperatures at or below 56 °F for maximum survival during the spawning and incubation period (USFWS 1999). Fry emerge from mid-June through mid-October and move to river margins to rear. Emigration past RBDD begins in mid-July, typically peaks in September, and can continue through March in dry years (Vogel and Marine 1991, NMFS 1997). Winter-run continue to rear in non-natal tributary streams to the Sacramento River during their out-migration. From 1995 to 1999, all winter-run Chinook salmon outmigrating as fry passed RBDD by October, and all outmigrating pre-smolts and smolts passed RBDD by March (Martin *et al.* 2001).

Since 1967, the estimated adult winter-run Chinook salmon population ranged from 186 in 1994 to 117,808 in 1969 (CDFG 2002). The estimate declined from an average of 86,000 adults in

1967-1969 to only 2,000 by 1987-1989, and continued downward to an average 830 fish in 1994-1996. Since then, estimates have increased to an average of 3,136 fish for the period of 1998-2001. Winter-run Chinook salmon abundance estimates and cohort replacement rates since 1986 are shown in Table 1.

Although the population estimates display broad fluctuation since 1986 (*i.e.*, from 2,596 in 1986 to 186 in 1994 to 15,730 in 2005), there is an increasing trend in the 5-year moving average since 1997 (*e.g.*, from 491 for 1990-1994 to 9,463 for 2001-2005). The 5-year moving average cohort replacement rate (CRR) has fluctuated up and down (*e.g.*, the 1994, 1997 and 2000 cohorts represent 4.73, 1.54, and 6.08 CRRs). The CRR for cohort 2001 is less than half of the CRR of the 1998 generation (0.94 versus 2.74).

Trends in winter-run Chinook salmon abundance and cohort replacement indicate some recovery since the listing. However, the population remains well below the recovery goals of the draft recovery plan and is particularly susceptible to extinction because of the reduction of the genetic pool to one population. The 2007 escapement reflects the vulnerability of winter-run to a current negative shift in the marine environmental regime.

Table 1. Winter-run Chinook salmon population estimates from RBDD counts, and corresponding cohort replacement rates (CRR) for years since 1986.

Year	Population Estimate	5 Year Moving Average of Population Estimate	Cohort Replacement Rate	5 Year Moving Average of Cohort Replacement Rate
1986	2596	-	0.27	0.64
1987	2186	-	0.20	0.77
1988	2885	-	0.07	0.94
1989	696	-	1.78	1.61
1990	430	1759	0.90	2.20
1991	211	1282	0.88	2.48
1992	1240	1092	1.05	2.80
1993	387	593	3.45	2.90
1994	186	491	4.73	2.76
1995	1297	664	2.31	2.22
1996	1337	889	2.46	3.02
1997	880	817	1.54	2.71
1998	3002	1340	2.74	2.76
1999	3288	1961	2.26	2.26
2000	1352	1972	6.08	3.02
2001	8224	3349	0.96	2.72
2002	7441	4661	2.13	2.83
2003	8218	5705	2.11	2.71
2004	7869	6621	-	-
2005	15,839	9518	-	-
2006	17,303	11,334	-	-
2007	3,000		-	-

Redd and carcass surveys, and fish counts indicate that the abundance of winter-run Chinook salmon is increasing. Population growth is estimated to be positive in the short-term trend at 0.26; however, the long-term trend is negative, averaging -0.14. Recent winter-run Chinook salmon abundance represents only 3 percent of the maximum post-1967, 5-year geometric mean, and is not yet well established (NMFS 2003). Recent CRR estimate suggests a reduction in productivity for the 1998-2001 cohort, exacerbated by the low return in 2007. Also, the hatchery winter-run component of the spawning population has been increasing, and in 2005, it exceeded 18 percent (USFWS unpublished data, *in* Lindley et al. 2007). Hatchery representation beyond 5 percent in future cohorts will reclassify the winter-run Chinook salmon population at moderate or greater risk.

The greatest risk factor for winter-run Chinook salmon lies with their spatial structure (NMFS 2003). The remnant population cannot access historical winter-run habitat and must be artificially maintained in the Sacramento River by a regulated cold water pool from Shasta Dam. Winter-run Chinook salmon require cold water temperatures in summer that simulate their upper basin habitat, and they are more likely to be exposed to the impacts of drought in a lower basin environment. The Battle Creek Restoration Project has the potential to allow the ESU to expand its spatial structure into 48 miles of restored habitat, once it is completed. Currently the population and ESU is limited to the 25-mile reach of the mainstem Sacramento River below Keswick Dam.

The second highest risk factor for the Sacramento River winter-run Chinook salmon ESU has been the detrimental effects on its genetic diversity. The present winter-run population is a composite of several stocks that merged when Shasta Dam blocked access to the upper watershed. A second genetic bottleneck occurred with the construction of Keswick Dam; there may have been several others within the recent past (NMFS 2003).

2. Central Valley Spring-Run Chinook Salmon and Critical Habitat

NMFS listed the Central Valley spring-run Chinook salmon ESU as threatened on September 16, 1999 (64 FR 50394), and published a final 4(d) rule for this ESU on January 9, 2002 (67 FR 1116). NMFS proposed that the Central Valley spring-run ESU retain its listing status in the recent status review of West Coast Pacific salmonid ESUs (69 FR 33102), which was finalized in June 2005 (70 FR 37160). A final rule designating critical habitat was published on September 2, 2005 (70 FR 52488). Critical habitat was designated for watersheds along the Sacramento-San Joaquin corridor, in the following counties: Tehama, Butte, Glenn, Shasta, Yolo, Sacramento, Solano, Colusa, Yuba, Sutter, Trinity, Alameda, San Joaquin, and Contra Costa. Critical habitat includes the stream channels within the designated stream reaches, and their lateral extent as defined by the ordinary high-water line (33 CFR 329.11) or the full bank elevation. Critical habitat in estuarine reaches is defined by the perimeter of the water body or the elevation of the extreme high water mark, whichever is greater. The primary constituent elements (PCEs) of critical habitat essential for the conservation of the ESU are considered those sites and habitat components that support one or more life stages, including: freshwater spawning sites, freshwater rearing sites, freshwater migration corridors, and estuarine areas with appropriate water quality and quantity, floodplain connectivity, forage base, natural cover, and complexity.

The Central Valley spring-run Chinook salmon ESU includes all naturally spawned populations of spring-run Chinook salmon (and their progeny) in the Central Valley. The Feather River Hatchery (FRH) spring-run Chinook salmon population is part of the Central Valley spring-run Chinook salmon ESU (June 28, 2005, 70 FR 37160). Naturally spawning populations of Central Valley spring-run Chinook salmon currently are restricted to accessible reaches of the upper Sacramento River, Antelope Creek, Battle Creek, Beegum Creek, Big Chico Creek, Butte Creek, Clear Creek, Deer Creek, Feather River, Mill Creek, and Yuba River (DFG 1998).

Historically, spring-run Chinook salmon were the dominant run in the Sacramento River basin, occupying the middle and upper elevation reaches (1,000 to 6,000 feet) of most streams and rivers with sufficient habitat for over-summering adults (Clark 1929). Clark (1929) estimated that there were 6,000 miles of salmon habitat in the Central Valley basin (much of which was high elevation spring-run Chinook salmon habitat) and that by 1928, 80 percent of this habitat had been lost. Yoshiyama *et al.* (1996) determined that, historically, there were approximately 2,000 miles of salmon habitat available prior to dam construction and mining and that only 18 percent of that habitat remains.

Central Valley spring-run Chinook salmon exhibit both ocean-type and stream-type life histories (CDFG 1998). Ocean-type spring-run may begin outmigrating soon after emergence, whereas stream-type spring-run oversummer and emigrate as yearlings with the onset of increased fall storms (CDFG 1998). The emigration period for spring-run Chinook salmon extends from November to early May, with up to 69 percent of young-of-the-year outmigrants passing through the lower Sacramento River between mid-November and early January (Snider and Titus 2000). Outmigrants are also known to rear in non-natal tributaries to the Sacramento River and the Delta (CDFG 1998).

Spring-run Chinook salmon fry and fingerlings can enter the Delta as early as January and as late as June; a cohort's length of residency within the Delta is unknown but probably lessens as the season progresses into the late spring months (CDFG 1998). Shifts in juvenile salmonid abundance demonstrated with various sampling gear reflect discretionary use of the Delta by juvenile salmonids based on their size, age, and degree of smoltification. Chinook salmon spend between 1 and 4 years in the ocean before returning to their natal streams to spawn (Myers *et al.* 1998). Fisher (1994) reported that 87 percent of Chinook trapped and examined at RBDD between 1985 and 1991 were 3-years old.

Adult spring-run Chinook salmon enter the Delta from the Pacific Ocean beginning in January and enter natal streams from March to July. This run timing is well adapted for gaining access to the upper reaches of river systems, 1,500 to 5,200 feet in elevation, prior to the onset of high water temperatures and low flows that would inhibit access to these areas during the fall. In Mill Creek, Van Woert (1964) noted that of 18,290 spring-run Chinook salmon observed from 1953 to 1963, 93.5 percent were counted between April 1 and July 14, and 89.3 percent were counted between April 29 and June 30. During their upstream migration, adult Chinook salmon require streamflows sufficient to provide olfactory and other orientation cues used to locate their natal streams. Adequate streamflows are also necessary to allow adult passage to upstream holding habitat. The preferred temperature range for upstream migration is 38 EF to 56 EF (Bell 1991, CDFG 1998).

Upon entering fresh water, spring-run Chinook salmon are sexually immature and must hold in cold water for several months to mature. Typically, spring-run Chinook salmon utilize mid- to high-elevation streams that provide appropriate temperatures and sufficient flow, cover, and pool depth to allow over-summering. Spring-run Chinook salmon may also utilize tailwaters below dams if cold water releases provide suitable habitat conditions. Chinook salmon are semelparous, *i.e.*, they breed only once in their life history. Spawning occurs between September and October and, depending on water temperature, emergence occurs between November and February.

Spring-run Chinook salmon were once the most abundant run of salmon in the Central Valley (Campbell and Moyle 1992), and were found in both the Sacramento and San Joaquin drainages. More than 500,000 spring-run Chinook salmon were caught in the Sacramento-San Joaquin commercial fishery in 1883 alone (Yoshiyama *et al.* 1998). The San Joaquin populations essentially were extirpated by the 1940s, with only small remnants of the run that persisted through the 1950s in the Merced River (Hallock and Van Woert 1959, Yoshiyama *et al.* 1998). Populations in the upper Sacramento, Feather, and Yuba Rivers were eliminated with the construction of major dams during the1950s and 1960s.

Since 1969, the Central Valley spring-run Chinook salmon ESU has displayed broad fluctuations in abundance, ranging from 1,403 in 1993 to 25,890 in 1982 (CDFG, unpublished data, 2003). The average abundance for the ESU was 12,590 for the period of 1969 to 1979, 13,334 for the period of 1980 to 1990, and 6,554 from 1991 to 2001. Evaluating the abundance of the ESU as a whole, however, complicates trend detection. For example, although the mainstem Sacramento River population appears to have undergone a significant decline, the data are not necessarily comparable because coded wire tag information gathered from fall-run Chinook salmon returns since the early 1990s has resulted in adjustments to ladder counts at RBDD that have reduced the overall number of fish that are categorized as spring-run Chinook salmon (Colleen Harvey-Arrison, CDFG, pers. comm.).

Sacramento River tributary populations in Mill, Deer, and Butte Creeks are probably the best trend indicators for spring-run Chinook salmon abundance. These streams have shown positive escapement trends since 1991, yet recent escapements to Butte Creek, including 20,259 in 1998, 9,605 in 2001 and 8,785 in 2002, are responsible for the majority of tributary abundance (CDFG unpublished data 2002, 2003). The Butte Creek estimates do not include pre-spawning mortality. In the last several years as the Butte Creek population has increased, mortality of adult spawners has increased from 21 percent in 2002 to 60 percent in 2003 due to over-crowding and diseases associated with high water temperatures. This trend may indicate that the population in Butte Creek may have reached its carrying capacity (Ward *et al.* 2003). Table 2 shows the population trends from the three tributaries since 1986, including the 5-year moving average, CRR, and estimated juvenile production (JPE). Although recent tributary production is promising, annual abundance estimates display a high level of fluctuation and the overall number of Central Valley spring-run Chinook salmon remains well below estimates of historic abundance.

The extent of spring-run Chinook salmon spawning in the mainstem of the upper Sacramento River is unclear. Very few salmon redds (less than 15 per year) were observed in the month of September from 1989-1993, and none in 1994, during aerial redd counts (USFWS 2003). Recently, the number of redds in September has varied from 22 to 105 during 2001 though 2006 depending on the number of survey flights (CDFG, unpublished data). In 2002, based on RBDD ladder counts, 485 spring-run Chinook salmon adults may have spawned in the mainstem Sacramento River or entered upstream tributaries such as Clear or Battle Creek (CDFG 2004). In 2003, no adult spring-run Chinook salmon were believed to have spawned in the mainstem Sacramento River. Due to geographic overlap of ESUs and suspected hybridization since the construction of Shasta Dam, Chinook salmon that spawn in the mainstem Sacramento River during September are more likely to be identified as early fall-run rather than spring-run Chinook salmon.

