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

AUG 21 2012

In reply refer to:
2011/01511

Michael R. Finnegan, Area Manager
U.S. Department of the Interior
Bureau of Reclamation, Mid-Pacific Region
7794 Folsom Dam Road
Folsom, California 95630-1799

Dear Mr. Finnegan:

This document transmits NOAA's National Marine Fisheries Service's (NMFS) biological opinion based on our review of the proposed Nimbus Fish Hatchery Fish Passage Project located in the lower American River downstream of Nimbus Dam at river mile 23, in Sacramento County, California, and its effects on the threatened California Central Valley (CCV) steelhead (*Oncorhynchus mykiss*) distinct population segment and designated critical habitat, in accordance with section 7 of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531 *et seq.*; Enclosure 1).

This biological opinion is based on information provided in the March 2011 Biological Assessment and essential fish habitat (EFH) assessment for the proposed project; several meetings and telephone conversations between NMFS staff and representatives of the Bureau of Reclamation (Reclamation), California Department of Fish and Game, and Nimbus Fish Hatchery, and other sources of information including site visits. A complete administrative record of this consultation is on file at the NMFS Central Valley Area Office.

Based on the best available scientific and commercial information, the final biological opinion concludes that the Nimbus Fish Hatchery Fish Passage Project-Phases I and II are not likely to jeopardize the continued existence of CCV steelhead or adversely modify designated critical habitat. Because detailed information on Phase III cannot be developed until after the completion of Phase II, Phase III documentation is inadequate to assess the effects of the weir removal at this time. So, only incidental observations about Phase III and no effects analysis of Phase III will be included in this biological opinion. Reclamation will have to submit a complete biological assessment for Phase III (Nimbus Fish Weir Decommissioning) when all the design criteria are known. NMFS 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 proposed project.

Also enclosed are EFH conservation recommendations for Pacific salmon (*Oncorhynchus spp.*) 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 Nimbus Fish Hatchery Fish Passage Project will temporarily adversely affect EFH for Pacific salmon in the action area and adopts certain ESA reasonable and prudent measures and associated terms and conditions from the final biological opinion as the EFH conservation recommendations.

Section 305(b)4(B) of the MSA requires Reclamation to provide NMFS with a detailed written response within 30 days, and 10 days in advance of any action, to the EFH conservation recommendations, including a description of measures adopted by Reclamation 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, Reclamation 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 Gary Sprague by telephone at (916) 930-3615 or by e-mail at gary.sprague@noaa.gov.

Sincerely,

For

Rodney R. McInnis
Regional Administrator

Enclosures (2)

cc: Copy to file: ARN:151422SWR2011SA00188
PRD, Long Beach, CA

Enclosure 1

BIOLOGICAL OPINION

ACTION AGENCY: Bureau of Reclamation

ACTIVITY: Nimbus Fish Hatchery Fish Passage Project

CONSULTATION CONDUCTED BY: Southwest Region, National Marine Fisheries Service

DATE ISSUED: **August 21, 2012**

I. CONSULTATION HISTORY

In 1997, the U.S. Bureau of Reclamation (Reclamation) consulted with NOAA's National Marine Fisheries Service (NMFS) on the potential impacts of repairing the Nimbus Fish Hatchery fish diversion weir and associated American River flow reductions on federally protected fish. NMFS issued its biological opinion (NMFS 1999) to Reclamation, which included a term and condition to develop a long-term solution to minimize flow fluctuations associated with the installation and removal of the Nimbus Fish Hatchery fish diversion weir racks and pickets. Reclamation responded with a design for a permanent in-place weir structure that would not require seasonal installation; however it was ultimately rejected based on the complexity of the design, the projected construction costs to build it, and the lack of a passageway to accommodate migrating salmonids.

In 2003, an alternative new weir design was completed which included an extended flume and fish ladder passageway from the hatchery to the base of Nimbus Dam; and Reclamation began work to develop an Environmental Assessment for the project.

In 1999, and again in 2006, NMFS requested that the weir design be modified to accommodate California Central Valley (CCV) steelhead (*Oncorhynchus mykiss*) passage upstream of Nimbus Fish Hatchery. Reclamation then requested that the California Department of Water Resources (DWR) Fish Passage Improvement Program provide review and comment on Reclamation's replacement weir design. DWR suggested extending the fish ladder to the stilling basin downstream of Nimbus Dam and using the dam as the diversion weir to direct Chinook salmon (*O. tshawytscha*) into the ladder. In December 2001, Reclamation held two public meetings in Rancho Cordova, California, to document questions from the community, to identify issues and concerns, and to solicit suggestions on the weir replacement.

In 2006, Reclamation convened a Project Alternatives Solutions Study (PASS) workshop to assist in refining alternatives. PASS participants included representatives from the California

Department of Parks and Recreation, California Department of Fish and Game (CDFG), DWR and NMFS. The PASS workshop proposed an action alternative and a no action alternative for the development of a draft environmental assessment on the Nimbus Fish Hatchery Fish Passage Project. Reclamation prepared a draft environmental assessment in 2007, and Reclamation and CDFG prepared a draft Environmental Impact Report/Environmental Impact Statement (EIR/EIS) (Reclamation and CDFG 2011).

In August of 2008, Reclamation provided NMFS with the document, *Nimbus Fish Hatchery Weir Replacement Project Geologic Investigation*, which included physical geologic specifications for the construction of a Nimbus Fish Hatchery fish ladder extension.

On October 28, 2009, Reclamation and CDFG met with NMFS to describe the proposed project alternatives, and discuss further potential issues and recommendations to address in the preparation of the final biological assessment for the Nimbus Fish Hatchery Fish Passage Project.

On August 16, 2010, Reclamation provided NMFS with the document, *Summary of Hydraulic Studies for Ladder and Flume Fish passageway Design-Nimbus Fish Hatchery Fish Passage, HL-2010-04* (http://www.usbr.gov/pmts/hydraulicsJab/pubs/HLIHL-201 0-04.pdf) (Reclamation 2010). The report contains alternative in-river designs and final design of the flume, ladder, and rock weir entrance channel for the Nimbus Fish Hatchery. Reclamation and CDFG began preparing a draft EIR/EIS, and met with NMFS on December 1, 2010, and January 31, 2011, for input on the document (Reclamation and CDFG 2011a).

On April 5, 2011, Reclamation requested formal consultation by letter to NMFS, on the proposed Nimbus Fish Hatchery Fish Passage Project, and provided a consultation package which included the document, *Biological Assessment and Essential Fish Habitat Assessment, March 2011*.

On August 11, 2011, Reclamation and CDFG released the final environmental impact report/environmental impact statement (EIR/EIS) for the Nimbus Fish Hatchery Fish Passage Project (http://www.usbr.gov/mp/nepa/nepa_projdetails.cfm?Project_ID=5216). The final EIR/EIS included responses to comments received during the September 30 through November 30, 2010, public comment period on the draft EIR/EIS.

II. DESCRIPTION OF THE PROPOSED ACTION

Reclamation proposes to replace the existing fish diversion weir downstream of Nimbus Fish Hatchery with a new flume and fish ladder design. The present diversion weir will be permanently removed and a new fish passageway will be constructed. The entrance to the fish passageway will be located in the Nimbus Dam stilling basin, commonly referred to as "Nimbus Shoals." The new fish passageway will tie in to the existing fish ladder near Nimbus Fish Hatchery, and Nimbus Dam will serve as the upstream barrier to fish migration.

The proposed project area is on the lower American River between river miles 22 and 23, and consists of 74 acres in Rancho Cordova, California, from Nimbus Dam downstream along the

lower American River to 500 feet downstream of the U.S. Geological Survey (USGS) gaging station cable (Figure 1). The proposed project area includes the lower American River, the north and south banks of the river, the hatchery complex and adjacent parking lot, and the Nimbus Shoals area. The hatchery and weir are 0.25 miles downstream of Nimbus Dam, with the hatchery on the south bank of the American River.

Figure 1. Proposed project area

A. Fish Passageway Project Design

The upper portion of the fish passageway will consist of a low-gradient concrete flume fish passageway that will begin at the top of the fish ladder and will extend along the south bank of the American River beneath the Hazel Avenue Bridge to a point just downstream from the access road to Nimbus Shoals (Figure 2).

A pool and weir fish ladder section will extend from the end of the flume section to a point along the edge of Nimbus Shoals. This will be followed by a rock-lined trapezoidal channel that will extend from the bottom of the ladder section to the edge of the Nimbus Dam stilling basin.

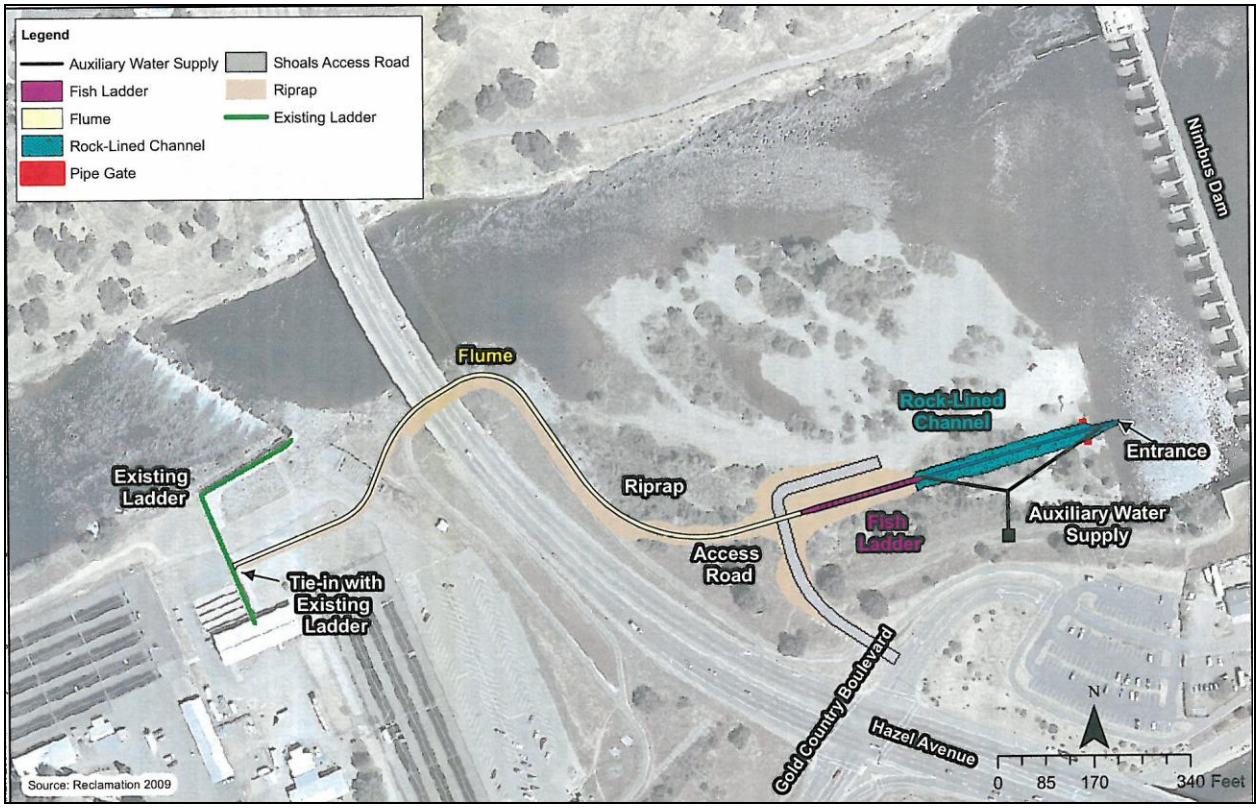


Figure 2. Proposed project overview

1. <u>Flume and Ladder Sections</u>

The flume section (Figure 3) will extend for 700 feet at a gradient of 0.028 percent and at a width of 6 feet. The gradient will be increased to 0.5 percent in the remaining 606 feet of the flume. The flume section will have slots to install stoplogs (beams or boards that assist with hydraulic adjustments) every 100 feet and will have the capability to add additional supports and weirs as needed. The velocity through the flume is expected to be one foot per second (fps). The invert elevation (the floor or bottom of the internal cross section of a conduit) will be 98.0 feet at its upladder end where the flume section connects to the fish ladder, and 95.45 feet at the bottom end where it will transition into the new fish ladder section.

The ladder section (Figure 3) will have an invert elevation of 80 feet at the downstream end and will be positioned to start near the access road (Figure 4) into the stilling basin. The gradient within the ladder section will be 8.3 percent. The top of the concrete ladder walls at the downstream end of the ladder will be at an elevation of 88.6 feet. A bridge to maintain access to Nimbus Shoals will be constructed over the top of the fish passageway at the transition between the flume and ladder sections.

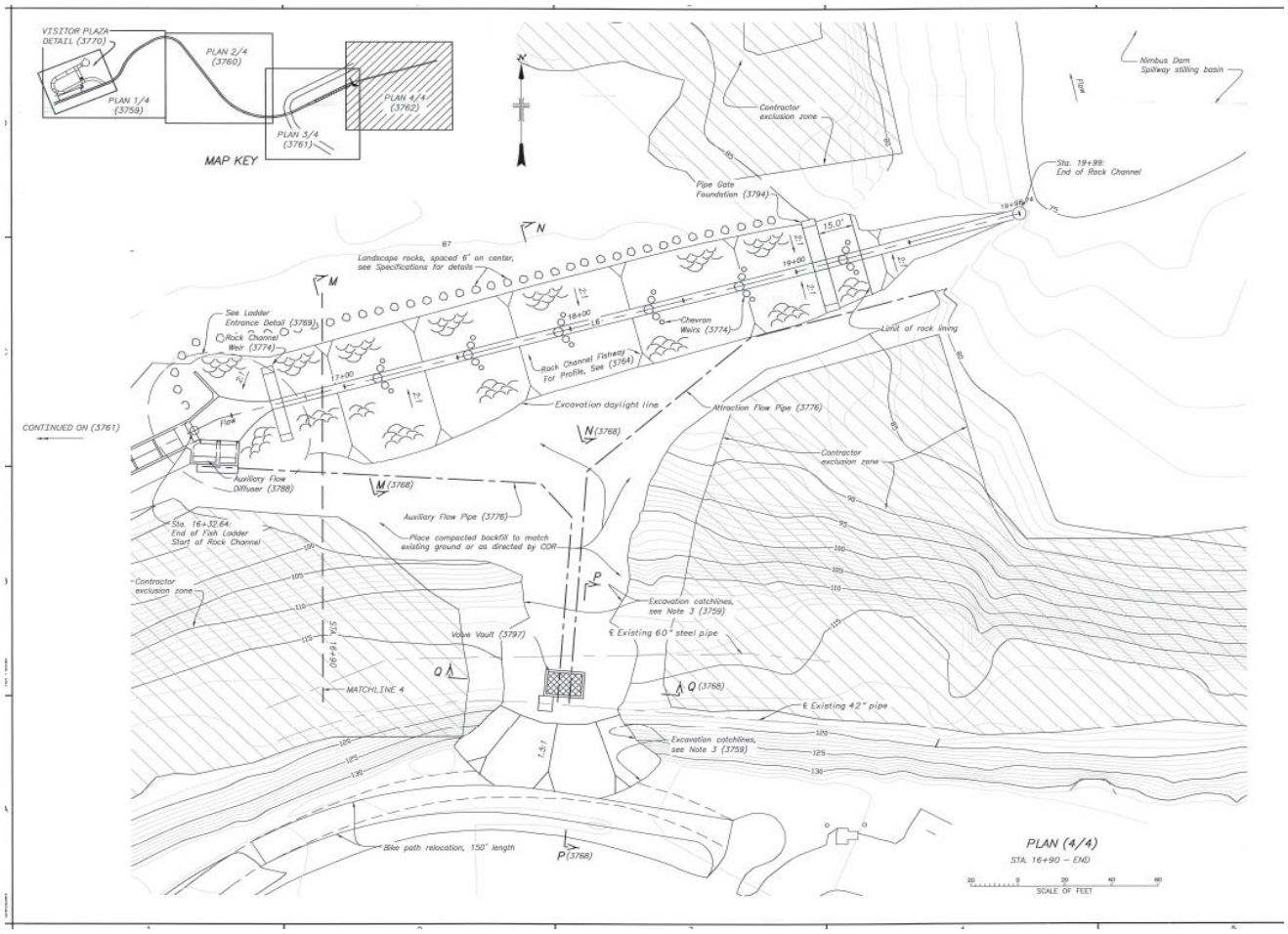


Figure 3. Ladder and flume design of the proposed Nimbus Fish Hatchery Fish Passage Project

The ladder will be under submergence once the flow depth over the Nimbus Shoals exceeds an elevation of 88.6 feet mean sea level (msl). Based on the flow versus elevation relationship for the power plant tailrace (downstream outfall), an elevation of 88.6 feet will occur at a discharge of 15,000 cubic feet per second (cfs).

2. <u>Transition from the Rock Channel to the Ladder</u>

The major portion of auxiliary flow will be input at the transition between the ladder and the rock channel, through a diffuser with a target velocity of one fps or less through concrete walls. Keeping the velocity at or below one fps will prevent false attraction that could delay fishes' upladder migration. A pipe gate similar to the one on the existing facility will be placed at the end of the ladder to control the number of fish entering the facility.

