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

In response refer to:
2006/04974

JUN 04 2007

Gene K. Fong
Division Administrator
Federal Highway Administration
650 Capitol Mall, Suite 4-100
Sacramento, California 95814

Dear Mr. Fong:

This document transmits NOAA's National Marine Fisheries Service's (NMFS) biological opinion (Enclosure 1) based on our review of the proposed Hazel Avenue Widening project in Sacramento County, California, and its effects on Federally listed threatened Central Valley steelhead (*O. mykiss*) and the designated critical habitat of Central Valley steelhead in accordance with section 7 of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531 *et seq.*). Your September 12, 2006, request for formal consultation was received on October 6, 2006. Formal consultation was initiated on October 6, 2006.

This biological opinion is based on information provided in the September 2005 biological assessment as revised in May 2006, and discussions held at meetings with representatives of NMFS, Sacramento County, and the Federal Highway Administration (FHWA). A complete administrative record of this consultation is on file at the NMFS Sacramento Area Office.

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

Also enclosed are essential fish habitat (EFH) conservation recommendations for Pacific salmon as required by the Magnuson-Stevens Fishery Conservation and Management Act (MSA) as amended (16 U.S.C. 1801 *et seq.*; Enclosure 2). This document concludes that the Hazel Avenue Widening project will adversely affect the EFH of Pacific salmon in the action area and adopts certain terms and conditions of the incidental take statement and the ESA conservation recommendations of the biological opinion as the EFH conservation recommendations.

Section 305(b)4(B) of the MSA requires the FHWA 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 the FHWA 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, the FHWA 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 correspondence please contact Mr. John Baker in our Sacramento Area Office. Mr. Baker may be reached by telephone at (916) 930-3616 or via email at John.baker@noaa.gov.

Sincerely,

for Rodney R. McInnis
Regional Administrator

Enclosures (2)

cc: Copy to file – ARN 151422SWR2002SA6417
NMFS-PRD, Long Beach, California

Enclosure 1

BIOLOGICAL OPINION

ACTION AGENCY:	Federal Highway Administration
ACTIVITY:	Hazel Avenue Widening Project
CONSULTATION CONDUCTED BY:	NOAA's National Marine Fisheries Service
PCTS TN:	2006/04974
DATE ISSUED:	June 4, 2007

I. CONSULTATION HISTORY

On May 2, 2005, John Baker of NOAA's National Marine Fisheries Service (NMFS) met with Tim Hawkins, Sacramento County Department of Environmental Review and Assessment, and Gary Sweeten of the Federal Highway Administration (FHWA) to discuss NMFS's process and informational requirements for consultation under section 7 of the Endangered Species Act (ESA) for the Hazel Avenue Widening project.

On January 30, 2006, NMFS received a letter requesting concurrence under section 7 of the ESA that the proposed California Department of Transportation (CALTRANS) Hazel Avenue Widening project may affect, but is not likely to adversely affect (NLAA) threatened Central Valley steelhead *(Oncorhynchus mykiss)*, or the species of concern fall-run Chinook salmon *(Oncorhynchus tshawytscha)*.

On March 10, 2006, NMFS informed CALTRANS of its non-concurrence with the NLAA determination and requested additional information on the project description. This non-concurrence determination was based on the fact that the CALTRANS analysis of the proposed project shows adverse effects to Central Valley steelhead and designated critical habitat that include injury, death, or changes to behavior (distribution, predation, stranding, and noise). Additionally, CALTRANS had based its analysis on the project footprint rather than the area in which effects to listed species and habitat could be expected to occur.

On March 31, 2006, John Baker and Tim Hawkins met to discuss informational needs and revisions to the biological assessment for the project. On October 6, 2006, NMFS received the requested information and a request for formal consultation from the FHWA. NMFS responded to the FHWA request and initiated formal consultation on October 6, 2006.

NMFS, Tim Hawkins, and Gary Sweeten. A complete administrative record of this consultation is on file at the NMFS Sacramento Area Office.

II. DESCRIPTION OF THE PROPOSED ACTION

The proposed project will widen Hazel Avenue to six lanes with a landscaped center median. Figure 1 shows the project location and Figures 2 – 4 show the proposed modifications to the Hazel Avenue Bridge over the Lower American River.

A. Project Activities

This biological opinion will focus on those construction activities that may affect listed fish or critical habitat. In particular, bridge construction activities in the American River. The following is a breakdown of the construction activities necessary to complete the bridge modifications:

1. A staging area in the parking lot of the Nimbus fish hatchery will be setup and a temporary construction trestle (access bridge) adjacent to the new foundation locations constructed. Installation of the temporary construction trestle will involve driving approximately 40 steel H-piles. Piles supporting the temporary structure will be removed upon project completion. The method of removal may include a vibratory hammer, direct pull, clamshell grab, or cutting/breaking the pile below the mud line. As deck sections are laid out, bent beams and stringers will be delivered and installed from the deck platform.

2. Sheet piling will be driven around the new foundation locations to form cofferdams. The steel sheet piling will be delivered to the river edge (from the previously identified staging area), picked up by a crane, placed in the proper location, and driven to a stable depth. Three cofferdams will be constructed, occupying an approximately 1,750 square feet (35-feet by 50-feet) each.

3. All construction work for the permanent foundations will occur within the cofferdams. Construction activities associated with the construction of the permanent foundations will consist of pumping out excess water, excavation of material to the bottom of the final footing, installation of a new drilled shaft piling, placement of a tremmie seal, reinforcement steel, concrete forms, footing concrete, and rock tie-down anchors.

4. Construction work for the pier columns will consist of the placement of column reinforcement, erection of pier formwork, and placement of pier concrete. Construction activities will occur within the cofferdams.

5. Construction of the Cast-In-Place Box Girder Superstructure type will involve the installation of falsework support pile extensions, beams and caps, formwork on top of falsework supports, superstructure reinforcement and concrete, and the removal of falsework beams, caps, and piling.

B. Interrelated and Interdependent Activities

No interrelated and interdependent activities have been identified for this project.

C. Proposed Conservation Measures

The following conservation measures are included as part of the project description:

1. Minimize risk of direct take by avoiding in-channel construction on the main channel of the American River during the peak migration period (November through May).

2. Develop and implement a fish salvage and rescue program (FSR) that will help reduce direct take of fishes during coffer dam and pier placement, dewatering, and under any debris or spill clean-up operations. The FSR will require participation by a qualified fish biologist with all required permits to oversee field operations, salvage activities, and determine suitable time(s) and location(s) of release for rescued fish.

3. The following will be implemented to lessen the potential of overbank flood waters to entrain construction materials and result in injury to fish, and to prevent water quality impacts that result from over-wintering soil erosion or pollutant sources within the floodplain, implement the following:

> a. Temporary stockpiling of construction material, including vehicles, portable equipment, supplies, fuels and chemicals, will be restricted to designated construction staging areas with the project area.
>
> b. Construction activities that occur within the floodplain between October 15 and May 5, will be limited to those actions that can adequately withstand high flows without resulting in the inundation of and entrainment of construction materials in flood flows.

4. Water pollution protection provisions and conditions established by all regulatory authorities with jurisdiction over the project will be complied with. These measures will include, but may not be limited to, the following:

> a. If the project requires excavation within the American River bed, saturated material from within the cofferdam will be either placed in an adjacent temporary sediment basin, or pumped into a material barge for offsite disposal, or transported under the river via a submerged slurry line to a temporary sediment basin/disposal site.
>
> b. Prior to excavation activities at abutments, temporary sediment control best management practices will be place down slope of area where disturbance of native soil is anticipated. Excavated soil from abutments will be hauled away from the job site, and disposed of at an appropriate permitted disposal facility.

c. All disturbed areas that will not be covered by paving will be stabilized to prevent erosion using temporary soil stabilization best management practices.

5. An erosion control and water quality protection plan that will be subject to the review and approval of the County Department of Water Resource will be prepared and implemented. The Plan will include, but is not be limited to, the following measures to protect water quality during construction:

a. Construction activities within the area of the Ordinary High Water (OHW) line will be limited to the period from May 30th to October 1st of each construction year.

b. Construction activities that occur between October 15 and May 15 within the leveed floodway, but above the OHW line, will be limited to those actions that can adequately withstand high river flows without resulting in the inundation of and entrainment of materials during flood flows.

c. Stockpiling of construction materials, including portable equipment, vehicles and supplies, including chemicals, will be restricted to the designated construction staging areas and exclusive of the wetlands avoidance areas.

d. Sheet metal coffer dams will be used for all areas of extended in-water work, and pumped water will be routed to either: (1) a sedimentation pond located on a flat stable area above the OHW that prevents silt-laden runoff to enter the river; or (2) a sedimentation tank/holding facility that allows only clear water to return to the river and includes disposal of settled solids at an appropriate off-site location.

e. Erosion control measures that prevent soil or sediment from entering the river will be emplaced, monitored for effectiveness, and maintained throughout the construction operations.

f. Refueling of construction equipment and vehicles within the leveed floodway will only occur within designated, paved, bermed areas where possible spills will be readily contained.

g. Truck and cement equipment wash-down will not occur within the leveed floodway. Equipment and vehicle operated within the leveed floodway will be checked and maintained daily to prevent leaks of fuels, lubricant, or other fluids to the river.

h. Litter and construction debris will be removed from below the OHW line daily, and disposed of at an appropriate site. All litter, debris, unused materials, equipment, and supplies will be removed from construction staging areas above OHW at the end of each summer construction season.

i. No on-site harvesting of in-situ gravels will occur for temporary landings and ramps. Where additional earth material is required below the OHW line, clean gravels (from an off-site commercial/permitted source) will be the preferred material. If another type of engineered fill is required, it will likewise be obtained from an off-site permitted source, and all excess earth material will be properly disposed of outside the leveed floodway upon completion of the construction phase. If it is determined by the California Department of Fish and Game (DFG) that the gravels used for fill would benefit fisheries, these gravels may be left on-site consistent with the DFG Streambed Alteration Agreement.

6. Implement the following measures related to dewatering and drilling fluids:

a. Water pumped from the coffer dams will be routed to a sedimentation tank/holding facility located above the OHW that allows only clear water to return to the American River and includes disposal of settled solids at an appropriate off-site location.

b. An effluent monitor plan which includes routine monitoring and reporting of the discharge water and the receiving water conditions must be prepared by the applicant and approved by the Regional Water Quality Control Board (RWQCB).

c. All tailings and drilling fluids from the construction of any cast-in-hold pilings for the existing bridge or new pedestrian bridge will be contained and end-hauled from the site for proper disposal.

7. Woody vegetation will be cut only in the minimum area required to provide access or permanent footprint space. Where possible, vegetation will be cut rather than grubbed out, to allow for vegetative regeneration and to facilitate soil protection and stabilization.

8. Retain a qualified underwater noise monitoring expert to monitor underwater sound pressure levels associated with driving piles in water.

9. To avoid or minimize potential impacts to listed salmonids related to increased turbidity and sedimentation, turbidity increases associated with project construction activities should not exceed the California RWQCB, Central Valley Region (Regional Board) water quality objectives for turbidity in the Sacramento River Basin (Regional Board 1998). Turbidity levels are defined in Nephelometric Turbidity Units (NTUs). The current thresholds for turbidity levels in the American River, as listed in the Water Quality Control Plan (Basin Plan) for the Central Valley (Regional Board 1998), are summarized below. Increases in turbidity attributable to controllable water quality factors will not exceed the following limits:

a. Where natural turbidity is between 0 and 5 NTUs, increases will not exceed 1 NTU.

b. Where natural turbidity is between 5 and 50 NTUs, increases will not exceed 20 percent.

c. Where natural turbidity is between 50 and 100 NTUs, increases will not exceed 10 NTUs.

d. Where natural turbidity is greater than 100 NTUs, increases will not exceed 10 percent.

e. To ensure that turbidity levels do not exceed the thresholds listed above during in-stream project construction activities, the County will retain a qualified water quality specialist to monitor turbidity levels 50 feet upstream and 300 feet downstream of the point of in-stream construction activities. When construction activities potentially have the greatest water quality impact (*e.g.*, during installation of temporary construction platform), water samples would be collected four times daily. In the event of a plume detection, work will halt until the plume has dissipated to satisfactory levels.

10. In order to compensate for the permanent loss of 0.05 acres of steelhead critical habitat, the County shall pay into the Sacramento Area Flood Control Agency's (SAFCA) Riverine Habitat Restoration fund. The amount paid is based on a 3:1 compensation ratio for 0.05 acres of permanent loss at $75,000 per acre. This totals $11,250 (0.15 acres x $75,000). This amount is based on comparable mitigation banks within the region. The money will be used to implement riverine restoration projects within the American River watershed.