Table 2. Spring-run Chinook salmon population estimates from CDFG Grand Tab (February 2005) with corresponding cohort replacement rates for years since 1986.

Year	Deer/Mill/Butte Creek Escapement Run Size	5-Year Moving Average of Population Estimate	Cohort Replacement Rate	5-Year Moving Average Cohort Replacement Rate	NMFS Calculated JPE[a]
1986	24,263	-	-	-	4,396,998
1987	12,675	-	-	-	2,296,993
1988	12,100	-	-	-	2,192,790
1989	7,085	-	0.29	-	1,283,960
1990	5,790	12,383	0.46	-	1,049,277
1991	1,623	7,855	0.13	-	294,124
1992	1,547	5,629	0.22	-	280,351
1993	1,403	3,490	0.24	0.27	254,255
1994	2,546	2,582	1.57	0.52	461,392
1995	9,824	3,389	6.35	1.70	1,780,328
1996	2,701	3,604	1.93	2.06	489,482
1997	1,431	3,581	0.56	2.13	259,329
1998	24,725	8,245	2.52	2.58	4,480,722
1999	6,069	8,950	2.25	2.72	1,099,838
2000	5,457	8,077	3.81	2.21	988,930
2001	13,326	10,202	0.54	1.94	2,414,969
2002	13,218	12,559	2.18	2.26	2,395,397
2003	8,902	9,394	1.63	2.08	1,613,241
2004	9,872	10,155	0.74	1.78	1,789,027
median	7,085	8,077	1.15	2.07	1,283,960

[a]NMFS calculated the spring-run JPE using returning adult escapement numbers to Mill, Deer, and Butte Creeks for the period between 1986 and 2004, and assuming a female-to-male ratio of 3:2 and pre-spawning mortality of 25 percent. NMFS utilized the female fecundity values in Fisher (1994) for spring-run Chinook salmon (4,900 eggs/female). The remaining survival estimates used the winter-run values for calculating JPE.

The initial factors that led to the decline of Central Valley spring-run Chinook salmon were related to gold mining practices and the loss of upstream habitat behind impassible dams. Since this initial loss of habitat, other factors have contributed to the decline of Central Valley spring-run Chinook salmon and affected the ESU's ability to recover. These include a combination of physical, biological, and management factors such as climatic variation, water management, hybridization, predation, and harvest (CDFG 1998). Although protective measures likely have led to recent increases in Central Valley spring-run Chinook salmon abundance, the ESU still is below levels observed from the 1960s through 1990. Because threats to the spring-run Chinook salmon ESU continue to persist, and because the ESU is confined to relatively few remaining streams and continues to display broad fluctuations in abundance, the population is at moderate risk of extinction.

The 5-year geometric mean for the extant Butte, Deer, and Mill Creek spring-run populations ranges from 491 to 4,513 fish (NMFS 2003), indicating increasing productivity over the short-term and projected as likely to continue (NMFS 2003). The productivity of the Feather River and Yuba River populations and contribution to the Central Valley spring-run ESU currently is unknown, but increased monitoring had indicated a higher than expected spring-run component in the Feather-Yuba system. The FRH has developed a conservation approach for the spring-run hatchery program.

The Central Valley spring-run ESU is comprised of two genetic complexes. Analysis of natural and hatchery spring-run Chinook salmon stocks in the Central Valley indicates that the southern Cascades spring-run population complex (Mill, Deer, and Butte creeks) retains genetic integrity. The two extant Sierra Nevada spring-run complex populations may have been genetically compromised. The Feather River spring-run have introgressed with fall-run, and it appears that the Yuba River population may have been impacted by FRH fish straying into the Yuba River. The diversity of the spring-run ESU has been further reduced with the loss of the San Joaquin River basin spring-run populations.

3. Central Valley Steelhead and Critical Habitat

NMFS listed the Central Valley steelhead DPS as threatened on March 19, 1998 (63 FR 13347), and published a final 4(d) rule for Central Valley steelhead on July 10, 2000 (65 FR 42422). The DPS includes all naturally-produced Central Valley steelhead in the Sacramento-San Joaquin River Basins, excluding steelhead from San Francisco and San Pablo Bays and their tributaries. The Coleman National Fish Hatchery and Feather River Hatchery steelhead programs are now part of the Central Valley steelhead DPS (71 FR 834); these populations were previously included in the DPS but were not deemed essential for conservation and thus not part of the listed steelhead population. A final rule designating critical habitat was published on September 2, 2005 (70 FR 52488). Central Valley steelhead critical habitat was designated for watersheds along the Sacramento-San Joaquin corridor, including the following counties: Tehama, Butte, Glenn, Shasta, Yolo, Sacramento, Solano, Yuba, Sutter, Placer, Calaveras, San Joaquin, Stanislaus, Tuolumne, Merced, Alameda, and Contra Costa. Critical habitat includes the stream channels within the designated stream reaches, and their lateral extent as defined by the ordinary high-water line (33 CFR 329.11) or the full bank elevation. Critical habitat in estuarine reaches is defined by the perimeter of the water body or the elevation of the extreme high water mark, whichever is greater. The PCEs of critical habitat essential for the conservation of the ESU are considered those sites and habitat components that support one or more life stages, including: freshwater spawning sites, freshwater rearing sites, freshwater migration corridors, and estuarine areas with appropriate water quality and quantity, floodplain connectivity, forage base, natural cover, and complexity.

All steelhead stocks in the Central Valley are thought to be winter-run steelhead (McEwan and Jackson 1996). Steelhead are similar to Pacific salmon in their life history requirements. They are propagated in freshwater, emigrate to the ocean, and return to freshwater to spawn. Unlike other Pacific salmon, steelhead are iteroparous, *i.e.*, capable of spawning more than once before they die.

The majority of the Central Valley steelhead spawning migration occurs from October through February, and spawning occurs from December to April in streams with cool, well oxygenated water. Van Woert (1964) and Harvey (1995) observed that in Mill Creek, the steelhead migration is continuous, and although there are two peak periods, 60 percent of the run is passed by December 30. Similar bimodal run patterns have also been observed in the Feather River (Ryan Kurth, DWR, pers. comm.), and the American River (John Hannon, Reclamation, pers. comm.), indicating the importance of mainstem tributaries for the DPS.

Egg incubation time is dependent upon water temperature. Eggs held between 50 °F and 59 °F hatch within 3 to 4 weeks (Moyle 1976). Fry usually emerge from redds after about 4 to 6 weeks depending on redd depth, gravel size, siltation, and water temperature (Shapovalov and Taft 1954). Newly emerged fry move to shallow stream margins to escape high water velocities and predation (Barnhart 1986). As fry grow larger, they move into riffles and pools, and establish feeding locations. Juveniles rear in freshwater for 1 to 4 years (Meehan and Bjornn 1991) emigrating episodically from natal springs during fall, winter, and spring high flows (Colleen Harvey-Arrison, CDFG, pers. comm.). Steelhead typically spend 2 years in freshwater. Adults spend 1 to 4 years at sea before returning to freshwater to spawn as four- or five-year-olds (Moyle 1976).

Hallock *et al.* (1961) found that juvenile steelhead in the Sacramento River basin migrated downstream during most months of the year, but the peak period of emigration occurred in the spring, with a much smaller peak in the fall. Steelhead smolts show up at the Tracy and Banks pumping plants between December and June. Adult steelhead migrate upstream in the Sacramento River mainstem from July through March, with peaks in September and February (Bailey 1954, Hallock *et al.* 1961). The timing of upstream migration is generally correlated with higher flow events, such as freshets or sand bar breaches, and associated lower water temperatures.

Central Valley steelhead historically were well-distributed throughout the Sacramento and San Joaquin Rivers (Busby *et al.* 1996). Steelhead were found from the upper Sacramento and Pit River systems, south to the Kings and possibly the Kern River systems, and in both east- and west-side Sacramento River tributaries (Yoshiyama *et al.* 1996). The present distribution has been greatly reduced (McEwan and Jackson 1996). The California Advisory Committee on Salmon and Steelhead (1988) reported a reduction of steelhead habitat from 6,000 miles historically to 300 miles. The California Fish and Wildlife Plan (CDFG 1965) estimated there were 40,000 steelhead in the early 1950s. Hallock *et al.* (1961) estimated an average of 20,540 adult steelhead through the 1960s in the Sacramento River, upstream of the Feather River.

Existing wild steelhead stocks in the Central Valley are confined mostly to the Sacramento River and its tributaries, including Antelope, Deer, and Mill Creeks, and the Yuba River. Populations may exist in Big Chico and Butte Creeks, and a few wild steelhead are produced in the American and Feather Rivers (McEwan and Jackson 1996). It is possible that naturally-spawning populations exist in many other streams but are undetected due to lack of monitoring programs (Interagency Ecological Program (IEP) Steelhead Project Work Team 1999). Until recently, steelhead were thought to be extirpated from the San Joaquin River system. Recent monitoring has detected self-sustaining populations of steelhead in the Stanislaus, Mokelumne, Calaveras, and other streams previously thought to be void of steelhead (McEwan 2001).

Reliable estimates of steelhead abundance for different basins are not available (McEwan 2001), monitoring of steelhead populations in the Sacramento River and its tributaries is limited to the direct counts made at Coleman NFH weir and at RBDD, FRH, and Nimbus Hatchery. McEwan and Jackson (1996) estimate the total annual run size for the entire Sacramento-San Joaquin system, based on RBDD counts, to be no more than 10,000 adults. Steelhead counts at the RBDD have declined from an average of 11,187 for the period of 1967 to 1977, to an average of approximately 2,000 through the 1990s (McEwan and Jackson 1996, McEwan 2001). Trawling data collected in the Sacramento River and at Chipps Island indicate that the vast majority of out-migrating juvenile steelhead are of hatchery origin, with juvenile numbers having decreased overall from the 2001-2002 juvenile estimates.

Nobriga and Cadrett (2003) compared coded-wire tagged (CWT) and untagged (wild) steelhead smolt catch ratios at Chipps Island trawl from 1998-2001 to estimate that about 100,000 to 300,000 steelhead juveniles are produced naturally each year in the Central Valley. In the draft *Updated Status Review of West Coast Salmon and Steelhead* (NMFS 2003), the NMFS made the following conclusion based on the Chipps Island data:

> "If we make the fairly generous assumptions (in the sense of generating large estimates of spawners) that average fecundity is 5,000 eggs per female, 1 percent of eggs survive to reach Chipps Island, and 181,000 smolts are produced (the 1998-2000 average), about 3,628 female steelhead spawn naturally in the entire Central Valley. This can be

compared with McEwan's (2001) estimate of 1 million to 2 million spawners before 1850, and 40,000 spawners in the 1960s".

The only consistent data available on steelhead numbers in the San Joaquin River basin come from CDFG mid-water trawling samples collected on the lower San Joaquin River at Mossdale. These data indicate a decline in steelhead numbers in the early 1990s, which have remained low through 2002 (CDFG 2003). In 2003, a total of 12 steelhead smolts were collected at Mossdale (CDFG, unpublished data).

Both the Biological Review Team (NMFS 2003) and the Artificial Propagation Evaluation Workshop (69 FR 33102) concluded that the Central Valley steelhead DPS presently are "in danger of extinction." However, in the proposed status review NMFS concluded that the DPS in-total is "not in danger of extinction, but is likely to become endangered within the foreseeable future" citing unknown benefits of restoration efforts and a yet-to-be-funded monitoring program (69 FR 33102). Steelhead already have been extirpated from most of their historical range in this region. Habitat concerns in this DPS focus on the widespread degradation, destruction, and blockage of freshwater habitat within the region, and water allocation problems. Hatchery steelhead production within this DPS also raises concerns about the potential ecological interactions between introduced stocks and native stocks. Because the Central Valley steelhead population has been fragmented into smaller isolated tributaries without any large source population and the remaining habitat continues to be degraded by water diversions, the population is at high risk of extinction.

Analysis of natural-and hatchery-steelhead stocks in the Central Valley reveal some genetic structure still remaining in the DPS (Nielsen *et al.* 2003). There appears to be a great amount of gene flow among upper Sacramento River Basin steelhead stocks, although recent reductions in natural population sizes have created genetic bottlenecks in several Central Valley steelhead stocks (NMFS 2003, Nielsen *et al.* 2003). The Nimbus Hatchery and Mokelumne River Hatchery stocks were founded with Eel River steelhead, and are not part of the Central Valley steelhead DPS.

All indications are that naturally spawned Central Valley steelhead continue to decrease in abundance and proportion compared to hatchery steelhead over the past 25 years (NMFS 2003). Central Vally hatcheries have been 100 percent adipose fin-clipping their production since 1998. Analysis of these fin clipped fish indicate that hatchery steelhead adult returns are dominant over natural steelhead in watersheds having a fish hatchery component. The estimated ratio of non-clipped to clipped steelhead has decreased from 0.3 percent to less than 0.1 percent, with a net decrease to one-third of wild female spawners from 1998 to 2000 (NMFS 2003).

An estimated 100,000 to 300,000 natural juvenile steelhead are estimated to leave the Central Valley annually, based on rough calculations from sporadic catches in trawl gear (NMFS 2003). Concurrently, one million in-DPS hatchery steelhead smolts and another half million out-of-DPS hatchery steelhead smolts are released annually in the Central Valley.

