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

AUG 12 2008

In response refer to:
2007/06640

Ms. Margaret Lawrence
Environmental MPS & Local Assistance Branch
California Department of Transportation
P.O. Box 2048
Stockton, California 95201

Dear Ms. Lawrence:

This document transmits NOAA's National Marine Fisheries Service's (NMFS) biological opinion (Enclosure 1) based on our review of the proposed Navy Drive Bridge Replacement Project in San Joaquin County, California, and its effects on Federally listed as threatened Central Valley steelhead (*Oncorhynchus mykiss*), their designated critical habitat; and the Southern Distinct Population Segment of North American green sturgeon (*Acipenser medirostris*), in accordance with section 7 of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531 *et seq.*). Your October 1, 2007, request for formal consultation was received on October 3, 2007.

This biological opinion is based on information provided in the September 2007 Biological Assessment, discussions held between representatives of NMFS, the California Department of Transportation (Caltrans), and the Port of Stockton, and the best available scientific and commercial information. A complete administrative record of this consultation is on file at the NMFS Sacramento Area Office.

Based on the information described above, the biological opinion concludes that the proposed Navy Drive Bridge Replacement project will adversely affect listed species, but that the proposed project will not jeopardize the continued existence of the listed species or adversely modify their respective critical habitat. NMFS has included an incidental take statement with reasonable and prudent measures and non-discretionary terms and conditions that are necessary and appropriate to minimize incidental take of listed species associated with the Navy Drive Bridge Replacement project. The ESA section 9 prohibitions against taking of listed species and the terms and conditions in the Incidental Take Statement of this biological opinion will not apply to the Southern DPS of North American green sturgeon until a final ESA section 4(d) rule becomes effective.

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 Navy Drive Bridge Replacement Project will adversely affect the EFH of Pacific Salmon in the action

area and adopts a subset of the 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 Caltrans to provide NMFS with a detailed written response within 30 days, and at least 10 days in advance of any action, to the EFH conservation recommendations, including a description of measures adopted by Caltrans 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, Caltrans 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.

Please contact Douglas Hampton by telephone at (916) 930-3610, or via email at Douglas.Hampton@noaa.gov, if you have any questions or require additional information concerning this correspondence.

Sincerely,

Russell M Strach

for Rodney R. McInnis
Regional Administrator

cc: Copy to file – ARN #151422SWR2007SA00453
NMFS-PRD, Long Beach, CA
Henry McKay, Special Projects Manager, Port of Stockton
Jim Brady, Senior Engineer, Moffitt and Nichol
Susan Moore, Field Supervisor, U.S. Fish and Wildlife Service

Enclosure 1

BIOLOGICAL OPINION

AGENCY: California Department of Transportation

ACTIVITY: Navy Drive Bridge Replacement Project

CONSULTATION CONDUCTED BY: Southwest Region, National Marine Fisheries Service

DATE ISSUED: August 12, 2008

I. CONSULTATION HISTORY

- In a letter dated October 1, 2007, and received by NOAA's National Marine Fisheries Service (NMFS) on October 3, 2007, the California Department of Transportation (Caltrans) requested initiation of consultation under Section 7 of the Endangered Species Act (ESA) with NMFS, on the Navy Drive Bridge Replacement Project.

- On October 3, 2007, NMFS received Caltrans' September 2007 *Navy Drive Bridge Replacement Project Biological Assessment* in support of their request to initiate Section 7 consultation.

- On March 11, 2008, NMFS received an email from Caltrans summarizing a discussion that took place during a March 5, 2008, telephone conference addressing concerns over the work window for in-water work for the proposed project.

- On April 24, 2008, Douglas Hampton of NMFS conducted a site visit with Caltrans staff and representatives from the Port of Stockton.

II. DESCRIPTION OF THE PROPOSED ACTION

The proposed action is to replace the Navy Drive Bridge across the San Joaquin River in the City of Stockton, San Joaquin County, California. Navy Drive is an undivided two-lane east-west collector that currently provides the sole vehicular access point, via the Navy Drive Bridge, between the Port of Stockton's East Complex and West Complex on Rough and Ready Island, and is a critical link between the Port of Stockton and the regional transportation system. The existing two-lane swing bridge will be replaced with a new four-lane fixed bridge on a slightly different alignment.

The new four-lane bridge will be constructed upstream of the existing Navy Drive Bridge with the south abutment of the replacement bridge being placed next to the existing abutment. The existing bridge is perpendicular to the San Joaquin River, whereas the replacement bridge will be constructed at a 10-degree skew to the channel in order to improve the alignment and allow a higher design speed than is available on the current bridge. Additionally, the new bridge will provide four lanes of traffic instead of two, a 4-foot wide median, two 8-foot wide shoulders, and two 6-foot wide sidewalks with barriers. The replacement bridge will be 80 feet wide and will increase in overall length from 271 feet to 302 feet accommodating the new alignment and the fact that the river widens just upstream from the existing bridge. The added length of the replacement bridge will also allow the abutments on both sides of the channel to be constructed to the rear of the top of the bank (back from the edge of the flood control levees) thereby minimizing disturbance of the rivers banks.

The replacement bridge will be constructed using a Precast Bulb Tee Girder design, consisting of twenty-four 61-inch deep precast bulb tee girders with an 8-inch thick, cast-in-place deck. The bulb tee girders accommodate longer spans than standard Caltrans precast I girders, and would be post-tensioned together longitudinally prior to deck placement to ensure continuity. Two different girder lengths will be used; sixteen of the girders will have lengths of 88.5 feet and eight of the girders will have 125 foot lengths. The girders will be evenly spaced, and the entire bulb tee superstructure (including deck, deck fillets, and deck cross slope) will have a structural depth of 6.5 feet. Ten cast-in-steel-shell (CISS) piles will be placed in the channel and extend to an approximate elevation of -76 feet mean lower low water (MLLW) level. The CISS piles will frame into several 5.5-foot wide by 6-foot deep by 82-foot long drop bent caps. The abutment piles will be approximately 45 feet long and the wingwall piles will be about 40 feet long. The alignments and approaches of both the West Complex and the East Complex are being planned and designed to tie in to the new bridge under separate projects.

A. Project Activities

Work would begin with the construction of two temporary trestles extending from the north and south river banks, respectively, and the two in-channel bents. The trestles would each be about 80 feet long by 60 feet wide with three temporary steel pile bents in the channel. Each of the temporary trestle bents would consist of seven temporary steel piles for a total of 42 temporary steel piles composing all six in-channel temporary trestle bents. The temporary steel piles would be either H-pile (HP) sections or 12-inch to 24-inch diameter tubular piles. The temporary steel piles would be either driven or vibrated in to the river bed to depth to support the anticipated construction loads. A temporary deck structure would be constructed above the bents to support cranes and concrete trucks needed for the CISS pile construction and bent caps.

Once the temporary trestles are in place, the CISS steel pile shells will be driven to depth using an impact hammer from the temporary trestle. Once each shell is driven, soil will be removed from inside the shell and disposed of off-site. A reinforcing cage will be placed inside the steel shell before concrete is then placed in the shell using the tremie method. Water taken off the tremie lift will be discharged to a settling pond on shore where it will percolate into the soil. Any residue will be removed when construction is completed. Expected water volume is 500

gallons per pile for each of ten piles. Dewatering inside of the CISS shell is not required as water above the concrete is removed during the concrete placement process.

Following completion of the two in-channel bents either the center span girders will be placed or the temporary trestles dismantled and removed. The contractor may wish to take advantage of the temporary trestles to place the center girders. However, the contractor may alternatively choose to dismantle the temporary trestles and begin placing bridge girders from the shore, leaving the center span girders until the shore spans are completed. In either case, the temporary trestles will be dismantled and removed following placement of either the center span or shore span girders.

The abutments will be built entirely in the dry as these are located behind the top of the levee bank and above the high water level. Relatively shallow excavations will be made and CISS shells will be driven to depth and left in place. The same protocol for the placement of concrete inside the in-channel CISS piles will be employed for the abutment piles. Four small diameter Cast-in-Drilled-Hole (CIDH) piles will support the ends of the wing walls. Placement of reinforcing steel, concrete, and water from the CIDH piles will be done in the same manner as the CISS piles. The CIDH holes may be up to 40 feet deep and may require dewatering of groundwater.