C. Action Area

The action area is defined as all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR §402.02). The action area, for the purposes of this biological opinion, is the Lower American River from approximately 500 feet above to 500 feet below the Hazel Avenue Bridge. This area was selected because it represents the extent of anticipated direct and indirect effects of project actions.

III. STATUS OF THE SPECIES AND HABITAT

This biological opinion analyzes the effects of Hazel Avenue Widening project on the following threatened Distinct Population Segments (DPSs), and designated critical habitat:

Central Valley steelhead DPS
(*Oncorhynchus mykiss*; threatened January 5, 2006, 71 FR 834)

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

A. Species and Critical Habitat Listing Status

NMFS listed the Central Valley steelhead (CV steelhead) DPS as threatened on March 19, 1998 (63 FR 13347). The DPS includes all naturally produced CV steelhead in the Sacramento-San Joaquin River basin. NMFS published a final 4(d) rule for steelhead on July 10, 2000 (65 FR 42422). The 4(d) rule applies the section 9 take prohibitions to threatened species except in cases where the take is associated with State and local programs that are approved by NMFS. In June 2004, NMFS proposed that CV steelhead remain listed as threatened (69 FR 33102). This proposal was based on the recognition that although the NMFS Biological Review Team (BRT) (Good *et al.* 2005) found the DPS "in danger of extinction," ongoing protective efforts for this DPS and the likely implementation of an DPS-wide monitoring program effectively counter this finding. NMFS also is proposing changes involving steelhead hatchery populations (69 FR 31354). The Coleman National Fish Hatchery and Feather River Fish Hatchery steelhead populations are proposed for inclusion in the listed population of steelhead. These populations previously were included in the DPS but were not deemed essential for conservation and thus not part of the listed steelhead population. Finally, NMFS has proposed to include resident *Oncorhynchus mykiss* (rainbow trout), present below natural or long-standing artificial barriers, in all steelhead DPSs (69 FR 33102).

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

The majority of the CV 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. Van Woert (1964) and Harvey (1995) observed that in Mill Creek, the CV steelhead spawning migration is continuous, and although there are two peak periods, 60 percent of the run is passed upstream by December 30.

Incubation time is dependent upon water temperature. Eggs incubate for 1.5 to 4 months before emerging. Eggs held between 50 ^{o}F and 59 ^{o}F hatch within 3 to 4 weeks (Moyle 1976). Fry emerge from redds within in about 4 to 6 weeks depending on redd depth, gravel size, siltation, and temperature (Shapovalov and Taft 1954). Newly emerged fry move to shallow stream margins to escape high water velocities and predation (Barnhart 1986). As fry grow larger they move into riffles and pools and establish feeding locations. Juveniles rear in freshwater for 1 to 4 years (Meehan and Bjornn 1991). Steelhead typically spend 2 years in fresh water. Adults spend to 4 years at sea before returning to freshwater to spawn as 4 or 5 year olds (Moyle 1976).

Steelhead historically were well-distributed throughout the Sacramento and San Joaquin Rivers (Busby *et al.* 1996). Steelhead were found from the upper Sacramento and Pit River systems south to the Kings and possibly the Kern River systems and in both east- and west-side Sacramento River tributaries (Yoshiyama *et al.* 1996). The present distribution has been greatly reduced (McEwan and Jackson 1996). The California Advisory Committee on Salmon and Steelhead (1998) reported a reduction of steelhead habitat from 6,000 miles historically to 300 miles. The California Fish and Wildlife Plan (DFG 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.

Nobriga and Cadrett (2003) compared coded wire tagged (CWT) and untagged (wild) steelhead smolt catch ratios at Chipps Island trawl from 1998 to 2001 to estimate that about 100,000 to 300,000 steelhead juveniles are produced naturally each year in the Central Valley. In the *Updated Status of Federally Listed ESUs of West Coast Salmon and Steelhead* (Good *et al*. 2005), the BRT made the following conclusion based on the Chipps Island data:

> "If we make the fairly generous assumptions (in the sense of generating large estimates of spawners) that average fecundity is 5,000 eggs per female, 1 percent of eggs survive to reach Chipps Island, and 181,000 smolts are produced (the 1998-2000 average), about 3,628 female steelhead spawn naturally in the entire Central Valley. This can be compared with McEwan's (2001) estimate of 1 million to 2 million spawners before 1850, and 40,000 spawners in the 1960s."

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

Existing wild steelhead stocks in the Central Valley mostly are confined to 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, CV steelhead were thought to be extirpated from the San Joaquin River system. Recent monitoring has detected populations of steelhead in the Stanislaus, Mokelumne, and Calaveras Rivers, and other streams previously thought to be void of steelhead (McEwan 2001). According to the findings of the Interagency Ecological Program Steelhead Project Work Team (IEP SPWT 1999), naturally spawning populations may exist in many other streams but are undetected due to lack of monitoring programs.

Reliable estimates of CV steelhead abundance for different basins are not available (McEwan 2001); however, McEwan and Jackson (1996) estimate the total annual run size for the entire Sacramento-San Joaquin system, based on Red Bluff Diversion Dam (RBDD) counts, to be no more than 10,000 adults. Steelhead counts at the RBDD have declined from an average of 11,187 for the period of 1967- 1977, to an average of approximately 2,000 through the 1990s (McEwan and Jackson 1996, McEwan 2001). The future of CV steelhead is uncertain because of the lack of status and trend data.

B. Critical Habitat Condition and Function for Species' Conservation

Critical habitat for CV steelhead was designated on September 2, 2005 (70 FR 52488). Critical habitat includes stream channels within certain occupied stream reaches and includes a lateral extent as defined by the OHW (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 primary constituent elements (PCEs) of critical habitat include freshwater spawning sites, freshwater rearing areas, freshwater migration corridors, and estuarine areas. The Lower American River is designated critical habitat for CV steelhead.

The freshwater habitat of steelhead in the Lower American River varies in function depending on location. Spawning areas are located in accessible, upstream reaches of Lower American River where viable spawning gravels and water quality are found. Freshwater spawning sites are PCEs of critical habitat for steelhead. The condition of spawning habitat is greatly affected by factors such as water temperature, dissolved oxygen (DO), and silt load, which can greatly affect the survival of eggs and larvae. High quality spawning habitat is now inaccessible behind large dams in this watershed, which limits salmonids to spawning in marginal tailwater habitat below Nimbus Dam. Despite often intensive management efforts, the existing spawning habitat below dams is highly susceptible to inadequate and fluctuating flows and high temperatures due to competing demands for water, which impairs the habitat function.

Freshwater migration corridors also are PCEs of critical habitat. They are located downstream of spawning habitat. These areas allow the upstream passage of adults and the downstream emigration of juveniles. Migratory habitat conditions are impaired by the presence of barriers, which include, inadequate and fluctuating water flows, and degraded water quality.

Freshwater rearing sites for juveniles, which feed and grow before and during their outmigration, are PCEs of critical habitat. Rearing habitat condition is strongly affected by factors such as water quantity and quality, and the availability of natural cover and food, which allow juveniles to grow and avoid predators. Few complex, productive habitats with floodplains remain in the Lower American River system. The channelized, leveed, and riprapped river reaches that are common in the Lower American River systems typically have low cover availability, and offer little protection from either fish or avian predators.

C. Factors Affecting the Species and Habitat

A number of documents have addressed the history of human activities, present environmental conditions, and factors contributing to the decline of steelhead species in the Central Valley. For example, NMFS prepared range-wide status reviews for west coast Chinook salmon (Myers *et al.* 1998) and steelhead (Busby *et al.* 1996). Also, the NMFS BRT published an updated status review for west coast Chinook salmon and steelhead in June 2005 (Good *et al.* 2005). Information also is available in Federal Register notices announcing ESA listing proposals and determinations for some of these species and their critical habitat (*e.g.*, 58 FR 33212, 59 FR 440, 62 FR 24588, 62 FR 43937, 63 FR 13347, 64 FR 24049, 64 FR 50394, 65 FR 7764). The Final Programmatic Environmental Impact Statement/Report (EIS/EIR) for the CALFED Bay-Delta

Program (CBDA 1999) and the Department of the Interior’s (DOI) Final Programmatic EIS for the Central Valley Project Improvement Act (CVPIA) (DOI 1999) provide summaries of historical and recent environmental conditions for salmon and steelhead in the Central Valley. The following general description of the factors affecting the viability of CV steelhead is based on a summarization of these documents.

In general, the human activities that have affected listed anadromous salmonids, North American green sturgeon, or their habitats consist of: (1) dam construction that blocks previously accessible habitat; (2) water development and management activities that affect water quantity, flow timing, and quality; (3) land use activities such as agriculture, flood control, urban development, mining, road construction, and logging that degrade aquatic and riparian habitat; (4) hatchery operation and practices; (5) harvest activities; (6) predation; and (7) ecosystem restoration actions.

1. <u>Habitat Blockage</u>

Hydropower, flood control, and water supply dams of the Central Valley Project (CVP), State Water Project (SWP), and other municipal and private entities have permanently blocked or hindered salmonid access to historical spawning and rearing grounds. Clark (1929) estimated that originally there were 6,000 miles of salmon habitat in the Central Valley system and that 80 percent of this habitat had been lost by 1928. Yoshiyama *et al.* (1996) calculated that roughly 2,000 miles of salmon habitat was actually available before dam construction and mining, and concluded that 82 percent is not accessible today.

In general, large dams on every major tributary to the Sacramento River, San Joaquin River, and the Delta block salmon and steelhead access to the upper portions of the respective watersheds. On the Sacramento River, Keswick Dam blocks passage to historic spawning and rearing habitat in the upper Sacramento, McCloud, and Pit Rivers. Whiskeytown Dam blocks access to the upper watershed of Clear Creek. Oroville Dam and associated facilities block passage to the upper Feather River watershed. Nimbus Dam blocks access to most of the American River basin.

As a result of the dams, salmon and CV steelhead populations on these rivers have been confined to lower elevation main channels that historically only were used for migration. Population abundances have declined in these streams due to decreased quantity and quality of spawning and rearing habitat. Higher temperatures at these lower elevations during late-summer and fall are a major stressor to adult and juvenile salmonids.

2. <u>Water Development</u>

The diversion and storage of natural flows by dams and diversion structures on Central Valley waterways have depleted stream flows and altered the natural cycles by which juvenile and adult salmonids base their migrations. Depleted flows have contributed to higher temperatures, lower DO levels, and decreased recruitment of gravel and large woody debris (LWD). Furthermore,

more uniform year-round flows have resulted in diminished natural channel formation, altered foodweb processes, and slower regeneration of riparian vegetation. These stable flow patterns have reduced bedload movement (Ayers 2001), caused spawning gravels to become embedded and reduced channel width, which has decreased the available spawning and rearing habitat below dams.

Water diversions for irrigated agriculture, municipal and industrial use, and managed wetlands are found throughout the Central Valley. Hundreds of small and medium-size water diversions exist along the Sacramento River, San Joaquin River, and their tributaries. Although efforts have been made in recent years to screen some of these diversions, many remain unscreened. Depending on the size, location, and season of operation, these unscreened intakes entrain and kill many life stages of aquatic species, including juvenile salmonids. For example, as of 1997, 98.5 percent of the 3,356 diversions included in a Central Valley database were either unscreened or screened insufficiently to prevent fish entrainment (Herren and Kawasaki 2001). Most of the 370 water diversions operating in Suisun Marsh are unscreened (FWS 2003).

Outmigrant juvenile salmonids in the Delta have been subjected to adverse environmental conditions created by water export operations at the CVP/SWP. Specifically, juvenile salmonid survival has been reduced from: (1) water diversion from the main channel Sacramento River into the Central Delta via the Delta Cross Channel; (2) upstream or reverse flows of water in the lower San Joaquin River and southern Delta waterways; (3) entrainment at the CVP/SWP export facilities and associated problems at Clifton Court Forebay; and (4) increased exposure to introduced, non-native predators such as striped bass (*Morone saxatilis*), largemouth bass (*Micropterus salmoides*), and American shad (*Alosa sapidissima*).