B. Habitat Condition and Function for Species' Conservation

The freshwater habitat of salmon and steelhead in the Sacramento-San Joaquin drainage varies in function depending on location. Potential spawning areas are located in accessible, upstream reaches of the watersheds where viable spawning gravels and water conditions are found. Spawning habitat condition is strongly affected by water flow and quality, especially temperature, dissolved oxygen, and silt load, all of which can greatly affect the survival of eggs and larvae.

Migratory corridors extend from the spawning areas downstream and include the Delta. These corridors allow the upstream passage of adults, and the downstream emigration of juveniles. Migratory habitat condition is strongly affected by the presence of barriers, which can include dams, culverts, flood control structures, unscreened or poorly screened diversions, and degraded water quality.

Both spawning areas and migratory corridors comprise rearing habitat for juveniles, which feed and grow before and during their outmigration. Non-natal, intermittent tributaries also may be used for juvenile rearing. Rearing habitat condition and function may be affected by annual and seasonal flow and temperature characteristics. Specifically, the lower reaches of streams often become less suitable for juvenile rearing during the summer. Rearing habitat condition is strongly affected by habitat complexity, food supply, or presence of predators of juvenile salmonids. Some complex, productive habitats with floodplains remain in the system (*e.g.*, the lower Cosumnes River, Sacramento River reaches with setback levees (primarily located upstream of the City of Colusa) and the flood control bypasses).

C. Factors Affecting the Species and Habitat

Profound alterations to the riverine habitat of the Central Valley began with the discovery of gold in the mid-1800s which resulted in increased sedimentation, which reduced spawning and rearing habitat quality from mining activities and land uses. Other human activities have contributed to the decline in Central Valley anadromous salmonids and their habitats, eventually leading to listing the species under the ESA. These activities are ongoing and continue to affect the species, and include: (1) dam construction and continued use that blocks previously accessible spawning and rearing habitat; (2) water development activities that affect flow quantity, timing, and water quality; (3) land use activities such as agriculture, flood control, urban development, mining, and logging that degrade aquatic habitat and decrease prey abundance; (4) hatchery operation and practices; and (5) harvest activities.

Hydropower, flood control, and water supply dams of the Central Valley Project (CVP), the State Water Project (SWP), and other municipal and private entities have permanently blocked or hindered salmonid access to historical spawning and rearing grounds. Large dams on every major tributary to the Sacramento and San Joaquin Rivers block Chinook salmon and steelhead access to the upper portions of the respective watersheds. On the Sacramento River, Keswick and Shasta Dams block passage to historic spawning and rearing habitat in the upper Sacramento, McCloud, and Pit Rivers. On the Feather River, Oroville Dam and associated facilities block passage to the upper Feather River watershed. Nimbus Dam blocks access to most of the American River basin. Englebright Dam and Daguerre Point Dam block access to the upper Yuba River. The upper watersheds of these basins comprised preferred spawning and rearing habitat for Sacramento River winter-run Chinook salmon, Central Valley spring-run Chinook salmon, and Central Valley steelhead.

Depleted flows in dammed waterways have contributed to elevated temperatures, reduced dissolved oxygen levels, and decreased recruitment of gravel, large woody debris, and riparian vegetation (Spence *et al.* 1996). Historical seasonal flow patterns included high flood flows in the winter and spring with declining flows throughout the summer and early fall. With the completion of upstream reservoir storage projects throughout the Central Valley, the seasonal distribution of flows differs substantially from historical patterns. The magnitude and duration of peak flows during the winter and spring are reduced by water impoundment in upstream reservoirs. Instream flows during the summer and early-fall months have increased over historic levels for deliveries of municipal and agricultural water supplies (CALFED 2000). Water management now reduces natural variability by creating more uniform flows year-round that diminish natural channel forming, riparian vegetation, and food web functions.

Water diversions for irrigated agriculture, municipal and industrial use, and managed wetlands, are found throughout the Central Valley. Hundreds of water diversions exist along the Sacramento River and its tributaries. Depending on the size, location, and season of operation, unscreened intakes may entrain many life stages of aquatic species, including juvenile salmonids.

About 150 years ago, the Sacramento River was bordered by up to 500,000 acres of riparian forest, with bands of vegetation literally spreading 4 to 5 miles (Resources Agency, State of California 1989). By 1979, riparian habitat along the Sacramento River diminished to 11,000-12,000 acres or about 2 percent of historic levels (McGill 1979). More recently, about 16,000 acres of remaining riparian vegetation has been reported (McGill 1987). Degradation and fragmentation of riparian habitat has resulted mainly from flood control and bank protection projects, together with the conversion of riparian land to agriculture (Jones and Stokes Associates 1993).

Increased sedimentation resulting from agricultural and urban practices within the Central Valley is another cause of salmonid habitat degradation. Sedimentation can adversely affect salmonids during all freshwater life stages by clogging or abrading gill surfaces; adhering to eggs, inducing behavioral modifications including habitat avoidance or cessation of feeding, burying eggs or alevins, scouring and filling pools and riffles, reducing primary productivity and photosynthetic activity, decreasing intergravel permeability, and decreasing dissolved oxygen levels. Embedded substrates can reduce the production of juvenile salmonids and hinder the ability of some over-wintering juveniles to hide in the gravels during high flow events. The flow regimes, sediment budgets, and channel dynamics of tributaries to the Sacramento and San Joaquin Rivers have been altered since 1850 to great extent. Reservoir storage is equivalent to about 80 percent of mean annual runoff in the Sacramento River basin, and about 135 percent in the San Joaquin

(Kondolf 2000). Reduction of winter floods has reduced sediment transport capacity and channel dynamics to 17 percent of original transport capacity.

Salmon have historically played a role in providing marine-derived nutrients to watersheds (Gresh *et al.* 2000). The death and decay of salmon after spawning results in the release of nutrients. The dramatic decline of salmon runs has decreased nitrogen and phosphorus input into watersheds from historical levels in the majority of river basins.

Land use activities associated with road construction, urban development, logging, mining, agriculture, and recreation have significantly altered fish habitat quantity and quality through alteration of streambank and channel morphology, alteration of ambient stream water temperatures, degradation of water quality, elimination of spawning and rearing habitat, fragmentation of available habitats, elimination of downstream recruitment of gravel and large woody debris, removal of riparian vegetation and elimination of large trees, and increased streambank erosion. Large woody debris influences stream morphology by affecting pool formation, channel pattern and position, and channel geometry. Organic input to the water course also provides nutrients necessary for primary productivity and as a food source for aquatic insects, which are in turn are consumed by salmonids.

Hatchery practices as well as spatial and temporal overlaps of habitat use and spawning activity between spring- and fall-run Chinook salmon has led to the hybridization and homogenization of some subpopulations (CDFG 1998). As early as the 1960s, Slater (1963) observed that early fall-run fish were competing with spring-run Chinook salmon for spawning sites in the Sacramento River below Keswick Dam and speculated that the two runs may have hybridized. FRH spring-run Chinook salmon have been documented as straying throughout Central Valley streams for many years (CDFG 1998), and in many cases have been recovered from the spawning grounds of fall-run Chinook salmon (Colleen Harvey-Arrison and Paul Ward, CDFG, pers. comm.). This indicates that the FRH spring-run Chinook salmon may exhibit fall-run life-history characteristics. Although the degree of hybridization has not been comprehensively determined, it is clear that the populations of spring-run Chinook salmon spawning in the Feather River and counted at RBDD contain hybridized fish.

Accelerated predation may also be a factor in the decline of Chinook salmon and steelhead in the Central Valley. Although predation is a natural component of salmonid ecology, the rate of predation on Central Valley salmonids likely has greatly increased through the introduction of non-native predatory species such as striped bass and largemouth bass, and through the alteration of natural flow regimes and the development of structures that attract predators, including dams, bank revetment, bridges, diversions, piers, and wharfs (Stevens 1961, Decato 1978, Vogel *et al.* 1988, Garcia 1989). U.S. Fish and Wildlife Service staff found that more predatory fish occurred at rock revetment bank protection sites between Chico Landing and Red Bluff than at sites with naturally-eroding banks (Michny and Hampton 1984). On the mainstem Sacramento River, high rates of predation are known to occur at RBDD, the Anderson-Cottonwood Irrigation District (ACID) diversion, the Glenn-Colusa Irrigation District diversion, and at south Delta water diversion structures (CDFG 1998). From October 1976 to November 1993, CDFG conducted 10 mark/recapture experiments at the SWP's Clifton Court Forebay to estimate pre-screen losses using hatchery-reared juvenile Chinook salmon. Pre-screen losses ranged from 69 percent to 99 percent. Predation from striped bass is thought to be the primary cause of the loss (Gingras 1997, CDFG 1998).

Threats to the Delta ecosystem (USFWS 1996) include: (1) loss of habitat from increased freshwater exports; (2) increased salinity, dredging, diking and filling; (3) introduced aquatic species that have disrupted the food chain; (4) programs which employ chemical controls to contain exotic vegetation; and, (5) entrainment (movement of fish by currents) in Federal, State, and private water diversions (USFWS 1996). Channelized, leveed, and rip-rapped river reaches and sloughs that are common in the Delta typically have low habitat complexity, low abundance of food organisms, and offer little protection from either fish or avian predators. Changed pattern and timing of flows through the Delta, sport and commercial harvest, and interactions with hatchery stocks have all affected salmon and steelhead runs entering the Delta (USFWS 1996).

Chinook salmon are harvested in ocean commercial, ocean recreational, and inland recreational fisheries. CWT returns indicate that Sacramento River salmon congregate off the coast between Point Arena and Morro Bay. Ocean fisheries have affected the age structure of spring-run Chinook salmon through targeting large fish for many years and reducing the number of 4 and 5 year olds (CDFG 1998). An analysis of six tagged groups of FRH spring-run Chinook salmon by Cramer and Demko (1997) indicated that harvest rates of 3-year-old fish ranged from 18 percent to 22 percent, 4-year-olds ranged from 57 percent to 84 percent, and 5-year-olds ranged from 97 percent to 100 percent. Reducing the age structure of the species reduces its resiliency to factors that may impact a year class. In-river recreational fisheries historically have taken fish throughout the species' range. During the summer, holding adult spring-run Chinook salmon are easily targeted by anglers when they congregate in large pools. Poaching also occurs at fish ladders, and other areas where adults congregate, but the significance of poaching on the adult population is unknown.

Several actions have been taken to improve habitat conditions for Central Valley salmonids. The impetus for initiating restoration actions stem primarily from temperature, flow, and diversion requirements in NMFS biological opinions; State Water Resources Control Board (SWRCB) orders requiring compliance with Sacramento River water temperature objectives; a 1992 amendment to the authority of the CVP through the CVPIA to give fish and wildlife equal priority with other CVP objectives; fiscal support of habitat improvement projects from CALFED (*e.g.*, installation of the Glenn-Colusa Irrigation District fish screen, establishment of an Environmental Water Account (EWA), *etc.*); and, U.S. Environmental Protection Agency (EPA) pollution control efforts to alleviate acidic mine drainage from Iron Mountain Mine.

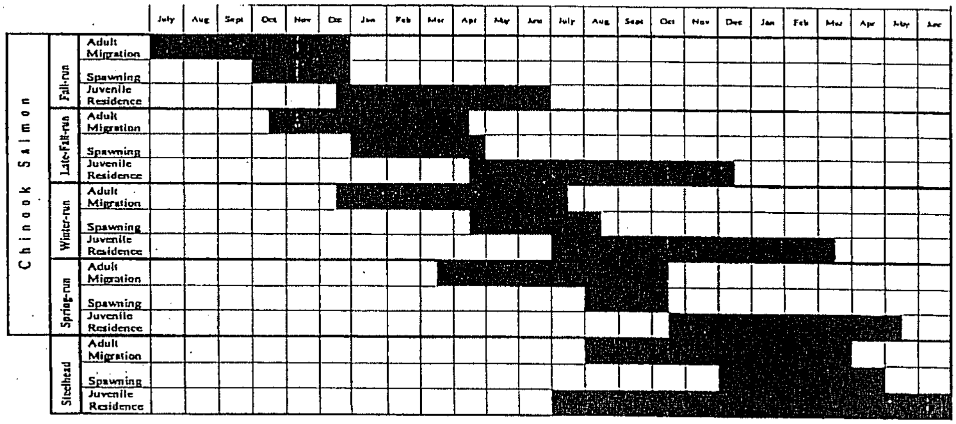
IV. ENVIRONMENTAL BASELINE

The environmental baseline is an analysis of the effects of past and ongoing human and natural factors leading to the current status of the species within the action area. The environmental baseline "includes the past and present impacts of all Federal, State, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section 7 consultation, and the impact of State or private actions which are contemporaneous with the consultation in process" (50 CFR §402.02).

A. Status of the Species and Habitat within the Action Area

The original salmonid populations of Battle Creek are thought to have been extirpated or drastically reduced by hydropower development in Battle Creek, and further reduced by the construction of the Coleman NFH and barrier weir. The salmon and steelhead now migrating into Battle Creek may be hatchery fish, natural progeny of hatchery fish, strays from the upper Sacramento River basin, or persistent remnants of the natural Battle Creek populations (Harza 2001).

Table 3. Seasonal occurrences of salmonid life stages in the Upper Sacramento River.