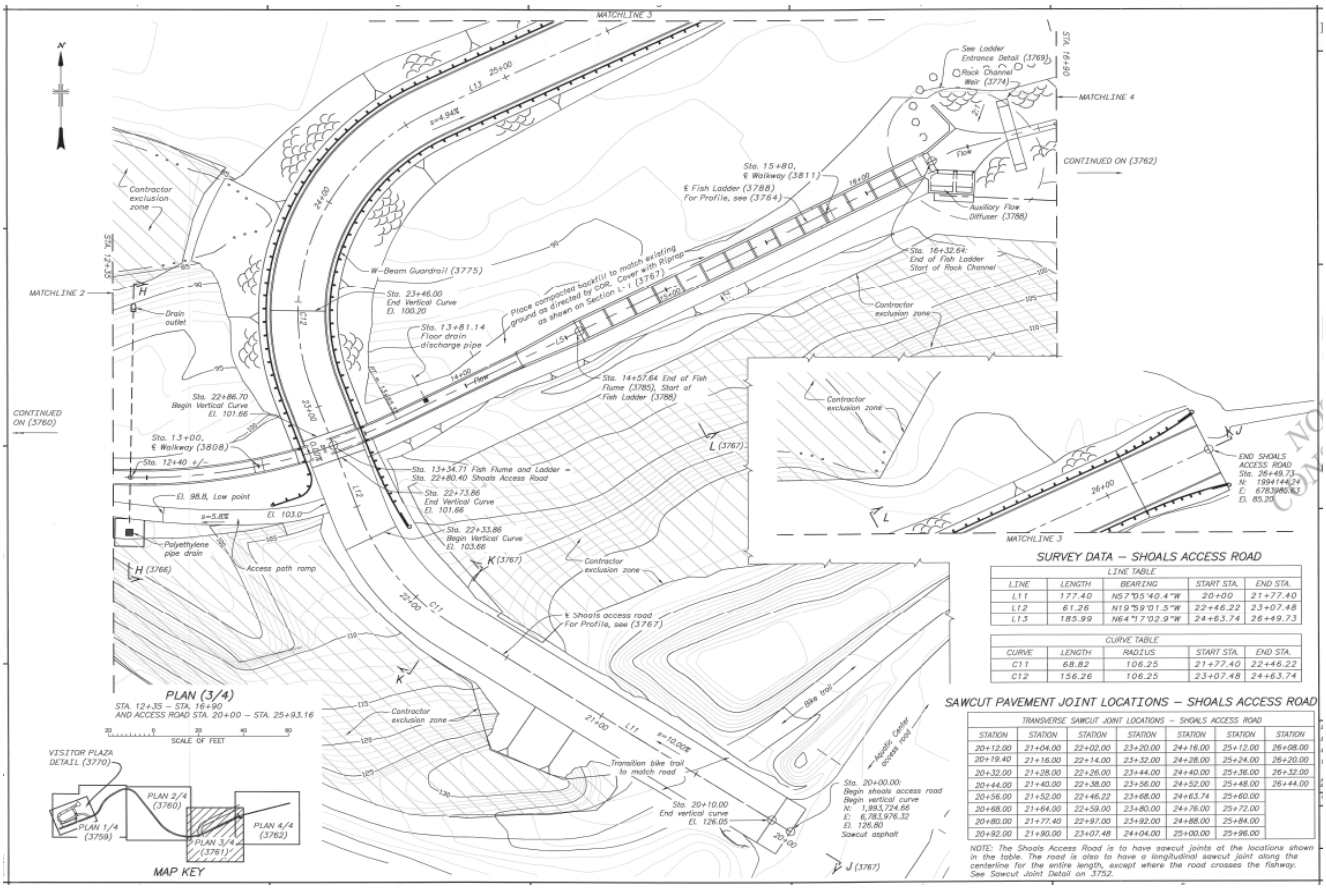


Figure 4. Access road design for the proposed Nimbus Fish Hatchery Fish Passage Project

3. <u>Rock Channel</u>

The non-grouted rock channel will be a trapezoid, with a bottom width of 4 feet and 2 to 1 side slopes, a fairly mild slope of about 1.3 percent over about 400 feet. The drop will be about 4 feet from an elevation of 80 feet msl at the entrance to the ladder, down to an elevation of 76 feet msl where it will enter the stilling basin at the toe of Nimbus Dam. The velocities in the channel will range between one and two fps.

The water level in the channel will be controlled by a series of six chevron-shaped gradient control structures made of rocks or cylinders that will be imbedded in the channel to form small drops and pools. The depth in the rock channel will range between two and three feet but will be maximized as much as possible, given the flow and geometry constraints.

A pipe gate similar to the one proposed for the downstream end of the ladder was considered in the design for the entrance to the rock channel to restrict the number of fish entering the rock channel at one time. A foundation capable of supporting an entrance gate will be installed during construction, and evaluations during the performance monitoring period will determine if a control structure and gate are necessary.

Flow simulations with the new fish passageway design included have also been performed on the river between Nimbus Dam and the Nimbus Shoals area (Robinson 2010). It was found that an area of high contours 500 feet downstream of the dam will control the upstream water surface elevations and produce a riffle at low flows. Most of the rock channel will be at or below the elevation of the river and surrounding topography; therefore, the water will be in the rock channel most of the year, even when the fish ladder is not operational. The lowest river flow assumed in the design of the rock channel entrance invert was 250 cfs, based on current operational requirements. The invert of the rock channel entrance is designed to provide a minimum of three to four feet of depth at the entrance to the fish passageway when the river is at its lowest flow rate. The rock channel invert will be set at an elevation of 76 feet msl. The rock channel and shoals will submerge at random, and the submergence will be controlled by the topography. The watered area in the rock channel will be 0.177 acre when the fish passageway is in operation and 0.04 acre when it is not operating.

4. Auxiliary Flow

The auxiliary flow system will introduce water at both the bottom of the ladder section and at the entrance to the fish passageway. Most of the available auxiliary water will be introduced at the top of the rock channel to produce adequate flow velocity and depth through the rock channel. The remainder of the auxiliary flow will be added to the Nimbus Dam tailrace at the fish passageway entrance, providing a small amount of flow to assist with attraction. The auxiliary flow system will utilize a previously installed 42-inch pipeline to divert up to 40 cfs from Lake Natoma (Nimbus Dam reservoir pool, Folsom Dam afterbay) for fish attraction flows. A new buried 30-inch pipeline will connect the 42-inch pipeline to the lower portion of the fish ladder. The diverted water will then reenter the lower American River at the fish passageway entrance in the Nimbus stilling basin. There will be no change in downstream flows.

5. Viewing Plaza

A viewing plaza will be constructed on the north side of the fish passageway near the top of the flume section, where fish enter the hatchery. The viewing plaza will be 100 feet long by 30 feet wide and will provide a public viewing area of the fish passageway. It will be connected to an existing walkway that leads from the parking lot three-quarters of the way to the lower American River in the vicinity of the existing weir. Construction of the viewing plaza and modification of the walkway will be contingent on the availability of funds.

B. Design Flow Criteria

The fish passageway design flows range from 500 to 5,000 cfs, based on American River flow data recorded at the USGS Fair Oaks gage downstream from Nimbus Fish Hatchery (Figure 5). A conventional concrete fish ladder with a 12 to 1 slope, 9-foot-wide with 4-foot-high stoplog weirs without orifices, will be located at the end of the flume.

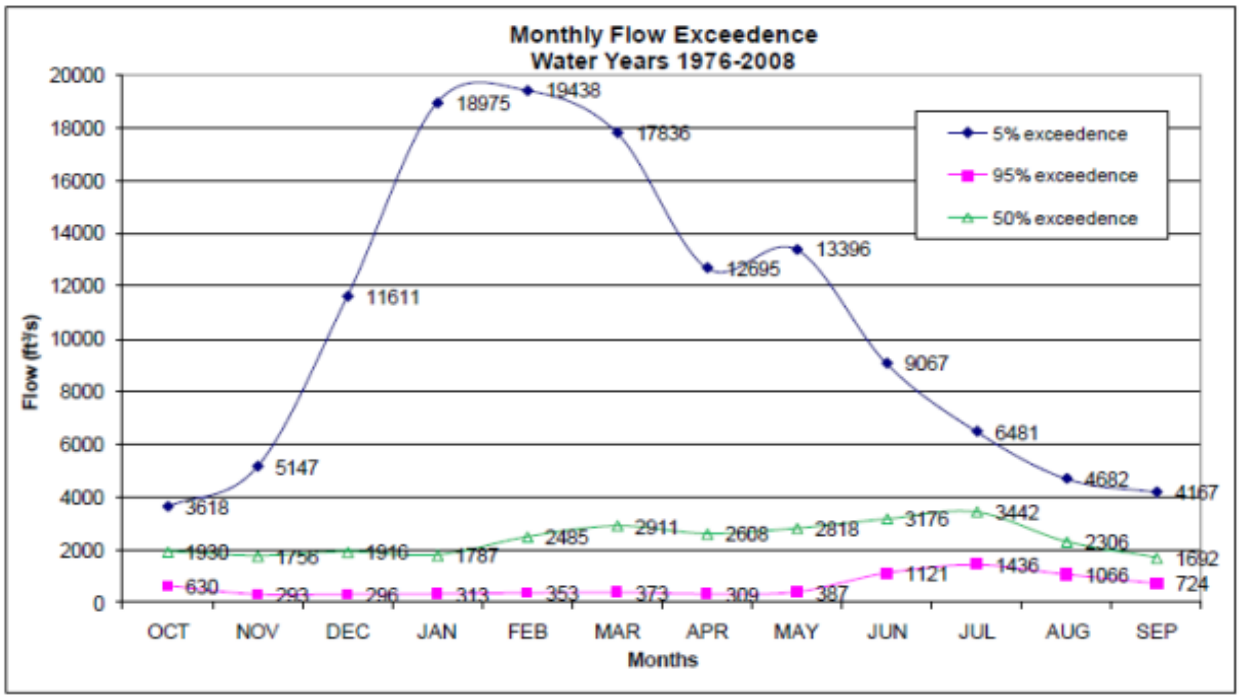


Figure 5. Monthly flow exceedence recorded at USGS Fair Oaks gage, 1976 to 2008

The ladder entrance is at elevation (EL) 80.0 feet with the top of the walls at the entrance at EL 88.6 feet. A 24-inch by 28-inch pipe gate will be located at the ladder entrance to regulate the number of fish into the hatchery. The proposed project will expand the capability of the facility to get fish to the hatchery under higher flows (Table 1), given that the fish passageway becomes non-functional once the concrete weir and pool ladder walls submerge when the water level exceeds EL 88.6 feet. The average discharge of the lower American River is 3,750 cfs, but it has varied from 730 to 7,900 cfs (Williams 2001).

C. Interrelated Actions

All the lands associated with Nimbus Fish Hatchery are owned by Reclamation and managed by the CDFG under a long-term contract. CDFG is responsible for managing public access, security and safety for the property including the maintenance of fencing, gates, security personnel and trash removal. Land not currently under CDFG management jurisdiction will become an integral part of the hatchery operations, but authorities and responsibilities for maintenance of the flume will be negotiated between Reclamation and CDFG. The following interrelated actions are being considered by Reclamation and CDFG under their respective management authorities, due to CCV steelhead ESA implications once the new project design is completed.

Table 1. Design flow values for the fish passageway based upon monthly flows			
	Discharge (cfs)		
Flow Exceedences	Chinook season*	Steelhead season**	Design values
Highest monthly 5%	11,611	19,438	20,000
Highest monthly 50%	1,930	2,911	1,930
Lowest monthly 95%	293	309	250***

*The months of September, November and December were used in the computation of exceedence for the adult fall-run Chinook salmon migration and spawning season.
**The months of January through April were used in the computation of exceedences for the adult steelhead migration and spawning season.
***A minimum stream flow requirement of 250 cubic-feet was used for the 95 percent exceedence, a conservatively low water surface elevation at the fish passageway entrance.
Ref.: Reclamation 2011a

Nimbus Shoals is owned by Reclamation and managed by the California Department of Parks and Recreation (Parks) under agreement of disputed length and conditions. This agreement is part of a larger management agreement between Reclamation and Parks to manage the Folsom Lake State Recreation Area. Nimbus Shoals is popular with fishermen because salmon and steelhead congregate in the Nimbus Dam stilling basin. The boating community has also expressed an interest in launching watercraft from Nimbus Shoals if the hatchery weir is removed. Reclamation has anticipated the controversy associated with any change in public access as well as the additional public safety hazards associated with the new flume. The management of public use and safety issues is being reviewed in an updated *Folsom Lake State Recreation Area General Plan/Resources Management Plan*. Associated issues of public use on Nimbus Shoals are the restriction of fishing access to the entrance of the flume and along its course, which are under the jurisdiction of the CDFG. The costs of enclosing the flume and increased law enforcement are anticipated but have not been estimated in the PASS process.

1. Public Access

Currently, the public has full access to Nimbus Shoals from 6:00 in the morning to 9:00 in the evening during the summer and from 7:00 in the morning to 7:00 in the evening during the winter. Reclamation has identified three alternative visitor management options for Nimbus Shoals: (1) public vehicle access with defined parking, (2) walk-in only access (no public vehicle access), and (3) no public access. Public vehicle access with defined parking is Reclamation's preferred visitor management option. Currently, the public may access Nimbus Shoals by foot and by bike on both sides of the river or by driving right to the river's edge (or by boat in the river from the south).

2. Fishing Regulations

With the implementation of the proposed project, there will be no barrier to salmon and steelhead access into Nimbus Shoals, and the project potentially creates the opportunity to increase angling

pressure in the reach between Nimbus Dam and Nimbus Fish Hatchery. The lower American River is open year-round to steelhead and rainbow trout (*O. mykiss*) fishing, from Nimbus Dam to the Hazel Avenue Bridge, in accordance with title 14 California Code of Regulations (CCR), section 7.50(b)(5)(A). The river is open to all fishing from January 1 to September 14 from the Hazel Avenue Bridge to the USGS gaging station cable crossing 900 feet downstream of the diversion weir. From the USGS gaging station cable to the Sacramento Municipal Utility District (SMUD) power line crossing at the southwest boundary of Ancil Hoffman Park river mile (RM) 15, the river is open to fishing from January 1 to October 31. The American River is open all year long to fishing from the Sacramento Municipal District (SMUD) power line crossing at the southwest boundary of Ancil Hoffman Park downstream to the confluence with the Sacramento River (CDFG 2010a).

CDFG fishing regulation Title 14 CCR 2.35 states that no fish may be taken within 250 feet of a fish passageway, egg-taking station, dam, or weir or any rack that has a fish passageway or egg-taking station. In consideration of the north bank public access to the river and public accessibility of steelhead spawning and rearing habitat the new project will create in the Nimbus Shoals area, CDFG intends to recommend to the California Fish and Game Commission a year-round closure of fishing in the area that extends from Nimbus Dam to the USGS gaging station cable crossing. This closure will be in addition to the existing seasonal closure from the Hazel Avenue Bridge to the USGS gaging station cable crossing, in accordance with Title 14 CCR, 750(b)(5)(B).

3. Project Alignment with the Central Valley Recovery Plan

The conceptual recovery scenario for the CCV steelhead distinct population segment (DPS) includes an in-DPS steelhead stock reintroduction into the north, middle and south forks of the American River upstream of Folsom Dam and the maintenance of a steelhead spawning population in the reach extending from Nimbus Dam to Watt Avenue (CV Recovery Plan, unpublished working draft, 2012). The new fish passageway design will allow full access to the upper reach of the American River for naturally spawning steelhead. Nimbus Shoals is being augmented with gravel to increase spawning habitat for the American River steelhead population, and a greater presence of steelhead is expected to utilize Nimbus Shoals with the new fish passageway improvement. The passageway incorporates a natural component into its design (*i.e.,* rock channel) which is compatible with the freshwater physical constituent elements (PCEs) for steelhead habitat. The new project will also allow for flexibility in resource management and align with steelhead recovery scenarios such as the investigation of feasibility of fish passage upstream of Nimbus and Folsom dams.

D. Project Activities

1. Construction Schedule

Implementation would take place in three phases. First, the new fish passageway would be constructed. No reductions in flows or modifications of Central Valley Project operations are required to construct the fish passageway. Next, the new fish passageway would be operated and evaluated for a couple of spawning seasons to support the operational integration of the new fish

passageway before decommissioning the portions of the existing facilities that are no longer needed. Finally, after satisfactory performance of the new passageway is demonstrated, the weir would be removed and any modifications to the new fish passageway would be made. All in-river work would be limited to June through September to protect adult salmon and steelhead and to avoid high flood releases. Appropriate water temperature is important to the species that inhabit the lower American River. All construction would be conducted in accordance with the Annual Operations Forecast and Temperature Management Plan, in accordance with the biological opinion and conference opinion on long-term operations of the Central Valley Project and State Water Project (NMFS 2009) to ensure that water temperature is not negatively affected. This section 7 consultation will be primarily for Phases I and II as not all engineering information is known for Phase III at this time. Because the development of Phase III is dependent upon information that will be collected after the completion of Phase II and the success of Phase II, Phase III will be consulted under a separate action.

a. Phase I: Construction and evaluation of the new fish passageway

Construction of the fish passageway will be conducted in the first 10 to 12 months of the proposed project. Equipment will be staged in two areas. The concrete flume fish passageway will be constructed in a 65-foot corridor, except under the Hazel Avenue Bridge, where it would be more restricted. Reclamation will utilize the 19-acre site between CDFG offices and Gold County Boulevard as the staging site for the project. The main staging area will occupy 1.1 acres of the Nimbus Fish Hatchery parking lot and will require temporarily closing 65 parking spaces for 8 months during the first year for constructing the fish passageway. An additional 0.2 acre staging area in the California State University Sacramento (CSUS) Aquatic Center parking lot will require temporarily closing 30 parking spaces, including 2 spaces for the disabled. The construction equipment will be limited in use to the construction footprint, access corridor, and areas specifically designated for machine maintenance and storage. Equipment will use an access road from the staging area to the ladder construction site. All natural woody riparian habitats will be avoided or preserved to the maximum extent practicable. Trees that must be cut will have their root systems intact to remain viable after construction or replaced in-kind. The staging area will be restored after project construction completion. The borrow area to acquire fill material will also be located within the staging site, and will be restored. Access to Nimbus Shoals by vehicle and foot traffic will be controlled or restricted as needed to ensure public safety during fish passageway construction.

A temporary, watertight cofferdam, built with large sand-filled bags will be used to dewater 0.2 acre (about 93 square feet) within the tailrace of Nimbus Dam for constructing the entrance to the fish channel. The materials used to build the cofferdam will be removed to an off-site storage or disposal area after construction.

Phase II: Operation and evaluation of the passageway

The new fish passageway will be operated and evaluated to support the operational integration of the new fish passageway before decommissioning the portions of the facilities that are no longer needed. The objectives of the evaluation will be to ensure: (1) that the new fish passageway meets the fish passage hydraulic design criteria; (2) that Chinook salmon and steelhead can

find, enter, and move through the new facility without blockage or undue delay, and (3) that overall performance is sufficient to allow the collection of the fish necessary to meet hatchery mitigation goals. Studies will be designed to evaluate the operational flexibilities of the fish passageway flow distribution and volume to maximize fish attraction and passage under various hydrologic conditions. Two years of evaluation of fish way hydraulics and fish movements will be needed to capture a range of different hydrologic conditions. The extent of studies needed will be driven by the response of fish to the new passageway. Only non-listed hatchery-origin fish will be used to conduct any studies of fish movements.

The existing fish ladder and weir foundation will remain in place until the new fish passageway is demonstrated to function properly; the existing fish ladder and weir structure will not be in operation during this time.

b. Phase III: Removal of the hatchery weir and foundation

Upon the new fish passageway demonstrating satisfactory performance to Reclamation in meeting operational criteria over one or two seasons of evaluation, the weir will be removed to a fixed elevation and any modifications will be made to the new fish passageway in year three or four of the project. The 1.1-acre staging area in the hatchery parking lot will be closed from May through September during weir removal. The abandoned portion of the fish ladder will likely be left in place after the project is complete and either covered over or filled in with uncontaminated inert solid material (*e.g.*, top soil, clay, sand, gravel, rubble, brick, concrete rock, stone, and asphalt). The area affected by removal of the diversion weir structure will extend about 35 feet upstream and 35 feet downstream of the diversion weir and will total 0.5 acre.

River flows may be lowered for up to five days so that a bypass channel can be created. The bypass channel will likely be a notch excavated in the foundation between the right abutment and next closest pier. The notch will reduce the volume of water flowing over the weir to help access the structure and to control sediment during excavation. Once the bypass channel is created, river flows could return to normal for the remainder of the weir removal work. Construction will not conflict with temperature management recommendations for the lower American River (Water Forum 2005) and Reclamation will coordinate with the American River Group to ensure that water temperature and flows are not negatively impacted by project construction.