The consultation for the CVP operations, criteria, and plan (OCAP) was completed with the issuance of a biological opinion by NMFS on October 22, 2004. The OCAP biological opinion found that CVP and SWP actions are likely to adversely affect Federally listed Sacramento River (SR) winter-run Chinook salmon, Central Valley (CV) spring-run Chinook salmon, and CV steelhead, and the critical habitat of winter-run Chinook salmon, due to reservoir releases, Sacramento River flows, water temperatures, and physical facility operations that reduce habitat availability and suitability. These effects are expected to impact and result in the take of individual fish by delaying or blocking adult migration into suitable spawning habitat and decreasing spawning success, killing vulnerable life stages such as eggs, larvae, and juveniles due to stranding or elevated water temperatures, or increasing the likelihood of disease or juvenile vulnerability to predation due to temperature stress. NMFS determined that these effects are not likely to jeopardize the continued existence of SR winter-run Chinook salmon, CV spring-run Chinook salmon, or CV steelhead, and are not likely to destroy or adversely modify their designated critical habitat.

3. <u>Land Use Activities</u>

Land use activities continue to have large impacts on salmonid habitat in the Central Valley. Until about 150 years ago, the Sacramento River was bordered by up to 500,000 acres of riparian forest, with bands of vegetation extending outward for 4 or 5 miles (California Resources Agency 1989). By 1979, riparian habitat along the Sacramento River had diminished to 11,000 to 12,000 acres, or about 2 percent of historic levels (McGill 1987). The degradation and fragmentation of riparian habitat had resulted mainly from flood control and bank protection projects, together with the conversion of riparian land to agriculture (Jones and Stokes Associates, Incorporated 1993).

Increased sedimentation resulting from agricultural and urban practices within the Central Valley is a primary cause of salmonid habitat degradation (NMFS 1996). Sedimentation can adversely affect salmonids during all freshwater life stages by: clogging or abrading gill surfaces, adhering to eggs, and restricting fry emergence (Phillips and Campbell 1961); burying eggs or alevins; scouring and filling in pools and riffles; reducing primary productivity and photosynthesis activity (Cordone and Kelley 1961); and affecting intergravel permeability and DO levels. Excessive sedimentation over time can cause substrates to become embedded, which reduces successful salmonid spawning, and egg and fry survival (Hartmann *et al.* 1987).

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 water temperatures, degradation of water quality, elimination of spawning and rearing habitat, fragmentation of available habitats, elimination of downstream recruitment of LWD, and removal of riparian vegetation resulting in increased streambank erosion (Meehan and Bjornn 1991). Agricultural practices in the Central Valley have eliminated large trees and logs and other woody debris that would otherwise be recruited into the stream channel (NMFS 1998). LWD influences stream morphology by affecting channel pattern, position, and geometry, as well as pool formation (Keller and Swanson 1979, Bilby 1984, Robison and Beschta 1990).

Since the 1850s, wetlands reclamation for urban and agricultural development has caused the cumulative loss of 79 and 94 percent of the tidal marsh habitat in the Delta downstream and upstream of Chipp's Island, respectively (Goals Project 1999). In Suisun Marsh, salt water intrusion and land subsidence gradually have led to the decline of agricultural production. Presently, Suisun Marsh consists largely of tidal sloughs and managed wetlands for duck clubs.

Juvenile salmonids are exposed to increased water temperatures in the Delta during the late spring and summer due to the loss of riparian shading, and by thermal inputs from municipal, industrial, and agricultural discharges. Studies by CDWR on water quality in the Delta over the last 30 years show a steady decline in the food sources available for juvenile salmonids and an increase in the clarity of the water. These conditions likely have contributed to increased mortality of juvenile Chinook salmon and steelhead as they move through the Delta.

4. Hatchery Operations and Practices

Five hatcheries currently produce Chinook salmon in the Central Valley and four of these also produce steelhead. Releasing large numbers of hatchery fish can pose a threat to wild Chinook salmon and steelhead stocks through genetic impacts, competition for food and other resources between hatchery and wild fish, predation of hatchery fish on wild fish, and increased fishing pressure on wild stocks as a result of hatchery production (Waples 1991). The genetic impacts of artificial propagation programs in the Central Valley primarily are caused by straying of hatchery fish and the subsequent interbreeding of hatchery fish with wild fish. In the Central Valley, practices such as transferring eggs between hatcheries and trucking smolts to distant sites for release contribute to elevated straying levels (DOI 1999). For example, Nimbus Hatchery on the American River rears Eel River steelhead stock and releases these fish in the Sacramento River.

Hatchery practices as well as spatial and temporal overlaps of habitat use and spawning activity between spring- and fall-run fish have led to the hybridization and homogenization of some subpopulations (DFG 1998). As early as the 1960s, Slater (1963) observed that early fall- and spring-run Chinook salmon were competing for spawning sites in the Sacramento River below Keswick Dam, and speculated that the two runs may have hybridized. FRH spring-run Chinook salmon have been documented as straying throughout the Central Valley for many years (DFG 1998). Although the degree of hybridization has not been comprehensively determined, it is clear that the populations of spring-run Chinook salmon spawning in the Feather River and counted at RBDD contain hybridized fish.

The management of hatcheries, such as Nimbus Hatchery and FRH, can directly impact CV spring-run Chinook salmon and CV steelhead populations by overproducing the natural capacity of the limited habitat available below dams. In the case of the Feather River, significant redd superimposition occurs in-river due to hatchery overproduction and the inability to physically separate CV spring- and fall-run Chinook salmon adults. This concurrent spawning has led to hybridization between the spring- and fall-run Chinook salmon in the Feather River. At Nimbus Hatchery, operating Folsom Dam to meet temperature requirements for returning hatchery fall-run Chinook salmon often limits the amount of water available for steelhead spawning and rearing the rest of the year.

The increase in Central Valley hatchery production has reversed the composition of the steelhead population, from 88 percent naturally-produced fish in the 1950s (McEwan 2001) to an estimated 23 to 37 percent naturally produced fish currently (Nobriga and Cadrett 2003). The increase in hatchery steelhead production proportionate to the wild population has reduced the viability of the wild steelhead populations, increased the use of out-of-basin stocks for hatchery production, and increased straying (NMFS 2001). Thus, the ability of natural populations to successfully reproduce has likely been diminished.

The relatively low number of spawners needed to sustain a hatchery population can result in high harvest-to-escapement ratios in waters where regulations are set according to hatchery population. This can lead to over-exploitation and reduction in size of wild populations coexisting in the same system (McEwan 2001).

Hatcheries also can have some positive effects on salmonid populations. Artificial propagation has been shown effective in bolstering the numbers of naturally spawning fish in the short term under certain conditions, and in conserving genetic resources and guarding against catastrophic loss of naturally spawned populations at critically low abundance levels, such as SR winter-run Chinook salmon. However, relative abundance is only one component of a viable salmonid population.

5. Ocean and Sport Harvest

There is little information on steelhead harvest rates in California. Hallock *et al.* (1961) estimated that harvest rates for Sacramento River steelhead from the 1953-1954 through 1958-1959 seasons ranged from 25.1 percent to 45.6 percent assuming a 20 percent non-return rate of tags. Staley (1975) estimated the harvest rate in the American River during the 1971-1972 and 1973-1974 seasons to be 27 percent. The average annual harvest rate of adult steelhead above RBDD for the three-year period from 1991-1992 through 1993-1994 was 16 percent (McEwan and Jackson 1996). Since 1998, all hatchery steelhead have been marked with an adipose fin clip allowing anglers to distinguish hatchery and wild steelhead. Current regulations restrict anglers from keeping unmarked steelhead in Central Valley streams (DFG 2004b). Overall, this regulation has greatly increased protection of naturally produced adult CV steelhead.

6. Predation

Accelerated predation also may be a factor in the decline of salmon, and to a lesser degree CV steelhead. Additionally, human-induced habitat changes such alteration of natural flow regimes and installation of bank revetment and structures such as dams, bridges, water diversions, piers, and wharves often provide conditions that both disorient juvenile salmonids and attract predators (Stevens 1961, Decato 1978, Vogel *et al.* 1988, Garcia 1989).

On the main channel Sacramento River, high rates of predation are known to occur at RBDD, Anderson Cottonwood Irrigation District, Glenn Colusa Irrigation District, areas where rock revetment has replaced natural river bank vegetation, and at south Delta water diversion structures (*e.g.*, Clifton Court Forebay; DFG 1998). Predation at RBDD on salmonids is believed to be higher than normal due to factors such as water quality and flow dynamics associated with the operation of this structure. In passing the dam, juveniles are subject to conditions which severely disorient them, making them highly susceptible to predation by fish or birds. Sacramento pikeminnow (*Ptychocheilus grandis*) and striped bass congregate below the dam and prey on juvenile salmonids.

FWS found that more predatory fish were found at rock revetment bank protection sites between Chico Landing and Red Bluff than at sites with naturally eroding banks (Michny and Hampton 1984). From October 1976 to November 1993, DFG conducted 10 mark/recapture experiments at the SWP's Clifton Court Forebay to estimate pre-screen losses using hatchery-reared juvenile Chinook salmon. Pre-screen losses ranged from 69 percent to 99 percent. Predation from striped bass is thought to be the primary cause of the loss (Gingras 1997).

Other locations in the Central Valley where predation is of concern include flood bypasses and release sites for salmonids salvaged at the State and Federal fish facilities. Predation on salmon by striped bass and pikeminnow at salvage release sites in the Delta and lower Sacramento River has been documented (Orsi 1967, Pickard *et al.* 1982). Predation rates at these sites are difficult to determine. DFG conducted predation studies from 1987-1993 at the SMSCG to determine if the structure attracts and concentrates predators. The dominant predator species at the structure was striped bass, and juvenile salmonids were identified in their stomach contents (NMFS 1997).

7. <u>Environmental Variation</u>

Natural changes in the freshwater and marine environments play a major role in salmonid abundance. Recent evidence suggests that marine survival among salmonids fluctuates in response to 20- to 30-year cycles of climatic conditions and ocean productivity (Hare *et al*. 1999, Mantua and Hare 2002). This phenomenon has been referred to as the Pacific Decadal Oscillation. In addition, large-scale climatic regime shifts, such as the El Nino condition, appear to change productivity levels over large expanses of the Pacific Ocean. A further confounding effect is the fluctuation between drought and wet conditions in the basins of the American west. During the first part of the 1990s, much of the Pacific Coast was subject to a series of very dry years, which reduced inflows to watersheds up and down the west coast.

A key factor affecting many West Coast stocks has been a general 30-year decline in ocean productivity. The mechanism whereby stocks are affected is not well understood, partially because the pattern of response to these changing ocean conditions has differed among stocks, presumably due to differences in their ocean timing and distribution. It is presumed that survival in the ocean is driven largely by events occurring between ocean entry and recruitment to a subadult life stage.

Salmon and steelhead are exposed to high rates of natural predation, particularly during freshwater rearing and migration stages. Predation rates on juvenile and adult green sturgeon have not been adequately studied to date. Ocean predation may also contribute to significant natural mortality, although it is not known to what extent. In general, salmonids are prey for pelagic fishes, birds, and marine mammals, including harbor seals, sea lions, and killer whales. There have been recent concerns that the rebound of seal and sea lion populations following their protection under the Marine Mammal Protection Act of 1972 has increased the number of salmonid deaths.

Unusual drought conditions may warrant additional consideration in California. Flows in 2001 were among the lowest flow conditions on record in the Central Valley. The available water in the Sacramento watershed and San Joaquin watershed was 70 percent and 66 percent of normal, according to the Sacramento River Index and the San Joaquin River Index, respectively. Back-to-back drought years could be catastrophic to small populations of listed salmonids that are dependent upon reservoir releases for their success (*e.g.*, winter-run Chinook salmon). Therefore, reservoir carryover storage (usually referred to as end-of-September storage) is a key element in providing adequate reserves to protect salmon and steelhead during extended drought periods. In order to buffer the effect of drought conditions and over allocation of resources, NMFS in the past has recommended that minimum carryover storage be maintained in Shasta and other reservoirs to help alleviate critical flow and temperature conditions in the fall.

The future effects of global warming are of key interest to salmonid and green sturgeon survival. It is predicted that Sierra snow packs will dwindle with global warming and that the majority of runoff in California will be from rainfall in the winter rather than from melting snow pack in the mountains. This will alter river runoff patterns and transform the tributaries that feed the Central Valley from a spring/summer snowmelt dominated system to a winter rain dominated system. It can be rationally hypothesized that summer temperatures and flow levels will become unsuitable for salmonid survival. The cold snowmelt that furnishes the late spring and early summer runoff will be replaced by warmer precipitation runoff. This should truncate the period of time that suitable cold-water conditions exist below existing reservoirs and dams due to the warmer inflow temperatures to the reservoir from rain runoff. Without the necessary cold-water pool developed from melting snow pack filling reservoirs in the spring and early summer, late summer and fall temperatures below reservoirs, such as Lake Shasta, could potentially rise above thermal tolerances for juvenile and adult salmonids (*i.e.*, CV steelhead) that must hold below the dam over the summer and fall periods.