X - Denotes approximate peak of life stage if a significant peak occurs.

Sources: Vogel and Marine (1991) and Schaffer (1980) as reported in Kier Associates (1998).

1. Sacramento River Winter-Run Chinook Salmon

Winter-run Chinook salmon inhabit the upper Sacramento River basin, and opportunistically utilize Sacramento River tributaries and intermittent streams as non-natal rearing habitat, and when conditions are favorable, as spawning habitat (Maslin *et al.* 1996a, b). Historically through recent times, winter-run have been documented in Battle Creek (CDFG 1965; Yoshiyama *et al.* 2000). The presence of winter-run fry in Battle Creek was recorded in 1898 and 1900 (Rutter 1904), and Coleman NFH trapping efforts resulted in over 300 captured winter-run in 1958 (USFWS 1963). A winter-run Chinook salmon conservation hatchery program was initiated at Coleman NFH, following a four-agency cooperative agreement in 1988. Due to imprinting on Battle Creek, the hatchery winter-run did not assimilate into the natural population in the upper Sacramento River basin (USFWS 1996). To remediate the situation, operations were moved to the newly constructed Livingston Stone National Fish Hatchery on the upper Sacramento River, in 1998, and hatchery winter-run returns to Battle Creek declined. Most recent monitoring efforts have found only remnant numbers of winter-run in Battle Creek (five adults over years

2000-2005 combined; Reclamation and USFWS 2005). Five hatchery-origin winter Chinook salmon were observed in Battle Creek in 2006.

a. *Sacramento River Winter-Run Chinook Salmon Designated Critical Habitat*

Critical habitat for Sacramento River winter-run Chinook salmon has only been designated within the Sacramento River mainstem and lower estuary areas. Therefore, there is no designated critical habitat within the action area.

2. Central Valley Spring-run Chinook Salmon

The Battle Creek spring-run Chinook salmon population was severely reduced by hydropower development previous to the construction of Coleman NFH. A spring-run Chinook salmon artificial propagation program started in 1943 by Coleman NFH was discontinued in 1951, due to the relative lack of broodstock and high water temperatures. From 1952 to 1956, CDFG estimated 1,700 to 2,200 spring-run Chinook salmon spawning in Battle Creek (CDFG 1961, as cited in Ward and Kier 1999), and stream surveys recorded spring-run presence in Eagle Canyon (1960s-1970s) and South Fork Battle Creek (1970s; CDFG 1966; 1970). Adult begin returning to Battle Creek in March, and peak in early May. Spawning occurs from mid-August through October, peaking in late September. Adults hold and spawn far upstream of the intakes in reaches where water temperatures are cooler. Spring-run Chinook salmon may pass above Coleman NFH from early March through July 31, when the upstream fish ladder is open. A USFWS survey conducted in 1997 estimated 106 spring-run Chinook salmon returning to Battle Creek between early March and the end of June; spring-run numbers ranging between 34 and 94 fish returned to Battle Creek from 1995 to 2003 (CDFG 2004). Juvenile outmigration peaks between December and February, but can continue through August. Outmigration has averaged approximately 16,000 to 120,000 fish per year.

a. *Central Valley Spring-Run Chinook Salmon Designated Critical Habitat*

Spring-run Chinook salmon critical habitat has been designated in the Battle Creek mainstem, North Fork, and South Fork, based on the stream's high quality holding, spawning and rearing habitat (70 FR 52488). The Battle Creek channel is characterized by alternating pools and riffles. The channel form, along with boulders, ledges, and turbulence, provides key characteristics supporting the PCEs of critical habitat (*i.e.*, freshwater spawning sites, freshwater rearing sites, and freshwater migration corridors).

3. Central Valley Steelhead

A significant portion of the Central Valley steelhead DPS spawns and rears in Battle Creek and at Coleman NFH. Most of the steelhead in Battle Creek likely are of Coleman NFH steelhead stock origin (Cramer *et al.* 1995; USFWS 2001). Both the Battle Creek natural steelhead population and Coleman NFH steelhead stock are part of the threatened Central Valley steelhead DPS, and are protected under the ESA (71 FR 834). Steelhead may be present in August, but the majority of adults enter Battle Creek between September and January. Spawning occurs between late-

December and early May. Based on USFWS monitoring, over the last three years an annual average of approximately 67 natural-origin adult steelhead have been passed into the project area during the months of May through August. An estimated annual average of 3,075 outmigrating juveniles occurs between May and September. The upstream fish ladder is closed on August 1, after which migrating adults are restricted to the area below the Coleman NFH weir until October 1. Steelhead may enter the hatchery once the Coleman NFH ladder is opened, from October 1 through early March. Non-clipped steelhead that enter the hatchery during this period, and are not used in the hatchery propagation program, are bypassed above the hatchery. Adult steelhead have been observed at the project site through August.

As part of the Battle Creek Salmon and Steelhead Project restoration goal of a natural steelhead run in upper Battle Creek, Coleman NFH bypasses non-clipped steelhead, integrating hatchery operations with restoration efforts. All non-clipped steelhead entering the hatchery are manually bypassed into upper Battle Creek, with the exception of 40 natural steelhead held back for broodstock purposes. During the principal period of steelhead migration in Battle Creek, average monthly flows range from 296 cfs in October to 727 cfs in February. Studies have indicated that adult steelhead are able to achieve some level of volitional passage over the weir at flows above 350 cfs. This indicates that some escapement past the weir likely occurred throughout the timing of steelhead migration (Kier and Associates 1999). A modification to the Coleman NFH barrier weir, currently under construction, will provide the capability of blocking fish migration up Battle Creek at flows up to 800 cubic feet per second (cfs), and allow selective passage management at flows up to 3,000 cfs, the flow at which the stream overflows its banks.

Juvenile outmigration occurs throughout the year, but occurs to a lesser extent during the summer months, due to high water temperatures. Steelhead juveniles caught by rotary screw trap have provided estimates of 1,410 outmigrants in June, 28 outmigrants in July, and no juveniles in August or September.

a. *Central Valley Steelhead Designated Critical Habitat*

Steelhead critical habitat has been designated in the Battle Creek mainstem, the North and South Forks, and their adjoining tributaries, based on the stream's high quality spawning and rearing habitat (70 FR 52488). As with spring-run Chinook salmon, the channel form of Battle Creek, along with boulders, ledges, and turbulence, provides key characteristics supporting the PCEs of steelhead critical habitat (*i.e.*, freshwater spawning sites, freshwater rearing sites, and freshwater migration corridors).

B. Factors Affecting the Species and Habitat within the Action Area

The essential features of freshwater salmonid habitat within the action area include: adequate substrate, water quality, water quantity, water temperature, water velocity, cover/shelter, food, riparian vegetation, space, and safe passage conditions. These features have been affected by human activities such as water management, flood control, agriculture, and urban development throughout the action area. Impacts to these features have led to salmonid population declines significant enough to warrant the listing of several salmonid species in the Central Valley of California.

Battle Creek is fed by Lassen Peak in the southern volcanic Cascade Range and numerous springs throughout the year. It is typed as "montane riverine aquatic" habitat in the CALFED MSCS (CALFED 2000a). The creek is approximately 60 miles long, with an entrenched meandering channel with primarily riffle habitat, and encompasses a watershed of 357 square miles above the stream gage near Coleman NFH. Approximately 21 percent of the Battle Creek watershed lies within the Lassen National Forest (LNF). Upper Battle Creek contains remote, deep-shaded gorges similar to streams now blocked by Shasta Dam (U.S. Forest Service 1998). Natural barriers, deep bedrock pools, and cool water springs offer holding and spawning habitat for spring-run Chinook salmon and steelhead in the North Fork Battle Creek. The North Fork is 29.5 miles long and the South Fork is 28 miles long from the headwaters to the confluence with the mainstem of Battle Creek. The overall gradient of Battle Creek is steep, falling over 5,000 feet in less than 50 miles (Reclamation 2003). Battle Creek is an entrenched meandering channel with primarily riffle habitat and a slope of approximately 0.0125 percent. Flows in Battle Creek are less than 500 cfs more than 90 percent of the time, but the stream is "flashy" with winter floods reported to be in excess of 6,000 cfs an average of once every two years. The north and south forks converge into the main channel of Battle Creek about 9.5 miles from the confluence with the Sacramento River, near the community of Cottonwood.

There is evidence that Battle Creek may have supported all runs of Central Valley salmonids (Yoshiyama *et al.* 1996). Hydropower development in Battle Creek began in 1899. The Volta hydroelectric plant on the north fork Battle Creek was delivering power to Mountain Copper Company's smelters in the Keswick area in 1901, and was later taken over by PG&E in 1919. The project was licensed by the Federal Power Commission in 1932 and relicensed by the Federal Energy Regulatory Commission (FERC) in 1976, for a period of 50 years.

Silviculture, cattle grazing, fish culture, timber sales, fuel treatments, prescribed burns, fireline construction, road construction or obliteration, culvert placements, tree thinning, tree regeneration, watershed and aquatic restoration, recreation development, and general riparian area management activities dominate upper Battle Creek. Approximately 79 percent of the watershed is in private lands, much of which has been developed for fruit orchards, vineyards, cattle and sheep ranching, and private and state fish enterprises. These human activities within the Battle Creek watershed have resulted in a reduction in the quantity and quality of salmon and steelhead habitat as described below.

The "properly functioning condition" (PFC) of the Battle Creek basin has been compromised to some extent in its ability to provide rearing habitat for juvenile salmonids, and as a corridor for migrating juvenile and adult salmonids. Carrying capacity and complexity of the habitat has decreased with impacts to shaded riverine aquatic (SRA) habitat (*e.g.*, removal of riverine trees and instream woody material), riprap actions or other modification to the embankment, and water diversion. Spawning habitat capacity in the 17-mile reach above the Coleman NFH weir to the Coleman Diversion Dam can be diminished by unnaturally low water flows. Spawning success may be reduced by habitat limitations, fish competition, and displacement. Battle Creek has a dependable cold water flow all year. Its proposed restoration would allow natural processes to increase the ecological function of the habitat, while at the same time removing adverse impacts of current practices. The final planning stages for Battle Creek restoration efforts are in process and when fully implemented, the restoration of Battle Creek is expected to assist the recovery of the Sacramento River winter-run and Central Valley spring-run Chinook salmon ESUs and the Central Valley steelhead DPS, by increasing their abundance and spatial structure, and reducing the risk of extinction (USFWS 2002).

1. Hydroelectric Development and Water Diversions

Battle Creek flows have been diverted for hydroelectric development, irrigation, and hatchery operations (USFWS 2001). Flows vary seasonally and range from 30 cfs in August to 8,000 - 20,000 cfs during spring. The current anadromous habitat in the Battle Creek watershed is strongly influenced by the Battle Creek hydroelectric project, which consists of five powerhouses, two small storage reservoirs, three forebays, five diversions on the north fork Battle Creek, three diversions on the south fork Battle Creek, numerous tributary and spring diversions, and a network of some 20 canals, ditches, flumes, and a pipeline. Small feeder dams divert water from secondary streams into the projects canals. The Ripley and Soap Creek feeders divert additional tributary water into the Inskip and South Canal, respectively. The Asbury Diversion Dam feeds water into the Coleman Canal on Baldwin Creek. Dam construction and operations had extirpated most of the original salmonid populations in Battle Creek by the early 1900s, and continue to have an impact on salmon and steelhead by limiting their access to habitat and availability of water during high water demands.

a. *Increased Water Temperatures*

Habitat quality and salmonid survival in Battle Creek is significantly affected by water temperature as influenced by the hydro-project's diversion of cold spring water away from adjacent stream sections and reduced flows in the stream below diversion dams. Other factors that influence water temperature in Battle Creek include weather, channel form and dimension, shade, and natural flow levels. Flow diversion and subsequent warming substantially reduce the habitat area that can support migration, holding, spawning, and rearing of salmonids in Battle Creek (Kier Associates 1999).

Transbasin water diversions from North Fork Battle Creek to the South Fork tend to warm North Fork Battle Creek and cool South Fork Battle Creek. These operations have a detrimental effect on habitat conditions in the North Fork while potentially improving temperature conditions in the South Fork. However, the supply of cold water to the South fork is not reliable. Canal and powerhouse outages occur at unpredictable times, producing substantial flow and temperature fluctuations that reduce habitat value for fish that are lured to the South Fork by the cold water releases from the hydropower system.

b. *Predation*

Predation by native and nonnative species may cause substantial mortality of salmonids and other species, especially where the stream channel or habitat conditions have been altered from natural conditions (California Department of Water Resource 1995). The existing diversion dams in the action may create environmental conditions that increase the probability that predator species will capture juvenile Chinook salmon and steelhead during downstream movement. Water turbulence in the vicinity of the dams and other structures may disorient migrating juvenile Chinook salmon and steelhead, increasing their vulnerability to predators. In addition, changes in water temperature, flow velocity and depth affect the quality of habitat and potentially increase vulnerability of fish species to predation by other fish species, birds, and mammals.

c. *Food*

A primary factory affecting food production in Battle Creek is streamflow. Flow affects stream surface area and thus the wetted area available for the production of aquatic invertebrate food sources. Food availability and type affect fitness and survival of juvenile salmonids. Diversion for power generation has substantially reduced streamflow in several reaches of Battle Creek. In addition, hydropower diversions entrain food organisms, exporting nutrients from segments of Battle Creek. The decay of salmon carcasses has been shown to increase nutrient input to stream systems and contribute to increased growth rates of juvenile salmonids (Wilfli et al. 2002). The historical reduction of Chinook salmon populations may have reduced food availability and productivity of Battle Creek.