A design and conceptual process for removing the weir is not complete at this time, but is expected to include the shearing off and off-site disposal of the piers, removing all the sheet pile, wire, and rebar in the foundation and surrounding river bottom, and removing and redistributing the large angular rock and cobble in the foundation to the finished grade of the river. A second temporary construction road, not connected to the Nimbus Shoals road, will provide access from the staging area to the foundation of the weir. Heavy equipment will be driven along the access road and foundation within the river channel to access the northwest side of the river, where a notch in the foundation between the right abutment and next closest pier will be excavated. The notch will reduce the volume of water flowing over the weir to help access the structure and to control sediment during excavation. After the diversion weir is removed, the access road will be removed, riprap will be replaced along the bank, and the disturbed area landward of the riprap will be restored. Concrete and steel remnants of the diversion weir will be disposed of off-site.

Because removal of the weir is dependent on the success of Phase II, the procedure in this paragraph is still not fully engineered, but will be explained in the subsequent section 7 consultation for the Phase III weir removal.

Initial modeling has shown that the riffle immediately downstream of Nimbus Dam will be further exposed in the river under low flows. The final design criteria for removing the weir foundation will include enhancement of the streambed and salmon habitat by top-dressing the remaining angular rock foundation with spawning gravels.

NMFS' consultations will eventually analyze the effects of all phases of the proposed Nimbus Fish Hatchery Fish Passage Project. However, the current consultation is applicable only to Phases I and II of the proposed project; a comprehensive analysis on the effects of implementing Phase III will be conducted when Reclamation initiates section 7 consultation on a final project description on the removal of the Nimbus Fish Hatchery weir.

E. Phases I and II Construction Impacts

Passageway construction will involve dredging and dewatering activities, the disposal of fill onto wetlands, and the backfilling of dredged areas with cobble, resulting in temporary and permanent impacts to wetlands and other waters acreage within the project area (Table 2 and Figure 6).

Table 2. Acreage affected by the proposed Nimbus Fish Hatchery Fish Passage Project (Phases I &II)

	Area Temporarily Impacted	Area Permanently Impacted
Wetlands	0.02 acres / 871 square feet	0.012 acres / 507 square feet
Other Waters	0.77 acres / 33,541 square feet	0.038 acres / 1,655 square feet
Total	0.79 acres / 34,412 square feet	0.05 acres / 2,162 square feet

(Reference: Reclamation and CDFG 2011)

The fish passageway and construction zones have been sited to avoid wetlands as much as possible. A delineation of wetlands was conducted in September 2007 (North State Resources 2007), and found a total of 3.336 acres of waters of the U.S. delineated within the project area. This included three types of wetlands: fresh emergent (0.381 acre), riparian (0.193 acre), and seasonal (0.005 acre). Four "other waters" types were also delineated within the project area: ephemeral drainage (0.007 acre), intermittent stream (0.004 acre), perennial stream (2.434 acre), and open water (0.312 acre).

Additionally, excavation quantities will consist of 1,744 cubic yards for the flume and fish ladder sections, and 1,280 cubic yards for the rock-lined channel section. An estimated 500 cubic yards of concrete will be required to construct the flume and ladder sections, and the rock-lined channel will require 300 cubic yards of rock. A total of 7.1 acres (including access roads and staging areas) would be subject to disturbance at various times, although only a portion of this area would be affected at any one time.

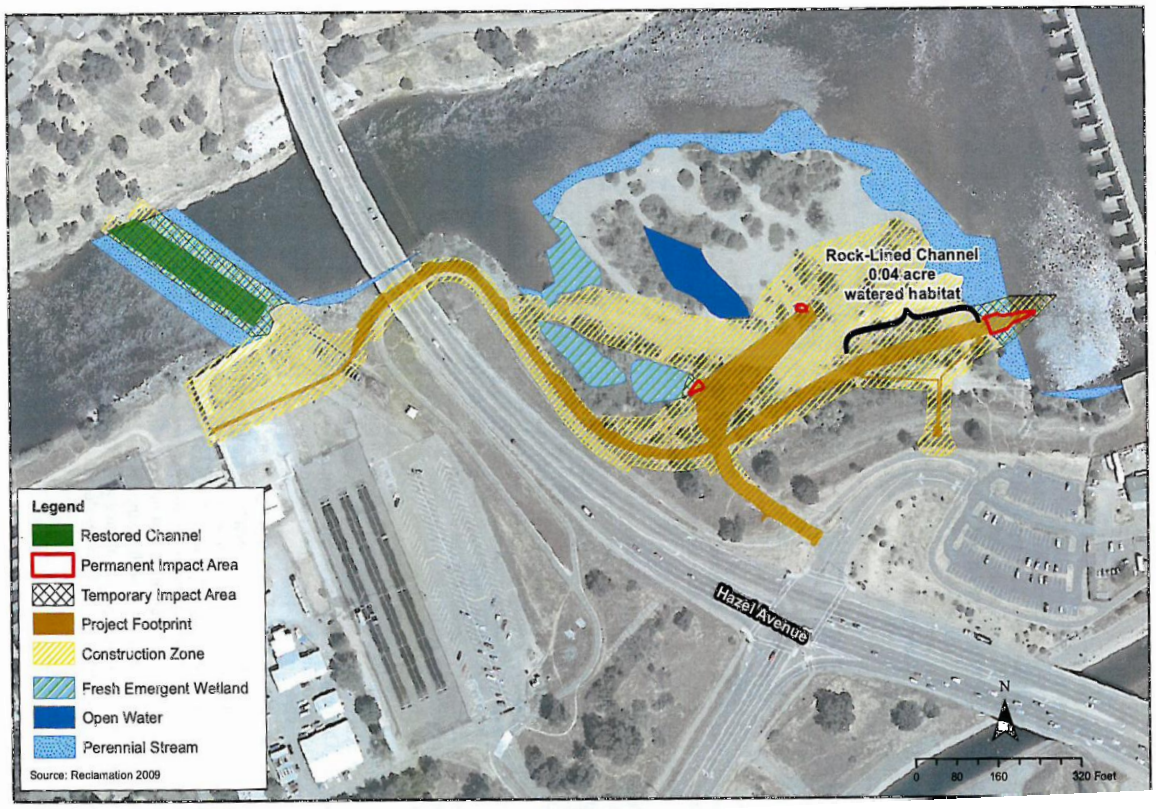


Figure 6. Wetlands and U.S. waters impacted by the proposed Nimbus Fish Hatchery Fish Passage project (Reference: Reclamation and CDFG 2011)

Another 0.04 to 0.05 acre of habitat will be created in the rock channel portion of the fish ladder. Only 2,162 square feet (0.05 acre) of wetlands and other waters will be permanently affected by the installation of the new fish passageway; impacts to 0.038 acre of other waters would consist of dredging and the placement of cobble to create the rock-lined ditch that is the entrance to the fish passageway, and impacts to 0.012 acre of wetlands would occur from reconstruction of the access road to Nimbus Shoals. The implementation of the proposed project is expected to increase salmonid habitat in the American River by 0.35 acre (0.4 acre restored or created, less 0.05 acre permanently impacted). Construction actions and impacts associated with the proposed Nimbus Fish Hatchery Fish Passage Project on waters of the United States (US), critical habitat (CH) and essential fish habitat (EFH) are summarized in Table 3.

The permanent effects by project construction activities to 0.05 acre of upland and aquatic area will be due to: (1) the placement of 250 cubic yards of fill into on-site designated wetlands; (2) the excavation of 294 cubic yards at the fish ladder entrance, and (3) the partial backfill with 45 cubic yards of clean washed cobble, including 6 cubic yards of material that will be placed above the existing grade. Overall, 0.22 acre of upland and aquatic areas will be temporarily affected by construction of the fish passageway and removal of the weir, and will be restored after completion of the proposed project.

Table 3. Summary of construction actions for Phases I and II and impacts associated with the proposed Nimbus Fish Hatchery Fish Passage Project				
Location	**Description of Action**	**Temporary impacts**	**Permanent impacts**	**Beneficial impacts**
Fish passageway entrance (portion that overlaps the lower American River)	Temporary dewatering of 0.2 acre would occur during construction. Permanent impacts would occur on 0.038 acre and result from the excavation of 294 cubic yards and the partial backfill of the area with 45 cubic yards of clean washed cobble, including six yards of material that would be placed above the existing grade.	0.2 acre	0.038 acre	None
Rock-lined channel	The rock-lined channel would be above the OHW mark on Nimbus Shoals. Excavation and fill would be required; however, this would not impact Waters of the US, CH, or EFH. Construction of the rock-lined channel would create 0.04 acre of new watered habitat when the fish passageway was not operating and 0.177 acre when it was operating, resulting in a net beneficial impact.	None below OHW mark	None below OHW mark	0.04 acre (when fish passageway is not operating; 0.177 acre when it is operating due to higher stilling basin elevation)
Flume and fish ladder	The flume and fish ladder would be above the OHW mark on Nimbus Shoals. Excavation and fill would be required; however, this would not impact Waters of the US, CH, or EFH.	None below OHW mark	None below OHW mark	None
Wetlands	Wetlands on Nimbus Shoals would be impacted. Temporary impacts on 0.02 acre and permanent impacts on 0.012 acre would occur from the placement of 250 cubic yards of fill necessary to reconstruct the Nimbus Shoals access road.	0.02	0.012	None
TOTAL		**0.22 acre**	**0.05 acre**	**0.04 to 0.177 acre**

Reclamation will develop a wetlands mitigation plan for the acreage of waters of the United States that will be permanently impacted by the construction of the proposed project. The mitigation plan will entail the replacement or restoration and enhancement of designated wetlands on a “no-net-loss” basis, in accordance with section 404 of the Clean Water Act regulations.

F. Proposed Avoidance and Minimization Measures

Reclamation has made multiple environmental commitments during the proposed project planning and design stages to reduce adverse effects. These measures are considered part of the proposed action. Reclamation has the primary responsibility to see that these commitments are met if the project is implemented. These environmental commitments will be integrated into the project to reduce its environmental impacts. The following environmental commitments related to biological resources and water quality will minimize impacts on the species, critical habitat, and EFH evaluated in this biological assessment.

1. Worker Environmental Training Program

Personnel will participate in and comply with a government-provided environmental training program for Federal, state, and local environmental laws and regulations and permits, as well as penalties for noncompliance with permit environmental requirements, conditions, and measures; threatened and endangered species, species of concern, and species of special concern; environmentally sensitive locations; weed abatement; and environmental protection measures, mitigation, compensation, and restoration.

2. Environmental Timeframes

All activities will be completed in a timely manner to minimize duration and resulting impacts. To avoid or minimize impacts, all activities will take place during times of the year that are least detrimental to salmon and steelhead habitat within the action area of the proposed project. All instream work relating to the proposed project will take place within an established work window of June 1 through September 30, during low flood potential periods. Construction will be timed with awareness of precipitation forecasts and likely increases in stream flow.

3. Monitoring

Qualified biologists and environmental resource specialists will be retained to locate and fence, stake, or flag environmentally sensitive locations. This would include areas that support threatened and endangered species, species of concern and special status species, nesting migratory birds, woody riparian vegetation, wetlands, and perennial drainage crossings. These areas would then be marked for avoidance. The environmental monitors and construction inspectors will routinely inspect protected areas to ensure that protective measures are in place and are effective. They will work with Reclamation to ensure that environmental protection measures, such as environmental fencing, flagging, staking, and setback buffers were maintained, that environmental guidelines were followed, and that appropriate environmental compliance documentation were maintained. Monitoring of turbidity will be part of the Storm Water Pollution Prevention Plan. (See item 7 below.)

4. Demarcation of Environmentally Sensitive Locations

Qualified biologists and environmental resource specialists will be retained to monitor construction. They will work with Reclamation to ensure that environmental protection

measures, such as environmental fencing, flagging, staking, and setback buffers, are maintained, that environmental guidelines are followed and appropriate environmental compliance documentation is maintained. Targeted areas will include those that support threatened and endangered species, species of concern and special status species, nesting migratory birds, woody riparian vegetation, wetlands, and perennial drainage crossings. Protection measures will include:

- Construction within use area limits only; all marked environmentally sensitive locations in and outside use area limits will be avoided;

- Use and storage of construction equipment will be confined to designated use area limits;

- Existing roads and access points will be used to the extent possible to minimize disturbance to wildlife and their habitats;

- Excavating, filling, and earth moving in use areas will be completed gradually to allow wildlife to escape in advance of machinery and moving soils; and,

- Staging areas, borrow material sites, parking locations, stockpile areas, and storage areas will be located outside of environmentally sensitive locations and will be clearly marked and monitored.

5. Protection of Woody Riparian Vegetation

- Woody riparian vegetation exclusion zones will be demarcated by placing orange construction fencing 20 feet beyond the drip line of the vegetation;

- Trees and shrubs in the use area will be removed only if they have been designated for removal. All removed trees and shrubs will be replaced in kind, be of the same size as the removed vegetation, or be the maximum size practicable that can be planted and sustained in the particular environment;

- Long-term impacts on woody riparian vegetation will be minimized by trimming limbs and branches rather than removing trees and shrubs. Where possible, trees and shrubs will be cut at least a foot above the ground level to leave the root systems intact and to allow for more rapid regeneration following construction;

- Riparian vegetation or wetlands temporarily affected by loss or reduction of water supplies as a result of construction would be provided with replacement water supplies;

- Natural landscape and existing vegetation not required or otherwise authorized to be removed will be preserved and protected;

- Unnecessary destruction, scarring, or defacing of natural surroundings will be prevented in the vicinity of the project;

- Crews and equipment will be moved in rights-of-way and over routes provided for access to work in a manner that will prevent damage to land or property;

- Vegetation will be protected from damage or injury caused by construction, personnel or equipment, by barriers or other methods;

- Clearings and cuts through vegetation will be minimized. Authorized clearings and cuts will be irregularly shaped to soften undesirable aesthetic impacts; and,

- Trees will not be used for anchorages except in emergency cases or as approved by Reclamation. For such use, the tree trunk will be wrapped with a sufficient thickness of approved protective material before any rope, cable, or wire was placed.

6. Section 404 of the Clean Water Act

Before implementation of the project, a qualified wetland biologist will delineate jurisdictional wetlands and other waters of the United States that could be affected by the project and could be subject to U.S. Army Corps of Engineers (USACE) jurisdiction under section 404 of the Clean Water Act (CWA). The delineation will be submitted to the USACE Sacramento District for verification, and all conditions contained the CWA permit will be complied with for the project.

- Biologists will stake and flag wetland areas. The exclusion zones will include wetland buffer areas and will be demarcated by orange construction barrier fencing placed at least 20 feet beyond the staked and flagged boundaries of the wetland;

- Environmental monitors and construction inspectors will routinely inspect protected areas to ensure that protective measures are in place and are effective; and all protective measures will remain in place until construction has been completed.

As part of the section 404 permitting process, a conceptual wetlands mitigation plan will be developed. The acreage of waters of the United States that will be removed will be replaced or restored and enhanced on a “no-net-loss” basis, in accordance with USACE regulations. The mitigation plan will quantify the total jurisdictional acreage lost and will describe the creation and replacement ratios for acres filled, annual success criteria, potential mitigation sites, and monitoring and maintenance requirements. A plan will be developed in accordance and through consultation, with the USACE. Full implementation of the plan is intended to compensate for loss of jurisdictional waters of the United States.

In accordance with section 404 of the CWA, Reclamation is also applying to the USACE for issuance of a Nationwide Permit 4 (Fish and Wildlife Harvesting, Enhancement, and Attraction

Devices and Activities), and a Nationwide Permit 33 (Temporary Construction, Access, and Dewatering) for the proposed action prior to project construction.

7. National Pollutant Discharge Elimination System

Reclamation will obtain coverage under the National Pollutant Discharge Elimination System (NPDES) General Stormwater Permit for Construction Activities from the State Water Resources Control Board and will adhere to any applicable waste discharge requirements. Work under NPDES jurisdiction requires the preparation of a stormwater pollution prevention plan (SWPPP) which will describe the proposed construction and pollution prevention measures that will be implemented to prevent a discharge of pollutants. The SWPPP will also include a description of the inspection and monitoring activities that will be conducted. Pollution prevention includes erosion and sediment control measures and measures for non-stormwater discharges (*i.e*., construction dewatering and appropriate spill prevention and containment measures). Construction and post-construction will be monitored to ensure that all pollution prevention efforts are performed as described in the SWPPP. The SWPPP will be amended in the event modifications to the pollution prevention measures become necessary.

The SWPPP will identify and provide guidelines for all water quality, erosion, and sediment control measures; the responsibilities of all parties in implementing the SWPPP, contingency measures, agency contacts, and training requirements and documentation for those personnel responsible for installing, inspecting, maintaining, and repairing erosion control measures, as well as those responsible for overseeing, revising, and amending the SWPPP.

The SWPPP will also identify construction areas, activities, and schedules; temporary storage and borrow areas; construction materials handling and disposal; dewatering and treatment and disposal of groundwater removed from excavations; discharges; equipment washing; inspection and maintenance measures; final stabilization and cleanup; and appropriate use of seeding, mulching, erosion control blankets, and other erosion control measures.

The SWPPP will include an erosion control plan, whose general goals will be to minimize runoff from leaving the construction site, to remove sediment from on-site runoff before it leaves the site, to slow runoff rates across construction sites, and to provide soil stabilization during and after construction.

A comprehensive environmental monitoring and mitigation compliance and reporting program for construction and operations of the entire project will be included in the SWPPP. The plan will focus on required measures and will establish clear standards for environmental compliance, construction inspection and monitoring, environmental awareness training, contractor and agency roles and responsibilities, compliance levels and reporting procedures, variance request and response procedures, and communication protocols. The goal will be to ensure that all required measures and permit terms and conditions are implemented.

8. Best Management Practices

Measures implemented to minimize and mitigate adverse impacts on water quality include:

- Removal of litter and construction debris from the floodway and disposed of at an approved upland site;

- Adequate provisions (*e.g.*, sediment barriers and drainage settling basins) will be provided for any temporary access roads constructed in the floodway or near any body of water, to prevent sediment from getting into the water;

- Appropriate erosion control measures will be incorporated into the stormwater pollution prevention program;

- Any construction material placed in the water will be nontoxic. Any combination of wood, plastic, concrete, or steel will be acceptable, provided there are no toxic coatings, chemical antifouling products, or other toxic treatments that may leach into the surrounding environment;

- Post-project construction, temporary access roads will be removed, re-graded to original contours where feasible, and restored; and,

- A Spill Prevention and Countermeasure Plan (SPCP) will be in place, consisting of : (1) checking and maintaining equipment and vehicles operating in the staging areas in the floodway or near any water bodies to prevent leaks of fuels, lubricants, and other fluids; and (2) immediately cleaning up any spills of hazardous material, and reporting spills in construction compliance reports.