8. <u>Ecosystem Restoration</u>

a. *CALFED Bay-Delta Authority*

Two programs under CBDA, the Environmental Restoration Program (ERP) and the Environmental Water Account (EWA), were created to improve conditions for fish, including listed salmonids, in the Central Valley. Restoration actions implemented by the ERP include the installation of fish screens, modification of barriers to improve fish passage, habitat acquisition, and instream habitat restoration. The majority of these recent actions address key factors affecting listed salmonids, and emphasis has been placed in tributary drainages with high potential for CV steelhead and salmon production. Additional ongoing actions include new efforts to enhance fisheries monitoring and directly support salmonid production through hatchery releases. Recent habitat restoration initiatives sponsored and funded primarily by the CBDA-ERP program have resulted in plans to restore ecological function to 9,543 acres of shallow-water tidal and marsh habitats within the Delta. Restoration of these areas primarily involves flooding lands previously used for agriculture, thereby creating additional rearing habitat for juvenile salmonids. Similar habitat restoration is imminent adjacent to Suisun Marsh (*i.e.*, at the confluence of Montezuma Slough and the Sacramento River) as part of the Montezuma Wetlands project, which is intended to provide for commercial disposal of material dredged from San Francisco Bay in conjunction with tidal wetland restoration.

A sub-program of the ERP called the Environmental Water Program has been established to support ERP projects through enhancement of instream flows that are biologically and ecologically significant. This program is in the development stage and the benefits to listed salmonids are not yet clear. Clear Creek is one of five watersheds in the Central Valley that has been targeted for action during Phase I of this program.

The EWA is geared to providing water at critical times to meet ESA requirements and incidental take limits without water supply impacts to other users. In early 2001, EWA released 290,000 acre-feet of water at key times to offset reductions in south Delta pumping to protect winter-run Chinook salmon and other Delta fish species. The actual number of fish saved was very small. The anticipated benefits to fisheries from EWA were much higher than what has actually occurred.

b. *Central Valley Project Improvement Act*

The CVPIA, implemented in 1992, requires that fish and wildlife get equal consideration with water allocations from the CVP. From this act arose two programs that benefit listed salmonids: the Anadromous Fish Restoration Program (AFRP) and the Water Acquisition Program (WAP). The AFRP has engaged in monitoring, education, and restoration projects geared toward recovery of all anadromous fish species residing in the Central Valley. Restoration projects funded through the AFRP include fish passage, fish screening, riparian easement and land acquisition, development of watershed planning groups, instream and riparian habitat improvement, and gravel replenishment. The goal of the WAP is to acquire water supplies to meet the habitat restoration and enhancement goals of the CVPIA and to improve the DOI’s ability to meet regulatory water quality requirements. Water has been used successfully to improve fish habitat for salmon and CV steelhead by maintaining or increasing instream flows in Butte and Mill Creeks and the San Joaquin River at critical times.

c. *Iron Mountain Mine Remediation*

The Environmental Protection Agency’s Iron Mountain Mine remediation involves the removal of toxic metals in acidic mine drainage from the Spring Creek Watershed with a state-of-the-art lime neutralization plant. Contaminant loading into the Sacramento River from Iron Mountain Mine has shown measurable reductions since the early 1990s. Decreasing the heavy metal contaminants that enter the Sacramento River should increase the survival of salmonid eggs and juveniles. However, during periods of heavy rainfall upstream of the Iron Mountain Mine, the Bureau of Reclamation (BOR) substantially increases Sacramento River flows in order to dilute heavy metal contaminants being spilled from Spring Creek debris dam. This rapid change in flows can cause juvenile salmonids to become stranded or isolated in side channels below Keswick Dam.

d. *State Water Project Delta Pumping Plant Fish Protection Agreement (Four-Pumps Agreement)*

The Four-Pumps Agreement Program has approved about $49 million for projects that benefit salmon and steelhead production in the Sacramento-San Joaquin basins and Delta since the agreement inception in 1986. Four Pumps projects that benefit salmon and CV steelhead include water exchange programs on Mill and Deer Creeks; enhanced law enforcement efforts from San Francisco Bay upstream to the Sacramento and San Joaquin Rivers and their tributaries; design and construction of fish screens and ladders on Butte Creek; and screening of diversions in Suisun Marsh and San Joaquin tributaries. Other Four-Pumps projects, predator habitat isolation and removal, and spawning habitat enhancement projects on the San Joaquin tributaries, benefit CV steelhead.

The provisions of funds to cover over-budget costs for the Durham Mutual/Parrot Phelan Screen and Ladders project expedited completion of the construction phase of this project which was completed during 1996. The project continues to benefit salmon and steelhead by facilitating upstream passage of adult spawners and downstream passage of juveniles.

The Mill and Deer Creek Water Exchange projects are designed to provide new wells that enable diverters to bank groundwater in place of stream flow, thus leaving water in the stream during critical migration periods. On Mill Creek several agreements between Los Molinos Mutual Water Company (LMMWC), Orange Cove Irrigation District (OCID), DFG, and CDWR allows CDWR to pump groundwater from two wells into the LMMWC canals to pay back LMMWC water rights for surface water released downstream for fish. Although the Mill Creek Water Exchange project was initiated in 1990 and the agreement was for a well capacity of 25 cfs, only 12 cfs has been developed to date (BOR and OCID 1999). In addition, it has been determined that a base flow of greater than 25 cfs is needed during the April through June period for upstream passage of adult CV spring-run Chinook salmon in Mill Creek (BOR and OCID 1999). In some years, water diversions from the creek are curtailed by amounts sufficient to provide for passage of upstream migrating adult CV spring-run Chinook salmon and downstream migrating juvenile CV steelhead and CV spring-run Chinook salmon. However, the current arrangement does not ensure adequate flow conditions will be maintained in all years. CDWR, DFG, and FWS have developed the Mill Creek Adaptive Management Enhancement Plan to address the instream flow issues. A pilot project using one of the 10 pumps originally proposed for Deer Creek was tested in summer 2003. Future testing is planned with implementation to follow.

IV. ENVIRONMENTAL BASELINE

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

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

The action area lies within the DPS and designated critical habitat of the CV steelhead. The primary constituent elements of critical habitat in the action area are freshwater rearing sites and migration corridors, and spawning habitat.

1. Status of the Species within the Action Area

Historically, nearly all steelhead spawning occurred upstream of what is now the Nimbus Dam. By 1955, it is believed that summer-run steelhead were extinct from the American River and only remnant populations of the fall-run and winter-run steelhead remained. Adult steelhead migrate into the Lower American River (LAR) to spawn, and juvenile steelhead typically rear in the LAR for one year before emigrating to the Pacific Ocean. The entire LAR is used by steelhead for one or more portions of their lifecycle. The peak of the upstream migration and spawning period occurs from December to March.

There are no comprehensive estimates available for run size of LAR steelhead. Since the Nimbus Fish Hatchery began operation in 1955, it has provided the best available measure of steelhead run size. Figure 2 depicts the total number of steelhead entering the Nimbus Hatchery from 1955–2002, with most of these fish originating from the hatchery.

Estimates of naturally spawning steelhead in the LAR were made in the early 1990s. Run sizes of 305, 1,462, and 255 adults were estimated for the 1990-1991, 1991-1992 and 1992-1993 spawning seasons, respectively, based on counts at the hatchery that were corrected for harvest. More recently, biologists with BOR and DFG conducted surveys of steelhead redds (nest sites) in the LAR (Hannon and Deason 2005). In 2002, they found 159 steelhead redds and their 2002 estimate of in-river spawning steelhead was 200 to 401 fish. In 2003, they found 215 steelhead redds and their 2003 estimate of in-river spawning steelhead was 240 to 479 fish. In 2004, they found 197 redds and their 2004 estimate of in-river spawning steelhead was 221 to 441 fish. The 2005 count was 155 redds with an in-river spawning estimate of 162-324 fish.

2. Status of Habitat within the Action Area

The action area is designated critical habitat for CV steelhead. The essential features of freshwater salmonid habitat within the action area include: adequate substrate, water quality, water quantity, water temperature, water velocity, cover/shelter, food, riparian vegetation, space, and safe passage conditions.

The LAR is the 23-mile section of the American River, extending from its mouth at the Sacramento River to Nimbus Dam. Confined by high ground along its upper reach, the LAR has levees along its north and south banks for about 13 miles from the Sacramento River to the easterly end of Arden Way in Carmichael on the north and to the Mayhew Drain on the south.

Flows on the LAR are controlled by operation of Folsom Dam and Folsom Lake (also called Folsom Reservoir), located about 30 miles east of Sacramento. Folsom Reservoir, Folsom Dam, Lake Natoma, and Nimbus Dam are a unit of the CVP constructed by the the U.S. Army Corps of Engineers (Corps) and operated by the BOR. 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 San Francisco Bay/Sacramento-San Joaquin River Delta Estuary (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 serves as an afterbay to Folsom Reservoir, regulating fluctuating discharges and allowing dam operators to coordinate power generation and flows in the LAR channel during normal reservoir operations. Lake Natoma has a surface area of 500 acres and its elevation fluctuates between three to four feet daily. Nimbus Dam is located about 7 miles downstream of Folsom Dam. The Folsom South Canal extends from Lake Natoma southward about 27 miles towards the Cosumnes River.

The American River is the second largest tributary to the Sacramento River, with an average annual runoff (rain, snow melt, or other water that flows off the land) coming into Folsom Reservoir of 2.7 million acre-feet from about 1,875 square miles of drainage area. An acre-foot is the volume of water needed to cover an acre of land to a depth of one foot, equivalent to about 326,000 gallons. The Corps specifies flood control requirements and regulating criteria, depending on the time of year. BOR, under an agreement with SAFCA, is presently following a more conservative flood control operation to provide increased flood control space in Folsom Reservoir.

The LAR 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”.

Numerous influences (man-made and natural) impact the LAR corridor and the LAR ecosystem. Before 1800 and the advent of European settlement, the Nisenan, Southern Maidu, and Patwin were the human inhabitants of the LAR floodplain. Vegetation adjacent to the river formed extensive, continuous forests in the LAR’s floodplain. The area supported an abundance of native vegetation and wildlife and the LAR historically supported numerous fish species, including spring- and fall-run Chinook salmon and summer-, fall-, and winter-run steelhead. These species had access to more than 125 miles of habitat in the upper reaches of the American River Basin.

Following the discovery of gold, widespread hydraulic mining began to substantially impact the American River and its watershed. Between 1849 and 1909, hydraulic gold mining in the watershed of the North and Middle forks of the American River caused an estimated 257 million cubic yards of sand, silt, and fine gravels to be deposited in the river. From 5-30 feet of these materials were deposited on the bed of the LAR as a result of hydraulic mining and dredging.

The deposition of these sediments resulted in extensive sand and gravel bars in the LAR, an overall rise of the channel and surrounding floodplain, and the covering of fish spawning gravels. From the late 1800s to the mid-1900s, large-scale dredge gold mining was conducted south of the river, downstream of Folsom. In addition, miners began scraping gravel bars in the river to obtain rock material for concrete production, from Folsom to as far downstream as Watt Avenue, raising the river channel bed. Excavation of shoreline gravel material in dredge mining operations drastically altered the surface features of the floodplain, resulting in tracts of land being swept away, deposits left in other areas, and accumulation of mining debris forming new channels.

Dams and the levee system built primarily along the lower portion of the LAR were constructed, in part, to provide flood protection to the Sacramento area, which is built largely in the river floodplain. Dam construction has had severe and unintended consequences to the vegetation, wildlife, fish, and habitat of the river. Beginning in the mid-1800s, upstream access for migrating fish was impeded by dams constructed for mining debris containment, flood control, and diversions. Many of the dams constructed had inadequate or no passage systems (*e.g.*, fish ladders) that would have allowed fish to migrate upstream. In 1950, floods destroyed the fish ladder at the Old Folsom Dam, restricting fish to the lower 25 miles of the American River. Construction of Folsom and Nimbus Dams in 1955 permanently blocked upstream migration of fish above the lower 23 miles of the American River (the portion of the river now referred to as the LAR), blocking about 70 percent of the spawning habitat historically used by Chinook salmon and 100 percent of the spawning habitat historically used by steelhead. The Nimbus Salmon and Steelhead Hatchery was constructed to mitigate for the salmon and steelhead habitat lost as a result of the construction of Nimbus and Folsom dams.