2. <u>Agricultural Effects</u>

a. *Entrainment into Canals*

There are two significant agricultural diversion on lower Battle Creek, the Gover ditch and the Orwick ditch. Each diverts approximately 50 cfs from the creek. For many years, neither of these diversions had any sort of screening to prevent fish from being entrained into the ditches. Any juveniles that were entrained were most likely lost due to high water temperatures, predation, or desiccation in the fields. Within the last five years, both diversions were fitted with fish screens. These screens meet most of the NMFS screening criteria and function well in preventing entrainment of salmonids into the ditches during the irrigation season. However, during high flow periods, these screens can be overwhelmed by flows and debris. The screen panels are often removed during these periods, allowing juvenile salmonids to be entrained into the ditches. These impacts can cause increased stress and mortality of listed salmonids that are entrained into the diversions.

3. <u>Coleman National Fish Hatchery Operations</u>

Coleman NFH was authorized by the Central Valley Project (CVP) and constructed by Reclamation as mitigation for the loss of 187 miles of historical salmonid spawning and rearing habitat blocked by the construction of Shasta and Keswick Dams (Black 2001, USFWS 2001). The hatchery was constructed on Battle Creek in 1942, and fish culture operations began in 1943. Coleman NFH fish contribute to commercial and recreational fisheries and are used in research and migration studies. Coleman NFH annual production release goals include: 12 million 3-inch Central Valley fall-run Chinook salmon smolts; 1 million 5-inch Central Valley late fall-run Chinook salmon smolts; and 600,000 8-inch Central Valley steelhead smolts.

All broodstock enter the hatchery fish ladder from Battle Creek, but some natural late fall-run fish also are trapped annually at Keswick Dam for incorporation into the late fall-run culture program. Chinook salmon fish production releases occur in Battle Creek from Coleman NFH; fish reared for monitoring studies are generally released at study sites, typically with the Delta region system.

a. *Barrier Weir and Fish Ladder*

The Coleman NFH fish ladder was designed to pass 40 cfs of water to meet flow criteria during the dry season when fall-run Chinook are migrating. Some adult salmonids have been able to leap over the weir and reach upper Battle Creek when laminar flows greater than 350 cfs occurred over the apron of the barrier weir. The barrier weir is operated to block hatchery Chinook salmon from accessing upstream habitat, and ensures broodstock collection for artificial propagation. The closure of the upstream fish ladder from August 1 through early March prevents further fish passage into upper Battle Creek. Beginning October 1, fish may access the hatchery through a fish ladder on the barrier weir. Biological data is collected from all natural winter- and spring-run Chinook salmon, and steelhead entering the hatchery, and all are passed upstream of the barrier weir by hatchery staff (with the exception of 40 natural steelhead that are retained for broodstock). Potential adverse effects on adults from operation of the fish barrier weir includes delaying upstream migration, inability to pass the weir or fishway structure and spawning downstream of the weir (displaced spawning), falling back downstream after passing upstream, being injured or killed as adults attempt to jump the barrier, and induced stress by handling.

b. *Genetic Effects*

Genetic integration of Coleman NFH domestic stocks with wild Battle Creek salmonid populations has occurred over many years. During the winter-run propagation program at Coleman NFH there was evidence of hatchery crossings of winter-run Chinook salmon with wild Battle Creek spring-run Chinook salmon (USFWS 2000). The steelhead propagation program at Coleman NFH also has had a long history of crossing hatchery origin fish with naturally-spawned Battle Creek fish and passing hatchery-origin adults into upper Battle Creek to spawn with wild steelhead. Because of domestication effects in hatchery stocks (*i.e.*, a reduction in fitness of a stock due to prolonged hatchery propagation), the integration of these domestic stocks with wild populations, particularly wild populations whose numbers have been depressed through other factors, can reduce the overall fitness of the wild population and reduce its likelihood of recovering to self-sustaining levels (Chilcote 2003; Reisenbichler *et al*. 2003). The cessation of passing hatchery steelhead (Table 5) above the weir was implemented in 2005, in order to allow the naturally-spawning population in upper Battle Creek to recover without excessive influence from hatchery stocks.

Table 4. Passage estimates for *O. mykiss* above Coleman NFH barrier weir, 2001-2006.

Methodology	*O. mykiss*	2001	2002	2003	2004	2005	2006
Weir Trap Mar. – May	nonclipped	61	103	62	62	44	126
	clipped	25	13	1	7	0	0
Video May - Aug.	nonclipped	33	80	56	69	30	56
	clipped	5	1	2	7	0	2
Hatchery Sep. - Mar.	nonclipped	131	237	428	179	270	249
	clipped	1,352	1,629	769	314	0	0
Bypassed	nonclipped	225	420	546	304	344	431
	clipped	1,382	1,643	772	329	0	2
Total Bypassed		**1,607**	**2,063**	**1,318**	**633**	**344**	**433**

References: FWS 2006 Preliminary Draft; FWS 2004 Weekly Summaries; Brown, *et al.* 2004, draft; Brown and Alston 2003, draft; Brown, and Newton, 2002.

4. Coleman NFH Water Supply

Coleman NFH relies on three water intakes and four water discharge locations for its operations. The hatchery primarily is dependent upon flow through unscreened Intake 1, located in the tailrace of the Pacific Gas and Electric Company (PG&E) Coleman Powerhouse, between October 1 and March 15. The water diverted into Intake 1 from the tailrace originates from the area of Battle Creek that is inaccessible to anadromous fish and is thus free of listed salmonids. The capacity of Intake 1 is 90 cfs, but the maximum water that is diverted through Intake 1 is 72 cfs. The tailrace empties into Battle Creek approximately 1.6 miles upstream of the hatchery property and is blocked by a fish barrier to prevent listed salmonids from accessing this area where they could become entrained into Intake 1.

Intake 2, located on the south bank of Battle Creek, shares a 46-inch conveyance pipe to the Coleman NFH water delivery canal with Intake 1. Delivery capacity of unscreened Intake 2 is 33 cfs. Intake 2 is used when water cannot be supplied via Intake 1, *e.g.*, during a failure of the canal, and during planned or emergency powerhouse maintenance.

Intake 3 draws water from Battle Creek and delivers it to Coleman NFH via a 4,600-foot, 48-inch diameter pipeline. Delivery capacity of Intake 3, which has a removable, small-mesh perforated and plated fish screen, is 50 cfs. Emergency overspill water from Intake 3 is routed through the untreated water canal for discharge back into Battle Creek above the Coleman NFH barrier weir.

Single pass flow-through waters from non-chemically treated raceways (with exception of oxytetracycline-treated feed) and hatchery building are discharged at a site below the Coleman NFH barrier weir and fish ladder. Chemical-laden raceway water is routed to the unlined, 4-acre pollution abatement pond before its discharge downstream. The pond has a retention time of approximately 4 days, with maximum daily and monthly average flow rates of 3.3 million gallons per day (mgd) and 2.3 mgd, respectively. Chemically treated water released from the spawning building is routed to the evaporation/percolation pond and is not discharged to Battle Creek.

a. *Entrainment Into Water Intakes*

Diversion of the water supply for Coleman NFH out of Battle Creek via non-screened Intake 2 and inadequately screened Intake 3 results in the entrainment of juvenile salmonids into the hatchery intake system. The estimated annual levels of entrainment and/or impingement of listed salmonids at these two intakes are 5,940 winter-run Chinook salmon, 814 spring-run Chinook salmon, and 6,269 steelhead (USFWS 2000).

Table 5. Estimated Annual Juvenile Take for Coleman NFH Water Supply Intakes 2 & 3

Species	2000-2005 Avg. Take*	Dec. 2005 – Jul. 2006	Dec. 2005 – Nov. 2006
winter-run	7,013	0	0
spring-run	933	6,773	6,792
steelhead	7,641	1,078	1,148

Source: USFWS 2001

Until 2005, the average amount of time that Coleman NFH has been dependent upon emergency Intake 2 was 412 hours per year (USFWS 2001). However, severe mechanical or structural break-downs in the hydropower system resulting in powerhouse outages may require extended use of Intake 2 while repairs are made. This situation occurred in 2005 through 2006 when Coleman NFH depended upon Intakes 2 and 3 for all of its water supply from December of 2005 to July of 2006, due to an emergency outage of the Coleman Powerhouse.

b. *Salvage Operations*

Fish salvage is periodically conducted in the Coleman Canal, settling basins, and sand traps, to rescue fish that have been diverted into the Coleman NFH water supply through Intakes 2 and 3. An example of one such operation took place from May 24 to July 13, 2000, during which 782 Chinook salmon and 749 steelhead were collected and released back into Battle Creek. These efforts mostly affect naturally spawned salmonids at the juvenile stage, and their entrainment and subsequent salvage may result in the delay of out-migration and/or temporary or lethal impacts from capture by electroshocking, netting, and angling capture techniques. Coleman NFH minimizes the effects of fish salvage operations by operating under protocols developed in consultation with NMFS, and has also experimented with "real-time salvage" efforts (*i.e.*, fyke net salvage). During the experimental "real-time" salvage in 2004, a total of 69 non-salmonids were rescued during monitoring periods between May 11 and August 12. However, net damage was considered a possible factor in the absence of salmonids. Salvage operations at Coleman NFH are expected to continue until Intakes 2 and 3 are properly screened.

c. *Water Discharge*

Coleman NFH follows waste discharge management requirements under its National Pollution Discharge Elimination System permit (NPDES). Coleman NFH directs 3.3 million gallons per day (mgd) of its daily 40.8 mgd flow-through effluent into its pollution abatement pond for filtering out large particulate matter associated with raceway cleaning (USFWS 2001). An additional 0.4 mgd of cooling water from the ozone water treatment plant is discharged into the bypass channel, and 24.0 mgd of the hatchery water supply is directly bypassed during normal conditions. Hatchery discharge is also directed through an overflow channel, the fish ladder, and a separate wastewater ditch. Effluent released from the hatchery must meet requirements for water temperature, pH, suspended solids, and chemical oxygen demand in the receiving stream's mixing zone (FWS 2001). Coleman NFH has developed a *Spill Prevention Control and Countermeasure* as a preventative measure against the potential spill of fuel and oil from the hatchery's two diesel tanks, a gasoline tank, and a waste oil tank.

5. Monitoring

Fish monitoring in Battle Creek occurs at the Coleman NFH barrier dam by video monitoring and trapping, adult distribution snorkel surveys, and juvenile trapping via rotary screw trap. Data is collected on (1) adult numbers; (2) run-timing of adult migration; (3) age, size and gender of adults; (4) spawn timing; (5) location of spawning; (6) weight and condition of juveniles; (7) timing of juvenile emigration; (8) size of emigrating salmonids; (9) number of juveniles produced; and (10) potential limiting factors at various life stages. All fish passed into upper Battle Creek from Coleman NFH are first passed through a tunnel-type detector to identify coded wire tagged (CWT) fish. Tagged fish are euthanized for CWT removal and data analysis.

Upstream adult fish passage is monitored at Coleman NFH using live trapping from early March 1 through May 27, and followed by underwater videography until July 31. A false-bottom fish trap is used to capture Chinook salmon and steelhead as they pass through the upstream fish ladder at the barrier weir. The trap is located in the upstream end of the vertical slot fish ladder, and is operated 7.5 hours per day. Trapping is terminated for the season and video taping begins when water temperatures exceed 60 degrees Fahrenheit (^{0}F) for a majority of the trap operation period in a day. Tissue samples from fish taken in the barrier weir trap and carcasses are collected for genetic analysis. Stream surveys are conducted from May to mid-November in the North Fork, South Fork, and the mainstem of Battle Creek (USFWS 2000).

Battle Creek's out-migrating juveniles are monitored by rotary screw traps located 2.8 miles and 6.0 miles upstream from the confluence of Battle Creek and the Sacramento River.

C. Likelihood of Species Survival and Recovery and Conservation Value of Critical Habitat in the Action Area

Under a 1999 Memorandum of Understanding (MOU), Reclamation, USFWS, CDFG, NMFS, and PG&E made the commitment to restore 42 miles of upper Battle Creek watershed to salmonid habitat, with an additional 6 miles of restoration in its tributaries, through increased minimum instream flows, dam removal, and other improvements in fish passage. NMFS recently completed consultation on the Battle Creek Salmon and Steelhead Restoration project (NMFS 2005), which is expected increase high quality instream habitat by 300 to 500 percent over current levels. The goal of the restoration effort is to facilitate recovery of natural salmonid populations in Battle Creek by restoring the Battle Creek watershed, under the guidance of the Central Valley Project Improvement Act (Public Law 102-575 Section 3401 et seq. CVPIA) and Anadromous Fish Restoration Program (AFRP). The integration of Coleman NFH operations with efforts to restore natural salmon and steelhead populations in the Sacramento River basin is integral to the project. As outlined in the 1999 MOU, the following facility changes in upper Battle Creek would occur:

- Removal of the South, Wildcat, Lower Ripley Creek, and Soap Creek diversion dams and appurtenant facilities.