9. Mitigation Measures

In addition to the proposed Avoidance and Minimization Measures, the following measures will be implemented to mitigate and further reduce the adverse impacts on fisheries identified for the proposed action:

- Develop and implement a fish capture and relocation program that will help reduce direct take of fish during building and removal of the temporary cofferdam, dewatering, and cleaning up debris or spills. The program should require a qualified fish biologist, with all required ESA permits, to oversee field operations and capture and to determine suitable times and locations to release captured fish;

- Develop and implement a detailed re-vegetation plan for replacing trees removed to accommodate the construction of the proposed project, including a replacement compensation ratio (*e.g.,* 3:1) for temporal impacts to shaded, riverine aquatic habitat, to be determined after a NMFS site visit to the impacted area; and,

- During dewatering operations, only low-flow pumps with screened intakes will be utilized to minimize injury and death from project construction.

G. Operations of the New Fish Passageway

With the construction of an extended fish ladder and the removal of the Nimbus Fish Hatchery weir structure, steelhead are expected to congregate primarily in Nimbus Shoals, which has unrestricted public access. In addition, the Nimbus stilling basin will provide optimal rearing habitat for juvenile steelhead because of the colder water and the presence of two deep pools directly downstream of the dam. Salmon and steelhead inhabiting the Nimbus stilling basin will be more vulnerable to sport anglers with permanent removal of the weir as part of the proposed action. The opening of the fish passageway will occur, as with current fish ladder operations, when the hatchery can maintain temperatures of 60°F or lower, usually in the first 2 weeks of November. The fish passageway will be closed in April.

1. Fisheries Management in Nimbus Shoals

The public will continue to have full access to Nimbus Shoals during established hours. The area between Hazel Avenue and Nimbus Dam is popular for vehicle use. There is a possibility for habitat degradation from oil and fuel spills and garbage. Fishing is allowed year-round in Nimbus Shoals, which historically has one of the highest citation rates for the illegal take of salmon in northern California (Lucero 2009). In August, adult Chinook salmon congregate in three deep pools within the action area before spawning. There is no available statistical data on hooking mortality rates specifically in Nimbus Shoals, but hooking mortality for species in the area is high (Reclamation 2011a). There are no other anadromous waters in California where fishing is allowed directly downstream of a major dam in anadromous waters (Reclamation 2011a). Fishing regulations are being negotiated at this time between Reclamation and CDFG. So, the final decision about the location of the fishing areas is not known now. The current regulation will have to be considered temporary until a settlement is determined.

There may be impacts to CCV steelhead from recreational fishing in the proposed project area during the construction and operation of the fish passageway and removal of the weir. It is expected that with the removal of the weir, there will be an increase in fish densities in the stilling basin, resulting in increased sport fishing pressure. Chinook salmon and steelhead will be highly vulnerable to sport fish harvest in the stilling basin under the existing fishing regulations, especially during spawning time. This impact will be mitigated to less than significant by Reclamation restricting or closing public access to Nimbus Shoals, if the California State Fish and Game Commission were not to close the area to fishing (Reclamation 2011a).

Eliminating fishing will protect sensitive fish species at critical life stages, and increase the number of fish that rear and spawn in the stilling basin. Nimbus Fish Hatchery will more likely meet its mitigation and production goals with the increase of non-harvested fish in Nimbus Shoals. Eliminating fishing from Nimbus Dam to the USGS gaging cable may help to limit the spread of New Zealand mudsnails (*Potamopyrgus antipodarum*) by reducing the possibility of their being transported on fishing gear and boots from infested areas near the American River Trout Hatchery, and being introduced into the uppermost reaches of the lower American River and including the Nimbus Shoals area.

H. Action Area

The proposed 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). The area encompasses the geographic extent of environmental changes (*i.e.*, the physical, chemical and biotic effects) that will result directly and indirectly from the action.

The project area is 74 acres in Rancho Cordova, California, from Nimbus Dam downstream, along the lower American River to 500 feet downstream of the US Geological Survey (USGS) gaging station cable (RM 22). The project area includes the lower American River, the north and south banks of the river, the hatchery complex and adjacent parking lot, and Nimbus Shoals, which is east of Hazel Avenue. The Nimbus Hatchery and fish weir are about 0.25 mile downstream of Nimbus Dam on the south side of the lower American River.

III. STATUS OF THE SPECIES AND CRITICAL HABITAT

The following federally listed species and designated critical habitat occur in the action area and may be affected by the Nimbus Fish Hatchery Fish Passage Project:

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

California Central Valley steelhead designated critical habitat
threatened (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 which permit faunal interchange; and (4) regional ecologic interaction that sustained 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. <u>CCV Steelhead</u>

NMFS listed the CCV steelhead DPS as threatened on March 19, 1998 (63 FR 13345), 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 (CNFH) and Feather River Fish Hatchery (FRFH) steelhead populations are included in the listed population of steelhead (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). CCV 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 bankfull 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 evolutionarily significant unit 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 currently present 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 CCV steelhead spawning migration occurs from October through February, and spawning occurs from December to April in streams with cool, well oxygenated water that is available year-round (Table 4). Van Woert (1964) 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 important of mainstem tributaries as rearing and refugia habitat for the DPS.

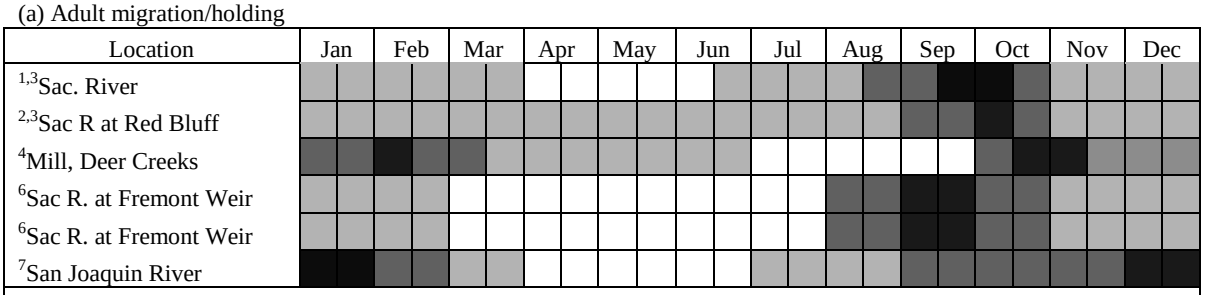
Egg incubation time is dependent upon water temperature. Eggs held between 50 degrees Fahrenheit (^{o}F) and 59 ^{o}F hatch within 3 to 4 weeks (Moyle 1976). Fry usually emerge from redds after about four to six weeks depending on redd depth, gravel size, siltation, and water temperature (Shapovalov 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 one to four 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 two years in freshwater. Adults spend one to four 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

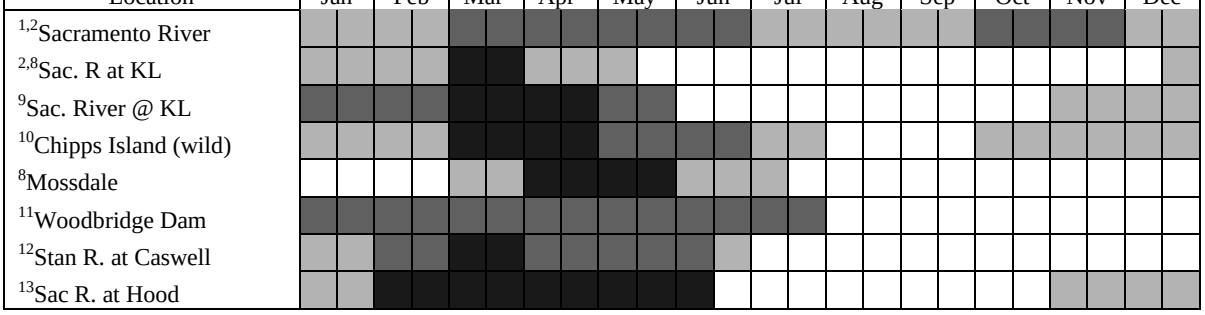
spring, with a much smaller peak in the fall. Steelhead smolts show up in the Sacramento-San Joaquin Delta (Delta) at the Tracy and Banks pumping plants between December and June. Adult steelhead migrate upstream in the Sacramento River mainstem from July through March, with peaks in September and February (Bailey 1954, Hallock *et al.* 1961).

Table 4. The temporal occurrence of adult (a) and juvenile (b) California Central Valley steelhead in the Central Valley, with darker shades indicating months of greatest relative abundance

(a) Adult migration/holding



(b) Juvenile migration



Relative Abundance: = High = Medium = Low

Sources: [1]Hallock 1961; [2]McEwan 2001; [3]USFWS unpublished data; [4]CDFG 1995; [5]Hallock *et al*. 1957; [6]Bailey 1954; [7]CDFG Steelhead Report Card Data; [8]CDFG unpublished data; [9]Snider and Titus 2000; [10]Nobriga and Cadrett 2003; [11]Jones & Stokes Associates, Inc., 2002; [12]S.P. Cramer and Associates, Inc. 2000 and 2001; [13]Schaffter 1980, 1997.

Steelhead were historically 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. Overall, the status of CCV steelhead appears to have worsened since the Good *et al.* 2005 status review when the NMFS' Biological Review Team (BRT) concluded that the DPS was in danger of extinction (Williams *et al.* In Preparation). Analysis of catch data from the Chipps Island monitoring program suggests that natural steelhead production has continued to decline and that hatchery origin fish represent an increasing proportion of the juvenile production (NMFS 2010).

Information from the Central Valley Project (CVP) and State Water Project (SWP) salvage facilities in the Delta also suggests a general decline in the natural production of steelhead.

Existing wild steelhead stocks in the Central Valley are confined mostly to the upper 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). 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). It is possible that naturally-spawning populations exist in many other streams, and there has been a greater emphasis on directed rather than opportunistic monitoring of steelhead throughout the Central Valley (CDFG 2010b). However, the lack of available funding recommendations of CDFG's *Central Valley Steelhead Monitoring Plan* (CDFG 2010b) remains a hindrance to full implementation of the plan. Reliable estimates of steelhead abundance for different basins have not been available (McEwan 2001), monitoring of steelhead populations in the Sacramento River and its tributaries has been historically limited to the direct counts made at CNFH weir, the Red Bluff Diversion Dam (RBDD), FRFH, and Nimbus Fish Hatchery. Steelhead counts at the RBDD have declined from an average of 11,187 for the period of 1967 to 1977, to an average of 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.

Steelhead redd counts are made in Clear Creek and the American River, but the data are currently insufficient to compute population metrics (Williams *et al.* In Preparation). An average of 151 steelhead redds have been counted annually in Clear Creek from 2001 to 2010 and the total number of observed redds has steadily increased since Saeltzer Dam was removed in 2000. The vast majority of steelhead in Clear Creek are likely of natural origin since hatchery fish are not stocked there and no hatchery origin fish were found during monitoring through at least 2008 (Matt Brown, USFWS, pers. comm.). In the American River, an average of 154 redds were counted annually between 2002 and 2010 and the available data suggests a declining trend (Hannon and Deason 2008, Hannon *et al*. 2003, Chase 2010).

The East Bay Municipal Utilities District has included steelhead in their redd surveys on the Lower Mokelumne River since the 1999-2000 spawning season. Based on data from these surveys, the overall trend suggests that redd numbers have slightly increased over the years. According to Satterthwaite *et al.* (2010), it is likely that most of the *O. mykiss* spawning in the Mokelumne River are non-anadromous (or resident) fish rather than steelhead.

On the Stanislaus River, steelhead smolts have been captured in rotary screw traps at Caswell State Park and Oakdale each year since 1995 (Demko *et al.* 2000). After three years of operating a fish counting weir on the Stanislaus River only one adult steelhead has been observed moving upstream, although several large rainbow trout have washed up on the weir in late winter (S.P. Cramer 2005).

Steelhead returns to the FRFH have decreased substantially in the last several years with only 679, 312 and 86 fish returning in 2008, 2009 and 2010, respectively. Because almost all of the returning fish are of hatchery origin and stocking levels have remained fairly constant over the years, the data suggest that adverse freshwater and ocean survival conditions have caused or at least contribute to these declining hatchery returns. The Central Valley experienced three consecutive years of drought (2007-2009) which likely impacted parr and smolt growth and survival. Poor ocean conditions are known to have occurred in at least 2005 and 2006 which impacted Chinook populations in the Central Valley and may well have also impacted steelhead populations. Preliminary return data for 2011 from CDFG suggest a strong rebound in return numbers, with 712 adults returning to the FRFH through April 5, 2011.

Nobriga and Cadrett (2003) compared coded-wire tagged 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. NMFS made the conclusion, based on the average fecundity of 5,000 eggs per female, 1 percent survival of eggs to reach Chipps Island, and the 1998 to 2000 average production of 181,000 smolts, about 3,628 female steelhead spawn naturally in the entire Central Valley. This compares with McEwan's (2001) estimate of 1 million to 2 million spawners before 1850, and 40,000 spawners in the 1960s. The Chipps Island midwater trawl dataset from the U.S. Fish and Wildlife Service (USFWS) provides information on the trend in the overall abundance of the CCV steelhead DPS (Williams *et al.* In Preparation). Updated through 2010, the trawl data indicate that the apparent decline in natural production of steelhead has continued since the 2005 status review. Catch-per-unit-effort has fluctuated over the past decade, but the proportion of the catch that is adipose fin-clipped (all California hatchery-produced steelhead have been adipose fin-clipped since 1998) has steadily increased, exceeding 90 percent in recent years and reaching 95 percent in 2010 (Williams *et al.* In Preparation). Because hatchery releases have been fairly constant over the years, these data suggest that natural production of steelhead has been declining (NMFS 2011).

Steelhead salvage data from the fish collection facilities at the Federal and State pumping plants in the southern Delta are another source of information on the relative abundance of CCV steelhead over time, as well as the production of wild steelhead relative to hatchery steelhead (CDFG; ftp.delta.dfg.ca.gov/salvage). The annual salvage of steelhead at the facilities has fluctuated dramatically since 1993, but there has been a marked decline in the total number of salvaged fish over the past decade, with the largest decline in the number of salvaged hatchery origin fish. The percentage of salvaged fish that are wild has also fluctuated over the past decade, but has also declined in the past several years.

Garza and Pearse (2008) analyzed the genetic relationships among CCV steelhead populations and found that unlike the situation in coastal California watersheds, fish downstream of barriers in the Central Valley were more closely related to downstream of barrier fish from other watersheds than to *O. mykiss* upstream of barriers in the same watershed. This pattern suggests the ancestral genetic structure is still relatively intact upstream of barriers, but may have been altered downstream of barriers by stock transfers.

Overall, the status of CCV steelhead appears to have worsened since the 2005 status review when the BRT concluded that the DPS was in danger of extinction (Williams *et al*. In

Preparation). Analysis of catch data from the Chipps Island monitoring program suggests that natural steelhead production has continued to decline and that hatchery origin fish represent an increasing proportion of the juvenile production. Information from the Delta salvage facilities also suggests a general decline in the natural production of steelhead. Limited information for some individual populations suggests a decline in abundance, but data for the Battle Creek population indicate the declines have been relatively moderate since 2005 and that the population in Clear Creek is increasing. Hatchery populations (CNFH and FRFH hatcheries) suggest hatchery populations have declined in the last several years perhaps in response to poor freshwater and ocean habitat conditions.

In the most recent five-year status review on CCV steelhead (NMFS 2011), NMFS concluded that the CCV steelhead 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. Steelhead already have been extirpated from most of their historical range. Habitat concerns in this DPS focus on the widespread degradation, destruction, and blockage of freshwater habitat, 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 CCV steelhead DPS 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.

2. Viable Salmonid Population Summary for CCV Steelhead

NMFS recognizes four parameters by which the viability of salmonid populations may be evaluated: abundance, population growth rate, population spatial structure, and diversity (McElhany *et al.* 2000). These viable salmonid population (VSP) parameters are considered to be reasonable predictors of extinction risk (McElhany *et al.* 2000). NMFS provides the following current viability assessment on CCV steelhead, based on VSP criteria:

Abundance. All indications are that naturally spawned CCV steelhead have continued to decrease in abundance and in the proportion of the steelhead population compared to hatchery fish over the past 25 years (NMFS 2003); the long-term trend remains negative. There has been little steelhead population monitoring despite 100 percent marking of hatchery steelhead since 1998, but in 2009, CDFG completed a CCV steelhead monitoring plan (2010b) and are seeking funds to implement the plan. Hatchery production and returns are dominant over natural fish and include significant numbers of out-of-basin, non-DPS-origin steelhead stocks. Two Central Valley steelhead hatchery programs contribute to overall steelhead abundance but are not included in any VSP parameter of the CCV steelhead DPS, due to their founding or supplemental coastal Eel River stock.

Productivity. 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. 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). Recent trawl data collected at Chipps Island indicate that 90 percent of outmigrating smolts are of hatchery-origin, which do not undergo the natural selection forces of early mortality of wild steelhead. In 2010, the incidence of hatchery smolts at Chipps Island had increased to 95 percent.

Spatial Structure. Steelhead appear to be well-distributed where found throughout the Central Valley (NMFS 2003). Until recently, there was very little documented evidence of steelhead due to the lack of monitoring efforts. Since 2000, steelhead have been confirmed in the Stanislaus and Calaveras rivers. There are also efforts in protecting and supporting steelhead in the Merced River through the Federal Energy Regulatory Commission process, and in establishing a self-sustaining population in the San Joaquin River through a multi-agency Restoration Program.

Diversity. Analysis of natural-and hatchery-steelhead stocks in the Central Valley reveal genetic structure still remaining in the DPS; however, introgression is occurring among straying steelhead from different river systems (Nielsen *et al.* 2003; Garza and Pearse 2008). This is partially due to the post-dam, lower basin distribution of steelhead and management of hatchery stocks and large-scale transfer of CVP and SWP water operations. *O. mykiss* stocks upstream of barrier dams are more closely related to each other than to the steelhead populations downstream of dams (Deiner 2004, Garza and Pearse 2008). Overall, the diversity of the CCV steelhead DPS has been impaired, but there are efforts in the Central Valley to manage for genetic and life history integrity of steelheads, and to reintroduce steelhead into uninhabited streams and create self-sustaining wild populations (Battle Creek, San Joaquin River). The out-of-basin steelhead stocks of the Nimbus and the Mokelumne River hatcheries are not included in the CCV steelhead DPS.

B. Habitat Condition and Function for Species' Conservation

NMFS has identified those physical or biological features that are essential to the conservation of a given species, including space for individual and population growth and for normal behavior; food, water, air, light, minerals, or other nutritional or physiological requirements; cover or shelter; sites for breeding, reproduction, and rearing of offspring; and habitats that are protected from disturbance or are representative of the historical geographical and ecological distribution of a species. The principal biological or physical constituent elements are essential to the conservation of the species, and may support one or more life stages of the CCV steelhead DPS (sites for spawning, rearing, migration and foraging). These sites in turn contain physical or biological features essential to the conservation of the DPS (for example, spawning gravels, water quality and quantity, side channels, forage species). Specific PCEs for salmonids include: (1) freshwater spawning sites with water quantity and quality conditions and substrate supporting spawning, incubation and larval development; (2) freshwater rearing sites with water quantity and floodplain connectivity to form and maintain physical habitat conditions and support juvenile growth and mobility; water quality and forage supporting juvenile development; and natural cover such as shade, submerged and overhanging large wood, log jams and beaver dams, aquatic vegetation, large rocks and boulders, side channels, and undercut banks; (3) freshwater migration corridors free of obstruction with water quantity and quality conditions and natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and

boulders, side channels, and undercut banks supporting juvenile and adult mobility and survival; and (4) estuarine areas free of obstruction with water quality, water quantity, and salinity conditions supporting juvenile and adult physiological transitions between fresh- and saltwater; natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, and side channels; and juvenile and adult forage, including aquatic invertebrates and fishes, supporting growth and maturation.