Additionally, demolition of the existing Navy Drive Bridge will be required and will occur following completion of the new bridge's construction in order to maintain uninterrupted access to Rough and Ready Island throughout the implementation of the project. The contractor is required to prevent all superstructure debris from entering the channel and is prohibited from using blasting as a demolition method. The existing truss bridge will be sequentially demolished using a system of barges that will either be floated under the existing rail bridge and Navy Drive Bridge or assembled together from Flexi-Floats that would be trucked into the site. The concrete decking may be demolished and the house, guardrail, lights, stairs, and any other appurtenances may be removed in order to reduce weight. Debris will be trapped by the floats and brought to shore for off-site disposal. The truss will then be cut into segments and lifted out of the channel to be set on land for dismantling and removal.

The existing substructure will be removed to one foot below the design mudline without allowing any debris to remain in the channel. This will be accomplished by first removing the interior walls of the center pier down to the top of the center pier footing with demolished concrete being removed from the center of the pier by an excavator or clamshell operating off of Flexi-Floats. Once the interior of the center pier is demolished, the exterior of the center pier will be demolished using an excavator with a chipping tool working the sides down with debris falling into the center of the pier. Approximately ten feet below water divers with underwater jackhammers will complete the demolition to the top of the footing with a clamshell removing debris from the center of the pier as the demolition progresses. The side piers and abutments will be demolished to just below the top of the bank using an excavator with a chipper, and conventional demolition equipment, respectively. Finally, the timber fender system of the existing bridge will be demolished by pulling the piles, snapping them off just below the mudline, or alternatively having divers with underwater chainsaws cut them off just below the

mudline. All demolished timber will be carried to shore by floats, offloaded, and trucked to an offsite disposal area.

B. Proposed Conservation Measures

The following conservation measures have been proposed by Caltrans (2007) as part of the project description for the Navy Drive Bridge Replacement project.

1. Increased Turbidity and Suspended Sediment

Implementation of Best Management Practices (BMPs), such as placing hay bales around construction areas and erecting silt fencing, will help contain and reduce offsite sedimentation and substantially decrease the potential for erosion associated with the discharge of sediments in to the San Joaquin River. In addition, approval of a site specific Storm Water Pollution Prevention Plan (SWPPP) will be required, which will implement measures to protect water quality including hazardous spill prevention plans and erosion prevention techniques.

During in-water construction activities, no fill material, including concrete, will be allowed to enter the water column and channel disturbances will be kept to a minimum. A turbidity curtain (*i.e.*, a fabric barrier that is designed to allow water to flow through a limited area while deflecting and containing sediment within that area and providing sufficient retention time so that the soil particles will settle out) will be used to isolate the work area. After deploying the turbidity curtain, the Port or its contractor will monitor turbidity and suspended solids during construction activities, and if levels exceed Regional Water Quality Control Board's (RWQCB) Basin Plan standards, the Port or its contractor will stop work until levels are within Basin Plan limits.

Furthermore, no portion of the existing bridge will be left in the channel, and if any construction or demolition activities result in the suspension and dispersion of oxygen demanding substances into the river (*i.e.*, causing dissolved oxygen levels to decrease), the Port will operate aeration equipment continuously during these activities, and until such time following their cessation that potential impacts to dissolved oxygen levels in the river have been eliminated.

2. Loss of Shaded Riverine Aquatic (SRA) and Riparian Habitat

The removal and disturbance of riparian vegetation will be kept to a feasible minimum. Any stream banks disturbed during construction will be returned to their preconstruction condition, and lost riparian vegetation will be replaced with an appropriate assemblage of native vegetation prior to the onset of the rainy season.

3. Limiting the Work Window for In-channel Construction Activities.

Measures shall be taken to minimize incidental take of listed and proposed anadromous fish by restricting and isolating in-channel work to avoid vulnerable life stages. All in-channel percussive work shall be restricted to the period between June 1 and October 31. Percussive work includes all pile driving and pile removal activities that utilize "hammering". In addition,

in-channel work shall not be conducted at night to afford fish quiet, unobstructed passage during night-time hours.

4. Limiting and Monitoring Sound Pressure Levels.

Based on the results of geotechnical investigations, whenever possible and to the greatest extent feasible, Caltrans will partially or entirely vibrate piles into the channel substrate rather than driving them by means of "hammering". Vibratory pile driving does not generate peak sound pressure levels that cause direct impacts to fish species.

Pile driving activities that rely on impact hammers rather than vibratory techniques will be designed to assure compliance with the interim criteria for Sound Exposure Levels (SEL) less or equal to 187 dB in any single strike, and peak sound pressure less or equal to 208 dB in any single strike, measured at a distance of 32.8 feet from the source. In addition, to reduce sound pressure levels to the greatest extent feasible, a cushioning block between hammer and pile will always be used.

Bubble curtains will be used at all permanent piles driven by impact hammers. An air bubble curtain system typically consists of rings of perforated pipes surrounding the pile and template system (used for holding the piles in place). The perforated pipes emit air bubbles, thus allowing for the pile driving operation to be completely enclosed by bubbles for the full depth of the water column and for a radial dimension of at least 6.5 feet as measured from the outside surface of the pile. Bubble curtains attenuate the effects of sound pressure waves on fish during pile driving, reducing barotrauma injury and related mortality (Caltrans 2004).

C. Description of the 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 purpose of this biological opinion, centers on the Navy Drive Bridge over the San Joaquin River at 37° 56' 48"North; 121° 20' 19" West, in the City of Stockton, San Joaquin County, California, and encompasses an area that begins 500 feet upstream of the bridge and extends 500 feet downstream of the bridge. This area was selected because it represents the upstream and downstream extent of anticipated acoustic effects from pile driving, and the downstream extent of anticipated effects related to sediment and turbidity.

III. STATUS OF THE SPECIES AND CRITICAL HABITAT

The following listed threatened and endangered species and designated critical habitat occur in the action area and may be affected by the proposed Navy Drive Bridge Replacement project:

Central Valley steelhead (*Oncorhynchus mykiss*) – threatened
Central Valley steelhead critical habitat
Southern Distinct Population Segment (DPS) of North American green sturgeon (*Acipenser medirostris*) – threatened

A. Species and Critical Habitat Listing Status

Central Valley steelhead were originally listed as threatened under the ESA on March 19, 1998 (63 FR 13347). This DPS consists of steelhead populations in the Sacramento and San Joaquin River basins in California's Central Valley. In June 2004, NMFS proposed that Central Valley steelhead remain listed as threatened (69 FR 33102). On June 28, 2005, after reviewing the best available scientific and commercial information, NMFS issued its final decision to retain the status of Central Valley steelhead as threatened (70 FR 37160). This decision also included the Coleman National Fish Hatchery and Feather River Fish Hatchery steelhead populations. These populations were previously included in the DPS but were not deemed essential for conservation and thus not part of the listed steelhead population. A final rule designating critical habitat for Central Valley steelhead was published on September 2, 2005 (70 FR 52488). The rule became effective on January 2, 2006. The designation includes numerous streams and stream reaches to the ordinary high water line throughout the Central Valley such as those of the American, Feather, and Yuba rivers, and Deer, Mill, Battle, Antelope, and Clear creeks in the Sacramento River basin; the Calaveras, Mokelumne, Stanislaus, and Tuolumne rivers in the San Joaquin River basin; and the Sacramento and San Joaquin rivers and Delta.

The critical habitat designation for Central Valley steelhead identifies the primary constituent elements (PCEs) of critical habitat which include those physical and biological features of the habitat that are essential to the conservation of the species. Within the Sacramento and San Joaquin rivers these PCEs include freshwater spawning sites, freshwater rearing sites, freshwater migration corridors and estuarine areas. The PCEs of critical habitat for these species are made up of essential physical and biological elements such as water of an appropriate quality and quantity, suitable spawning substrates, forage and food sources, and natural cover such as shade, submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, side channels, and undercut banks.