- Removal of Coleman Dam, but retention of Coleman Canal to function as a conduit to Coleman Powerhouse.

- Construction of new fish screens and fish ladders at the Inskip, North Battle Creek Feeder, and Eagle Canyon diversion dams.

- Construction of a tailrace connector between the Inskip Powerhouse and Coleman Canal. Inskip Powerhouse would be replaced with a new system and integrated with this new tailrace connector.

- Construction of a tailrace connector tunnel between South Powerhouse and Inskip Canal. Water leaving South Powerhouse would be conveyed through the tunnel and outlet works to Inskip Canal. The existing South Powerhouse bypass would be integrated with the new tailrace connector.

The purpose of the new tailrace connectors is to convey water directly from the South and Inskip Powerhouses to associated downstream canals to avoid returning this water into Battle Creek. This structural change to the system is expected to meet several fishery restoration goals, including allowing stream habitat to stabilize, improving the ability of spawning fish to return to their natal areas and preventing North and South Battle Creek waters from mixing, thereby eliminating the potential for false attraction of fish into the wrong (non-natal) fork of the creek (Reclamation 2001).

The restoration project also includes several operational changes to the hydroelectric facilities on Battle Creek. The minimum instream flow releases would be increased at North Battle Creek Feeder (47 cfs summer flows), Eagle Canyon (35 cfs summer flows), Inskip (40 cfs summer flows), and Asbury (5 cfs summer flows) Diversion Dams. At the sites on the stream where the dams are removed, the flow releases from the upstream dams would not be diverted and would be augmented by accretion flows. The new minimum instream flow requirements also include ramping rates to provide gradual changes in water surface elevation.

It is expected that project construction will require 2.5 years to complete, and an estimated 20,000 salmon and steelhead may be produced in a fully-restored Battle Creek watershed (Kier and Associates 1999).

Under current conditions, without implementation of the Restoration project, the likelihood of survival and recovery of naturally-reproducing winter-run Chinook salmon, spring-run Chinook salmon, and steelhead in Battle Creek is very low. Winter-run Chinook salmon are thought to be completely extirpated from the creek, and the continuation of the current hydropower operations is likely to produce the poor habitat conditions in Battle Creek under which winter-run Chinook salmon have been unable to survive. Naturally-reproducing spring-run Chinook salmon and steelhead still maintain remnant populations in Battle Creek, but their numbers have shown a decreasing trend in recent decades. Without access to the upper reaches of the creek, screening of the hydropower diversions, and increased minimum flow requirements, it is unlikely that they will be able to maintain these remnant populations, and even less likely that they will actually recover to a point of long-term sustainability.

V. EFFECTS OF THE ACTION

Pursuant to Section 7(a)(2) of the ESA (16 U.S.C. §1536), Federal agencies are directed to ensure that their activities are not likely to jeopardize the continued existence of any listed species or result in the destruction or adverse modification of critical habitat. This biological opinion assesses the effects of the Coleman NFH Water Intakes Rehabilitation project on Sacramento River winter-run Chinook salmon, Central Valley spring-run Chinook salmon and Central Valley steelhead. The primary purpose of the project is to prevent the entrainment of listed salmonids into the Coleman NFH water delivery system while insuring a reliable, high quality water supply in sufficient quantity to meet hatchery operational needs.

Instream construction elements of the project are likely to adversely affect listed species through implementation of the fish rescue plan, which entails seining and possible electrofishing as a capture method. Implementation of the project is likely to adversely affect critical habitat through activities such as: excavation and vegetation removal; dewatering of the creek within the project area; temporary stockpiling and sidecasting of soil, construction materials and wastes; construction of temporary access roads, soil compaction; dust and water runoff from the construction site; fording the creek with heavy equipment or construction of a temporary crossing to access the south bank; and construction-related noise. In the *Description of the Proposed*

Action section of this Opinion, NMFS provided an overview of the action. In the *Status of the Species* and *Environmental Baseline* sections of this Opinion, NMFS provided an overview of the threatened and endangered species and critical habitat that are likely to be adversely affected by the activity under consultation.

Regulations that implement section 7(b)(2) of the ESA require biological opinions to evaluate the direct and indirect effects of Federal actions and actions that are interrelated with or interdependent to the Federal action to determine if it would be reasonable to expect them to appreciably reduce listed species' likelihood of surviving and recovering in the wild by reducing their reproduction, numbers, or distribution (16 U.S.C. §1536; 50 CFR 402.02). Section 7 of the ESA and its implementing regulations also require biological opinions to determine if Federal actions would destroy or adversely modify the conservation value of designated or proposed critical habitat (16 U.S.C. §1536).

A. Approach to the Assessment

NMFS generally approaches "jeopardy" analyses in a series of steps. First, we evaluate the available evidence to identify the direct and indirect physical, chemical, and biotic effects of proposed actions on individual members of listed species or aspects of the species' environment (these effects include direct, physical harm or injury to individual members of a species; modifications to something in the species' environment - such as reducing a species' prey base, enhancing populations of predators, altering its spawning substrate, altering its ambient temperature regimes; or adding something novel to a species' environment - such as introducing exotic competitors or a sound). Once we have identified the effects of an action, we evaluate the available evidence to identify a species' probable response (including behavioral responses) to those effects to determine if those effects could reasonably be expected to reduce a species' reproduction, numbers, or distribution (for example, by changing birth, death, immigration, or emigration rates; increasing the age at which individuals reach sexual maturity; decreasing the age at which individuals stop reproducing; among others). We then use the evidence available to determine if these reductions, if there are any, could reasonably be expected to appreciably reduce a species' likelihood of surviving and recovering in the wild.

The regulatory definition of adverse modification of critical habitat has been invalidated by the courts. Until a new definition is adopted, NMFS will evaluate destruction or adverse modification of critical habitat by determining if the action reduces the value of critical habitat for the conservation of the species.

To conduct this assessment, NMFS examined evidence from a variety of sources. Detailed background information on the status of these species and critical habitat was obtained from a number of documents including the Action Specific Implementation Plan, peer reviewed scientific journals, primary reference materials, government and non-government reports, project-specific environmental reports, and project meetings.

B. Assessment

The proposed Coleman NFH Water Intakes Rehabilitation Project will prevent entrainment of salmon and steelhead into the hatchery's water delivery system via Intake 2 and Intake 3. Coleman NFH will have assurance of system redundancy and a cold water supply to maintain healthy hatchery stocks. The project will contribute to the restoration of salmon and steelhead runs in conjunction with the restoration of salmonid habitat through its association with the Battle Creek Salmon and Steelhead Restoration Project. Overall, it is expected that the proposed project will benefit the conservation value of critical habitat for Central Valley spring-run Chinook salmon and Central Valley steelhead spawning and rearing in upper Battle Creek, and help to facilitate the expansion of the spatial structure of the Central Valley ESU and DPS, thereby increasing abundance and productivity.

There is the potential for some short-term, adverse impacts which would be expected to occur primarily during the construction phase of the project, and some long-term impacts which will be compensated for as shaded, riverine aquatic habitat is recovered and the project site is restored. There is the potential for some immediate or delayed adverse impacts, resulting from fish capture by seining or electroshocking, and containment and transportation for release, due to fish rescue operations. All instream work will be conducted between May 1 and September 30 to minimize the risk of impacting listed salmonids. The avoidance, minimization, and conservation measures that have been incorporated into the project design are expected to greatly reduce the likelihood and severity of construction and fish rescue impacts. Adverse impacts to salmonid habitats and their functional value will be compensated by in-kind replacement onsite. The project will be monitored to ensure the implementation of BMPs and conservation measures are effective in avoiding or minimizing detrimental effects to listed salmon and steelhead, and critical habitat. Appropriate implementation of BMPs and conservation measures is expected to reduce the potential impacts to water quality in particular to the level that they would not be likely to adversely affect listed salmonids.

1. Project Effects

Impacts to habitat from project construction are expected to be in the form of loss of substrate and riparian habitat. Potential impacts to listed fish species and critical habitat may occur during vegetation removal, dewatering of portions of the stream, excavation of the pipeline trenches, construction of cofferdams, streambank modification, placement of riprap, intake and fish screen installation, intake abandonment, pipeline construction, and grading. Conservation measures to offset impacts include restricting in-stream work activity to the summer work window, restoration of habitat to its original condition to the extent possible, and implementation of BMPs.

a. *Access Corridor*

The project will limit the effects from construction of the access corridor by utilizing existing roads and access points to the greatest extent possible. Construction equipment will be limited in use to the construction footprint, access corridor, and areas specifically designated for machine maintenance and storage. Equipment will either ford the creek or use a stream crossing with a culvert design that meets NMFS Southwest Region guidelines (NMFS 2001). Impacts to streambank, vegetation and cover, may cause streambank destabilization, a reduction of bank cover shading, and an increase in stream temperatures, inducing stress to salmonids. The destruction of riparian trees will also reduce the supply of large woody debris, diminishing instream habitat diversity by removing the source of materials responsible for creating pools and riffles which are critical for anadromous fish growth and survival. A decrease in habitat complexity and water of preferred depths or velocities will also affect the availability of refugia, especially for juvenile salmonids.

Natural woody riparian or SRA habitat will be avoided or preserved to the maximum extent practicable. Trees that are cut are expected to regrow rapidly as the remaining root systems should remain viable after construction. Impacted areas will be replanted with native woody species. SRA habitat is expected to continue to function adequately due to the localized and temporary nature of the construction impacts. Implementation of the environmental conservation measures is expected to avoid or minimize to the extent possible the effects of the construction of the access corridor.

b. *Fill and Riprap*

Project effects caused by trenching or cofferdam installation will be of temporary duration during the May 1 through September 1 construction window. Approximately 12,000 cubic yards of rock and fine sediments excavated from the project area would be removed from the site, and affected geomorphologic features will be re-contoured to resemble the original condition. The impacts are considered localized and would not change functional characteristics of geomorphological features, including meanders, bank angles, and rate of incision (Tetra Tech 2007). Excavated volume will be taken up by new pipelines and other infrastructures.

The proposed project would result in impacts on the streambank from installing a new screened intake 2,000 feet upstream of Intake 2, and from the installation of fill in the form of riprap or concrete at existing Intakes 1, 2, and 3. Discharge within jurisdictional waters will total approximately 2,838 cubic yards. The effects of placing this fill on wetlands and other waters would be permanent. Fill materials would be obtained from clean fill sources.

Fill primarily composed of topsoil would occur in the riparian zone where riparian wetland and vegetated riparian other waters are located, as a result of earth moving activities associated project construction. Compensation for impacts to waters would include the on-site restoration of 0.32 acres of riparian wetland, 2.37 acres of vegetated riparian waters and 2.82 acres of unvegetated waters. In addition, USFWS and Reclamation will work to identify on-site or off-site locations where restoration or enhancement may be possible.

Riparian and upland vegetation would be impacted throughout the project area. Mitigation plantings will replace these areas with grass and shrub-land vegetation directly over the pipeline, and in-kind at all other areas. Those areas that cannot be restored in this manner on-site will be mitigated for through purchase of credits at an approved mitigation bank.

b. *Vegetation Disturbance and Restoration*

The removal of approximately 600 linear feet of riparian vegetation, amounting to 0.4 acres (17,424 square feet) on the grounds adjacent to Battle Creek, is not expected to impact salmonid spawning and rearing. Affected riparian habitat is a small area relative to the total riparian habitat available in the action area, and is not anticipated to be extensive enough to cause water temperature increases. Juvenile salmonids will likely locate adequate feeding sites and refugia nearby. Riparian areas that have not successfully re-established themselves within 3 years will be replanted with native vegetation to re-establish shaded refugia and habitat structure. Post-project monitoring will evaluate the success of the restoration, and assist in identifying areas needing further restoration to meet the goal of replacement value prior to implementation of the project.

At the conclusion of the project, disturbed soils will be reseeded or replanted with native plant species to prevent soil erosion, in coordination with an erosion control specialist. The amount of riparian vegetation to be removed will be approximately 0.4 acres (17,424 square feet) on the grounds adjacent to Battle Creek,

Permanent loss of habitat will occur only where new Intake 2 will be constructed. This will amount to approximately 150 linear feet of non-SRA streambank extending in depth to the current invert level of the stream. Conservation measures intended to offset effects will be considered during the permitting process for Intake 2.

c. *Noise*

Wildlife habitat would be disrupted during the two-year construction period by noise, human presence, vegetation removal, and soil disturbance. Noise from construction activities could influence fish behavior in and around the project area, as it presents an audio barrier, *i.e.*, an area that fish will avoid, which could inhibit fish migration behavior. Noise is expected to be a temporary impact, however, as it is expected that fish will disperse themselves along the non-affected stream corridor.