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 CVP, the SWP, and other municipal and private entities have permanently blocked or hindered steelhead access to historical spawning and rearing grounds. Large dams on every major tributary to the Sacramento and San Joaquin rivers block 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 comprise preferred spawning and rearing habitat for CCV 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 steelhead 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.

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 consumed by salmonids.

Accelerated predation may also be a factor in the decline of steelhead in the Central Valley. Although predation is a natural component of salmonid ecology, the rate of predation on CCV steelhead likely has greatly increased through the introduction of non-native predatory species such as striped bass (*Morone saxatilis*) and largemouth bass (*Micropterus salmoides*), 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, Garcia 1989). Reclamation 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 diversion, the Glenn-Colusa Irrigation District diversion, and at south Delta water diversion structures (CDFG 1998). From October 1976 to November 1993, CDFG conducted ten mark and 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).

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 steelhead runs entering the Delta (Reclamation 1996).

Several actions have been taken to improve habitat conditions for CCV steelhead. The impetus for initiating restoration actions stem primarily from ESA temperature, flow, and diversion requirements (NMFS 2009); State Water Resources Control Board orders requiring compliance with Sacramento River water temperature objectives; a 1992 amendment to the authority of the CVP through the Central Valley Project Improvement Act (CVPIA) to give fish and wildlife equal priority with other CVPIA objectives (*e.g.*, in section 3406(b)(2), establishment of a water account to supplement CVPIA minimum flow requirements); fiscal support of habitat improvement projects from the Calfed Bay-Delta Program (*e.g.*, installation of the Glenn-Colusa Irrigation District fish screen, establishment of an Environmental Water Account and, U.S. Environmental Protection Agency (EPA) pollution control efforts to alleviate acidic mine drainage from Iron Mountain Mine.

There is consensus on change in the hydrology of the Sacramento River basin (Reclamation 2011b). Spring runoff is declining, corresponding with increases in winter runoff. Increasing spring temperatures appear to be the primary driver, and magnitude for the decreases in April to July runoff is correlated with the altitude of the basin watershed. The Sacramento River basin is lower in altitude than the San Joaquin River basin, and experiences a greater decrease in spring runoff than the latter. Likewise, spring snowpack and snowfall trends have shown a decreasing trend in the latter part of the 20th century (Mote 2006).

Snowpack decrease is projected to be more substantial over the portions of the basin where baseline cool season temperatures are generally closer to freezing thresholds and more sensitive to projected warming. These areas include much of the northern Sierra Nevada and Cascade Mountains of the Sacramento River basin (as well as lower to middle elevations in the southern Sierra Nevada of the San Joaquin River basin). Changes in climate and snowpack within the Sacramento River basin will change the availability of natural water supplies. These effects may be experienced in terms of changes to annual and seasonal runoff. For example, warming without precipitation change will lead to increased evapotranspiration from the watershed and decreased annual runoff.

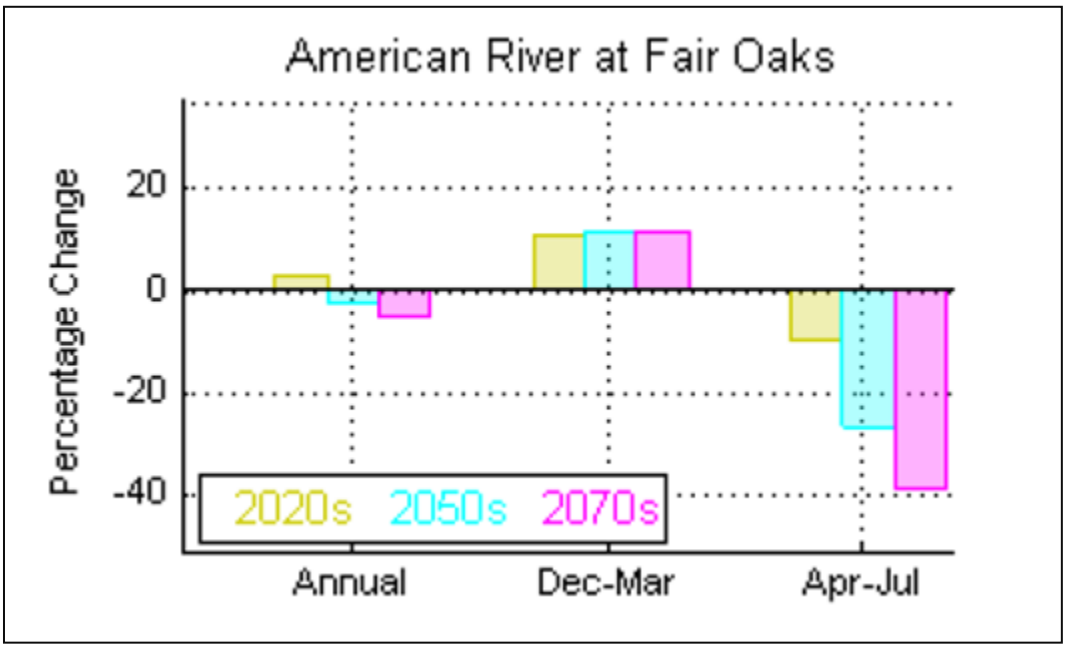


Figure 7. Simulated changes in decade-mean runoff for the lower American River subbasin showing the percentage changes in mean runoff for three future decades relative to baseline 1990s conditions (Reclamation 2011b)

One observed change in the American River is in the seasonal timing of runoff and a decrease of about 10 percent in fraction of total runoff occurring between April to July (Figure 6). Although increases or decreases in cool season precipitation could somewhat offset or amplify changes in snowpack, it is apparent that warming in the Sacramento River tends to dominate projected effects.

The Sacramento River basin is projected to generally experience a slight increase in precipitation during the early to mid-century (2020s and 2050s) followed by a reversal to a slight precipitation decline (2070s). The seasonality of runoff is also projected to change. Warming may lead to more rainfall-runoff during the cool season rather than snowpack accumulation, leading to more drought periods and impacting salmonids which exhibit extended freshwater juvenile rearing or adult freshwater holding, prior to spawning.

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).

Baseline stressors to CCV steelhead in the American River include the presence of Folsom and Nimbus dams, loss of natural riverine function and morphology, competition for spawning habitat between natural- and hatchery-origin; effects on the genetic fitness of the natural population, predation of juveniles, and water quality.

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

1. American River Population of CCV Steelhead

All naturally spawned steelhead in the American River are part of the CCV steelhead DPS. Nimbus Fish Hatchery steelhead continue to exhibit the prevalent genetics of the coastal Eel River founding seed stock, and are not part of the CCV steelhead DPS.

Based on counts from 1943 to 1947, steelhead passed the area of Folsom during every month except August and September, and peaking during May and June. This suggests that the river may have supported a spring/summer run of steelhead in addition to fall- and winter-runs of steelhead (Hinze *et al.* 1956). McEwan (2001) reported that presently, Central Valley drainages support only winter-run steelhead. The present steelhead population in the American River exhibits a winter-run life history, and migrating adults will start to enter the river in August and September, peaking in January and February.

The Nimbus Fish Hatchery diversion weir is in place by mid-October to early January, preventing steelhead from migrating beyond the hatchery. However, some steelhead do get by prior to the installation of the diversion weir and enter Nimbus Shoals, as documented in redd spawning surveys conducted in 2007 and 2009 (Hannon and Deason 2007; See and Chase 2009).

During steelhead redd surveys, 10 redds were observed upstream of the weir in 2003, 9 redds in 2004, 6 in 2005, and 5 in 2007 (Hannon and Deason 2007). These redds were concentrated in the riffle at the northeast corner of Nimbus Shoals (Hannon and Deason 2007), though some redds probably were not documented in the main channel when flows were greater than 2,500 cfs. Based on snorkel surveys conducted by Reclamation, the character of the substrate in the riffle extends into deeper water to the North. Upstream of the weir in the stilling basin, much of the gravel is large, but it has been improved for steelhead spawning activities through gravel augmentation activities in 2008 and 2009 (See and Chase 2009). Although no juvenile steelhead rearing habitat has been documented in the riffle at the weir (Reclamation 2011a), hatch-up and early rearing life-stages of steelhead may be present.

Table 5. Estimates of CCV steelhead population in the American River, within 1944 – 2010 time period				
Population Year	Estimated population	Sampling methodology	References	#redds
1944-45	400-1246	Migrating fish counts passing Old Folsom Dam during its construction period	Gerstung 1971	n/a
1945-46				
1946-47				
1950	Destruction of fish ladder on old Folsom Dam			
1955	Extirpation of spring/summer American River steelhead post-completion of Folsom Dam			
1971-72	19,583	mark recapture, wire fyke traps	Staley 1976	n/a
1973-74	12,274			
1991	305	unknown	Water Forum 2005	
1992	1,462			
1993	255			
2001	56	jet or drift boat, canoe, snorkel, wading	Hannon and Healey 2002	30
2002	201 - 400			159
2003	240 - 479		Hannon *et al.* 2003	215
2003 - 2004	221 - 441		Hannon and Deason 2004	197
2004 - 2005	162 - 324		Hannon and Deason 2005	155
2007	429		Hannon and Deason 2007	178
2008 – 2009	71 - 142		See and Chase 2009	68
2009 - 2010	82 - 164		Chase 2010	79

Steelhead returns to the hatchery are highly variable from year to year, ranging from several hundred to several thousand (Table 5). From 1999 to 2003, the average number of steelhead trapped at the hatchery has been 3,408. Over 18 million eggs were collected from 3,656 females from 1997 to 2006 (Dennis Lee, CDFG, pers. comm.). As steelhead do not die after spawning, eggs are collected and then the fish are released back into the American River, downriver of the weir and fish ladder entrance.

2. Genetic Dynamics in the American River

Landscape features play an important role in influencing the genetic structure and diversity of salmonid populations (Deiner 2004). *O. mykiss* stocks in the Russian River system upstream of barrier dam sites as compared among different tributaries were characterized by high genetic variation and high assignment probabilities, whereas the opposite was found for below-barrier comparisons on different tributaries (Deiner 2004). In their genetic analysis of tissues collected from the American River watershed, Garza and Pearse (2008) support this phenomenon. One percent of the genetic variation partitioned between the Nimbus Fish Hatchery and lower American River population samples and less than half that between the North and Middle Fork American River populations upstream of Folsom Dam. The fish sampled downstream of Folsom Dam came from the Nimbus Fish Hatchery and the lower American River. The two samples

also clustered together consistently, in spite of substantial heterogeneity within the fish sampled at Nimbus Fish Hatchery. This provides evidence of lack of gene flow between *O. mykiss* populations upstream and downstream of the dams, and gene flow between the Nimbus Fish Hatchery steelhead stock and the American River population. Consequently, the listed steelhead population is linked to the dominant non-listed Eel River genome of the Nimbus Fish Hatchery steelhead stock. Based on the genetic influence of the hatchery stock, a decline in the productivity of the natural population, and the potential for fish passage upstream of Nimbus and Folsom dams, the Central Valley Recovery Plan (public draft) recommends replacement of the Nimbus Fish Hatchery stock with a native stock (*e.g.*, evaluate the potential to replace the Nimbus Fish Hatchery broodstock with genetically more appropriate sources (*e.g*., the *O. mykiss* in the watershed upstream of Folsom Dam which retain ancestral American River steelhead genetics) and evaluate Nimbus Fish Hatchery steelhead production and stocking practices to identify and implement measures that would promote restoration of wild steelhead in the lower American River

3. <u>CCV steelhead Designated Critical Habitat</u>

The lower American River, from Nimbus Dam (RM 23) to the confluence of the Sacramento River (RM 0) is designated steelhead critical habitat (70 FR 52488), and is located within the American River Hydrologic Unit Code 5514. In the proposed action area, the primary elements of designated critical habitat for CCV steelhead include juvenile freshwater rearing and migration areas, as well as adult migration portions. There is a general consensus in the available literature suggesting that habitat for steelhead in the American River is impaired (Water Forum 2005; Surface Water Resources, Inc. 2001; CDFG 2001). Of particular concern are warm water temperatures during embryo incubation, rearing, and migration, flow fluctuations during embryo incubation and rearing, and limited flow-dependent habitat availability during rearing.

Adult steelhead returns to Nimbus Fish Hatchery have historically provided the only index of steelhead abundance in the American River (Figure 8). The CCV steelhead DPS includes only the naturally spawning steelhead in the American River. Fish produced in Nimbus Fish Hatchery are excluded from the DPS. Populations of naturally spawning steelhead since Folsom and Nimbus dams were constructed are unknown.

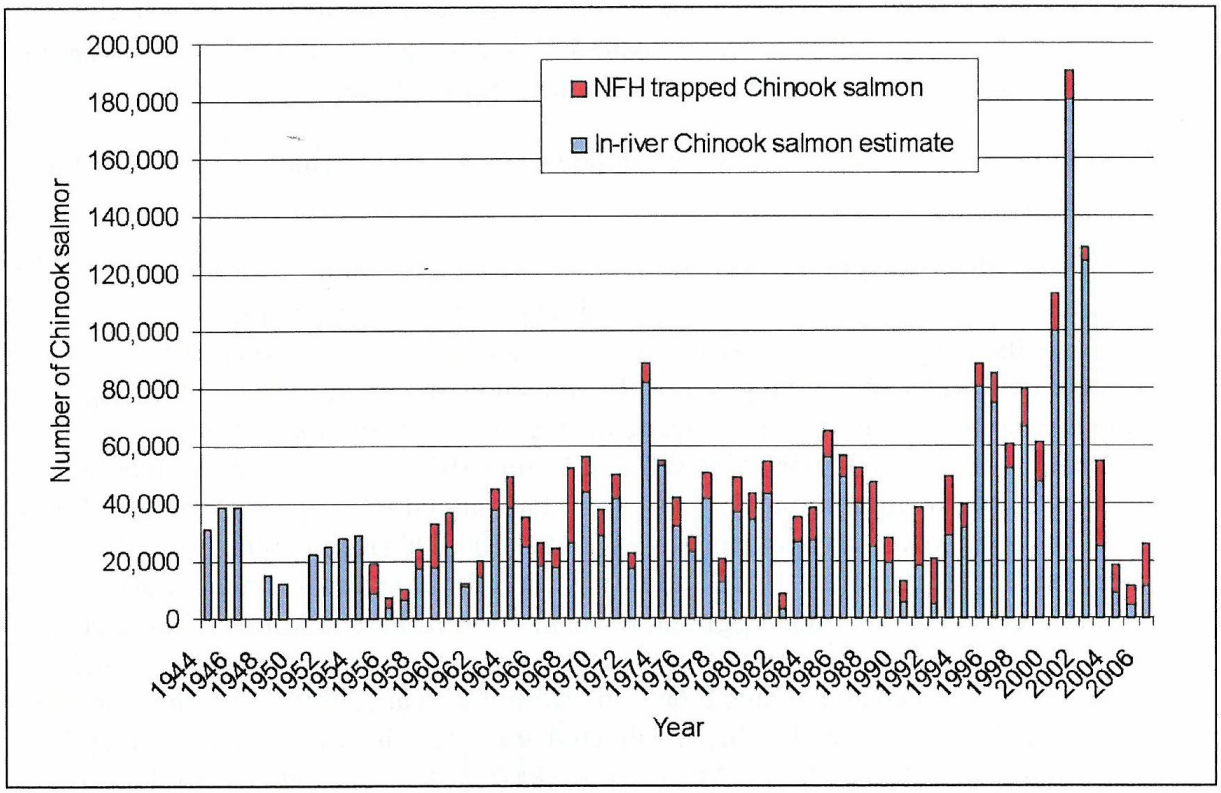


Figure 8. Number of steelhead trapped at Nimbus Fish Hatchery, 1955-2006

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

The essential features of freshwater salmonid habitat within the proposed 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, fish culture activities, recreational use of the river including angling activities, predation and water quality within the action area.

1. The American River

Prior to 1849, the riparian vegetation along the river formed extensive, continuous forests in the floodplain, reaching widths of up to 4 miles. Settlement of the lower American River floodplain by non-indigenous peoples and the resulting modifications of the physical processes shaping the river and its floodplain has drastically altered the habitats along the river. Early settlers removed trees and converted riparian areas to agricultural fields. Hydraulic gold mining in the watershed caused deposits of 5 to 30 feet of sand, silt, and fine gravels on the riverbed of the lower American River. These deposits resulted in extensive sand and gravel bars in the lower river and an overall rising of the river channel and surrounding floodplain. This was later exacerbated by gravel extraction activities. As a result, the floodplain's water table has dropped, reducing the growth and regeneration of the riparian forest (Water Forum 2005).

The American River provides habitat for a persistent, dependent population of steelhead. The steelhead immigration life stage occurs throughout the entire lower American River with adults holding and spawning from RM 5 to Nimbus Dam at RM 23 (Hannon and Deason 2008). Ninety percent of spawning occurs upstream of the Watt Avenue bridge area located at about RM 9.4 (Hannon and Deason 2008). The juvenile steelhead life stage occurs throughout the entire river, with rearing generally occurring in the vicinity of the upstream areas used for spawning. Most juvenile steelhead are believed to migrate through the lower sections of the American River into the Sacramento River as smolts.

The CCV steelhead DPS includes naturally-spawned steelhead in the American River (and other Central Valley stocks) and excludes steelhead spawned and reared at Nimbus Fish Hatchery. The abundance of naturally-spawning steelhead in the lower American River has been low for several years. Population abundance estimates of naturally spawning steelhead in the American River were 305, 1,462 and 255 for the 1991, 1992 and 1993 spawning seasons, respectively (Water Forum 2005), although the methodology for how these estimates were obtained was not stated. From 2002 through 2007, annual population abundance estimates for American River steelhead spawning in the river have ranged from about 160 to about 240 individuals (Hannon and Deason 2008). This is below the viability minimum criteria of 500 spawning adults (Lindley *et al.* 2007), and because it is heavily supplemented by Nimbus Fish Hatchery steelhead, it has been classified as being at a high risk of extinction (Lindley *et al.* 2007). Populations at low abundance levels, such as those estimated for naturally spawning steelhead in the American River, could become extinct due to demographic stochasticity - seemingly random effects of variation in individual survival or fecundity with little or no environmental pressure (Shaffer 1981, Allendorf *et al.* 1997, McElhany *et al.* 2000). The relatively small population size, complete loss of historic spawning habitat, and reduced genetic diversity further support this classification (NMFS 2009).

The American River watershed is characterized as having a moderate potential to support a viable population of steelhead. Lindley *et al.* (2007) classifies the naturally spawning population of American River steelhead at a high risk of extinction because this population is reportedly mostly composed of steelhead originating from Nimbus Fish Hatchery. The small population size and complete loss of historic spawning habitat and genetic composition further support this classification. Other major factors influencing the status of naturally spawning steelhead in the American River include: (1) a 100 percent blockage of historic spawning habitat resulting from the construction of Nimbus and Folsom dams, which has obvious implications for the spatial structure of the population; and (2) the operation of Nimbus Fish Hatchery, which has completely altered the diversity of the population.