Dam construction effectively cut off the supply of upstream sediments to the LAR, resulting in a deepening of the river channel since the 1950s. In several locations, the channel has degraded to its previous bed elevation, and it is thought that the mining debris that once filled the channel of the LAR has been completely removed by river flows and gravels mining. However, the surrounding floodplain remains at its post-mining elevation. Sediment supply is now derived from the surrounding river banks which increases erosion and leads to accelerated loss of valuable shaded riverine aquatic habitat (SRA), loss of soft bank and disrupts/changes the natural recruitment process of large woody debris. Large woody debris accumulates naturally in rivers and plays an important role in stream mechanics and fish 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. These impacts coupled with reduced frequency of seasonal flooding and a deeper water table on the high floodplain has altered the vegetation communities along the river to habitats that provide less value to wildlife and fish.

Today, the factors that impact management of this ecosystem include water temperature, river flow, upstream hydropower production, habitat for fish reproduction and rearing, water quality, water diversions, predation, fish migration barriers, flood control, non-native plants and animals, bank erosion, and river channel characteristics.

Operation of Folsom and Nimbus dams has dramatically altered the LAR and its adjacent habitats by causing an overall decline in extremes of flow and temperature compared with historical conditions. Current LAR flows and temperatures are different than pre-dam conditions because river flows are managed by BOR to meet multiple objectives. The timing of peak river flows has shifted from spring to early winter and summer water temperatures have declined significantly as summer flows increased.

In the 1920s, gravel bars were scraped to obtain aggregate for concrete production, and by 1940 gravel bars as far downstream as Watt Avenue were affected. These operations caused repeated destruction of the channel from 1900 to 1955. In the 1950s and early 1960s, gravel extraction activities were located immediately adjacent to the river upstream of the Interstate-80, Howe Avenue, and Watt Avenue bridges and at Arden Bar. Gravel extraction from elevated terraces at Sacramento Bar and Arden Bar caused the formation of ponds and debris mounds. These ponds are connected to the rivers floodplain, and may trap fish at high flows, resulting in fish isolation, stranding and mortality.

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

1. Adult Migration, Spawning, and Incubation

The American River orginally supported summer-, fall-, and winter-run CV steelhead. By 1955, it is believed that summer-run CV steelhead had beeen extripated from the American River, and only remnant populations of fall- and winter-run CV steelhead remained (SWRI 2001). Adult CV steelhead migration in the American River typically occurs from November through April and peaks in December through March (McEwan and Jackson 1996). Predicted flows could drop as low as 500 cfs in up to 10 percent of years and be as high as 33,000 cfs as a monthly average. Flows in the future will be lower in these months with or without EWA. CV steelhead spawning habitat area peaks at 2,400 cfs, but shows very little variability in spawning habitat area between 1,000 and 4,000 cfs. Flows during the spawning period would be below 2,400 cfs in about 30 to 60 percent of years, depending on the month. Average monthly flows could range up over 30,000 cfs in the wettest years with instantaneous flows likely over 100,000 cfs for flood control. The flows over about 50,000 cfs could scour some redds (Ayres Associates 2001), but will provide needed reconfiguration of the channel for long-term maintenance of good spawning and rearing habitat. At the 90 percent exceedance level flows could average as low as 500 cfs. Spawning habitat area was not predicted for flows below 1,000 cfs but spawning habitat would certainly be less and important side channel spawning habitat would be nearly absent. The CV steelhead population in the American River does not appear to be ultimately limited by spawning habitat availability, but by factors following fry emergence such as summer water temperatures and predation. The number of juvenile CV steelhead in the river drops quickly at the beginning of the summer, possibly due to predation. Predators likely take more CV steelhead when the water is warmer. Flow conditions are expected to provide suitable depths and velocities for upstream passage of adults to spawning areas within the lower American River. The hatchery picket weir below Nimbus Dam is presents a migration barrier to adult CV steelhead when in operation.

CV steelhead prefer 46 °F to 52 °F water for upstream migration. Temperatures of 52 °F or lower are best for CV steelhead egg incubation. Average temperatures at Watt Avenue are generally within this range much of the time between December and March. During dry years temperatures in November, March, April, and May would be higher than preferred and could be as high as 71°F in May of warm dry years. Over 90 percent of the CV steelhead spawning activity is thought to occur during late December through March when temperatures are generally within an acceptable range for spawning (Hannon *et al*. 2003). CV steelhead eggs are in the gravel from December until mid-May. Temperatures from March through May could be above the preferred range for egg incubation at Watt Avenue in about 50 percent of years during March, and in all years in April and May. Fish surveys identify newly emerged CV steelhead in the American through May indicating that eggs do survive at temperatures above the preferred range. Temperatures are relatively unchanged between all modeling runs during the CV steelhead spawning and incubation period.

Most spawning occurs in the upper 3 miles of the river. Under reduced flow conditions in this area fish tend to spawn in overlapping areas rather than extending spawning distribution downstream, resulting in superimposition. Flows in the future would be lower than under present conditions throughout much of the year due to increased diversions upstream of Folsom. Flows in the river could potentially be as low as 300 cfs in May under the driest condition in the future in both scenarios.

Flood flows that are not reflected in the operations forecasts have the potential to scour CV steelhead redds resulting in the injury and mortality of CV steelhead eggs and sac-fry. Most flood control operations are not expected to result in flow conditions that are likely to create scour (>50,000 cfs). Flow reductions following flood control releases have the potential to dewater redds constructed during the higher flow period. Higher flood control releases over a one or two-day period rather than lower releases over an extended period would preclude CV steelhead spawning in areas that will be later dewatered. Planning for the normal operations of Folsom Reservoir during this period considers the potential for high flood control releases during spawning and incubation period. Non-flood control operations are typically designed to avoid large changes in flow that may create stranding problems. Because Folsom Reservoir is the closest water source to the Delta, releases from Folsom can be needed to maintain delta water quality requirements when delta water quality deterioration occurs. Once requirements are met or increased flows from other reservoirs make it to the delta Folsom releases are cut back to conserve storage, sometimes affecting fish or redds in the river. The increased flows for delta water quality open spawning habitat not normally available to spawning adult steelhead and redds made in these areas are dewatered upon reduction in flows. CVPIA section (b)(2) water, if available, can be used during this period to support higher flows or avoid reductions that otherwise would be made. Dewatered CV steelhead redds likely lowered the number of CV steelhead fry produced in 2003 and 2004. Although, the limiting period to in-river CV steelhead production seems to occur after fry emergence.

2. Juveniles and Smolts

The freshwater life stages of CV steelhead occupy the American River throughout the year. Most literature has indicated that rearing fry and juvenile CV steelhead prefer water temperatures between 45 °F and 60 °F (Reiser and Bjorn 1979; Bovee 1978; Bell 1986). However, Myrick (1998) found the preferred temperatures for Mokelumne River Hatchery CV steelhead placed into thermal gradients were between 62.6 °F and 68 °F. NOAA Fisheries generally uses a daily average temperature of 65 F at Watt Avenue as a temperature objective for CV steelhead rearing in the American River and then adjusts the temperature objective and point depending on Folsom cold-water pool each year. Temperatures could exceed a monthly average of 65 °F at times between May and October with the highest temperatures of up to 75 °F in occurring in July and August of years with a low cold-water pool storage in Folsom. Temperatures are modeled to be almost always higher than 65 °F at Nimbus Dam in July through September.

Temperatures would exceed 70°F during July in 20 percent of years and in August in 50 percent of years at Watt Avenue. These high summer temperatures are likely what limits the naturally spawned CV steelhead population in the American River. Monitoring during 2001 and 2002 indicated that CV steelhead did not appear to be finding water cooler than that found in the thalweg and they persisted below Watt Avenue in water with a daily average temperature of 72 °F and a daily maximum over 74 °F. Water temperature in the future runs is predicted to be approximately 1°F warmer from July to October and about 0.5 °F warmer in June and November. Temperatures are about the same with and without EWA. Temperatures the rest of the year will be relatively unchanged. The increased temperatures will put additional temperature stress on rearing CV steelhead during summer and adult Chinook holding and spawning. Due to the high temperatures the CV steelhead run in the American River will likely remain primarily supported by the hatchery.

Juvenile salmon emigration studies using rotary screw traps in the lower American River at Watt Avenue generally capture CV steelhead fry from March through June while CV steelhead yearlings and smolts emigrate from late December till May, with most captured in January (Snider and Titus 2000). Specific flow needs for emigration in the American River have not been determined. CV steelhead emigrate at a relatively large size so are good swimmers and presumably do not need large pulses to emigrate effectively from the American River as long as temperatures are suitable through the lower river and in the Sacramento River. Modeled flows are expected to provide suitable depth and velocity conditions for emigration during most years. Flows could drop below 1,000 cfs between December and May in about 5 to 15 percent of years depending on month. Low flows would occur slightly more often in the future than under current operations.

Reductions could be as great as 700 cfs in February and would result in significantly less rearing habitat available in dry years. This would probably affect juvenile salmon more than juvenile CV steelhead due to the high salmonid densities. The habitat is generally not fully seeded with CV steelhead fry. December through March forecast mean monthly temperatures are expected to be generally within the optimum smoltification and emigration range (44 °F to 52 °F) during most years but temperatures may exceed 52°F in February in about 10 percent of years and in about 50 percent of years in March. No change in temperatures between current and future operations during December through March is expected to occur.

Rearing CV steelhead fry and juveniles can be exposed to stranding and isolation from main channel flows when high flows are required for flood control or Delta outflow requirements and then subsequently reduced after the requirement subsides. BOR attempts to avoid flow fluctuations during non-flood control events that raise flows above 4,000 cfs and then drop them back below 4,000 cfs as recommended by Snider *et al* (2001). Flow fluctuations are sometimes difficult to avoid with competing standards to meet in the Delta and upstream so some stranding will continue to occur.

3. <u>Habitat Availability and Suitability</u>

Large-scale loss of spawning and rearing habitat has been attributed as having the single greatest effect on CV steelhead distribution and abundance (McEwan and Jackson 1996). Historically, CV steelhead spawned and reared primarily in mid- to high-elevation streams where water temperatures remained suitable all year. Yoshiyama *et al*. (1996) estimated that 82 percent of the historical Chinook salmon spawning and rearing habitat has been lost. The percentage of habitat loss for CV steelhead is presumably greater, because CV steelhead were more extensively distributed than Chinook salmon. CV steelhead could have used numerous smaller tributaries not used by Chinook salmon due to CV 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 CV steelhead in the American River are 161, 27, and 23 miles respectively. The extent of historical habitat is based on Chinook salmon distribution and should be considered minimum estimates for CV steelhead. The remaining areas below 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.

C. Likelihood of Species Continued Use of Habitat within the Action Area

The action area is located approximately 500 feet down stream of Nimbus Dam, within a reach of the LAR that is utilized by a small proportion of the CV steelhead DPS as a migratory corridor, and for spawning and rearing. Because of the size and location of the action area CV steelhead will continue to utilize the action area for migration, spawning and rearing.

V. EFFECTS OF THE ACTION

Pursuant to section 7(a)(2) of the ESA (16 U.S.C. §1536), Federal agencies are directed to ensure that their activities are not likely to jeopardize the continued existence of any listed species or result in the destruction or adverse modification of critical habitat. This biological opinion does not rely on the regulatory definition of "destruction or adverse modification" of critical habitat at 50 CFR 402.02. Instead, we have relied upon the statutory provisions of the ESA to complete the following analysis with respect to critical habitat. NMFS will evaluate destruction or adverse modification of critical habitat by determining if the action reduces the value of critical habitat for the conservation of the species. This section discusses the direct and indirect effects of the construction of the Hazel Avenue Widening project that are expected to result from the proposed action on CV steelhead and their designated critical habitat. Cumulative effects (*i.e.*, effects of future State, local, or private actions on endangered and threatened species or critical habitat) are discussed separately. The proposed project is likely to cause mainly adverse short-term effects to listed species and critical habitat. The project includes measures to avoid or minimize many potential impacts.

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 and endangered species and critical habitat that are likely to be adversely affected by the activity under consultation.