2. <u>Water Quality</u>

The proposed project would contribute to soil disturbance, erosion, runoff, and sedimentation, impacting water clarity from suspended particulate matter. There may be a temporary release of nutrients into the water column during construction, with no significant effect on water chemistry, temperature, color, odor, taste, dissolved gas levels, and eutrophication. Construction impacts are expected to be minimized to less than significant levels by implementation of environmental planning and the incorporation of best management practices. Water quality will be monitored for turbidity and settleable materials according to the RWQCB Section 401 Water

Quality Certification standard conditions. Settling ponds for dredge material would be constructed in accordance with RWQCB regulations and design criteria. Discharges from controllable sources of pollutants shall be conducted in a manner that complies with water quality objectives designated by the RWQCB for the maintenance of salmon and steelhead in designated habitats. Decant waters will meet RWQCB permit criteria prior to discharge into Battle Creek.

a. *Sedimentation*

Heavy equipment will cross the creek channel multiple times to access the south bank, in close proximity to the creek banks. Effects of the action may include soil compaction of the streambank and substrate, removal of riparian vegetation, erosion of the streambank, and increased sedimentation into Battle Creek. Deposition of fine sediment could fill interstitial spaces between gravel and cobble substrates, degrading spawning habitat and inhibiting the flow of oxygen-rich water to any eggs that may be deposited in the impacted area. Sedimentation may impair rearing habitat, and cause mortality of fish larvae, and rearing juveniles. Duration of effects could continue over several years, depending on the extent and duration of fine sediment input and on flow conditions that mobilize and transport fine sediment through the creek. Increases in suspended inorganic sediment can be deleterious to filter-feeding invertebrates and to fish, which exhibit avoidance behavior and negative physiological responses (Owens *et al.* 2005). Fish migration may be delayed, and juveniles in particular may incur reduced feeding and growth rates, and risk increased likelihood of predation if they are frightened into deeper, open-water habitat. Juveniles may be crushed if they are trapped by heavy equipment and cannot escape. Temporary sediment control measures will be located at disturbed areas to prevent sediment from entering Battle Creek, and kept in place until areas are stabilized. Disturbed soils will be sprayed with water to minimize wind erosion or dust during construction. Sedimentation prevention methods may include the use of clean spawning-sized gravel, riprap placement, super sacks (large sand bags), and geotechnical fabric.

To offset erosion and sedimentation over-winter, conservation measures such as the use of mulch, straw wattles, and silt fences will be utilized for the project. All measures will be specified in coordination with an erosion control specialist and will adhere to the RWQCB Construction Stormwater Permit.

b. *Contaminant Spills*

Accidental spills related to construction activity or hazardous materials may cause habitat degradation and result in fish mortality or reduced productivity of fish and other aquatic species. Heavy equipment would risk an accidental spill of petroleum products with each crossing of the creek channel.

The proposed project would avoid or minimize impacts from accidental spills by implementing the conservation measures of the Spill Prevention and Containment Plan (SPCP). All staging and storage areas for refueling machinery and for storing hazardous materials would be set back a minimum of 100 feet from Battle Creek, providing protection from direct runoff into the creek during daily fluid inspection and maintenance of equipment. Equipment fording the creek may be outfitted with "diapers" to catch oil or other petroleum products. Soils contaminated with fuel or other chemicals would be disposed of in a suitable manner and location to prevent them from being discharged into flowing waters or groundwater.

Any accidental spills would be cleaned up immediately, and RWQCB, NMFS, and CDFG would be notified of the event for further direction. To minimize the effect of a potential oil leak, the contractor would utilize biodegradable oils in the hydraulic systems of equipment used for instream work.

3. Cofferdams

Effects from the installation, utilization, and removal, of super sacks and portadam cofferdams on salmonid habitat are expected to be minimal. Sheet piling will not be used, and the trench that will be dug through the streambed to accommodate new pipelines for access to existing pipelines will be backfilled to grade with spawning-sized gravel. Cofferdams will be removed from Battle Creek upon completion of construction. Cofferdam installation is not expected to physically disturb the stream channel, and measures will be taken to decrease the risk of turbidity and suspended sediment.

Cofferdams may influence the creek channel, in the short-term. Disruption of stream and riparian connectivity, and changes in stream profile, morphology and substrate stability outside of the excavated area's perimeter, could occur during subsequent high water events. Active channels may naturally meander into the excavated area and fish may be stranded during flooding. Adult steelhead migrating or spawning during work periods may be temporarily displaced, but as only a small portion of the stream is affected, it is expected that fish will be able to maneuver around the dewatered area. The bypass channel would divert creek flow around the project construction area and reduce the flow during in-stream work. All water removed from the work site during dewatering will return via subsurface flow or direct release, following conditions of the RWQCB.

The placement of super sacks in Battle Creek may kill or injure less mobile juvenile salmonids by crushing if placed directly on top of them. The project will be monitored prior to cofferdam placement to ensure that impacts are minimal or avoided, and all contracted personnel will be trained to discern the risk of fish being present at the site. Fishery biologists will survey the area prior to cofferdam placement to make a determination of fish presence and to implement fish rescue operations, if called for.

a. *Dewatering Effects*

Dewatered portions of Battle Creek will decrease salmonid rearing habitat by 0.35 acres (15,000 square feet) during the in-stream construction window. Approximately 1.35 acres (60,000 square feet) of other waters of the US will be temporarily dewatered over the course of the project, with the risk of stranding adult and juvenile fish. The affected area is considered minor in relation to the remaining, non-affected amount of salmonid habitat in Battle Creek. Dewatering would occur over a maximum of half of the stream width at any given time, leaving room for fish passage around the cofferdam to allow for adult migration upstream and juvenile outmigration. Fish may encounter minor obstacles at the cofferdams but would be able to easily swim around these structures and proceed either upstream or downstream. Adult salmonids would be affected only during May through July, since the barrier weir fish ladder downstream of the hatchery is closed on August 1. There is a small chance of fish becoming stranded during dewatering of the work areas, but most fish are likely to leave the area when placement of the cofferdams begins.

The project may result in an increased chance of bird predation by forcing fish to pass through a narrow corridor at the locations of the cofferdams. However, predation risk is minimized by the fact that fish will still have access to the deepest part of the streams and will not be forced into shallow or slack water.

Likewise, increased disturbance around the cofferdams and trenches may drive away small fish that would serve as prey species for salmonids. This effect is expected to occur only in the vicinity of the cofferdams and to comprise only a very small amount of the foraging habitat available to salmonids in this area.

b. *Fish Rescue Activities*

There is potential for the stranding of adult and juvenile salmonids during the dewatering of portions of Battle Creek. A crew of fishery biologists will be on stand-by for possible implementation of real-time fish rescue operations immediately following the installation of the cofferdams. Seining is the preferred methodology, but rescuers may employ electroshockers, if determined to be necessary, following NMFS electroshocking guidelines (2000). Following professional protocols of fish capture and holding, the adult fish will be released upstream of the project site, and juvenile fish will be released downstream of the site.

Stranding may cause stress to fish by forcing them to occupy shallow pools of standing water that may have elevated temperatures and lower dissolved oxygen available. Fish may injure themselves as they try to escape. Likewise, capture and handling fish may cause stress, physical injury, disease, or death. Small fish can be gilled in the mesh of a seine, and fish scales and dermal mucus can be abraded by contacting the net. Fish can be suffocated or crushed if they are not quickly removed from a seine after the net is removed from the water.

Electroshocking can result in hemorrhages in soft tissues and fractures in hard tissues. Short-term effects may include stress, disorientation, vulnerability to predation, and respiratory failure. Long-term effects of electroshocking may include lowered survival and growth rate (Dalbey *et al.* 1996, Ainslie *et al.* 1998) and spinal injury. There is a negative effect on egg survival in electroshocked females (up to 93 percent mortality) and eggs electrofished post-spawning (up to 34 percent mortality) (Cho *et al.* 2002).

Careful placement of cofferdams will minimize the number of fish stranded. Adverse effects are expected to be minimized further by employing experienced fish biologists to carry out the rescue activities.

4. Infrastructure

The commercial electrical grid operated by PG&E in the project vicinity would provide power for any new facilities associated with the proposed project and for the power requirement of 28 kilowatts (kW) at each fish screen (total peak wattage 56 kW) to operate sweepers intended to keep screens free of debris. The power would be delivered to Intake 3 by existing power lines, but power delivery to the new Intake 2 on the north side of Battle Creek would require the installation of new power poles, lines and transformers from the existing power lines along Coleman Fish Hatchery Road. A housed generator at Intake 2 and Intake 3 would provide backup power. No effect is associated with power line installation.

5. Long-term Benefits

Beneficial effects of the project include the reduction of entrainment of juvenile fish in the Coleman NFH water delivery system; increasing hatchery fish survival rates in rearing ponds; enhancing reliability to water flows, and reduction of temperature fluctuations. The proposed action is compatible with the goal of the Battle Creek Salmon and Steelhead Restoration Project to restore runs of winter and spring Chinook salmon, and steelhead, on 42 miles of prime salmonid habitat on Battle Creek, plus an additional 6 miles of habitat on its tributaries.

VI. CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, tribal, local or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the ESA.

Non-Federal actions that may affect the action area include voluntary State or privately-sponsored habitat restoration activities, agricultural practices, livestock grazing and water withdrawals/diversions. Farming activities within or adjacent to the action area may have negative effects on water quality due to runoff laden with agricultural chemicals. Water withdrawals/diversions may result in entrainment of individuals into unscreened or improperly screened diversions, and may result in depleted river flows that are necessary for migration, spawning, rearing, flushing of sediment from spawning gravels, gravel recruitment and transport of LWD.

A. Aquaculture and Fish Hatcheries

Mount Lassen Trout Farms, Inc. consists of nine private trout-rearing facilities located within the Battle Creek Watershed. This operation rears rainbow and brown trout for stocking in private ponds and lakes through California. Although the facilities are located above the anadromous habitats of Battle Creek, some facilities are located near the hydroelectric project canals. These facilities have been certified as disease free for many years and the potential for fish or disease to escape from these facilities into Battle Creek is considered very small. No such impacts have ever been documented from these facilities and they are not expected to occur in the future.

Darrah Springs Fish Hatchery is located on Baldwin Creek, a tributary to mainstem Battle Creek. It is a key hatchery of CDFG's inland fisheries program and raises catchable trout for recreational fisheries. It is possible that fish or disease could escape the hatchery into Battle Creek, but again, no such impacts have ever been documented and are not expected to occur in the future.

B. Agricultural Practices

The primary agricultural practices in the Battle Creek Watershed consist of low density livestock grazing and small timber harvests. These practices have not produced measurable adverse impacts to salmonids or salmonid habitat in Battle Creek (Reclamation 2003). There are no current plans to modify the type or intensity of agricultural practices in the watershed and therefore any such changes could not be considered reasonably certain to occur. As discussed in the next section, conservation easements and agreements are being pursued along the riparian corridors of the Battle Creek Watershed, providing further assurance that future agricultural and other human practice will not be likely to adversely affect salmonids or salmonid habitat.

C. Conservation Agreements and Easements

The Battle Creek Watershed Conservancy and The Nature Conservancy have been working together in developing conservation agreements and easements throughout the riparian corridors and uplands of the Battle Creek Watershed. Several agreements and easements have already been established and several more are being pursued. Implementation of these agreements are expected to, at a minimum, maintain the current high quality of riparian and aquatic habitat in Battle Creek, and could potentially improve the condition of these habitats for salmonids.

VII. INTEGRATION AND SYNTHESIS

The purpose of this section is to summarize the effects of the action and then add those effects to the impacts described in the *Environmental Baseline and Cumulative Effects* sections of this biological opinion in order to determine whether or not the proposed action is likely to jeopardize the continued existence of Sacramento River winter-run Chinook salmon, Central Valley spring-run Chinook salmon and Central Valley steelhead.

A. Summary of Impacts of the Proposed Action on Sacramento River winter-run Chinook salmon, Central Valley spring-run Chinook salmon, and Central Valley steelhead.

Populations of Sacramento River winter-run Chinook salmon, Central Valley spring-run Chinook salmon and Central Valley steelhead have declined drastically over the last century, and their current status has not significantly improved to warrant their delisting. A major cause of the decline is habitat loss or severe impairment of habitat quality and function. Most of this habitat loss and degradation has resulted from anthropogenic watershed disturbances caused by dams, water diversion, flood control structures and activities, farming, urban development, logging, and mining.

The proposed Coleman NFH Water Intakes Rehabilitation Project is intended to protect salmon and steelhead from entrainment into the hatchery water delivery system due to lack or inadequate screening of Intakes 2 and 3. The project is expected to contribute to the conservation of salmon and steelhead in conjunction with the restoration of 48 miles of salmonid habitat in the upper Battle Creek watershed.

There is the potential for some short-term, adverse impacts which would be expected to occur during the construction of the project; however, the seasonal work window is expected to minimize the exposure of Central Valley spring-run Chinook salmon and Central Valley steelhead to the direct effects of project construction resulting from heavy equipment crossing the stream channel, excavation, construction of cofferdams, riprap of streambank, and other construction activities. Specifically, most migrating adult spring-run Chinook salmon are expected to pass Coleman NFH from March through the end of July. Although construction will begin May 1, migrating fish will continue to have free passage past the construction area throughout the construction period. Mature steelhead will begin to enter Battle Creek in August in the final month of the instream construction season and will likewise have free passage through the construction zone. Rearing juvenile salmonids may occur near the project site year-round, but are expected to be less abundant during the instream construction window because of non-optimum water temperatures. The presence of winter-run Chinook salmon in Battle Creek is rare, and they are not expected to be exposed to the adverse effects of instream construction.