2. <u>Nimbus and Folsom Dams</u>

Nimbus Dam was completed in 1955, blocking steelhead from all of their historic spawning habitat in the American River (Lindley *et al.* 2006). The construction of Folsom and Nimbus dams has resulted in a 100 percent blockage of historic steelhead and spring-run Chinook salmon (*O. tshawytscha*) spawning habitat (Lindley *et al.* 2006), which has impacted the diversity and spatial structure of the CCV steelhead population in the American River. Nimbus Dam is 6.8 miles downstream of Folsom Dam and re-regulates water released from Folsom Reservoir. The

concrete gravity Nimbus Dam is 1,093 feet long and 87 feet high, and forms Lake Natoma, with a capacity of 8,760 acre-feet. Eighteen radial gates, each 40 feet by 24 feet, control the flows. Operating Folsom Dam to meet temperature requirements for returning Chinook salmon has often limited the amount of water available for steelhead spawning and rearing the rest of the year (NMFS 2009).

Folsom Reservoir provides flood protection for the Sacramento area; water supplies for irrigation, domestic, municipal, and industrial uses; hydropower; extensive water-related recreational opportunities; water quality control in the Delta; and maintenance of flows stipulated to protect fish, wildlife, and recreational considerations (both downstream of Folsom Dam on the river and at adjacent areas such as the American River Parkway and the Folsom Lake State Recreation Area).

Lake Natoma is managed to regulate fluctuating discharges and allowing dam operators to coordinate power generation and flows in the American River channel during normal reservoir operations. Lake Natoma has a surface area of 500 acres and its elevation fluctuates between 3 to 4 feet daily. Nimbus Dam is located about seven miles downstream of Folsom Dam. The Folsom South Canal extends from Lake Natoma southward about 27 miles towards the Cosumnes River. Hydrological and ecological changes associated with the construction of the dams contributed to the extirpation of summer steelhead and spring-run Chinook, which were already greatly diminished by the effects of smaller dams (*e.g.*, Old Folsom Dam and the North Fork Ditch Company Dam) and mining activities (Yoshiyama *et al.* 1996).

Completion and operation of Folsom and Nimbus dams has resulted in higher flows during fall, significantly lower flows during winter and spring, and significantly higher flows during summer. Operation of Sacramento Municipal Utility District's Upper American River Project since 1962, as well as Placer County Water Agency's Middle Fork Project since 1967, altered inflow patterns to Folsom Reservoir (Surface Water Resources, Inc. 2001).

CCV steelhead could have used numerous smaller tributaries upstream of Folsom Dam not used by Chinook salmon due to CCV steelhead's upstream migration during periods of higher flow, superior leaping ability, ability to use a wider variety of spawning gravels, and ability to pass through shallower water. The estimated number of historical, pre-impassable dam, and post-impassable dam river miles available to CCV steelhead in the American River are 161, 27 with the construction of Folsom, and 23 miles with the construction of Nimbus, respectively. The remaining areas downstream of Nimbus Dam do not have optimal habitat characteristics. For example, lower elevation rivers have substantially different flow, substrate, cover, nutrient availability, and temperature regimes than headwater streams.

Dams produce extensive ecological disruptions, including alteration of flow regimes, sedimentation, and nutrient fluxes, modification of stream-channel morphology, spatial decoupling of rivers and their associated floodplains, disruption of food webs, and fragmentation and loss of habitat (Ligon *et al.* 1995, Levin and Tolimieri 2001). This sediment deficit reduces the amount of material that can deposit into bars in the lower reaches, resulting in less substrate for growth of cottonwoods and other riparian vegetation.

Since the 1970s, bank erosion, channel degradation and creation of riprap revetments have contributed to the decline of riparian vegetation along the river's edge, loss of soft bank and channel complexity, and reduced amounts of large woody debris in the river that are used by fish and other species. In particular, there has been a decrease in overhanging bank vegetation called shaded, riverine aquatic (SRA) habitat. SRA habitat provides multiple benefits to both fish and wildlife. In particular, it provides shade along the river to moderate water temperatures in the summer. Overhanging vegetation also provides cover to aquatic species, creating areas where they can feed and rest while being sheltered from predators. Living and dead vegetation provides habitat and food for many species of insects and other organisms, which can then be eaten by fish species, including salmonids (Water Forum 2005). Therefore, a loss of SRA corresponds to loss of salmonid productivity and decrease of habitat complexity.

3. Flow Management Standard for the Lower American River

The operation of the Folsom-Nimbus project significantly alters downstream flow and water temperature regimes. Of particular concern are warm water temperatures from spring through early fall, especially during the summer (NMFS 2009). In addition to elevating water temperatures during the steelhead embryo incubation, juvenile rearing, and juvenile migration periods, flow fluctuations are another major stressor, and have been documented to result in steelhead redd dewatering (Hannon *et al.* 2003; Water Forum 2005; Hannon and Deason 2008), and juvenile stranding and isolation in the lower American River (NMFS 2009).

In 2005, Reclamation agreed to support a flow management standard developed by the Sacramento Valley Water Forum. The standard will create better in-stream conditions by raising minimum flows and controlling water temperatures so that salmon, steelhead, and other fish can survive. The temperature management-flow management plan was fully implemented in 2011. Each year, the American River Group models conditions to develop a flow plan that address the temperature issues. In-season management results in some variation in flows, from the planned flows, in efforts to meet the temperature goals (Gary Sprague, NMFS, pers. comm.).

The Flow Management Standard (FMS) for the lower American River includes provisions for: (1) minimum flow and water temperature requirements; (2) the lower American River Group to play a consultative role in operational decisions; and (3) monitoring and evaluation to ascertain the biological and ecological status of the river, and to provide input into the river management and ramping processes. The Minimum Flow Requirements prescribe the minimum flows to be released from Nimbus Dam, and are the cornerstone of the FMS. The Minimum Flow Requirements do not preclude Reclamation from making higher releases at Nimbus Dam, and can vary throughout the year in response to the hydrology of Minimum Release Requirements (MRR).

MRRs range from 800 to 1,750 cfs based on a sequence of seasonal indices and adjustments (Table 6). The minimum Nimbus Dam release requirement is determined by applying the appropriate water availability index (Index Flow). Three water availability indices (*i.e.*, Four Reservoir Index, Sacramento River Index, and the Impaired Folsom Inflow Index (IFII)) are applied during different times of the year, which provides adaptive flexibility in response to changing hydrological and operational conditions. During some months, Prescriptive

Adjustments may be applied to the Index Flow, resulting in the MRR. If there is no Prescriptive Adjustment, the MRR is equal to the Index Flow.

Table 6. Flow Management Standard Indices and Flow Requirements (Water Forum 2005)

Month	Index	Index Flows (cfs)	Prescriptive Adjustments	Minimum Release Requirements (cfs)	Discretionary Adjustments	Adjusted Minimum Release Requirements (cfs)
June through Labor Day	*IFII	800 – 1,750	September End-of-Month Storage Adjustment When Calculated End-Of-September storage is < 300 TAF, then IFII Index Flow or Calculated Storage-Based Flow, whichever is less	800 – 1,750	Water Conservation or Fish Protection Adjustment	1,500-1,749
Post-Labor Day through September 30	*IFII	June through Labor Day MRR, but not more than 1500 cfs	N/A	800-1,500	Fish Protection Adjustment	1,250-1,499

*The IFII is an index of the forecasted volume of flow into Folsom Reservoir from May through September, and is used to calculate the Index Flow from March through September. (Reference: NMFS 2009)

4. Steelhead Spawning within the Action Area

The proposed action area is becoming increasingly important for the CCV steelhead population in the American River. During the 2009 to 2010 monitoring season, the majority (75 percent) of the steelhead redds observed (79) were found adjacent to Nimbus Fish Hatchery at Sailor Bar (RM 22) (Chase 2010). Adult steelhead were observed performing one or more of the following behavioral spawning characteristics: digging, spawning, and defending redds against adult Chinook salmon.

A lower Sunrise side channel (RM 19.5) was modified in 2008, to allow water to move through it at river flows of 900 cfs and higher. This project was intended to reduce the likelihood that the steelhead redds in the American River will be dewatered due to dam operations. The side channel appears to exhibit suitable spawning conditions in terms of gravel availability, substrate size, and suitable flow for steelhead spawning. Of the 13 steelhead redds observed in this Sunrise proximity, 7 steelhead redds were observed in the lower Sunrise side channel despite the lack of overhanging vegetation, woody debris, log jams, or boulders to aide in the spawning of adult steelhead and Chinook salmon and to increase the survival of out-migrant smolts.

5. Gravel Augmentation

Reclamation, in cooperation with the Sacramento Area Water Forum, is carrying out a gravel augmentation program, adding gravel in the lower American River between Nimbus Dam and

Sailor Bar, at the Upper Sunrise Recreation Area and at American River Parkway South. The gravel is used for Chinook salmon and steelhead spawning and rearing purposes. In addition, side channels are being created to increase in-river spawning and rearing habitat for both species. Funding for the project is provided through CVPIA section 3406(b)(13) (Spawning Gravel). The work is being performed in phases over the next five years to allow for best spawning-bed development. Gravel augmentation projects provide more suitable spawning habitat for adults, therefore decreasing competition among adults for spawning habitat. Log jams, boulders, and overhanging vegetation are encouraged to be added to the lower Sunrise side channel to improve juvenile rearing habitat and to provide hydrological breaks for juvenile and adult steelhead. Redd surveys have shown a positive response (increased productivity) to areas of gravel enhancement in the lower American River (Chase 2010), and specifically within the proposed action area (Nimbus Shoals).

6. Fall-run Chinook Presence in the lower American River

American River, fall-run Chinook salmon escapement has varied widely in the American River. Estimated escapement from 1944 through 1952, before the construction of Nimbus Dam ranged from 12,000 to 38,656 Chinook salmon, and averaging 25,948 fall-run Chinook salmon (USFWS and CDFG 1953). Since 1952, the average escapement has been approximately 42,000 Chinook salmon, and has ranged from 6,400 to 110,900 fish. In recent years escapement has exceeded 100,000 Chinook salmon (Kano 2006). Each fall, Nimbus Hatchery staff take approximately 10,000 adult fall-run Chinook salmon, with an annual goal of harvesting 8,000,000 eggs and releasing 4,000,000 smolts per year. All Chinook salmon collected at Nimbus Hatchery are euthanized and no trapped salmon are returned to the American River (Reclamation 2011a). The rest of the salmon spawn in the river or die before spawning or are harvested by anglers. Chinook salmon that reach the diversion weir and do not enter the hatchery are thought to ultimately drop back downstream and spawn there. Some may go past the weir and entrance to the Nimbus Hatchery ladder to spawn in the area between Nimbus Dam and the weir. Construction of the proposed project will overlap with the end of the Central Valley fall/late fall-run Chinook salmon evolutionarily significant unit (ESU) fry emergence and emigration period in June.

7. Nimbus Fish Hatchery

Nimbus Fish Hatchery produces juvenile fall-run Chinook salmon and winter-run steelhead to mitigate for the loss of spawning and rearing habitat upstream of Folsom and Nimbus dams. The hatchery collects broodstock to spawn, incubates eggs to hatch-out, rears juvenile fish for up to a year, and trucks them to release sites (San Pablo Bay for fall-run Chinook salmon; Discovery Park at RM 0 of the American River for steelhead). The Nimbus Fish Hatchery annual production goals are 430,000 steelhead and 4 million fall-run Chinook salmon (CDFG and NMFS 2001).

8. American River Hatchery

The American River Trout Hatchery, adjacent to Nimbus Fish Hatchery, obtains fish eggs or fingerling fish from other hatcheries, or collects fish eggs at remote sites. The eggs are incubated

and hatched, and fish are reared to various sizes to accommodate various management strategies. Most of the fish are reared for almost a year to reach "catchable size" (1/2 pound). The American River Trout Hatchery receives fertilized trout eggs for hatching and raises fish in one hatchery building, four 10-ft by 200-ft nursery ponds, and ten 10-ft by 600-ft raceways. A small number of salmon (kokanee) are also raised at the American River Trout Hatchery for CDFG's Inland Lake Stocking Program (*e.g.*, stocking Central Valley reservoirs). The CDFG Fish Health Center is located adjacent to the American River Trout Hatchery. The American River Trout Hatchery's current goal for fish rearing is one million fish per year, which are transferred to several California water bodies for release.

9. Water Discharge

The Nimbus Fish Hatchery and the American River Trout Hatchery receive their operations water from Lake Natoma, the pool upstream of Nimbus Dam, via a common 60-inch line. Combined water intake for both hatcheries is approximately 39 to 45 million gallons per day and, may be as high as 90 million gallons per day. Intake flow is adjusted to meet operational needs (*e.g.*, intake flow is reduced when the raceways are cleaned). The hatcheries also receive minor flow from Lake Natoma via the older 42-inch line (estimated to be less than 4.2 million gallons per day). Flow through the 42-inch line is maintained to prevent water in the line from becoming stagnant. All water is used on a once-through basis, and is discharged to the American River through four outfalls. Wastes generated at the facilities include fish fecal material, unconsumed fish food, nutrients, algae, silt, chemicals, and therapeutic agents used to treat fish and control disease.

Nimbus Fish Hatchery includes two parallel settling ponds for the disposal of wastewater from raceways and rearing ponds during normal cleaning operations, and from the incubator building, the fish disease lab, and local surface drainage. The settling ponds were constructed in highly permeable gravels, which allow the entire flow to indirectly discharge to the American River through seepage. The settling ponds were also constructed with overflow points to a 12-inch pipe that discharges directly to the American River.

The installation of an effluent outlet structure on the water quality detention pond located at the west end of Nimbus Fish Hatchery was proposed in 2011. A previous project involved the repair of the discharge pipe and surrounding levee in the pond closest to the American River. The proposed second effluent outlet structure is required to connect both settling ponds in order to prevent water levels in the south pond from exceeding the allowable freeboard criteria set by the Regional Water Quality Control Board (RWQCB), possibly overtopping the ponds or curtailing the flow to the hatchery facilities. The pipe is expected to discharge 0 to 36 cfs, but will be able to accommodate the full hatchery outflow of 55 cfs.

10. American River Parkway

The American River Parkway is a riparian corridor aligning the 23 miles of the lower American River. The parkway offers a diversity of activities to its annual 8 million visitors, including fishing, canoeing, kayaking, rafting, hiking, equestrian trails, a biking trail, and a nature center. The American River has been designated a "Recreational River" under both the California Wild

and Scenic Rivers Act and the National Wild and Scenic Rivers Act. These designations provide state and national recognition, and additional protection of the river's outstanding scenic, wildlife, historic, cultural, and recreational values. The trail system of the American River Parkway has been designated a "National Recreational Trail." Nimbus Fish Hatchery lies within the upper reaches of the parkway, and it offers a visitor center and nature trail along the river, as well as public visitation to its spawning building and raceways. The urban accessibility of the parkway has contributed to making the American River the most heavily fished in the Central Valley, and third in the state (Jackson 2007), based on the average number of reported fishing trips (2003 to 2005).

C. Factors Affecting the Species and Critical Habitat in the Action Area

1. Nimbus Fish Hatchery Ladder and Weir Operations

The Nimbus Fish Hatchery weir prevents adult Chinook salmon from continuing upstream and diverts them into the fish ladder. Fish that do not enter the ladder either drop back into the river to suitable habitat and spawn or elude the weir and congregate in the Nimbus Dam stilling basin between the weir and Nimbus Dam. The 326-foot-long weir is in place from mid-September until early January, and covers the fall-run Chinook salmon spawning period. Steelhead enter the fish ladder from mid-December through April without the weir in place. The removal of the weir in January does not impair the steelhead from locating the ladder. The fish ladder is cleaned shortly after it is closed in the spring. Any required maintenance of the fish ladder and weir is completed before the weir is reinstalled in the fall. The structure is angled at 55 degrees from the centerline of the river, with the north side of the structure farther downstream. The structure has eight vertical concrete piers, located every 30 feet across the river, and 2 riverbank abutments. The weir foundation, which is between the piers, consists of sheet piles, sheet H-beams, and rocks, with a crest elevation of 77.5 feet msl.

River flows are reduced by Nimbus Dam operations to perform the pipe rack barrier installation. The rack support frames and pipe racks are normally installed by September 15 and removed at the end of December or early January each year. The upstream migrating fish are held at the fish rack structure site until the water temperature drops below 60°F and the upstream migrants are ready to spawn. This usually occurs in November and the fish ladder entrance gate is opened allowing fish to travel up into the hatchery.

The weir structure is vulnerable to damage at flows over 5,000 cfs (Reclamation 2011a). The pickets must be removed if releases of 5,000 cfs are anticipated, the racks must be removed if releases of 10,000 cfs are anticipated, and the walkway is removed if releases of 15,000 cfs are anticipated. When flows that may result in damage are anticipated, the entire weir structure is usually completely, rather than incrementally, removed. Historically, following high floods, the weir's foundation has been severely damaged, allowing adult Chinook salmon to pass under the weir and continue upstream beyond the fish ladder entrance. Repair of the weir has involved placement of significant amounts of rock and cobble in voids in the foundation, which requires lowering the flow in the river. Subsequently, river flows downstream of Nimbus Dam have been reduced over the course of five to nine days in order to safely repair damages to the weir. Extended periods of flow reduction have reduced the amount of steelhead habitat per increased

fish densities, and increased the potential for fish predation and disease outbreaks (Reclamation and CDFG 2011). Lowering the flows can also degrade habitat by raising temperatures and decreasing dissolved oxygen (NMFS 2009). In 2010, preliminary CDFG adult escapement data on the American River estimated 7,115 fall-run Chinook salmon, representing 30 percent of the American River escapement, were blocked from migrating downstream to suitable spawning habitat by the early fall placement of the weir (Israel 2011).

2. Angling Effort

The American River is the most popular river in the Central Valley for steelhead angling (Jackson 2007). Fishing pressure in the American River increases after October, downstream of the USGS cable line at RM 22, but Nimbus Shoals experiences intense angling pressure at all times, with implications to listed steelhead rearing, holding, spawning and hatching, and presenting an unmanageable area for enforcing CDFG regulations (Don Tanner, NMFS Law Enforcement, pers. comm.). The open season for angling in the lower American River encompasses nearly the entire steelhead spawning season. The only steelhead spawning potentially occurring during the closed fishing season would occur for early spawners during late-December from Hazel Avenue bridge piers to the SMUD power line crossing at the south-west boundary of Ancil Hoffman Park (CDFG 2008). The entire lower river is open for fishing starting in January, although reach-specific gear and harvest restrictions apply. Although only hatchery steelhead may be harvested, catch and release of wild spawners may result in mortality if hooking injures critical organs (*e.g.*, gills; Cowen and Bailey 2007). Anglers must have a nontransferable *Steelhead Trout Catch Report Restoration Card* issued by CDFG in their possession while fishing for steelhead trout in anadromous waters (CDFG: http://www.dfg.ca.gov/regulations/FreshFish-Mar2012/ccr-t14-ch2-art4-sec5_65-5_95.html#sec5_88). For purposes of this regulation, a steelhead trout is defined as any rainbow trout greater than 16 inches in length found in anadromous waters. Anglers must record the month, day, location fished, number of steelhead caught and kept, and number of steelhead caught and released. Month, day and location must be recorded even if no steelhead were caught. Anglers are required by law to return (or report online) Steelhead Fishing Report and Restoration cards to CDFG by January 31 of the year following the card expiration.