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

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 evaluate the effects of the proposed action, NMFS examined the proposed in-river construction activities, aquatic habitat modification and loss associated with new in-river bridge columns, and conservation measures, to identify likely impacts to listed anadromous salmonids within the action area based on the best available information.

The primary information used in this assessment includes fishery information previously described in the *Status of the Species* and *Environmental Baseline* sections of this biological opinion; studies and accounts of the impacts of in-river construction activities on anadromous species; and documents prepared in support of the proposed action, including the FHWA September 2005 Biological Assessment and May 2006 Revision of the Biological Assessment.

A. Approach to Assessment

1. Information Available for the Assessment

To conduct the assessment, NMFS examined an extensive amount of evidence from a variety of sources. Detailed background information on the status of these species and critical habitat has been published in a number of documents including peer reviewed scientific journals, primary reference materials, governmental and non-governmental reports, scientific meetings, and environmental reports submitted by the project proponents. Additional information investigating the effects of the project’s actions on the listed species in question, their anticipated response to these actions, and the environmental consequences of the actions as a whole was obtained from the aforementioned resources. Final drafts of the plans for the fisheries monitoring and water quality monitoring programs proposed as part of the project have not been completed; therefore, NMFS has analyzed the effects of the project without relying on monitoring efforts to avoid or minimize effects on listed species.

2. Assumptions Underlying This Assessment

In the absence of definitive data or conclusive evidence, NMFS must make a logical series of assumptions to overcome the limits of the available information. These assumptions will be made using sound, scientific reasoning that can be logically derived from the available information. The progression of the reasoning will be stated for each assumption, and supporting evidence cited.

Additional information from fish monitoring studies conducted by DFG regarding salmonid density in the LAR was incorporated into the calculations for risk assessment. Turbidity effects utilized information pertaining to salmonids in general, rather than to the specific listed species present in the action area due to a lack of direct information concerning their response.

The degree to which contaminants would be suspended during construction activities and the effects of the contaminants on listed salmonids are not clear. Regulatory criteria have not been designated for all contaminants or life history events relevant to listed salmonids.

The fate of salmon and steelhead that migrate into the Nimbus Basin is not completely understood. Prior to and following installation of the Nimbus Fish Weir (September through December), fish could pass through to the Nimbus Basin. Salmon and steelhead blocked behind the weir are thought to be harvested by anglers, or die without spawning.

B. Assessment

The assessment will consider the nature, duration, and extent of the proposed action relative to the migration timing, behavior, and habitat requirements of Federally listed anadromous fish. This assessment will consider construction impacts and aquatic habitat modification and loss associated with new in-river bridge columns.

1. <u>Construction Impacts</u>

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 rescue and relocation; and permanent loss of aquatic habitat to the bridge column structure. Construction activities that occur behind the cofferdam are not likely to adversely affect salmon and steelhead because they will be isolated from the LAR, and stabilized prior to cofferdam removal. Decommissioning activities (removal of coffer dam and temporary structures) also are not likely to adversely affect salmon and steelhead because they will occur at a time of year that avoids peak migration and spawning periods, and because existing shoreline and in-water habitat features will not be modified as a result of decommissioning actions.

a. *Cofferdam Installation and Removal*

Installation of sheet pile and beams during construction of the cofferdam will be performed impact pile driver. Pile driving will May 30 and October 31 and will be on an intermittent and short duration basis (*i.e.*, hours or days) outside of migratory and spawning time periods. Pile driving will produce underwater sound pressure levels that may cause temporary disturbance within LAR and affect salmonid behavior and physiology through disruption of feeding behavior and potential increased exposure of juveniles to predation by forcing them from nearshore refugia.

The effect pile driving has on fish depends upon the pressure, measured in decibels (dB), of a sound or compression wave. Rassmusen (1967) found that immediate mortality of juvenile salmonids may occur at sound pressure levels exceeding 204 dB. Sustained sound pressures (4 hours) in excess of 180 dB damaged the hair cells in the inner ear of cichlids (Hastings *et al.* 1996).

Feist *et al.* (1992) found that pile driving in Puget Sound created sound within the range of salmonid hearing that could be detected at least 600 meters away. Abundance of juvenile salmon near pile-driving rigs was reduced on days when the rigs were operating compared to non-operating days. McKinley and Patrick (1986) found that salmon smolts exposed to pulsed sound (similar to pile driving) demonstrated a startle or avoidance response, and Anderson (1990) observed a startle response in salmon smolts at the beginning of a pile-driving episode but found that after a few poundings of the pilings fish were no longer startled. This suggests that pile driving or associated activity (*e.g.*, human movement, work boat operation, *etc.*) can cause avoidance of habitat in the immediate vicinity of the project site, but that fish also may become acclimated to the noise. If fish move into an area of higher predator concentration (*e.g.*, deeper water), they may experience increased susceptibility to predation and decreased survival. Fish that become acclimated may be exposed to additional project-related impacts.

At the City of Sacramento Water Treatment Plant Fish Screen Project, engineering analysis anticipated that the use of a smaller pile-driving hammer that is similar in size to the largest hammer expected to be used at the proposed project, would generate sound pressure levels of 95 to 120 dB. Actual levels were not monitored. Because of the similarities in river depth and size of the pile driver at the City of Sacramento Water Treatment Plant Fish Screen Project and the proposed project, maximum sound levels also should be similar, and below the 180 dB threshold known to cause internal tissue damage to fish. However, the levels may be high enough to affect adult and juvenile salmonids by startling fish and causing avoidance of habitats within 600 meters of the noise source. This is a conservative estimate based on observations in Puget Sound and does not take into account specific on-site variables such as river flow and riverbank morphology that may reduce the actual distance.

NMFS anticipates that pile driving that occurs when listed salmonids are present will be detectable up to 600 meters from the source, and that the sounds generated will harass juvenile salmon and steelhead by causing injury from temporary disruption of normal behaviors such as feeding, sheltering, and migrating. Disruption of these behaviors also may lead to increased predation if fish become disoriented or concentrated in areas with high predator densities. These effects should be small because pile driving will occur during the day, enabling unhindered fish passage at night during peak migration times. Additionally, given the limited and intermittent use of the hammers (*i.e.*, expected to be hours or days) the magnitude of potential adverse effects is expected to be low. Cofferdam installation also will avoid periods when migration and spawning is expected. Therefore, only a small portion of the population should be affected.

b. *Stranding and Fish Rescue*

Juvenile salmonids may be entrained and stranded during cofferdam construction. Cofferdam construction that occurs between May and October will correspond with the presence of rearing juvenile steelhead. Juvenile steelhead demonstrate a startle or avoidance response to noise (Anderson 1990). However, since juveniles are weaker swimmers than adults, they may not be able to overcome ambient flow conditions and could become entrained and stranded. We anticipate that the number of juveniles entrained and stranded in cofferdams will be low because cofferdams will be installed in an area not normally used by rearing juvenile steelhead.

As the water level behind the cofferdam is drawn down to allow construction of the foundation and columns in the dry, salmon and steelhead will be rescued (*i.e.*, netted) and returned to the river according to the Fish Rescue Program prepared for the project. Although salmonids recover well from capture, handling, and short relocations, there may be incidental injury and death to individuals during the rescue. We expect that the rescue program will not capture and release every entrained juvenile. Results of a similar fish rescue operation behind the cofferdam installed during construction of the RD 108 Wilkins Slough fish screen showed that no salmonids were stranded, and fewer than 10 fish total were collected in the fish rescue. Since coffer dam construction methods for the Hazel Avenue project are similar to past coffer dam construction methods of the RD 108 Wilkins Slough fish screen, and a similar fish rescue protocol will be applied when the cofferdams are closed, the loss of salmonids to stranding is expected to be low.

c. *Turbidity*

Quantifying turbidity levels, and their effect on fish species, is complicated by several factors. First, turbidity from an instream activity will typically decrease as distance from the activity increases. How quickly turbidity levels attenuate depends on the quantity of materials in suspension (*e.g.*, mass or volume), the particle size of suspended sediments, the amount and velocity of ambient water (dilution factor), and the physical/chemical properties of the sediments. Second, the impact of turbidity on fishes is not only related to the turbidity levels, but also the particle size of the suspended sediments.

For salmonids, the moderate levels of turbidity expected to be generated by the proposed action may elicit a number of behavioral and physiological responses (*i.e.*, gill flaring, coughing, habitat avoidance, increase in blood sugar levels) which indicate some level of stress (Bisson and Bilby 1982, Sigler *et al.* 1984, Berg and Northcote 1985, Servizi and Martens 1992). The magnitude of these stress responses is generally higher when turbidity is increased and particle size decreased (Bisson and Bilby 1982, Servizi and Martens 1987, Gregory and Northcote 1993). Although turbidity may cause stress, Gregory and Northcote (1993) have shown that moderate levels of turbidity (35-150 NTU) accelerate foraging rates among juvenile Chinook salmon, likely because of reduced vulnerability to predators (camouflaging effect).

When the particles causing turbidity settle from the water column, they contribute to sedimentation. Turbidity and subsequent sedimentation can influence the exchange of streamflow and shallow alluvial groundwater, depress riverine productivity, and contribute to decreased salmonid growth rates (Waters 1995, Newcombe and Jensen 1996).

Cofferdam installation and site preparation will result in increased short-term, localized turbidity and suspended sediment concentrations within the LAR. Exposure to increased turbidity and suspended sediment may affect CV 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.

Newcombe and Jensen (1996) believe that impacts on fish populations exposed to episodes of high suspended sediment may vary depending on the circumstance of the event. They also believe that wild fish may be less susceptible to direct and indirect effects of localized suspended sediment and turbidity increases because they are free to move elsewhere in the system and avoid sediment related effects. They emphasize that the severity of effects on salmonids depends not only on sediment concentration, but also on duration of exposure and the sensitivity of the affected life stage.

Suspended sediment from construction activities will increase turbidity at the project site and could continue downstream. Although Chinook salmon and steelhead are highly migratory and capable of moving freely throughout the action area, an increase in turbidity may injure juvenile salmonids by temporarily disrupting normal behaviors that are essential to growth and survival such as feeding, sheltering, and migrating. Injury is caused when disrupting these behaviors increases the likelihood that individual fish will face increased competition for food and space, and experience reduced growth rates or possibly weight loss. In either case, suspended sediment concentrations do not exceed the Regional Board Standards, and are well below levels measured in NTUs that cause sublethal physiological effects to salmonids. Therefore, we do not expect any injury to listed fish from temporary, localized increases in turbidity.

Project-related turbidity increases may affect the sheltering ability of some juvenile salmon and steelhead and may cause injury or death by increasing the susceptibility of some individuals to predation. The extent of these effects is expected to be small for several reasons. First, the highest turbidity levels will occur at the end of the seasonal juvenile migration period and should affect only a few individuals of the population. Second, the overall period in which turbidity increases will be intermittent and during the period when adults and juveniles are least likely to be present in the action area. This will also limit the number of individual fish that are exposed and potentially affected. Additionally, to ensure that turbidity levels do not exceed thresholds during in-stream project construction activities, a qualified water quality specialist will be maintained on site to monitor turbidity levels 50 feet upstream and 300 feet downstream of the point of in-stream construction activities. When construction activities potentially have the greatest water quality impact (*e.g.*, during installation of temporary construction platform), water samples will be collected four times daily. In the event of a plume detection, work will be halted until the plume has dissipated to satisfactory levels.

Once construction stops, water quality is expected to return to background levels within hours. Adherence to erosion control measures and Best Management Practices (BMPs) such as use of silt fences, straw bales and straw wattles will minimize the amount of project-related sediment and minimize the potential for post-construction turbidity changes.

As a result of the limited timing and distribution of any sediment plumes generated during construction, salmon and steelhead will have the opportunity to avoid the plume. Therefore turbidity-related effects that prevent successful upstream and downstream migration and spawning are not anticipated.

d. *Contaminants*

If contaminants are released during construction activities, their effects may be subtle and difficult to directly observe. 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.

Sublethal or nonlethal endpoints don't require that mortality be absent; rather they indicate that death is not the primary toxic endpoint being examined. Rand (1995) states that the most common sublethal endpoints in aquatic organisms are behavioral (*e.g.*, swimming, feeding, attraction-avoidance, and predator-prey interactions), physiological (*e.g.*, growth, reproduction, and development), biochemical (*e.g.*, blood enzyme and ion levels), and histological changes. Some sublethal effects may indirectly result in mortality. Changes in certain behaviors, such as swimming or olfactory responses, may diminish the ability of the salmonids to find food or escape from predators and may ultimately result in death. Some sublethal effects may have little or no long-term consequences to the fish because they are rapidly reversible or diminish and cease with time. Individual fish of the same species may exhibit different responses to the same concentration of toxicant. The individual condition of the fish can significantly influence the outcome of the toxicant exposure. Fish with greater energy stores will be better able to survive a temporary decline in foraging ability, or have sufficient metabolic stores to swim to areas with better environmental conditions. Fish that are already stressed are more susceptible to the deleterious effects of contaminants, and may succumb to toxicant levels that are considered sublethal to a healthy fish.