The Southern DPS of North American green sturgeon was listed as threatened on April 7, 2006, (70 FR 17386) and includes the North American green sturgeon population spawning in the Sacramento River and utilizing the Sacramento River, The San Joaquin River, the Sacramento-San Joaquin Delta, and the San Francisco Estuary. While the Southern DPS presently contains only a single documented spawning population in the Sacramento River, individuals may occur in the action area. No critical habitat has been designated or proposed for green sturgeon.

B. Species Life History and Population Dynamics

1. Central Valley Steelhead

a. *General Life History*

Based on their state of sexual maturity at the time of river entry and the duration of their spawning migration, steelhead can be divided into two life history types: stream-maturing and ocean-maturing. Stream-maturing steelhead enter freshwater in a sexually immature condition and require several months to mature and spawn, whereas ocean-maturing steelhead enter

freshwater with well-developed gonads and spawn shortly after river entry. These two life history types are more commonly referred to by their season of freshwater entry (*i.e.*, summer [stream-maturing] and winter [ocean-maturing] steelhead). Only winter steelhead are currently found in Central Valley rivers and streams (McEwan and Jackson 1996), although there are indications that summer steelhead were present in the Sacramento River system prior to the commencement of large-scale dam construction in the 1940s (Interagency Ecological Program [IEP] Steelhead Project Work Team 1999). At present, summer steelhead are found only in North Coast drainages, mostly in tributaries of the Eel, Klamath, and Trinity River systems (McEwan and Jackson 1996).

Winter steelhead generally leave the ocean from August through April, and spawn between December and May (Busby *et al.* 1996). Timing of upstream migration is correlated with higher flow events, such as freshets or sand bar breaches, and the associated lower water temperatures. The preferred water temperature for adult steelhead migration is 46 °F to 52 °F (McEwan and Jackson 1996; Myrick 1998; Myrick and Cech 2000). Thermal stress may occur at temperatures beginning at 66 °F and mortality has been demonstrated at temperatures beginning at 70 °F. The preferred water temperature for steelhead spawning is 39 °F to 52 °F, and the preferred water temperature for steelhead egg incubation is 48 °F to 52 °F (McEwan and Jackson 1996; Myrick 1998; Myrick and Cech 2000). The minimum stream depth necessary for successful upstream migration is 13 cm (Thompson 1972). Preferred water velocity for upstream migration is in the range of 40-90 cm/s, with a maximum velocity, beyond which upstream migration is not likely to occur, of 240 cm/s (Thompson 1972; Smith 1973).

Unlike Pacific salmon, steelhead are iteroparous, or capable of spawning more than once before death (Busby *et al.* 1996). However, it is rare for steelhead to spawn more than twice before dying; most that do so are females (Busby *et al.* 1996; Nickleson *et al.* 1992). Iteroparity is more common among southern steelhead populations than northern populations (Busby *et al.* 1996). Although one-time spawners are the great majority, Shapolov and Taft (1954) reported that repeat spawners are relatively numerous (17.2 percent) in California streams. Most steelhead spawning takes place from late December through April, with peaks from January though March (Hallock *et al.* 1961). Steelhead spawn in cool, clear streams featuring suitable gravel size, depth, and current velocity, and may spawn in intermittent streams as well (Everest 1973; Barnhart 1986).

The length of the incubation period for steelhead eggs is dependent on water temperature, dissolved oxygen concentration, and substrate composition. In late spring, and following yolk sac absorption, fry emerge from the gravel and actively begin feeding in shallow water along stream banks (Nickelson *et al.* 1992).

Steelhead rearing during the summer takes place primarily in higher velocity areas in pools, although young-of-the-year also are abundant in glides and riffles. Winter rearing occurs more uniformly at lower densities across a wide range of fast and slow habitat types. Productive steelhead habitat is characterized by complexity, primarily in the form of large and small woody debris. Cover is an important habitat component for juvenile steelhead both as velocity refuge and as a means of avoiding predation (Shirvell 1990; Meehan and Bjornn 1991). Some older juveniles move downstream to rear in large tributaries and mainstem rivers (Nickelson *et al.*

1992). Juveniles feed on a wide variety of aquatic and terrestrial insects (Chapman and Bjornn 1969), and emerging fry are sometimes preyed upon by older juveniles.

Steelhead generally spend two years in freshwater before emigrating downstream (Hallock *et al.* 1961; Hallock 1989). Rearing steelhead juveniles prefer water temperatures of 45 °F to 58 °F and have an upper lethal limit of 75 °F. They can survive in water up to 81 °F with saturated dissolved oxygen conditions and a plentiful food supply. Reiser and Bjornn (1979) recommended that dissolved oxygen concentrations remain at or near saturation levels with temporary reductions no lower than 5.0 mg/l for successful rearing of juvenile steelhead. During rearing, suspended and deposited fine sediments can directly affect salmonids by abrading and clogging gills, and indirectly cause reduced feeding, avoidance reactions, destruction of food supplies, and reduced egg and alevin survival (Reiser and Bjornn 1979). Bell (1973) found that silt loads of less than 25 mg/l permit good rearing conditions for juvenile salmonids.

Juvenile steelhead emigrate episodically from natal streams during fall, winter, and spring high flows. Emigrating Central Valley steelhead use the lower reaches of the Sacramento River and the Delta for rearing and as a migration corridor to the ocean. Some may utilize tidal marsh areas, non-tidal freshwater marshes, and other shallow water areas in the Delta as rearing areas for short periods prior to their final emigration to the sea. Barnhart (1986) reported that steelhead smolts in California range in size from 140 to 210 mm (fork length). Hallock *et al.* (1961) found that juvenile steelhead in the Sacramento River basin migrate downstream during most months of the year, but the peak period of emigration occurred in the spring, with a much smaller peak in the fall.

b. Population Trends – Central Valley Steelhead

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 (now inaccessible due to Shasta and Keswick Dams), south to the Kings and possibly the Kern River systems (now inaccessible due to extensive alteration from water diversion projects), and in both east and west-side Sacramento and San Joaquin River tributaries (Yoshiyama *et al.* 1996). The present distribution has been greatly reduced (McEwan and Jackson 1996). The California Advisory Committee on Salmon and Steelhead (1988) reported a reduction of steelhead habitat from 6,000 miles historically to 300 miles today. Historically, steelhead probably ascended Clear Creek past the French Gulch area, but access to the upper basin was blocked by Whiskeytown Dam in 1964 (Yoshiyama *et al.* 1996). Steelhead also occurred in the upper drainages of the Feather, American, Yuba and Stanislaus Rivers which are now inaccessible (McEwan and Jackson 1996, Yoshiyama *et al.* 1996).

Historic Central Valley steelhead run size is difficult to estimate given the paucity of data, but may have approached one to two million adults annually (McEwan 2001). By the early 1960s, the steelhead run size had declined to about 40,000 adults (McEwan 2001). Over the past 30 years, the naturally-spawned steelhead populations in the upper Sacramento River have declined substantially. Hallock *et al.* (1961) estimated an average of 20,540 adult steelhead in the Sacramento River, upstream of the Feather River, through the 1960s. Steelhead counts at the RBDD declined from an average of 11,187 for the period of 1967 to 1977, to an average of

approximately 2,000 through the early 1990s, with an estimated total annual run size for the entire Sacramento-San Joaquin system, based on RBDD counts, to be no more than 10,000 adults (McEwan and Jackson 1996, McEwan 2001). Steelhead escapement surveys at RBDD ended in 1993 due to changes in dam operations.

Nobriga and Cadrett (2003) compared coded wire tagged (CWT) and untagged (wild) steelhead smolt catch ratios at Chipps Island trawl from 1998 to 2001 and estimated that about 100,000 to 300,000 steelhead juveniles are produced naturally each year in the Central Valley. In the draft *Updated Status Review of West Coast Salmon and Steelhead* (Good *et al*. 2005), the Biological Review Team (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 steelhead numbers in the San Joaquin River basin come from CDFG mid-water trawling samples collected on the lower San Joaquin River at Mossdale. These data indicate a decline in steelhead numbers in the early 1990s, which have remained low through 2002 (CDFG 2003). In 2004, a total of 12 steelhead smolts were collected at Mossdale (CDFG, unpublished data).