The avoidance, minimization, and conservation measures that have been incorporated into the project design are expected to further reduce the likelihood and severity of short-term construction impacts. These include designating work zones and exclusion zones, avoiding and minimizing impacts to water quality through implementation of a SWPPP and SPCP, and conducting pre-monitoring to determine the presence of wildlife (*e.g.*, juvenile salmonids) before cofferdam installation. Overall, only a small number of adult and juvenile Central Valley spring-run Chinook salmon and Central Valley steelhead are anticipated to be adversely affected by construction impacts of the proposed project. Adverse impacts may include delays in migration or behavioral changes such as temporary cessation of feeding, and exhibiting escape or avoidance behaviors. Mortality of juveniles may occur because their small body size and poorer swimming ability increases the likelihood they may be crushed or stranded.

B. Effects on Species Likelihood of Survival and Recovery

Adverse impacts to salmonid habitats and their functional value will be compensated by in-kind replacement onsite. The project will be monitored to ensure the implementation of BMPs and that conservation measures are effective in avoiding or minimizing detrimental effects to listed salmon and steelhead habitat, including the PCEs of Central Valley spring-run Chinook salmon and Central Valley steelhead critical habitat (*i.e.*, freshwater migration corridors and freshwater rearing sites). Impacts to critical habitat are expected to include the temporary disturbance of in-channel habitat and the temporary loss of riparian habitat due to construction activities. Habitat components within the action area, such as SRA habitat and riparian vegetation, contribute to shoreline habitat complexity and refugia for juveniles, and contribute beneficially to the conservation value of critical habitat. These components will continue to function adequately due to the localized and temporary nature of the construction impacts. Appropriate implementation of BMPs and conservation measures is expected to reduce the potential impacts to water quality in particular to the level that they would not be likely to adversely affect listed salmonids. Potential long-term impacts to a relatively small amount of habitat will diminish and are expected to be fully compensated for over a few years as SRA habitat is recovered, and the riparian area adjacent to the project site is restored.

Fish rescue activities may be necessary when cofferdams are closed. There is the potential for some immediate or delayed adverse impacts resulting from stress or physical injury due to fish capture by seining or electroshocking, and the containment and transportation necessary for release. The project proponent plans to implement conservation measures to avoid or minimize adverse effects to listed salmonids from fish rescue operations.

The amount and severity of impacts from the proposed project are not expected to result in a significant effect at the ESU/DPS scale because the anticipated mortality rates are low, and the abundance of the local population will not be appreciably reduced. The short term nature of the expected adverse impacts, coupled with the long term benefits derived from implementation of the proposed project are expected to increase the likelihood of recovery of listed salmonids in Battle Creek and throughout the ESUs/DPS.

C. Effects of the Proposed Action on Critical Habitat

The proposed project will have temporary adverse effects on spring-run Chinook salmon and steelhead critical habitat, including effects from heavy equipment crossing the stream channel, excavation, installation of cofferdams, riprap, narrowing of the fish migration corridor, noise, and turbidity. The avoidance, minimization, and conservation measures that have been incorporated into the project design are expected to reduce the likelihood and severity of short-term construction impacts. The project will provide a long-term benefit to critical habitat by minimizing the risk of diversion into the Coleman NFH water delivery system, thus improving migratory elements of critical habitat in Battle Creek.

VIII. CONCLUSION

After reviewing the best available scientific and commercial information, the current status of Central Valley spring-run Chinook salmon and Central Valley steelhead, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, it is NMFS' biological opinion that the Coleman NFH Water Intakes Rehabilitation Project, as proposed, is not likely to jeopardize the continued existence of Sacramento River winter-run Chinook salmon, Central Valley spring-run Chinook salmon, and Central Valley steelhead, and is not likely to destroy or adversely modify designated critical habitat of Central Valley spring-run Chinook salmon and Central Valley steelhead.

IX. INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulations pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by NMFS as an act which kills or injures fish or wildlife. Such an act may include significant habitat modification or degradation where it actually kills or injures fish or wildlife by significantly impairing essential behavioral patterns, including breeding, spawning, rearing, migrating, feeding or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

The measures described below are non-discretionary, and must be undertaken by USFWS so that they become binding conditions of any grant or permit issued to the Contracted Party (Contractor) providing the construction services, for the exemption in section 7(o)(2) to apply. USFWS has a continuing duty to regulate the activity covered by this incidental take statement. If USFWS 1) fails to assume and implement the terms and conditions or 2) fails to require the Contractor to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, USFWS and the Contractor must report on the progress of the action and its impact on the species and proposed critical habitat to NMFS as specified in the incidental take statement (50 CFR §402.14[i][3]).

A. Amount or Extent of Take

No take of Sacramento River winter-run Chinook salmon is anticipated because they have rarely been observed in the action area in recent years. Based on baseline conditions, Central Valley spring-run abundance during each construction window is estimated to be 53 adults and 1,000 juveniles (106 adults and 2,000 juveniles combined over a two-year period). Recent monitoring data indicate a maximum run of approximately 50-150 adult fish per year, over normal escapement distribution beginning in March, peaking in late May, and ending in late July or early August. The in-stream construction window was conservatively calculated to encompass about 35 percent of the total run and therefore 35 percent of the escapement each year. Adult abundance estimates are derived by estimating that of the combined annual run of 50-150 adult fish, 35 percent (53 fish) would make it to or through the construction zone during each of the two construction windows. Juvenile outmigration has ranged from 16,000 to 120,000 per year over the past several years. Peak outmigration is between December and February, but continues throughout the summer months of June through August.

Table 6. Annual emigration estimates for spring Chinook salmon and steelhead/rainbow trout in Battle Creek.

Brood Year	Spring Chinook	Steelhead-Trout
2001	19,010	
2002	15,598	23,568
2003	120,152	9,398
2004	34,128	3,240
2005		7,464
Average	**47,222 (May-Aug 1,000)**	**10,918 (May-Aug 3,075)**

Source: USFWS, Red Bluff Fish and Wildlife Office, unpublished data.

From 2002 through 2005, an average of 10,918 juvenile steelhead-trout emigrated annually from Battle Creek (Table 5). An average of 3,075 natural juveniles is expected to utilize the action area during each construction window (total of 6,150 juveniles over two construction windows). The most recent monitoring data indicate that, on average, approximately 67 natural adult steelhead could be present at the project site during the in-stream construction window per year (total of 134 adult steelhead over two construction windows). Juvenile abundance estimates are based on direct rotary screw trap monitoring. NMFS anticipates that a total of 106 Central Valley spring-run adults and 2,000 spring-run juveniles could be exposed and taken at the Battle Creek project site over a 2-year period, based on 35 percent of the total adult run average of 100 spring-run returning to Battle Creek and the average number of 1000 outmigrating spring-run juveniles, during the May 1 to September 1 in-stream construction period. Likewise, NMFS anticipates that a total of 134 Central Valley steelhead adults and 6,150 steelhead juveniles could be exposed and taken at the Battle Creek project site over a 2-year period, based on the annual averages of 67 adults and 3,075 juveniles monitored in the project site area during the May 1 to September 1 in-stream construction period. The incidental take is expected to be in the form of increased stress levels, migration delays, displacement from preferred habitat, capture by seine or electroshocking, handling, transport, and associated monitoring. The actual occurrence of incidental take of listed species will likely be a small percent of these maximum numbers since best management practice and mitigation measures are integral components of the project plan, and the design of the construction features themselves greatly reduce the chances of adverse effects. Measures incorporated into the project will significantly reduce the likelihood, magnitude, and duration of any event that could result in incidental take of ESA-listed species. NMFS anticipates lethal take of 2 adult and 20 juvenile (< 150 mm FL) Central Valley spring-run Chinook salmon and 4 adult and 29 juveniles (< 250 mm FL) Central Valley steelhead per year in each of the construction seasons in 2008, and 2009, based on observed rates of lethal take during electroshocking (McMichael *et al.* 1998). Incidental take coverage will extend through the 2009 in-stream work season or until the completion of Phase 1.

Anticipated incidental take may be exceeded if project activities exceed the criteria described above or if the project is not implemented as described in the ASIP for the project, including the full implementation of the proposed conservation measures listed in the *Description of the Proposed Action* section.

B. Effect of the Take

In the accompanying biological opinion, NMFS determined that the level of anticipated take for the proposed project is not likely to result in jeopardy to the species or the destruction or adverse modification of critical habitat.

C. Reasonable and Prudent Measures.

Pursuant to section 7(b)(4) of the ESA, the following reasonable and prudent measures are necessary and appropriate to minimize take of Central Valley spring-run Chinook salmon and Central Valley steelhead:

1. **NMFS believes that measures which are necessary and appropriate to minimize take of Sacramento River winter-run Chinook salmon, Central Valley spring-run Chinook salmon, and Central Valley steelhead, during Phase 1 of the project have been incorporated into the project design. Therefore, the only Phase 1 requirement will be for thorough monitoring and reporting to NMFS on the efficacy of the proposed conservation measures and any documented take that results from Phase 1 of the project.**

2. **In order to further align management of the Coleman NFH water delivery system with the goals of the Battle Creek Restoration Project, and minimize take occurring at the unscreened Intake 2, USFWS, in cooperation with Reclamation, should take steps to ensure the timely completion of Phase 2 of the proposed project.**

D. Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the Act, the USFWS, in cooperation with Reclamation, must comply with the following terms and conditions, which implement the reasonable and prudent measures described above and outline required reporting/monitoring requirements. These terms and conditions are non-discretionary.

1. **NMFS believes that measures which are necessary and appropriate to minimize take of Sacramento River winter-run Chinook salmon, Central Valley spring-run Chinook salmon, and Central Valley steelhead, have been incorporated into Phase 1 of the project. Therefore, the only requirement will be for thorough monitoring and reporting to NMFS on the efficacy of the proposed conservation measures and any documented take that results from Phase 1 of the project.**

a. The U.S. Fish and Wildlife Service, in cooperation with Reclamation, shall closely monitor all construction activities and report any incidences of take of listed salmonids within 48 hours to NMFS at the contact information below.

b. The U.S. Fish and Wildlife Service, in cooperation with Reclamation, shall provide annual reports to NMFS' Sacramento Area Office (see contact information below) within six months of the close of each instream construction season (*i.e.*, approximately February 1, following an September 1 close of construction). These reports shall include: a summary of total numbers of listed salmonids encountered, captured, or killed during construction and rescue operations; progress on construction elements and updated timelines for project completion; and efficacy of the conservation measures and descriptions of any unforeseen problems or incidents that may have affected listed salmonids.

c. The U.S. Fish and Wildlife Service, in cooperation with Reclamation, for the purposes of agency review and approval shall provide to NMFS at least 14 days prior to implementation, the finalized project plans describing the following:

- the final design specifications and installation process for the Intake 3 screen design;
- the final stream crossing design;
- the source location of gravel and extraction methodology, if the area is within Battle Creek watershed;
- dredging activities; and,
- the final area of deposition of project spoils.

d. The U.S. Fish and Wildlife Service, in cooperation with Reclamation, for the purposes of agency review and comment, shall provide to NMFS at least 30 days prior to implementation the finalized project plans describing the following:

- Construction Schedule and Sequence; and,
- Final Screen Design for Intake 3.

e. The U.S. Fish and Wildlife Service, in cooperation with Reclamation, shall provide the following documents to NMFS' Sacramento Area Office upon their availability:

- the U.S. Army Corps of Engineers section 404 permit for the project
- the final design specifications on the new Intake 1 and the Intake 3 screen design

Updates and reports required by these terms and conditions shall be submitted to:

Office Supervisor
NMFS
Sacramento Area Office
650 Capitol Mall, Suite 8-300
Sacramento, CA 95814

Phone (916) 930-3600
Fax (916) 930-3629

2. **In order to align management of the Coleman NFH water delivery system with the goals of the Battle Creek Restoration Project, and minimize take occurring at the unscreened Intake 2, the U.S. Fish and Wildlife Service, in cooperation with Reclamation, should take steps to ensure the timely completion of Phase 2 of the proposed project.**

a. The U.S. Fish and Wildlife Service, in cooperation with Reclamation, shall provide written updates to NMFS every six months, on the status of funding and screen design for Phase 2 of the proposed project, and continue to collaborate with NMFS to facilitate completion of the proposed project.

X. CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

NMFS believes the following conservation recommendations are consistent with these obligations, and therefore should be implemented by USFWS and Reclamation.

a. In order to minimize take occurring at the unscreened Intake 2, the U.S. Fish and Wildlife Service, in cooperation with Reclamation, should expeditiously pursue funding and implementation of Phase 2 of the proposed project (screening of Intake 2). Implementation of Phase 2 should begin no later than 3 years from the issuance of this biological opinion, and be completed within 5 years of the issuance of this biological opinion

b. To minimize risk from construction activities within the project action area, it is recommended that upon entering Battle Creek, all heavy machinery proceed slowly and carefully to allow wildlife (*e.g.*, juvenile salmonids) sufficient time to escape in advance of machinery and advancing soil.

In order for NMFS to be kept informed of actions avoiding or minimizing adverse effects or benefitting listed species or their habitats, NMFS requests notification of implementation of the conservation recommendation.

XI. REINITIATION OF CONSULTATION

This concludes formal consultation on the action(s) outlined in the March 12, 2004 request for consultation received from the USFWS. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: 1) the amount or extent of incidental take is exceeded, 2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this Opinion, 3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this Opinion, or 4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, formal consultation shall be reinitiated immediately.

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