Exposure to sublethal levels of contaminants might have serious implications for salmonid health and survival. Recent studies have shown that low concentrations of commonly available pesticides can induce significant sublethal effects on salmonids. Scholz *et al.* (2000) and Moore and Waring (1996) have found that diazinon interferes with a range of physiological biochemical pathways that regulate olfaction, adversely affecting homing, reproductive, and anti-predator behavior of salmonids. Waring and Moore (1997) also found that the carbofuran had significant effects on olfactory mediated behavior and physiology in Atlantic salmon (*Salmo salar*). Ewing (1999) reviewed scientific literature on the effects of pesticides on salmonids and identified a wide range of sublethal effects such as impaired swimming performance, increased predation of juveniles, altered temperature selection behavior, reduced schooling behavior, impaired migratory abilities, and impaired seawater adaptation.

Other non-pesticide compounds that are common constituents of urban pollution and agricultural runoff also adversely affect salmonids. Exposure to chlorinated hydrocarbons and aromatic hydrocarbons causes immunosuppression and increased disease susceptibility (Arkoosh *et al.* 1994). In areas where chemical contaminant levels are elevated, disease may reduce the health and survival of affected fish populations (Arkoosh *et al.* 1994).

As noted above, there is a growing body of literature that suggests small amounts of certain contaminants may affect the biology of salmonids. At present, regulatory thresholds are likely inadequate to account for these effects (*i.e*., some contaminants do not have salmonid exposure criteria or bioaccumulation criteria). Therefore, it is expected that exposure criteria will be refined and expanded in the future. In the meantime, the FHWA has committed to conservation measures that avoid or minimize the exposure of listed salmonids to contaminants. The FHWA would refrain from inwater disposal of contaminated sediments and would implement BMPs to prevent fuels spills, hydraulic leaks, *etc*. during construction activities. If BMPs are successfully implemented, NMFS does not expect fuel spills or toxic compounds to cause injury or death to individual fish.

2. <u>Habitat Impacts</u>

Construction of the bridge columns will alter existing habitat conditions and result in a loss of substrate habitat in the river channel. The area will permanently exclude fish from 0.18 acres of existing aquatic habitat in the LAR channel.

Anadromous fish are present in the action area. The surrounding habitat is characterized as a narrow river channel and having a relatively deep, high velocity channel with no floodplains and sparse riparian vegetation. Because of these habitat conditions, the action area provides little favorable rearing conditions for salmon or steelhead, and primarily functions as a migration corridor. The area above and below the project area is used as holding and spawning habitat by salmonids. Because of the poor condition of excluded habitat, and projected high sweeping velocities through the action area, the impacts of habitat loss on juvenile growth should be small. The function of the action area for spawning or as a migratory corridor will not be affected by the loss of habitat by the installation of the bridge columns.

VI. CUMULATIVE EFFECTS

For purposes of the ESA, cumulative effects are defined as the effects of future State or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation (50 CFR §402.02). Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultations pursuant to section 7 of the ESA.

Future Non-Federal actions that may affect the action area include increased stormwater discharge from increased urbanization. Stormwater discharges related to urban activities contain numerous pesticides and herbicides that may adversely affect salmonid reproductive success and survival rates (Dubrovsky *et al.* 1998, 2000; Daughton 2003).

VII. INTEGRATION AND SYNTHESIS

In general, the direct adverse effects to salmon and steelhead in the action area will be substantially attenuated by the work window proposed by the FHWA, which will greatly reduce the exposure of listed salmonids. In water construction activities are to be restricted to the period between May 30 and October 1 in the main channel of the LAR, although other construction activities may continue after the work window ends. The proposed work window will avoid the majority of steelhead migration through the LAR to the Natomas Basin. In the action area, juvenile steelhead are expected to be exposed primarily during late May through September, when in water construction activities take place. Likewise, early migrating adult steelhead should not enter the action area until at least late October and more likely late November to early December when construction in the main channel of the LAR is completed. No adult CV steelhead are expected to be exposed to the direct adverse effects of the project. The proposed action is expected to contribute to the continuation of poor quality habitat conditions in the LAR that may be experienced by fish present throughout the year.

A. Effects on Listed and Proposed Species

Because the proposed project will be constructed in a location that avoids impacts to sensitive habitats, isolated from the LAR behind a cofferdam, and because the project incorporates a suite of impact avoidance and minimization measures, the potential adverse effects of the proposed project are small, limited, or short-term in nature.

Construction-related impacts are limited to cofferdam installation and implementation of the fish rescue. Cofferdam installation will cause temporary increases in underwater sound pressure and turbidity levels, and may injure or kill juveniles by causing physical trauma or causing increased susceptibility to predation. Cofferdam installation will occur between May 30 and October 1. The cofferdam dewatering may isolate and strand juvenile and adult steelhead. Individuals may be entrained into pumps and killed as water is drawn down prior to the fish rescue. The fish rescue may injure or kill fish during capture, transport, and relocation to the LAR. The dewatering and fish rescue are expected to be a one-time occurrence, lasting only 1 to 2 days.

Juveniles are more likely to be affected by the construction activities because of their small size and vulnerability to factors that affect their growth and distribution. Adults should not be injured because their size, preference for deep water, and crepuscular migratory behavior should enable them to avoid construction-related impacts. Although juveniles exhibit crepuscular behavior and because of their use of near-shore aquatic habitats, they are less susceptible to impacts from daytime construction activities. Construction impacts following the cofferdam installation period should be small to negligible because most work will be performed behind cofferdams, and other in-channel work will avoid peak juvenile outmigration and adult upstream migration periods.

Turbidity-related injury and predation will be minimized by implementing the proposed conservation measures such as implementation of BMPs, and adherence to Regional Board water quality standards. Adherence to BMPs is expected to prevent fuel spills and the release of other toxic compounds from causing injury or death to individuals. The fish rescue will minimize the mortality of fish that are entrained or stranded within cofferdams.

B. Effects on Species Likelihood of Survival and Recovery

NMFS anticipates that the proposed project will result in the exposure of a small number of listed salmonids to adverse effects from increased levels of turbidity and suspended sediment, sound, entrainment, and habitat loss. Fish exposure to sound effects, turbidity and suspended sediment would be intermittent and based on local hydrology and the spatial and temporal position of the rearing and migrating fish. The elevated stress levels may degrade the fish's health and the reproductive potential of adults, and increase the potential of juveniles to be preyed upon by striped bass or other large predators due to impaired behavioral and physiological responses. Individuals that appear different in their behavior attract predators, and thus experience higher mortality due to predator attacks.

Adult steelhead are expected to be present in the action area primarily during late November through April. Similarly, NMFS expects that a small number of rearing juvenile steelhead will be present in the action area during the work window due to poor rearing habitat habitat conditions in the action area. A few early-migrating adults may be present in October. The preceding information indicates overall that exposure of listed salmonids to sound, turbidity and suspended sediment should be infrequent and involve very few individuals. Exposed individuals are expected to be primarily rearing and outmigrating juveniles and smolts.

No spawning or major freshwater rearing habitat will be affected by the proposed activities, so impacts on spawning survival and survival from egg to smolt are not expected. The very small loss of juveniles and smolts anticipated would be unlikely to result in a change in adult returns, because the number expected to be lost is small in comparison to the number produced and likely to survive to become adults.

C. Effects of the Proposed Action on Critical Habitat

The Hazel Avenue Widening project is likely to temporally adversely affect the designated critical habitat of CV steelhead. Construction activities will periodically contribute to the suspended sediment, noise, and contaminant levels of the action area.

The LAR currently has marginal habitat quality due to anthropogenic alterations committed over the previous 150 years. These alterations include extensive levee construction, installation of rock slope protection on the levee faces (riprapping) which typically requires the removal of riparian vegetation, dredging of channels for mining, water diversions for agricultural and municipal purposes, straightening of channels to enhance water flow for flood control and water diversion purposes, and the discharge of agricultural and municipal waste effluents into the river channel at numerous locations within the LAR.

In July 2005, NMFS' critical habitat analytical review teams (CHARTs) issued their final assessments of critical habitat for 7 listed salmon and steelhead ESUs in California (NMFS 2005d). This included critical habitat descriptions for the CV steelhead DPS. Section 3 of the ESA (16 U.S.C. 1532(5)) defines critical habitat as "(i) the specific areas within the geographic area occupied by the species, at the time of the listing * * * on which are found those physical and biological features (I) essential to the conservation of the species and (II) which may require special management considerations or protection". These features include, but are not limited to, 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 the species. After considering the above features, the CHARTs considered the principal biological and physical constituent elements that are essential to the conservation of the species, known as PCEs. The specific PCEs considered in determining the critical habitat for listed salmonids in California include (NMFS 2005):

(1) **Freshwater spawning sites** with sufficient water quantity and quality and adequate substrate to support spawning, incubation and larval development.

(2) **Freshwater rearing sites** with sufficient water quantity and floodplain connectivity to form and maintain physical habitat conditions and allow salmonid development and mobility; sufficient water quality to support growth and development; food and nutrient resources such as terrestrial and aquatic invertebrates and forage fish; and natural cover such as shade, submerged and overhanging large woody debris, log jams, beaver dams, aquatic vegetation, large rocks and boulders, side channels, and undercut banks.

(3) **Freshwater migration corridors** free of obstruction and excessive predation with adequate water quantity to allow for juvenile and adult mobility; cover, shelter, and holding areas for juveniles and adults; and adequate water quality to allow for survival.

(4) **Estuarine areas** that provide uncontaminated water and substrates; food and nutrient sources to support growth and development; and connected shallow water areas and wetlands to cover juveniles.

(5) **Marine areas** with sufficient water quality to support salmonid growth, development, and mobility; food and nutrient resources such as marine invertebrates and forage fish; and nearshore marine habitats with adequate depth, cover, and marine vegetation to provide cover and shelter.

The CHART indicated in their review (NMFS 2005) that the LAR encompasses an area of approximately 305 square miles with 418 miles of stream channels. Of this, fish distribution and habitat use occur in approximately 355 miles of occupied riverine/estuarine habitat for CV steelhead. The CHART concluded that these occupied areas contained one or more PCEs (*i.e*. freshwater rearing and migratory habitat and estuarine areas) and described the LAR as having a high conservation value, primarily due to its use as a rearing and migratory corridor for listed steelhead.

The river channel within the action area is primarily used as a migratory corridor by CV steelhead moving into and out of the LAR watershed. These fish move through the LAR to the Sacramento River and Delta and the marine waters beyond. Due to the loss of riparian habitat resulting from decades of dredging and riprapping, the ecological value of the LAR as a rearing habitat has been greatly diminished from historical conditions, although rearing is still considered to occur in the lower river. The CHART has determined that the waterways of the LAR are necessary for connecting the freshwater spawning habitats upstream in the LAR with the downstream waterways leading to the ocean and thus have a high conservation value. The project itself will not significantly diminish the value of the waterway as a migratory corridor compared to its current condition. The construction activities should not cause acute conditions that will lead to direct mortality of fish or create an impassable barrier. If such conditions were to occur, the discharge would be out of compliance with state and federal water quality laws, and thus any take of fish occurring due to these violations or subsequent loss of aquatic habitat would not be subject to the conditions of this biological opinion and its incidental take statement. Incidental take of listed species can only be given for lawful actions.

In general, the LAR will continue to provide relatively uniform, deep, open habitat that lacks the suitable shallow water resting, sheltering, and feeding locations which characterize the freshwater rearing sites (a PCE of critical habitat) on which juvenile steelhead and other salmonids depend for adequate growth and protection from predators. The increase in shade from the additional bridge span may contribute to lower water temperatures in the upper section of the LAR. The critical habitat baseline is not anticipated to change significantly from the currently proposed action.

VIII. CONCLUSION

After reviewing the best available scientific and commercial information; the current status of CV steelhead; the environmental baseline; the effects of the proposed Hazel Avenue Widening project; and the cumulative effects; it is NMFS's biological opinion that the Hazel Avenue Widening project, as proposed, is not likely to jeopardize the continued existence of CV steelhead, or result in the destruction or adverse modification of the designated critical habitat for CV steelhead.