Existing wild steelhead stocks in the Central Valley are mostly confined to the upper Sacramento River and its tributaries, including Antelope, Deer, and Mill Creeks and the Yuba River. Populations may exist in Big Chico and Butte Creeks and a few wild steelhead are produced in the American and Feather Rivers (McEwan and Jackson 1996).

Recent snorkel surveys (1999 to 2002) indicate that steelhead are present in Clear Creek (J. Newton, FWS, pers. comm. 2002, as reported in Good *et al*. 2005). Because of the large resident *O. mykiss* population in Clear Creek, steelhead spawner abundance has not been estimated.

Until recently, steelhead were thought to be extirpated from the San Joaquin River system. Recent monitoring has detected small self-sustaining populations of steelhead in the Stanislaus, Mokelumne, Calaveras, and other streams previously thought to be void of steelhead (McEwan 2001). On the Stanislaus River, steelhead smolts have been captured in rotary screw traps at Caswell State Park and Oakdale each year since 1995 (Demko *et al.* 2000). After 3 years of operating a fish counting weir on the Stanislaus River only two adult steelhead have been observed moving upstream, although several large rainbow trout (*O. mykiss*) have washed up on the weir in late winter (Cramer 2005). It is possible that naturally spawning populations exist in many other streams but are undetected due to lack of monitoring programs (IEP Steelhead Project Work Team 1999). Incidental catches and observations of steelhead juveniles also have occurred on the Tuolumne and Merced rivers during fall-run Chinook salmon (*Oncorhynchus tshawytscha*) monitoring activities, indicating that steelhead are widespread, if not abundant, throughout accessible streams and rivers in the Central Valley (Good *et al*. 2005).

c. *Status of Central Valley Steelhead and Critical Habitat*

Both the BRT (Good *et al*. 2005) and the Artificial Propagation Evaluation Workshop (69 FR 33102) concluded that the Central Valley steelhead ESU is "in danger of extinction." However, in the proposed status review NMFS concluded that the ESU in-total is "not in danger of extinction, but is likely to become endangered within the foreseeable future" citing benefits of restoration efforts and a yet-to-be funded monitoring program (69 FR 33102). Central Valley steelhead have already been extirpated from most of their historical range. Critical habitat concerns for steelhead focus on the widespread degradation, destruction, and blockage of freshwater habitat within the region, and impacts to PCEs are exacerbated by dry hydrologic conditions resulting in reduced flows and warm water temperatures which negatively impact adults, eggs, and juveniles. Water management operations, including reservoir releases and unscreened or poorly screened diversions along steelhead migration routes, compound drought related problems by further reducing river flows, warming river water temperatures, and entraining juveniles. Widespread hatchery steelhead production within this ESU also raises concerns about the potential ecological interactions between introduced stocks and native stocks. Because the Central Valley steelhead population has been fragmented into smaller isolated tributaries without any large source population, and the remaining habitat continues to be degraded by water diversions and other land use practices, the population remains at an elevated risk for future population declines.

d. *Viable Salmonid Population Summary for Central Valley Steelhead*

Abundance. All indications are that natural Central Valley steelhead have continued to decrease in abundance and in the proportion of natural fish over the past 25 years (Good *et al.* 2005); the long-term trend remains negative. There has been little steelhead population monitoring despite 100 percent marking of hatchery steelhead since 1998. Hatchery production and returns are dominant over natural fish and include significant numbers of non-DPS-origin Eel River steelhead stock.

Productivity. An estimated 100,000 to 300,000 natural juvenile steelhead are estimated to leave the Central Valley annually, based on rough calculations from sporadic catches in trawl gear (Good *et al.* 2005). Concurrently, one million in-DPS hatchery steelhead smolts and another half million out-of-DPS hatchery steelhead smolts are released annually in the Central Valley. The estimated ratio of nonclipped to clipped steelhead has decreased from 0.3 percent to less than 0.1 percent, with a net decrease to one-third of wild female spawners from 1998 to 2000 (Good *et al.* 2005).

Spatial Structure. Steelhead appear to be well-distributed where found throughout the Central Valley (Good *et al.* 2005). Until recently, there was very little documented evidence of steelhead due to the lack of monitoring efforts. Since 2000, steelhead have been confirmed in the Stanislaus and Calaveras rivers.

Diversity. Analysis of natural and hatchery steelhead stocks in the Central Valley reveal genetic structure remaining in the DPS (Nielsen *et al.* 2003). There appears to be a great amount of gene

flow among upper Sacramento River basin stocks, due to the post-dam, lower basin distribution of steelhead and management of stocks. Recent reductions in natural population sizes have created genetic bottlenecks in several Central Valley steelhead stocks (Good *et al.* 2005; Nielsen *et al.* 2003). The out-of-basin steelhead stocks of the Nimbus and Mokelumne River hatcheries are not included in the Central Valley steelhead DPS.

2. Southern DPS of North American Green Sturgeon

The green sturgeon is the most widely distributed member of the sturgeon family Acipenseridae (70 FR 17386). North American green sturgeon are found in rivers from British Columbia south to the Sacramento River, California, though their ocean range is from the Bering Sea to Ensenada, Mexico (Moyle 2002). In assessing North American green sturgeon status, NMFS determined that two DPSs exist. The northern DPS is made up of known North American green sturgeon spawning (or single stock populations) in the Rogue, Klamath and Eel rivers. The Southern DPS presently contains only a single spawning population in the Sacramento River (70 FR 17386). NMFS proposed to list the Southern DPS of North American green sturgeon as threatened on April 6, 2005 (70 FR 17386).

a. *Life History*

North American green sturgeon is an anadromous species that generally migrate upstream into fresh water between late February and late July (CDFG 2002a). In the Klamath River, the water temperature tolerance of immigrating adult North American green sturgeon reportedly ranges from 44.4 °F to 60.8 °F (6.9 °C to 16 °C); North American green sturgeon were not found in areas of the river outside this surface water temperature range (FWS 1995). Mature males range from 139 to 199 centimeters (cm) fork length (FL) and 15 to 30 years of age (Van Eenennaam *et al*. 2001). Mature females range from 157 to 223 cm FL and 17 to 40 years of age. Maximum ages of adult North American green sturgeon are likely to range from 60 to 70 years (Moyle 2002).

Adult North American green sturgeon are thought to spawn every three to five years (70 FR 17386), but new information suggests that spawning could occur as frequently as every two years (Stephen Lindley, NMFS, pers. comm., 2004). Spawning occurs from March through July, with peak activity from April through June (Moyle *et al.* 1995). Spawning occurs in deep turbulent river mainstems. Specific spawning habitat preferences are unclear, but eggs likely are broadcast over large cobble where they settle into the cracks (Moyle *et al.* 1995). North American green sturgeon reportedly prefer to spawn in water temperatures ranging from 46.4 °F to 57.2 °F (8 °C to 14 °C) (FWS 1995; Environmental Protection Information Center *et al.* 2001; Moyle 2002). Water temperatures above 68 °F (20 °C) are reportedly lethal to North American green sturgeon embryos (Cech *et al*. 2000; Beamesderfer and Webb 2002). North American green sturgeon females produce 60,000 - 140,000 eggs (Moyle *et al.* 1992), and they are the largest eggs (diameter 4.34 mm) of any sturgeon species (Cech *et al.* 2000).

North American green sturgeon larvae hatch at around 200 hours (at 54.9° F) after spawning, and are dissimilar to other sturgeon species in that they lack a distinct swim-up or post-hatching stage (Moyle 2002; NMFS 2002). Optimal growth rates for North American green sturgeon juveniles

reportedly occur at water temperatures of 59 °F (Cech *et al.* 2000). North American green sturgeon larvae first feed at 10 days post hatch and grow quickly reaching a length of 66 mm and a weight of 1.8 g in three weeks of exogenous feeding. Metamorphosis to the juvenile stage is complete at 45 days. Juveniles continue to grow rapidly, reaching 300 mm in one year. Juveniles spend from one to four years in fresh and estuarine waters and disperse into salt water at lengths of 300 to 750 mm.