Steelhead fishing report card results show that the American River ranks third in steelhead angling effort in the State, with only the Trinity and Smith rivers receiving more (CDFG 2007). From 2003 through 2005, over 3,500 steelhead fishing trips were reported for the American River. During those years, anglers reportedly caught 1,840 wild steelhead and illegally harvested 31 of those; 1,440 hatchery steelhead were caught and released and 359 hatchery steelhead were harvested. In addition to the direct effects associated with catch and release fishing, steelhead eggs, incubating in redds, may be damaged by wading anglers or other recreationalists. While there could be false reports, this is the means by which CDFG assesses angling success.

3. New Zealand mudsnails

New Zealand mudsnails (*Potamopyrgus antipodarum*) are native to New Zealand and found in all types of aquatic habitats from eutrophic mud bottom ponds to clear rocky streams, feeding on plant and animal detritus, algae, and bacteria (Aquatic Nuisance Species Task Force 2007).

They can tolerate a wide range of water temperatures (except freezing), salinity, and turbidity in clean as well as degraded waters. They are very small (5 to 12 mm) and have an operculum plate covering the opening of the coiled gray and brown shell. Their asexual mode of reproduction (populations consist of females that are born with developing embryos in their reproductive system) allow them to become highly successive colonizers and they are easily transported into new river systems by anglers, boaters and others transporting contaminated gear. They were first discovered in North America in the late 1980's in the Snake River, Idaho and Madison River, Montana. They were first sampled in California on the Owens River in 1999 and since then, the incidence of mudsnail has occurred in several water bodies in California, including the lower American River (near the Howe Avenue boat launch). These animals spread very easily, and it is possible that they are present upstream or downstream from that location, even though it may have not yet been reported. If the snails become very dense and comprise a large percentage of the macroinvertebrate biomass, they can reduce food resources and populations of other macroinvertebrates, particularly mayflies, caddisflies and chironomids. They can also reduce whole-stream algal production. It does not appear as though they are the preferred food of trout. There is general consensus that New Zealand mudsnails could have a significant impact on trout fisheries. They cannot be eradicated but can be controlled through careful monitoring and maintaining clean equipment, boating gear and crafts before and after entering the aquatic environment (CDFG; http://www.dfg.ca.gov/invasives/mudsnail/).

4. Predation

Predators of juvenile steelhead in the lower American River include both native (*e.g.*, Sacramento pikeminnow [*Ptychocheilus grandis*]) and non-native (*e.g.*, striped bass) fish, as well as avian species (NMFS 2009). Striped bass, which were introduced in California in 1879 and 1882 (Surface Water Resources, Inc. 2001), have been shown to be effective predators of steelhead in the Central Valley (DWR 2008). CDFG biologists have estimated that striped bass eat 5 to 25 percent of the juvenile salmon population annually (Marty Gingras, CDFG, pers. comm.). Some striped bass reportedly reside in the lower American River year-round, although their abundance greatly increases in the spring and early summer as they migrate into the river at roughly the same time that steelhead are both emerging from spawning gravels as vulnerable fry and are migrating out of the river as smolts (Surface Water Resources, Inc. 2001). A large run of striped bass that can occasionally top the 50-pound mark peaks in the American River from April to May and September to October.

5. Water Quality

Poor water quality can affect steelhead in the lower American River. Tierney *et al.* (2008) demonstrated that environmentally observed pesticide mixtures can injure rainbow trout olfactory tissue, thereby affecting their ability to detect predators. Similarly, Sandahl *et al.* (2007) showed that runoff from urban landscapes has the potential to cause chemosensory deprivation and increased predation mortality in exposed salmon. Urbanization throughout the greater Sacramento area has led to a replacement of agricultural land uses within the American River floodplain with urban land uses, and a corresponding increase in urban runoff (Surface Water Resources, Inc. 2001). Based on data from 1992 through 1998 collected by the Ambient Monitoring Program, lower American River water quality exceeded State (California Toxics

Rule) or Federal (EPA) criteria with respect to concentrations of four metals – lead, copper, zinc, and cadmium (Surface Water Resources, Inc. 2001).

6. Wetlands

Wetlands protect stream banks against erosion, as they hold the soil in place with their roots, absorb the energy of waves, and slow the flow of stream or river currents along the shore. The combination of shallow water, high levels of nutrients, and high primary productivity is ideal for the growth of organisms that form the base of the food web. As the runoff water passes through, the wetlands retain excess nutrients and some pollutants, and reduce sediment that would clog waterways and affect fish and amphibian egg development. In addition to improving water quality through filtering, some wetlands maintain stream flow during dry periods, and many replenish groundwater. Wetlands on Nimbus Shoals would be impacted (Table 3). Temporary impacts on 0.02 acre and permanent impacts on 0.012 acre would occur from the placement of 250 cubic yards of fill necessary to reconstruct the Nimbus Shoals access road. Wetland acreage will be restored or developed on-site, in accordance with the section 404 conceptual wetlands "no net loss" mitigation plan.

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. The final biological opinion assesses the effects of the Nimbus Fish Hatchery Fish Passage Project on CCV steelhead. The project is expected to facilitate the availability of spawning habitat for steelhead, but it is likely to adversely affect listed species through implementation of its fish capture and relocation for the 0,2acre portion of the river channel to be dewatered, which entails seining and possible electrofishing as a capture method. Implementation of the proposed project is likely to adversely affect critical habitat through activities such as:

- dewatering of the creek within the project area,
- excavation and vegetation removal,
- 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,
- construction of a temporary crossing to access the south bank, and
- construction related noise.

In the *Description of the Proposed Action* section of this biological opinion, NMFS provided an overview of the action. In the *Status of the Species* and *Environmental Baseline* sections of this biological opinion, NMFS provided an overview of the threatened 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 will 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 will destroy or adversely modify the conservation value of designated or proposed critical habitat (16 U.S.C. §1536).

Overall, eight acres of upland and aquatic areas will be temporarily affected by construction of the fish passageway and removal of the current weir, and 1.6 acres of upland and aquatic areas will be permanently affected of which is 0.05 acres of critical habitat (Reclamation 2011a).

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.

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 peer reviewed scientific journals, primary reference materials, government and non-government reports, project-specific environmental reports, and project meetings.

B. Assessment

The proposed Nimbus Fish Hatchery Fish Passage Project will increase the potential for greater natural productivity and abundance of the CCV steelhead population in the American River, with improved accessibility and quality of steelhead habitat in Nimbus Shoals. It is expected that the proposed project (Phases I and II) will benefit the conservation value of critical habitat for CCV steelhead spawning and rearing in the upper reach of the lower American River.

Potential construction-related impacts include exposure of juvenile steelhead to noise and high sound pressure levels and increased turbidity during cofferdam installation and removal; entrainment behind the cofferdam; injury or death during fish capture and relocation; and permanent loss of wetland. Construction activities that occur behind the cofferdam are not likely to adversely affect salmon and steelhead because they will be isolated from the American River, and stabilized prior to cofferdam removal. The effects of decommissioning activities (removal of the weir coffer dam and weir structure) are unknown at this time, but will be a part of the Phase III evaluation.

Dredging and dewatering the stream channel will impact populations of benthic macroinvertebrate forage species in the entrance to the ladder passageway (0.2 acre). A study of the effects of dredging on benthic macroinvertebrates in the California Central Valley and Sierra Nevada watersheds of the North Fork of the American River and Butte Creek by Harvey (1986) found benthic macroinvertebrate populations were not highly sensitive to dredging in general, probably because the streams studied naturally have substantial seasonal and annual fluctuations in flow, turbidity, and substrate. The impact will be short-term, with re-colonization by the benthic macroinvertebrate fauna expected to occur within 6 months.

There is the potential for some immediate or delayed deleterious impacts, resulting from fish capture efforts, containment, and transportation for release. In recent studies at Putah Creek using electro-fishing techniques, salmonid mortality was between 0 and 5 percent for adults and juveniles, respectively (personal communication with Salomunovich 2011). All instream work will be conducted between June 1 and September 30 to minimize the risk of impacting steelhead. 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 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 best management practices (BMPs) and conservation measures are effective in avoiding or minimizing detrimental effects to listed steelhead and critical habitat. Appropriate implementation of these measures are expected to reduce the potential impacts to fish and habitat, to the level that they will not be likely to adversely affect listed steelhead.

1. <u>Construction of the Fish Passageway</u>

a. Construction Effects

The construction of a temporary access road will affect 0.02 acre (871 square feet) of wetland that will be restored upon completion of the proposed project (Table 3). There will also be a permanent impact to 0.012 acre (507 square feet) of wetland, which will need to be replaced on-site, as per the section 404 conceptual wetlands “no net loss” mitigation plan to be developed in accordance with USACE regulations. There could be potential water quality degradation downstream of Nimbus Dam, due to river sediments and silt runoff from areas disturbed by project construction. The proposed project will limit the effects from construction of the access corridor and fish ladder to existing roads and access points to the greatest extent possible, and equipment will be limited to within the construction footprint, access corridor, and areas specifically designated for machine maintenance and storage. In-river construction at the

entrance to the passageway will be limited to a 0.2-acre area that will be dewatered from June 1 through September 30, when CCV steelhead are not spawning and fish are expected to shy away from the project area due to construction activity around the dewatered area.

Cofferdam installation and site preparation will result in increased short-term, localized turbidity and suspended sediment concentrations within the American River. Exposure to increased turbidity and suspended sediment may affect CCV steelhead through disruption of normal feeding behavior and expose juveniles to increased predation by forcing them from shallow water refugia into the open water of the river channel. The period of increased turbidity will be limited to installation of the cofferdams and temporary access structures. Increased turbidity and suspended sediments would occur intermittently during construction of the cofferdam.

Reclamation intends to restore the access corridor, impacted vegetation, the borrow pit (located within the staging site), and the staging area to original condition, after project construction completion. Effects of construction of the access corridor and staging site are expected to be short-term and leave no permanent impact.

b. Excavation and Vegetation Removal

The disturbed structure of the soil can lead to increased sedimentation into the American River. Increased suspended sediments correlate with a decline in primary productivity, a temporary decline in the abundance of periphyton, and reductions in the abundance, density and diversity of invertebrate fauna in the affected area (Lloyd 1987, Newcombe and MacDonald 1991). Increased sediment delivery can also fill interstitial substrate spaces and reduce cover for juvenile fish (Platts *et. al.* 1979) and abundance and availability of aquatic invertebrates for food (Bjornn and Reiser 1991).

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 which suffocate eggs due to reduced interstitial flow of oxygenated water. 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. Increases in suspended inorganic sediment concentrations may occur during excavation of the riverbed or the stream bank, and can be deleterious or lethal to filter-feeding invertebrates and fish, which exhibit avoidance behavior or else negative physiological responses (Owens *et al.* 2005). Effects from sedimentation are anticipated to be avoided through implementation of sediment control measures located at disturbed areas to prevent sediment from entering the river, and kept in place until they are stabilized. These measures include turbidity curtains, silt fences, or straw bales for erosion control and potential river siltation. Because of the short duration of construction and with the implementation of the BMPs, the potential for adverse effects to steelhead by project-related sedimentation is considered minimal. Further recommendations may be included as part of the SWPPP developed for the project in conjunction with the RWQCB. As a precaution, water quality will be monitored for turbidity and settleable materials according to the RWQCB section 401 Water Quality Certification standard conditions.

c. Accidental Spills

If contaminants are released during construction activities, their effects may be subtle and difficult to observe directly. The effects of bioaccumulation are of particular concern as pollutants can reach concentrations in higher trophic level organisms (*e.g.,* salmonids) that far exceed ambient environmental levels (Allen and Hardy 1980). Bioaccumulation may therefore cause delayed stress, injury, or death as contaminants are transported from lower trophic levels (e.g., benthic invertebrates or other prey species) to predators long after the contaminants have entered the environment or food chain. It follows that some organisms may be adversely affected by contaminants while regulatory thresholds for the contaminants are not exceeded during measurements of water or sediments.

Accidental spills related to construction activities or hazardous materials may cause habitat degradation and result in fish mortality or reduce productivity of fish and other aquatic species. The project will avoid or minimize impacts from accidental spills by implementing spill prevention and containment measures for off-site disposal of contaminated soils and the storing of hazardous materials to areas protected from direct runoff. All staging and storage areas will lie outside of the stream zone. Areas for refueling machinery and for storing hazardous materials will be set back from the American River. Marked areas away from direct runoff will also be provided for fluid inspection, washing, and any rebuilding, of equipment.

Any accidental spills will be cleaned up immediately, and RWQCB, NMFS, and CDFG will be notified of the event for further direction. To minimize the effect of a potential oil leak, it is recommended that the contractor utilize biodegradable oils in the hydraulic systems of equipment used for instream work, which will also be beneficial to areas regarding any spills occurring outside of the streambed.

d. Construction of Cofferdam for the Ladder

A temporary, watertight cofferdam, built with large sandbags, will be used to dewater 0.2 acre within the tailrace of Nimbus Dam for constructing the entrance to the fish channel. The materials used to build the cofferdam will be removed to an off-site storage or disposal area after construction. The area within the cofferdam will first be surveyed for trapped adult and juvenile CCV steelhead, after which any fish present will be captured by seining and dip netting and relocated outside and downstream of the cofferdam. The area within the cofferdam will be then be dewatered by pumping. Cofferdam installation and site preparation will result in increased short-term, localized turbidity and suspended sediment concentrations within the American River. Exposure to increased turbidity and suspended sediment may affect CCV steelhead through disruption of normal feeding behavior and expose juveniles to increased predation by forcing them from shallow water refugia into the open water of the river channel. The period of increased turbidity would be limited to installation of the cofferdams and temporary access structures. Increased turbidity and suspended sediments would occur intermittently during construction of the cofferdams. Displacement of juveniles from preferred habitats may cause increased susceptibility of juveniles to predation. Suspension of sediments in the water due to dredging activities will be minimized by the use of BMPs and turbidity will not exceed the limits established by the Regional Water Control Board (RWQCB).

e. Fish Capture and Relocation

Adult and especially juvenile salmonids may become stranded during the dewatering process. Stranding may cause stress to fish by forcing them to occupy shallow pools of standing water that may have elevated temperatures and low dissolved oxygen available. Fish may be injured as they try to escape. Likewise, capture and handling of fish may cause stress, physical injury, or death. During dewatering of the cofferdam, using low-flow pumps with screened intakes, fish biologists will observe the impacted area to estimate the numbers and types of fish which may become stranded. Based on this information, fish biologists will decide which capture method is most appropriate to employ. Seining is the preferred first methodology, dip netting second, but fish biologists may employ electro-shockers. The use of electricity to capture fish is highly intrusive and can result in trauma, injury, hemorrhages, fractures, and immediate or delayed mortality (Dalbey *et al.* 1996, Ainslie *et al.* 1998). Recovery can take up to several days, during which fish are more vulnerable to predation. Electrofishing has more severe effects on adult salmonids than juveniles (Sharber and Carothers 1988). To minimize harm to fish, NMFS requires fishery biologists follow the NMFS' electrofishing guidelines (NMFS 2000). A crew of fishery biologists will be on stand-by for possible implementation of real-time fish capture operations after the installation of the cofferdam. This process will be carried out in June, when adult steelhead are not expected in the action area of the project. Following professional protocols of fish capture and holding, rescued fish will be released downstream of the project site. Resumption of dewatering in the cofferdam will occur once fish capture is completed.

Although salmonids recover well from capture, handling, and short relocations, there may be incidental injury and death to individuals during the rescue. Monitoring the condition of captured fish and following professional protocols for fish capture carried out by experienced biologists will reduce any adverse effects on captured steelhead. Reclamation will follow a fish capture plan to be developed for review by NMFS, to minimize long-term effects on captured or relocated steelhead.

2. <u>Increased Public Use of Nimbus Shoals</u>

Installing the new fish passageway and removing the weir will provide steelhead access to habitat in Nimbus Shoals all year long. With an expected increase in fish densities in the stilling basin, angler success rates are expected to increase, along with the number of anglers using the area, resulting in increased sportfishing in the area. Protected species would be highly vulnerable to sportfishing harvest, especially during spawning time. This impact is expected to be mitigated by restricting or closing public access to Nimbus Shoals or by the California State Fish and Game Commission closing the area to fishing.

Increased visitation to the Nimbus Shoals area by the general public could result in an increase in the amount of trash and litter in the area. If visitation to Nimbus Shoals were to increase and the area were to remain open to unrestricted vehicle traffic, there will likely be an increase in erosion and sedimentation from vehicles driving and parking near the water's edge. These activities would degrade the water quality and fish habitat, but their impacts will be mitigated by

Reclamation closing or limiting public access to Nimbus Shoals or by the California State Fish and Game Commission were to closing the area to fishing because visitation will be reduced.

Nimbus Shoals is owned by Reclamation and managed by California Department of Parks and Recreation (Parks and Recreation) under an agreement that includes a larger responsibility to manage the Folsom Lake State Recreation Area. Nimbus Shoals is very popular with fishermen, but the boating community has also expressed an interest in launching watercraft from the shoals if the hatchery weir is removed. Currently some illegal launching occurs. Parks and Recreation may change public access to Nimbus Shoals regarding public safety hazards associated with the new fish passageway. Management issues on public use and safety issues include consideration of user fees if boaters can legally launch from the shoals area. A second issue is the proposed concession of the shoals area to CSUS to manage the area for kayaking and rafting. The liability, public access and use fee issues associated with such a concession are anticipated to be controversial (Reclamation 2006). Management of the access to Nimbus Shoals would be tied to the recreational season, and in consideration of expression of steelhead life history. Potential effects to CCV steelhead from increased public access to holding, spawning, and rearing habitat on the lower American River include: stress, loss of gametes, destruction of redds and fish eggs, injury and mortality to swim-up fry and alevins. These effects would continue without appropriate management techniques to prevent deleterious interactions between fish and various user groups of the American River.

3. Fish and Wildlife Coordination Act (FWCA)

The purpose of the FWCA is to ensure that wildlife conservation receives equal consideration and is coordinated with other aspects of water resources development (16 U.S.C. 661). The FWCA establishes a consultation requirement for federal agencies that undertake any action that proposes to modify any stream or other body of water for any purpose, including navigation and drainage (16 U.S.C 662(a)). Consistent with this consultation requirement, NMFS provides recommendations and comments to Federal action agencies for the purpose of conserving fish and wildlife resources. Nimbus properties are owned by Reclamation and managed by CDFG. NMFS and USFWS served as co-partners on the interagency technical team that provided input and evaluation on all project alternatives and final project design. USFWS is active in carrying out the Anadromous Fish Restoration Program gravel enhancement activities in the American River, and has a vested interested in the proposed project to advance its anadromous fish doubling goals as part of the CVPIA section 3406(b)(1) to implement a program which makes all reasonable efforts to ensure that, by the year 2002, natural production of anadromous fish in Central Valley Rivers and streams will be sustainable, on a long-term basis, at levels not less than twice the average levels attained during the period of 1967-1991. In the case of the Nimbus Fish Hatchery Fish Passage Project, Reclamation owns the land and property while CDFG runs the facilities.