IX. INCIDENTAL TAKE STATEMENT

Section 9 of the ESA and Federal regulation 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 (ITS).

The measures described below are non-discretionary and must be undertaken by the FHWA so that they become binding conditions of any grant or permit issued to the applicant, as appropriate, for the exemption in section 7(o)(2) to apply. The FHWA has a continuing duty to regulate the activity covered in this ITS. If the FHWA: (1) fails to assume and implement the terms and conditions of the ITS; and/or (2) fails to require the agents of the FHWA to adhere to the terms and conditions of the ITS 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, the FHWA and the FHWA's agents must report the progress of the action and its impact on the species to NMFS as specified in this ITS (50 CFR §402.14[i][3]).

A. Amount or Extent of Take

NMFS anticipates incidental take of CV steelhead, through construction-related impacts, and habitat modification and loss at the project site. Specifically, NMFS anticipates that juvenile listed salmonids may be killed, injured, or harassed during construction and operations and maintenance activities. NMFS does not anticipate take of adults.

NMFS cannot, using the best available information, quantify the anticipated incidental take of individual CV steelhead 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 project area. However, it is possible to describe the conditions that will lead to the take.

Accordingly, NMFS is quantifying take of CV steelhead incidental take in terms associated with the extent and duration of construction activities, and as the extent of habitat loss or modification. Although the exact percentage of the DPS that will be affected cannot be determined, because of the small size of the project and the brief exposure time that fish will face, a small, and unknown percentage of the population will be harmed, injured, or killed.

It is anticipated that construction-related take will be in the form of harm, harassment, or death from physical injury or predation related to increased underwater sound pressure levels and turbidity, entrainment within the cofferdam, stranding, and physical injury or death from cofferdam installation, dewatering, and fish rescue efforts. Construction-related take is expected to last for 90 days until the cofferdam is installed and dewatered. The following level of incidental take from project activities is anticipated:

1. All rearing or migrating juvenile CV steelhead injured or killed from pile driving between May 30 and October 1 of the first construction year to construct the cofferdam. Take in the form of injury and death from pile driving is not expected to occur for more than a total of 90 day or more than 600 meters from the sound source. Sound levels are not expected to exceed 180 dB.

2. Take in the form of injury and death from predation is expected from turbidity levels within the Regional Board standards listed in the *Description of the Proposed Action* section, between May 30 and October 1 of the first construction year, extending downstream for up to 600 meters.

3. Take in the form of capture, injury and death is expected from the fish rescue that will occur within enclosed cofferdams between May 30 and October 1 of the first construction year. Death from fish rescue efforts is not expected to exceed 10 percent of fish captured.

4. All rearing or migrating juvenile steelhead harmed by permanent habitat loss and modification. NMFS estimates that construction of the bridge pilings will amount to the permanent loss of 0.1 8 acres of existing instream aquatic habitat.

Anticipated incidental take may be exceeded if project activities exceed the criteria described above, if the project is not implemented as described in the biological assessment for the project.

B. Effect of the Take

NMFS has determined that the above level of take is not likely to jeopardize CV steelhead. The effect of this action will consist of fish behavior modification, loss of habitat value, and potential death or injury of juvenile CV steelhead.

C. Reasonable and Prudent Measures

NMFS has determined that the following reasonable and prudent measures (RPMs) are necessary and appropriate to minimize the incidental take of listed anadromous salmonids.

1. Measures shall be taken to minimize injury and mortality from project construction, operations, and maintenance.

2. Measures shall be taken to maintain, monitor, and adaptively manage all conservation measures throughout the life of the project to ensure their effectiveness.

3. Measures shall be taken to minimize the effect of habitat modifications at the project site.

D. Terms and Conditions

1. Measures shall be taken to minimize injury and mortality from project construction, operations, and maintenance.

    a. FHWA shall require CALTRANS and its contractors to use low-flow pumps with screened intakes during cofferdam dewatering activities.

    b. FHWA shall require CALTRANS and its contractors to conduct the Fish Rescue Program consistent with NMFS Electrofishing Guidelines (NMFS 2000).

2. Measures shall be taken to maintain, monitor, and adaptively manage all project elements and conservation measures throughout the life of the project to ensure their effectiveness.

    a. FHWA shall provide a project summary and compliance report to NMFS within 60 days of completion of the proposed action. This report shall describe construction dates, implementation of project conservation measures, compliance monitoring and compliance with the terms and conditions of this biological opinion; observed or other known effects on CV steelhead, if any; and any occurrences of incidental take of the CV steelhead.

    b. FHWA shall notify NMFS upon initiation of in-water construction and implementation of the Fish Rescue Program.

3. Measures shall be taken to minimize the effect of habitat modifications at the project site.

a. FHWA shall require CALTRANS to replace riparian vegetation that is lost or damaged to construction at a three to one ratio, calculated on an acreage basis. Replacement vegetation shall consist of native plant species appropriate for the area.

Reports and notifications required by these terms and conditions shall be submitted to:

Supervisor
Sacramento Area Office
National Marine Fisheries Service
650 Capitol Mall, Suite 8-300
Sacramento California 95814-4706
FAX: (916) 930-3629
Phone: (916) 930-3600

X. CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the ESA directs Federal agencies to utilize their authorities to further the purposes of the ESA 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 a listed species or critical habitat or regarding the development of pertinent information.

1. The FHWA should support and promote aquatic and riparian habitat restoration within the LAR, and encourage its contractors to modify operation and maintenance procedures through the FHWA authorities so that those actions avoid or minimize negative impacts to steelhead.

2. The FHWA should support anadromous salmonid monitoring programs throughout the LAR to improve the understanding of migration and habitat utilization by salmonids in this region.

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

XI. REINITIATION OF CONSULTATION

This concludes formal consultation on the proposed Hazel Bridge Widening project. Reinitiation of formal consultation is required if: (1) the amount or extent of taking specified in any incidental take statement is exceeded; (2) new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not previously considered; (3) the action, including the avoidance, minimization, and compensation measures listed in the *Description of the Proposed Action* section is subsequently modified in a manner that causes an effect to the listed species that was not considered in the biological opinion; or (4) a new species is listed or critical habitat is 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 (U.S.C. 180 *et seq.*), requires that Essential Fish Habitat (EFH) be identified and described in Federal fishery management plans (FMPs). Federal action agencies must consult with the 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), and includes the Lower Sacramento hydrologic unit (18020109). Central Valley fall-/late fall-run Chinook salmon (*Oncorhynchus tshawytscha*) are species managed under the Salmon Plan that occur in the Lower Sacramento unit.

Factors limiting salmon populations in the LAR include periodic low flows due and high water temperatures, predation by introduced species, and reduction in the quality and quantity of rearing habitat due to channelization, pollution, rip-rapping, *etc*. (Dettman *et al.* 1987; California Advisory Committee on Salmon and Steelhead Trout 1988; Kondolf *et al.* 1996a, 1996b).

A. Life History and Habitat Requirements

1. Pacific Salmon

General life history information for Central Valley Chinook salmon is summarized below. 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 (63 FR 11482).

Adult Central Valley fall-run Chinook salmon enter the Lower American River from July through April and spawn from October through December (U.S. Fish and Wildlife Service 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.

II. PROPOSED ACTION

The proposed action is described in section II (*Description of the Proposed Action*) of the preceding biological opinion for threatened Central Valley steelhead (*O. 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 (*i.e.* for fall-run Chinook salmon) 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 Hazel Avenue Widening project may adversely affect EFH for Pacific salmon during its construction.

V. EFH CONSERVATION RECOMMENDATIONS

NMFS recommends that terms and conditions 1a, b, and c, and 2a and b, from the biological opinion be adopted as EFH Conservation Recommendations for EFH in the action area. In addition, certain other conservation measures need to be implemented in the project area, as addressed in Appendix A of Amendment 14 to the Pacific Coast Salmon Plan (PFMC 1999).

Riparian Habitat Management

In order to prevent adverse effects to riparian corridors, the Federal Highway Administration (FHWA) should:

1. Maintain riparian management zones of appropriate width in the Lower American River and watersheds that influence EFH;

2. Reduce erosion and runoff into waterways within the project area; and

3. Minimize the use of chemical treatments within the riparian management zone to manage nuisance vegetation along the roadway.

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, 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 FHWA should:

1. Monitor water quality discharge following Central Valley Region of the California Regional Water Quality Control Board requirements from all discharge points;

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

3. 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[j]). In the case of a response that is inconsistent with our recommendations, the FHWA 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.

VII. LITERATURE CITED

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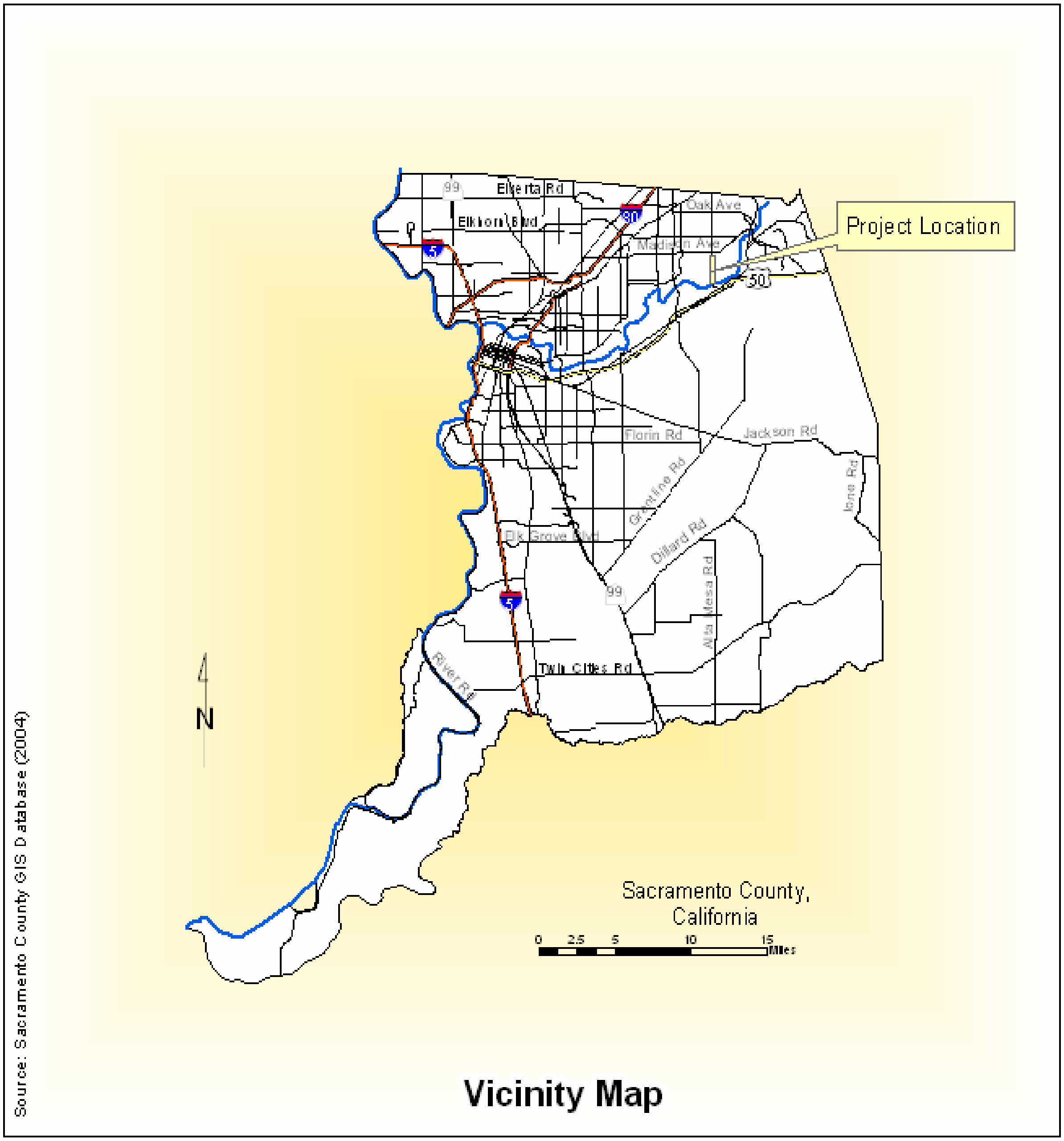

Figure 1. Location of Hazel Avenue Bridge Widening Project, Sacramento County, California.