The North American green sturgeon is the most marine oriented of the Pacific Coast sturgeon species (NMFS 2003). Individuals apparently remain near the estuaries at first, but then migrate considerable distances in the ocean as they grow. Based on recoveries of North American green sturgeon tagged in the San Francisco Bay estuary, most North American green sturgeon migrate northward, in some cases as far as British Columbia (Moyle 2002; NMFS 2002). Similarly, tagged North American green sturgeon from the Sacramento and Columbia rivers are primarily captured to the north in coastal and estuarine waters, with some fish tagged in the Columbia River being recaptured as far north as British Columbia (Washington Department of Fish and Wildlife (WDFW) 2002). While there is some bias associated with recovery of tagged fish through commercial fishing, the pattern of a northern migration is supported by the large concentration of North American green sturgeon in the Columbia River estuary, Willapa Bay, and Grays Harbor, which peaks in August. These fish tend to be immature; however, mature fish and at least one ripe fish have been found in the lower Columbia River (WDFW 2002). Genetic evidence suggests that most Columbia River green sturgeon are a mixture of fish spawned in other river systems including the Sacramento, Klamath, and Rogue Rivers (Israel *et al*. 2002).

Some general information is available on North American green sturgeon feeding habits. Adult North American green sturgeon scour the Sacramento-San Joaquin Delta benthos for invertebrates including shrimp, mollusks, amphipods, isopods, and small, disabled or dead fish (Environmental Protection Center *et al*. 2001). The primary diet for juvenile North American green sturgeon reportedly consists of small crustaceans, such as amphipods and opossum shrimp (CDFG 2001). As juvenile North American green sturgeon develop, they reportedly eat a wider variety of benthic invertebrates, including clams, crabs, and shrimp (CDFG 2001).

b. *Southern DPS of North American Green Sturgeon Population Status*

Population abundance information concerning the Southern DPS of North American green sturgeon is scant as described in the status review (NMFS 2002). Limited population abundance information comes from incidental captures of North American green sturgeon from the white sturgeon (*Acipenser transmontanus)* monitoring program by the CDFG sturgeon tagging program (CDFG 2002b). CDFG (2002b) utilizes a multiple-census or Peterson mark-recapture method to estimate the legal population of white sturgeon captures in trammel nets. By comparing ratios of white sturgeon to green sturgeon captures, CDFG provides estimates of adult and sub-adult North American green sturgeon abundance. Estimated abundance between 1954 and 2001 ranged from 175 fish to more than 8,000 per year and averaged 1,509 fish per year. Unfortunately, there are many biases and errors associated with these data, and CDFG does not consider these estimates reliable. Fish monitoring efforts at Red Bluff Diversion Dam and Glen Colusa Irrigation District on the upper Sacramento River have captured between 0 and 2,068 juvenile North American green sturgeon per year, mostly between June and July (NMFS 2002).

The only existing information regarding changes in the abundance of the Southern DPS of North American green sturgeon includes changes in abundance at the John Skinner Fish Protection Facility between 1968 and 2001 (State facility). The estimated average annual number of North American green sturgeon taken at the State Facility prior to 1986 was 732; from 1986 on, the average annual number was 47 (70 FR 17386). For the Tracy Fish Collection Facility (Federal facility), the average annual number prior to 1986 was 889; from 1986 to 2001 it was 32 (70 FR 17386). In light of the increased exports, particularly during the previous 10 years, it is clear that the abundance of the Southern DPS of North American green sturgeon is dropping. Catches of sub-adult and adult North American green sturgeon by the IEP between 1996 and 2004 ranged from 1 to 212 green sturgeon per year (212 occurred in 2001), however, the portion of these catches that were made up of the Southern DPS of North American green sturgeon is unknown as these captures were primarily located in San Pablo Bay which is known to consist of a mixture of the Northern and Southern population segments. Additional analysis of North American green and white sturgeon taken at the State and Federal facilities indicates that take of both North American green and white sturgeon per acre-foot of water exported has decreased substantially since the 1960's (70 FR 17386).

Larval and post larval North American green sturgeon are caught each year in rotary screw traps at the Red Bluff Diversion Dam (Gaines and Martin 2001). A total of 2,608 juvenile sturgeon were captured from 1994-2000. All were assumed to be North American green sturgeon since 124 of these fish were grown by University of California Davis researchers to an identifiable size and all were North American green sturgeon. Young sturgeon appear in catches from early May through August. Most range in size from 1 to 3 inches. Catch rates were greatest in 1995 and 1996 and were lowest in 1999 and 2000 (Gaines and Martin 2001).

No North American green sturgeon have been detected during intensive salmonid monitoring efforts in Clear, Battle, Butte, Deer and Mill creeks, all of which are tributaries to the Sacramento River (Matt Brown, FWS, pers. comm., 2004; Colleen Harvey-Arrison, CDFG, pers. comm., 2004). Sampling on these tributaries includes monitoring adult passage at fish ladders (Battle Creek), snorkel surveys (Deer, Butte, Clear and Battle creeks), and rotary screw trapping (Deer, Mill, Clear, Battle and Butte creeks). Much of this monitoring has occurred during time periods when adult North American green sturgeon would be expected to be in the rivers spawning, and when juvenile North American green sturgeon would be expected to be hatching, rearing and migrating through the river systems (S.P. Cramer & Associates, Inc. 2004).

Similar monitoring activities have likewise failed to detect North American green sturgeon in the American River (Mike Healey, CDFG, pers. comm., 2004; John Hannon, U.S. Bureau of Reclamation, pers. comm., 2004; Trevor Kennedy, Fishery Foundation of California, pers. comm., 2004). These sampling efforts included snorkeling, rotary screw trapping, and seining, and were conducted during periods when adult and juvenile North American green sturgeon would have been expected to be in the river (S.P. Cramer & Associates, Inc. 2004).

Green and white sturgeon adults have been observed periodically in small numbers in the Feather River (S.P. Cramer & Associates, Inc.2004). There are at least two confirmed records of adult North American green sturgeon. There are no records of larval or juvenile sturgeon of either species, even prior to the 1960s when Oroville Dam was built. There are reports that North

American green sturgeon may reproduce in the Feather River during high flow years (CDFG 2002b), but these are not specific and are unconfirmed (S.P. Cramer & Associates, Inc. 2004).

Recent confirmed observations of at least one and possibly two adult North American green sturgeon in the pool below Daguerre Point Dam on the Yuba River (Reedy 2006) provide evidence that adult green sturgeon occur in the lower Yuba River. However, several years of juvenile monitoring at several locations on the lower Yuba River using rotary screw traps has not detected the presence of juvenile sturgeon.

C. Factors Affecting the Species and Critical Habitat

The construction of dams for hydropower, flood control, and water supply resulted in the loss of vast amounts of upstream habitat (*i.e.*, approximately 80 percent, or a minimum linear estimate of over 1,000 stream miles), and has contributed to precipitous declines in affected salmonid populations. The reduced populations that remain below Central Valley dams are forced to spawn in lower elevation tailwater habitats of the mainstem rivers and tributaries that were previously not used for this purpose. This habitat is entirely dependent on managing reservoir releases to maintain cool water temperatures suitable for spawning, and/or rearing of salmonids. Maintaining these conditions has been difficult to achieve in drier water year types for all life stages of affected salmonid species. Steelhead, in particular, seem to require the qualities of small tributary habitat similar to what they historically used for spawning; habitat that is largely unavailable to them under the current water management scenario. Salmonid species have been adversely affected further by the production of hatchery fish associated with the mitigation for habitat lost to dam construction (*e.g.*, from genetic impacts, increased competition, exposure to novel diseases, *etc*.).

Land-use activities such as road construction, urban development, levee construction, logging, mining, agriculture, and recreation are pervasive and have significantly altered fish habitat quantity and quality for Chinook salmon and steelhead 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 large woody debris; and destruction of riparian vegetation resulting in increased streambank erosion. Human-induced habitat changes, such as: alteration of natural flow regimes; installation of bank revetment; and building structures such as dams, bridges, water diversions, piers, and wharves, often provide conditions that both disorient juvenile salmonids and attract predators. Harvest activities, ocean productivity, and drought conditions provide added stressors to listed salmonid populations. In contrast, various ecosystem restoration activities have contributed to improved conditions for listed salmonids (*e.g.*, various fish screens). However, some important restoration activities (*e.g.*, Battle Creek Restoration Project) have not yet been implemented, and benefits to listed salmonids from the Environmental Water Account have been smaller than anticipated.