No USFWS listed species or habitat will be affected by the Nimbus Hatchery Outfall Project, therefore, NMFS does not have any project recommendations regarding USFWS fish and wildlife species.

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.

The American River Parkway Plan (Plan), under the jurisdiction of the County of Sacramento, has an in-progress policy document that guides the land use decisions affecting the American River Parkway (parkway). The Plan will help to protect biological resources in the region over the long term, as the plan aims to appropriately manage other land uses, particularly recreation, to have a minimal impact on biological resources. Any cumulative effect from the Plan will likely be beneficial to the Nimbus Hatchery Fish Passage Project, which lies within the parkway.

The Hazel Light Rail Station Trans-Oriented Development project is part of the collaborative effort by the Sacramento Regional Transit and the City of Rancho Cordova, Sacramento County, to implement transit oriented development along the Folsom Boulevard light rail corridor. The proposed Hazel Light Rail Station will increase residential and commercial development near the proposed project action area. An increase in the local population may increase the number of recreationalists at Nimbus Shoals because it is a local and convenient place to visit. Effects of increased recreation may include: disturbed or destroyed riparian vegetation that overhangs the river and helps to regulate water temperatures, erosion of the levee embankment and sedimentation caused by vehicle traffic on Nimbus Shoals, degradation of water quality from leaks and spills of vehicle fuels, and an increase in illegal fishing.

VII. INTEGRATION AND SYNTHESIS

Populations of CCV 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 gravel mining.

The avoidance, minimization, and conservation measures that have been incorporated into the project design are expected to further reduce the likelihood and severity 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 slowly and carefully conducting excavating and fill activities to allow wildlife (*e.g.*, juvenile salmonids) to escape in advance of machinery and advancing soil. 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. A range of fish responses, from behavior avoidance to mortality, may occur through shock disturbance impacts from dredging and sheet pile removal. Overall, only a small number (5% or less of the capture number) of adult and juvenile CCV steelhead are anticipated to be adversely affected by

construction impacts of the proposed project. Impacts to critical habitat in the American River will be short-lived (*i.e.*, within two in-river construction windows); however, the long-term benefit of removing a barrier to CCV steelhead migration will provide permanent access to improved holding and spawning critical habitat in the uppermost reach of the American River and increase the potential for improving the viability of the CCV steelhead DPS.

VIII. CONCLUSION

After reviewing the best available scientific and commercial information, the current status of CCV steelhead, the environmental baseline for the action area, the effects of the proposed action, conservation measures and the cumulative effects, it is NMFS' biological opinion that the Nimbus Fish Hatchery Fish Barrier Weir and Ladder Modification project Phases I and II, as proposed, is not likely to jeopardize the continued existence of CCV steelhead, and is not likely to adversely modify designated critical habitat of CCV steelhead. Because Phase III is dependent upon the success of Phase II, the impact of removal of the fish weir (Phase III) on the CCV steelhead is unknown at this time and will be evaluated in a subsequent consultation.

IX. INCIDENTAL TAKE STATEMENT

Section 9 of the ESA and Federal regulations pursuant to section 4(d) of the ESA 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 ESA 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 Reclamation 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. Reclamation has a continuing duty to regulate the activity covered by this incidental take statement. If Reclamation 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, Reclamation 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

NMFS cannot, using the best available information, quantify the anticipated incidental take of individual fish because of the variability and uncertainty associated with the population size of each species, annual variations in the timing of migration, and uncertainties regarding individual habitat use of the proposed project area. However, it is possible to designate ecological surrogates for the extent of take anticipated to be caused by the proposed project, and to monitor those surrogates to determine the level of take that is occurring. NMFS anticipates incidental take in the form of harm or mortality of juvenile California CV steelhead from impacts directly related to dewatering activities, and associated with increased turbidity. The following levels of incidental take from the proposed project activities are anticipated:

1. Take in the form of mortality of stranded juvenile California CV steelhead during the dewatering activities from June 1 to September 30. Take will be a small percentage of the relocated (salvaged) California CV steelhead. There is the potential for listed juvenile fish to be directly killed or injured as a result of the fish salvage. The number of fish collected from the area to be dewatered is expected to be a low proportion of the population of California CV steelhead in the American River. A low mortality rate (expected to be less than 10 percent if consistent with the results of fish handling in similar fish salvage efforts) is expected from capturing and handling.

2. The analysis of the effects of the proposed project anticipates that take in the form of injury and death from predation will result from construction-related turbidity that will extend into project areas along the lower American River. However, such take cannot be accurately quantified, so the level of turbidity is an appropriate ecological surrogate. The analysis of the effects of the proposed project anticipates that the turbidity levels produced will not exceed those permitted under the project SWPPP. If the turbidity exceeds permitted levels under the NPDES program and the SWPPP, the level of allowable anticipated take will be exceeded.

3. Take in the form of injury and death is expected from dredging activities between June 1 and September 30 during the first year of construction of the fish passageway.

Anticipated incidental take may be exceeded if project activities exceed the criteria described above, or if the project is not implemented as described 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

NMFS has determined that the level of take is not likely to jeopardize CCV steelhead or adversely modify critical habitat. The effect of this action will consist of fish behavior modification, loss of habitat value, and potential death or injury of juvenile CCV steelhead directly related to dewatering activities.

C. Reasonable and Prudent Measures.

NMFS believes that the following reasonable and prudent measures are necessary and appropriate to minimize take of California Central Valley steelhead resulting from implementation of the action. These reasonable and prudent measures also would minimize adverse effects on designated critical habitat:

1. Measures shall be taken to limit the adverse effects of dredging activities in the stilling basin associated with construction of the ladder.
2. Measures shall be taken to reduce or eliminate the impacts of the ladder and its ongoing operations upon listed salmonids in the stilling basin and their habitat.
3. Measures shall be taken to reduce or eliminate the impacts to listed salmonids and their habitat from the operation of fishing boats in the stilling basin.

D. Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the ESA, 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 CCV steelhead have been considered for incorporation into the proposed project. NMFS will require thorough monitoring and reporting to NMFS on the efficacy of implementation of the proposed conservation measures and any documented take that results from construction of the project.**

    a. Reclamation shall closely monitor all construction activities and report any incidences of take of listed salmonids within 24 hours to NMFS at the contact information below.

    b. Reclamation shall provide annual reports to NMFS' Central Valley Area Office (see contact information below) within six months of the close of each instream construction season (*i.e.*, March 1, following an October 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; evaluation of the success on the new fish passageway in meeting objectives regarding fish passage; and progress on site restoration and re-vegetation of project-affected areas.

    c. Reclamation, for the purposes of agency review and approval, shall provide to NMFS at least 21 days prior to implementation of the finalized project plans, describing the following:

- Identification of the consultant biologists hired to oversee the implementation of BMPs and conservation measures, and their credentials;
- A list of any chemically-treated substances that will be used during the instream construction window;
- A final description of the fish capture plan for the proposed project, including the capture method, fish handling/holding and transfer protocols;
- The final re-vegetation plan, including identification, number and location of trees chosen for removal to accommodate the construction of the proposed project, their replacement in-kind (unless invasive species, which would then be replaced by trees native to the lower American River floodplain); replacement compensation ratios to account for temporal loss of SRA; a tree maintenance schedule until tree establishment; and the designated party responsible for carrying out tree maintenance and providing NMFS with status updates on tree re-establishment;
- The SWPPP, containing contingency measures, details about contractor responsibilities, and lists of responsible parties and agency contacts;
- The SPCP, intended to prevent contamination of soils and waterways from construction and hazardous materials, developed in coordination with the RWQCB through the section 401 Clean Water Act permitting process; and
- The section 404 conceptual wetlands mitigation plan, describing the restoration and enhancement of project-affected wetlands and U.S. waters on a "no-net-loss" basis, in accordance with USACE regulations;

d. Reclamation, for the purposes of agency review and approval, shall provide to NMFS at least 60 days prior to implementation, the finalized project plans for monitoring the project in-water for noise and shock disturbance effects of dredging and what fish protective measures will be adopted to prevent take of listed CCV steelhead by dredging and sand pile removal actions in the project area.

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

Supervisor, Central Valley Office
NOAA's National Marine Fisheries Service
650 Capitol Mall, Suite 5-100
Sacramento, California 95814

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 recommendation is consistent with these obligations, and therefore should be implemented by Reclamation.

a. Reclamation will monitor turbidity levels on the American River during ground disturbance activities. Monitoring will be conducted by measuring turbidity upstream and downstream of the disturbance area to determine if the changes in ambient turbidity exceed 20 percent of background turbidity, a threshold derived by the Sacramento and San Joaquin River Basin Plan (CRWQCB 1998). If so, the contractor will adjust work activities to ensure that turbidity levels do not exceed the 20 percent threshold.

b. The contractor will implement the following basic and applicable measure to control construction-related fugitive dust during site grading:

   (1) Water all exposed surfaces twice daily. Exposed surfaces include but are not limited to soil piles, graded areas, unpaved parking, staging areas, and unpaved access roads.
   (2) Use wet power vacuum street sweepers to remove any visible track-out mud or dirt onto adjacent public roads at least once a day.
   (3) Limit vehicle speeds on unpaved roads to 15 miles per hour.
   (4) Minimize idling time either by shutting equipment off when not in use or reducing the time of idling to 5 minutes (as per California Code of Regulations, Title 13, sections 2449[d][3] and 2485). Provide clear signage that posts this requirement for workers at the entrances to the site.
   (5) Maintain all construction equipment in proper working condition according to the manufacturer's specifications. The equipment must be checked by a certified mechanic and determined to be in proper running order before being operated.

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 recommendations.

XI. REINITIATION OF CONSULTATION

This concludes formal consultation on the action(s) outlined in the March 12, 2004 request for consultation received from the Reclamation. As provided in 50 CFR §402.16, re-initiation 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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Enclosure 2

Magnuson-Stevens Fishery Conservation and Management Act

ESSENTIAL FISH HABITAT CONSERVATION RECOMMENDATIONS

I. IDENTIFICATION OF ESSENTIAL FISH HABITAT

The Magnuson-Stevens Fishery Conservation and Management Act (MSA), as amended (16 U.S.C. § 1801 *et seq.*), requires that Essential Fish Habitat (EFH) be identified and described in Federal fishery management plans (FMPs). Federal action agencies must consult with NOAA's National Marine Fisheries Service (NMFS) on any activity which they fund, permit, or carry out that may adversely affect EFH. NMFS is required to provide EFH conservation and enhancement recommendations to the Federal action agencies.

EFH is defined as those waters and substrates necessary to fish for spawning, breeding, feeding, or growth to maturity. For the purposes of interpreting the definition of EFH, "waters" includes aquatic areas and their associated physical, chemical, and biological properties that are used by fish, and may include areas historically used by fish where appropriate; "substrate" includes sediment, hard bottom, structures underlying the waters, and associated biological communities; "necessary" means habitat required to support a sustainable fishery and a healthy ecosystem; and, "spawning, breeding, feeding, or growth to maturity" covers all habitat types used by a species throughout its life cycle. The proposed project site is within the region identified as EFH for Pacific salmon in Amendment 14 of the Pacific Salmon FMP.

The Pacific Fishery Management Council (PFMC) has identified and described EFH, Adverse Impacts and Recommended Conservation Measures for salmon in Amendment 14 to the Pacific Coast Salmon FMP (PFMC 1999). Freshwater EFH for Pacific salmon in the California Central Valley includes waters currently or historically accessible to salmon within the Central Valley ecosystem as described in Myers *et al.* (1998). Central Valley fall/late fall-run Chinook salmon (*Oncorhynchus tshawytscha*) are species managed under the Pacific Coast Salmon FMP that occur in the American River.

Factors limiting salmon populations in the Delta include periodic reversed flows due to high water exports (drawing juveniles into large diversion pumps), loss of fish into unscreened agricultural diversions, predation by introduced species, and reduction in the quality and quantity of rearing habitat due to channelization, pollution, riprapping, *etc*. (Dettman *et al.* 1987; California Advisory Committee on Salmon and Steelhead Trout 1998, Kondolf *et al.* 1996a, 1996b).

A. Life History and Habitat Requirements

Pacific Salmon

General life history information for Central Valley Chinook salmon is summarized below. Information on Sacramento River winter-run and Central Valley spring-run Chinook salmon life histories is summarized in the preceding biological opinion for the proposed project (Enclosure 1). Further detailed information on Chinook salmon Evolutionarily Significant Units (ESUs) are available in the NMFS status review of Chinook salmon from Washington, Idaho, Oregon, and California (Myers *et al.* 1998), and the NMFS proposed rule for listing several ESUs of Chinook salmon (70 FR 37160).

Adult Central Valley fall-run Chinook salmon enter the Sacramento and San Joaquin Rivers from July through December and spawn from October through December while adult Central Valley late fall-run Chinook salmon enter the Sacramento and San Joaquin Rivers from October to April and spawn from January to April (U.S. Fish and Wildlife Service [FWS] 1998). Chinook salmon spawning generally occurs in clean loose gravel in swift, relatively shallow riffles or along the edges of fast runs (NMFS 1997).

Egg incubation occurs from October through March (Reynolds *et al.* 1993). Shortly after emergence from their gravel nests, most fry disperse downstream towards the Delta and into the San Francisco Bay and its estuarine waters (Kjelson *et al.* 1982). The remaining fry hide in the gravel or station in calm, shallow waters with bank cover such as tree roots, logs, and submerged or overhead vegetation. These juveniles feed and grow from January through mid-May, and emigrate to the Delta and estuary from mid-March through mid-June (Lister and Genoe 1970).

As they grow, the juveniles associate with coarser substrates along the stream margin or farther from shore (Healey 1991). Along the emigration route, submerged and overhead cover in the form of rocks, aquatic and riparian vegetation, logs, and undercut banks provide habitat for food organisms, shade, and protect juveniles and smolts from predation. These smolts generally spend a very short time in the Delta and estuary before entry into the ocean. Whether entering the Delta or estuary as fry or juveniles, Central Valley Chinook salmon depend on passage through the Delta for access to the ocean.

II. PROPOSED ACTION

The proposed action is described in section II (*Description of the Proposed Action*) of the preceding biological opinion for Central Valley steelhead (*Oncorhynchus mykiss*) and critical habitat for Central Valley steelhead (Enclosure 1).

III. EFFECTS OF THE PROJECT ACTION

The effects of the proposed action on salmonid habitat are described at length in section V (*Effects of the Action*) of the preceding biological opinion, and generally are expected to apply to Pacific salmon EFH.

IV. CONCLUSION

Based on the best available information, NMFS believes that the proposed Nimbus Hatchery

Fish Passage Project may adversely affect, through temporary construction impacts, EFH for Pacific salmon protected under MSA during its construction and operation. There will be long-term benefits to EFH for Pacific salmon, in the form of increased spawning and rearing habitat between river mile (RM) 22 and 23 of the lower American River.

V. EFH CONSERVATION RECOMMENDATIONS

As the habitat requirements of Central Valley fall-run Chinook salmon within the action area are similar to those of CCV steelhead addressed in the attached biological opinion, NMFS recommends that term and conditions listed in the incidental take statement prepared for the CCV steelhead DPS in the associated biological opinion for the proposed Nimbus Fish Hatchery Fish Passage Project, be adopted as EFH conservation recommendations.

Riparian Habitat Management: In order to prevent adverse effects to riparian corridors, the Bureau of Reclamation (Reclamation) should:

- Maintain riparian management zones of appropriate width along American River;
- Reduce erosion and runoff into waterways within the project area; and
- Minimize the use of chemical treatments within the riparian management zone to manage nuisance vegetation along the levee banks.

Bank Stabilization: The installation of riprap or other streambank stabilization devices can reduce or eliminate the development of side channels, functioning riparian and floodplain areas and off channel sloughs. In order to minimize these impacts, the Reclamation should:

- Use vegetative methods of bank erosion control whenever feasible. Hard bank protection should be a last resort when all other options have been explored and deemed unacceptable;
- Determine the cumulative effects of existing and proposed bio-engineered or bank hardening projects on salmon EFH, including prey species, before planning new bank stabilization projects; and
- Develop plans that minimize alterations or disturbance of the bank and existing riparian vegetation.

Conservation Measures for Construction/Urbanization: Activities associated with urbanization (*e.g.*, building construction, utility installation, road and bridge building, and storm water discharge) can significantly alter the land surface, soil, vegetation, and hydrology and subsequently adversely impact salmon EFH through habitat loss or modification. In order to minimize these impacts, the Reclamation and the applicant should:

- Plan development sites to minimize clearing and grading;

- Use Best Management Practices in building as well as road construction and maintenance operations such as avoiding ground disturbing activities during the wet season, minimizing the time disturbed lands are left exposed, using erosion prevention and sediment control methods, minimizing vegetation disturbance, maintaining buffers of vegetation around wetlands, streams and drainage ways, and avoid building activities in areas of steep slopes with highly erodible soils. Use methods such as sediment ponds, sediment traps, or other facilities designed to slow water runoff and trap sediment and nutrients; and

- Where feasible, reduce impervious surfaces.

Wastewater/Pollutant Discharges: Water quality essential to salmon and their habitat can be altered when pollutants are introduced through surface runoff, through direct discharges of pollutants into the water, when deposited pollutants are resuspended (*e.g.*, from dredging), and when flow is altered. Indirect sources of water pollution in salmon habitat includes run-off from streets, yards, and construction sites. In order to minimize these impacts, the Reclamation and the applicant should:

- Monitor water quality discharge following National Pollution Discharge Elimination System requirements from all discharge points;

- For those waters that are listed under Clean Water Act section 303 (d) criteria (*e.g.*, the American River), work with State and Federal agencies to establish total maximum daily loads and develop appropriate management plans to attain management goals; and

- Establish and update, as necessary, pollution prevention plans, spill control practices, and spill control equipment for the handling and transport of toxic substances in salmon EFH (*e.g.*, oil and fuel, organic solvents, raw cement residue, sanitary wastes, *etc.*). Consider bonds or other damage compensation mechanisms to cover clean-up, restoration, and mitigation costs.

VI. STATUTORY REQUIREMENTS

Section 305 (b) 4(B) of the MSA requires that the Federal lead agency provide NMFS with a detailed written response within 30 days, and 10 days in advance of any action, to the EFH conservation recommendations, including a description of measures adopted by the lead agency for avoiding, minimizing, or mitigating the impact of the project on EFH (50 CFR 600.920[k]). In the case of a response that is inconsistent with our recommendations, the Reclamation must explain its reasons for not following the recommendations, including the scientific justification for any disagreement with NMFS over the anticipated effects of the proposed action and the measures needed to avoid, minimize, or mitigate such effects.

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