Similar to the listed salmonids, the Southern DPS of North American green sturgeon have been negatively impacted by dam construction and the associated hydroelectric and water storage operations in the Central Valley which ultimately affect the hydrology and accesibility of Central Valley rivers and streams to anadromous fish. Anthropogenic manipulations of the aquatic

habitat, such as introduction of non-native species, dredging, bank stabilization, and water polution have also degraded the quality of the Central Valley's waterways for green sturgeon.

IV. ENVIRONMENTAL BASELINE

The environmental baseline is an analysis of the effects of past and ongoing human and natural factors leading to the current status of the species, its habitat (including designated critical habitat), and ecosystem within the action area (*i.e.*, from 500 feet upstream to 500 feet downstream of the Navy Drive Bridge in the San Joaquin River) (FWS and NMFS 1998).

The action area functions primarily as a migratory corridor for adult and juvenile Central Valley steelhead and North American green sturgeon, and as juvenile rearing habitat for both of these species as well.

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

Starting in the mid-1800s, the U.S. Army Corps of Engineers (Corps) and other private consortiums began straightening river channels and artificially deepening them to enhance shipping commerce. This has led to declines in the natural meandering of river channels and the formation of pool and riffle segments. The deepening of channels beyond their natural depth also has led to a significant alteration in the transport of bedload in the riverine system as well as the local flow velocity in the channel (Mount 1995). The Sacramento Flood Control Project at the turn of the nineteenth century ushered in the start of large scale Corps actions in the Delta and along the rivers of California for reclamation and flood control. The creation of levees and the Sacramento and San Joaquin Deep Water Shipping Channels (DWSCs) reduced the natural tendency of the San Joaquin and Sacramento rivers to create floodplains along their banks with seasonal inundations during the wet winter season and the spring snow melt periods. These annual inundations provided necessary habitat for rearing and foraging of juvenile native fish that evolved with this flooding process. The armored riprapped levee banks and active maintenance actions of reclamation districts precluded the establishment of ecologically important riparian vegetation, introduction of valuable large woody debris (LWD) from these riparian corridors, and the productive intertidal mudflats characteristic of the undisturbed Delta habitat.

Low dissolved oxygen (DO) levels frequently are observed in the portion of the Stockton DWSC extending from Channel Point, downstream to Turner and Columbia Cuts. Over a 5-year period, starting in August 2000, a DO meter has recorded channel DO levels at Rough and Ready Island (Dock 20 of the Port of Stockton, West Complex). Over the course of this time period, there have been 297 days in which violations of the 5 mg/L DO criteria for the protection of aquatic life in the San Joaquin River between Channel Point and Turner and Columbia Cuts have occurred during the September through May migratory period for salmonids in the San Joaquin River. The data derived from the California Data Exchange Center files indicate that DO depressions occur during all migratory months, with significant events occurring from November through March when listed Central Valley steelhead adults and smolts would be utilizing this portion of the San Joaquin River as a migratory corridor.

Potential factors that contribute to these DO depressions are reduced river flows, released ammonia from the City of Stockton Wastewater Treatment Plant, upstream contributions of organic materials (*e.g.*, algal loads, nutrients, agricultural discharges), and the increased volume of the dredged ship channel. During the winter and early spring emigration period, increased ammonia concentrations in the discharges from the City of Stockton Waste Water Treatment Facility lowers the DO in the adjacent DWSC near the West Complex. In addition to the adverse effects of the lowered DO on salmonid physiology, ammonia in itself is toxic to salmonids at low concentrations. Likewise, adult fish migrating upstream will encounter lowered DO in the DWSC as they move upstream in the fall and early winter due to low flows and excessive algal and nutrient loads coming downstream from the upper San Joaquin River watershed. Levels of DO below 5 mg/L have been reported as delaying or blocking fall-run Chinook salmon in studies conducted by Hallock *et al.* (1970). As the river water and its constituents move downstream from the San Joaquin River channel to the DWSC, the channel depth increases from approximately 8 to 10 feet to over 35 feet. The water column is no longer mixed adequately to prevent DO from decreasing by contact with the air–water interface only. Photosynthesis by suspended algae is diminished by increased turbidity and circulation below the photosynthetic compensation depth. This is the depth to which light penetrates with adequate intensity to carry on photosynthesis in excess of the oxygen demands of respiration. As the oxygen demand from respiration, defined as biological oxygen demand, exceeds the rate at which oxygen can be produced by photosynthesis and mixing, then the level of DO in the water column will decrease. Additional demands on oxygen are also exerted in non-biological chemical reactions in which compounds consume oxygen in an oxidation-reduction reaction.

B. Presence of Central Valley Steelhead in the Action Area

All of the Central Valley steelhead in the San Joaquin River watershed originating from the Calaveras, Stanislaus, Tuolumne, or Merced Rivers must pass through the action area on both their downstream emigration to the ocean as smolts and on their upstream spawning migrations as adults. Those few adults that survive to spawn a second time would also pass through this portion of the river again. There is the potential for fish to make their way through either Old River or Middle River to access the upper San Joaquin watershed above the Head of Old River, but their success depends on whether or not the Head of Old River Barrier is in place. Smolts are more likely than adults to stay within the mainstem during their migrations, as they follow the prevailing current out to the ocean. Upstream migrating adults have the option of following either the Sacramento River or San Joaquin River upon their entry into the Delta. This co-mingling of water sources can result in milling behavior as fish seek out the olfactory cues of their natal stream.

Fish monitoring studies have shown that Central Valley steelhead juveniles and smolts from the Sacramento River watershed frequently enter into the San Joaquin River system depending on river flows and pumping rates. Fish from the Sacramento River can access the San Joaquin River from several points; the Delta Cross Channel via the North and South Forks of the Mokelumne River, Georgiana Slough, Three Mile Slough, and the mouth of the San Joaquin River near Antioch and Sherman Island. Fish entering into the San Joaquin River main channel would be exposed to the effects of this project while they migrated within the DWSC. In

addition, adult steelhead would also be exposed to the conditions of the DWSC if they entered into the San Joaquin River channel by mistake while trying to find their way upstream.

C. Presence of North American Green Sturgeon in the Action Area

Both adult and juvenile North American green sturgeon are known to occur within the lower reaches of the San Joaquin River and in the south Delta. Very little specific information is available about the presence of green sturgeon in the immediate action area. One white sturgeon was captured in November, 2006, in the proximity of channel marker 45 near Rough and Ready Island, and Corps sampling prior to the DWSC dredging activity detected the presence of 2 green sturgeon and 81 white sturgeon in the Stockton DWSC between August and December of the 2006 monitoring season. Both adult and juvenile green sturgeon may use the action area as a migratory, resting, or rearing habitat. Green sturgeon presence in the action area could occur in any month, as juveniles may reside in freshwater habitats throughout their first few years of growth. Adults are likely to be present in the winter and early spring as they move through the Delta towards their spawning grounds in the upper Sacramento River watershed. Following spawning, the fish will pass through the Delta again on their way back to the ocean, but the duration and timing of this event is not well understood in the Sacramento River system.

V. EFFECTS OF THE ACTION

Pursuant to section 7(a)(2) of the ESA (16 U.S.C. §1536), Federal agencies are directed to ensure that their activities are not likely to jeopardize the continued existence of any listed species or result in the destruction or adverse modification of critical habitat. This biological opinion assesses the effects of the Navy Drive Bridge Replacement project on threatened Central Valley steelhead, their designated critical habitats, and threatened Southern DPS of North American green sturgeon. The Navy Drive Bridge Replacement project is likely to adversely affect listed species through temporary construction impacts and short term critical habitat alteration. In the *Description of the Proposed Action* section of this opinion, NMFS provided an overview of the action. In the *Status of the Species* and *Environmental Baseline* sections of this opinion, NMFS provided an overview of the listed species and designated critical habitats that are likely to be adversely affected by the activity under consultation.

Regulations that implement section 7(a)(2) of the ESA require that biological opinions 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).

This biological opinion does not rely on the regulatory definition of "destruction or adverse modification" of critical habitat in 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.

A. Approach to the Assessment

NMFS generally approaches "jeopardy" analyses in a series of steps. First, NMFS evaluates the available evidence to identify direct and indirect physical, chemical, and biotic effects of the 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 disruptive noises). Once NMFS has identified the effects of the action, the available evidence is evaluated to identify a species' probable response, including behavioral reactions, to these effects. These responses then will be assessed to determine if they can 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). The available evidence is then used 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.

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, the biological assessment for this project, and project meeting notes. 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. For information that has been taken directly from published, citable documents, those citations have been referenced in the text and listed at the end of this document.

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.

In assessing the impacts of anthropogenic noise on the listed salmonid species, NMFS used the available data for several different species of fish for which acoustic experimental data is available, including the hearing specialist, fathead minnow (*Pimephales promelas*) and the hearing generalist, pink snapper (*Pagrus auratus*). Protective acoustic levels were then determined that were appropriate for fish in general, due to a lack of data specific to salmonids. In a recent review of available information on the effects of anthropogenic sound (*i.e.*, pile driving) generated by construction activities on the west coast of North America, Hastings and

Popper (2005) specifically cited the lack of salmonid data as a critical gap in the scientific record for evaluating noise impacts, and recommended increased and focused studies on this group of fish.

Additional information from fish monitoring studies conducted by the FWS and CDFG regarding salmonid density in the San Joaquin River and Sacramento River was incorporated into the calculations for risk assessment. Analysis of 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.

B. Assessment

The proposed project includes actions that may adversely affect several life stages of Central Valley steelhead and North American green sturgeon. Adverse effects to these species and their habitat may result from changes in water quality from construction activities, loss of riparian vegetation from construction activities, and physical damage and harassment of juveniles and adults from pile driving. The project includes integrated design features to avoid and minimize many of these potential impacts.

1. Presence of Listed Salmonids and North American Green Sturgeon in the Action Area

During the period between September and the end of December, adult Central Valley steelhead may be in the proximity of the bridge replacement activities as proposed; however, NMFS expects the most likely period for adult steelhead to be present is in the month of December. Adult steelhead begin to migrate into the region's watersheds (Calaveras and San Joaquin Rivers) during this period, particularly when increased attractant flows are being released from San Joaquin River reservoirs to enhance fall-run Chinook salmon spawning habitat in the San Joaquin River tributaries or early winter rains cause increased flows in the system. Prior to the fall attractant flows, low DO conditions may occur and cause adult steelhead to linger downstream of the Port of Stockton while they wait for more favorable water quality conditions.

The peak of juvenile Central Valley steelhead emigration from their tributaries in the San Joaquin Valley occurs during the period between February and May. Therefore, conducting in-water project activities between June 1 and October 31 should avoid impacts to the majority of juvenile Central Valley steelhead smolts in this locale. There are, however, larger steelhead smolts that migrate at other times of the year, including the fall and early winter period (Cramer 2005), and thus may be exposed to the project activities during their passage through the action area. As with adults, NMFS expects the most likely period for juvenile steelhead to be present in the action area is in the month of December.

Low numbers of North American green sturgeon are anticipated to be present in the action area throughout the proposed construction period. Although information on the density of green sturgeon in the action area is not currently available, their infrequent occurrence in sampling studies targeting other fish species indicates that they may be present throughout the year within the mainstem of the San Joaquin River and thus vulnerable to both short-term and long-term adverse effects of the project.

2. Water Quality

In-river construction and demolition work may increase suspended sediments and elevate turbidity above natural levels. Activities that could contribute sediment and increase turbidity include steel pile driving and removal, removal of existing piers and timbers, and use of near-river access roads and staging areas. Water quality may also be affected by hydraulic and fuel line leaks and petroleum spills. NMFS expects that the risk of introducing petroleum products or pollutants other than sediment to the waterway will be extremely low and discountable due to the implementation of prevention and contingency measures that will require frequent equipment checks to prevent leaks, will keep stockpiled materials away from the water, and will require that absorbent booms are kept onsite to prevent petroleum products from entering the river in the event of a spill or leak.

High turbidity can affect fish by reducing feeding success, causing avoidance of preferred rearing habitats, and disrupting upstream and downstream migration. Displacement of juveniles from preferred habitats may cause increased susceptibility of juveniles to predation. Bisson and Bilby (1982) reported that juvenile coho salmon avoid turbidities exceeding 70 NTUs, and Sigler *et al.* (1984) in Bjornn and Reiser (1991) found that exposure to turbidities between 25 and 50 NTUs over extended periods of time reduced growth of juvenile coho salmon and steelhead. Increased sediment delivery and high levels of turbidity can also fill interstitial substrate spaces resulting in reduced abundance and availability of aquatic invertebrates for food (Bjornn and Reiser 1991).

Effects of project-related turbidity and introduction of sediment to the San Joaquin River could affect the behavior, growth, and migration of listed species in the action area. Adherence to the preventative and contingency measures of the SWPPP will minimize project related-sediment plumes caused by in-river construction by removing excavated materials to locations outside of the river channel and halting work in the event of a plume being detected. Sediment management and preventative measures will minimize the amount of project-related sediment introduced to the waterway through the use of typical BMPs including the deployment of silt fences, hay bales, and a turbidity curtain around the action area. In the event that a project-related sediment plume does occur, it would be of short duration, since work would be suspended, and would be expected to result in a temporary change in the distribution of fish in the action area, lasting only as long as the plume was present.

These types of events are unlikely to affect migrating adults to the extent of injuring them, but may injure some juvenile fish, which are actively feeding and growing, as well as smaller and less mobile, by temporarily disrupting normal behaviors that are essential to growth and survival. Injury would be caused when disruption of 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. Project-related turbidity increases may also affect the sheltering abilities of some juvenile fish and may decrease their likelihood of survival by increasing their susceptibility to predation. However, because of the short duration of any turbidity events, and the fact that these events would be likely to occur during low migration periods when densities of listed juveniles in the action area would be relatively low, any injury or

death that may occur to listed species from changes in feeding behavior, distribution and predation, are not expected to result in appreciable reductions in the species' likelihood of surviving and recovering in the wild.

3. Riparian Habitat

The project is anticipated to temporarily remove approximately 0.06 acre of river bank riparian vegetation along the north and south banks of the San Joaquin River. As a result of riparian habitat disturbance there will be a temporal loss of SRA habitat, but with the implementation of proposed BMP's, the removal and/or disturbance of riparian vegetation will be kept to a feasible minimum, any stream banks disturbed during construction will be returned to their preconstruction condition, and lost riparian vegetation will be replaced with an appropriate assemblage of native vegetation prior to the onset of the rainy season. Provided that these BMP's and minimization measures are strictly adhered to, NMFS does not expected that the short term loss of riparian vegetation and SRA cover in the action area will significantly impact or appreciable reduce the number of salmonids or green sturgeon migrating and/or rearing in the San Joaquin River.

4. Impacts to Freshwater Migratory and Rearing Habitat PCEs

There are no suitable spawning sites within the project's action area for Central Valley steelhead; therefore the PCE's of designated critical habitat that will be physically disturbed due to bridge replacement activities are freshwater migration corridors and freshwater rearing sites for Central Valley steelhead. The proposed bridge replacement would result in the placement of 10 piers within the river bed resulting in a permanent displacement of approximately 126 square feet, or 0.003 acre, of designated critical habitat. In comparison, the existing bridge support structures currently displace approximately 707 square feet, or 0.016 acre, of critical habitat in the bed of the channel. Therefore, implementation of the project will have a temporary impact on the size of the freshwater migration corridor and rearing sites within the designated critical habitat of Central Valley steelhead in the San Joaquin River, but will ultimately result in an overall net gain of approximately 581 square feet, or 0.013 acre, of these PCE's available in the action area following project completion. Replacement of the Navy Drive Bridge is therefore expected to result in a long term beneficial effect to the PCE's of Central Valley steelhead critical habitat, and the short term impacts to freshwater migratory and rearing habitat are not expected to significantly impact or appreciably reduce the numbers of Central Valley steelhead migrating and/or rearing in the San Joaquin River.

5. Pile Driving and Bridge Demolition

Pile driving consists of driving steel piles into the riverbed with a mechanical hammer. The force of the hammer hitting a pile forms a sound wave that travels down the pile and causes the pile to resonate radially and longitudinally. Acoustic energy is formed as the walls of the steel pile expand and contract, forming a compression wave that moves through the pile. The outward movement of the pile wall sends a pressure wave propagating outward from the pile and through the riverbed and water column in all directions.

Because inconsistent mediums, such as water, will result in a higher rate of transmission loss, environmental factors such as water depth, water turbulence, air bubbles, and substrate consistency are important to consider when estimating the distance a compression wave will travel. A compression wave traveling through shallow water and substrates with variable consistencies (*i.e.*, variable particle size class distribution) will attenuate more rapidly than compression waves traveling through a constant medium such as deep water or bedrock. As a compression wave moves away from the source, the wave length increases and intersects with the air/water interface. Once the compression wave contacts the air, it attenuates rapidly and does not return to the water column.

Caltrans engineers estimate that sound pressure from driving the largest bridge piles could reach as high as 187 dB in any single strike at a distance of 32.8 feet from the source (*i.e.*, the pile being driven). Demolition of the existing bridge piers will require the use of an excavator with a chipper attachment to break up the concrete into manageable pieces for removal. While sound energy will be created during this process in much the same way as is described above for pile driving, the energy generated by the excavator with chipper attachment typically is much less than the energy generated by a pile-driving hammer by a factor of 10. For instance, the driving energy for a steel pile driver is approximately 75,000 ft-lbs, while the excavator with chipper attachment delivers around 7,500 ft-lbs of energy. The sound energy created by the excavator with chipper attachment during removal of the old bridge is not expected to exceed that of normal underwater background levels (60 to 65 dB) and is therefore not expected to adversely impact listed species.

a. *Immediate Mortality of Fish from Pile Driving*

The effect of pile driving on free swimming fish depends on the duration, frequency (Hz), and pressure (dB) of the compression wave. Rassmusen (1967) found that immediate mortality of juvenile salmonids may occur at sound pressure levels exceeding 208 dB. Due to their size, adult salmon, steelhead, and green sturgeon can tolerate higher pressure levels and immediate mortality rates for adults are expected to be less than those experienced by juveniles (Hubbs and Rechnitzer 1952). As sound pressure levels are not expected to exceed 187 dB, no immediate mortality of juvenile or adult fish is expected.

b. *Pile Driving Impacts on the Auditory Sensory Organs of Fish*

High levels of underwater acoustic noises have been shown to have adverse impacts upon the auditory sensory organs of fish within close proximity of the noise source. Recent studies by Scholik and Yan (2002) examined the effects of boat engine noise on the auditory sensitivity of the fathead minnow. Fish were exposed to a recording of the noise generated by a 55 hp outboard motor over a period of two hours. The noise level was adjusted to 142 dB, which was equivalent to the noise levels measured at 50 meters from a 70 hp outboard motor. The experimental fish suffered a drop in hearing sensitivity over the range of frequencies normally associated with their hearing capabilities. These responses were measured using electrophysiological responses of their auditory nerves under general anesthesia. Studies by McCauley *et al.* (2003) on the marine pink snapper, indicated that high-energy noise sources (approximately 180 dB maximum) can damage the inner ears of aquatic vertebrates by ablating

the sensory hairs on their inner ear epithelial tissue as revealed by electron microscopy. Damage remained apparent in fish held up to 58 days after exposure to the intense sound. Although no studies utilizing salmonids have been conducted, auditory effects on these other fish species can serve as surrogates for salmonids, and it is reasonable to assume that some level of adverse impacts to salmonids can be inferred from the above results.

The loss of hearing sensitivity may adversely affect a salmonid's ability to orient itself (*i.e.*, due to vestibular damage), detect predators, locate prey, or sense their acoustic environment. Chronic noise exposure can reduce a fish's ability to detect piscine predators either by reducing the sensitivity of the auditory response or by masking the noise of an approaching predator. Disruption of the exposed fish's ability to maintain position or swim with the school will enhance its potential as a target for predators. Unusual behavior or swimming characteristics single out an individual fish and allow a predator to focus its attack upon that fish more effectively.

c. *Behavioral Responses to Pile Driving*

Behavioral responses to high noise levels (startle response, avoidance, agitation, etc.) have been studied in salmonids with mixed results. Burner and Moore (1962) found that large juvenile and adult fish rarely responded to sudden or loud sound stimuli. Studies of low frequency sound transducers intended to repel salmonids from navigation channels (Goetz *et al.* 2001; Ploskey and Johnson 2001) found no difference between the reactions of treatment groups of Chinook and coho (*O. kisutch*) salmon exposed to no sound and groups exposed to sounds reaching 170-180 dB.

Other experiments by Mckinley and Patrick (1986) using pulsed sound similar to pile driving found that smaller juvenile salmonids demonstrated a startle or avoidance response. Feist *et al.* (1992) found that salmonids hear within a range of 10 to 400 Hz, with the greatest sensitivity between 180 and 190 Hz, and 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. Also, Shin (1995) found that pile driving may result in "agitation" of salmonids as indicated by a change in swimming behavior. These studies suggest that pile driving may cause startling and/or avoidance of habitat by fish in the immediate vicinity of the project site.

The startling of fish can cause injury 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. Disruption of these behaviors may also result in the death of some individuals due to increased predation if fish are disoriented or concentrated in areas with high predator densities. Disruption of these behaviors may occur for specific periods between June 1 and October 31, during daylight operation hours of the pile driving hammer. Downstream movement of salmonids occurs mainly at night or during the hours between dusk and dawn, although small numbers of fish may also move during daylight hours. Because of this nocturnal migratory behavior, daily migration delays are expected only to impact the portion of a population that migrates during

daylight hours in the periods that pile driving activities are occurring. On similar bridge projects lapses in pile driving activity are common throughout the day because construction crews suspend hammer work for equipment maintenance, to shift from one pile to another, and to take breaks. These construction lapses, including daily breaks and nighttime non-working periods, as well as long periods when no pile driving is scheduled to occur, will allow fish to migrate through the action area and minimize the extent of injury that occurs to populations.

The population-level effects of harassment to adult and juvenile steelhead and green sturgeon are expected to be limited in part because pile driving will occur during the day, enabling unhindered fish passage at night. Also, the June 1 through October 31 percussive work window will avoid the primary migration periods for Central Valley steelhead in the San Joaquin River (e.g., November through May) and should therefore minimize the exposure of these fish to any adverse direct effects resulting from implementation of the proposed project.

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.

Non-Federal actions that may affect the action area include ongoing agricultural activities and increased urbanization. Agricultural practices in and upstream of the San Joaquin River may adversely affect riparian and wetland habitats through upland modifications of the watershed that lead to increased siltation or reductions in water flow in stream channels flowing into the San Joaquin River. Unscreened agricultural diversions throughout the Delta entrain fish including juvenile salmonids. Grazing activities from dairy and cattle operations can degrade or reduce suitable critical habitat for listed salmonids by increasing erosion and sedimentation as well as introducing nitrogen, ammonia, and other nutrients into the watershed, which then flow into the receiving waters of the San Joaquin River. Stormwater and irrigation discharges related to both agricultural and urban activities contain numerous pesticides and herbicides that may adversely affect salmonid reproductive success and survival rates (Dubrovsky *et al.* 1998, 2000; Daughton 2003).

The San Joaquin River, Delta and East Bay regions, which include portions of Contra Costa, Alameda, Sacramento, San Joaquin, Solano, Stanislaus, and Yolo counties, are expected to increase in population by nearly 3 million people by the year 2020 (California Commercial, Industrial, and Residential Real Estate Services Directory 2002). Increases in urbanization and housing developments can impact habitat by altering watershed characteristics, and changing both water use and stormwater runoff patterns. The project site is within the region controlled by the San Joaquin County Council of Governments, and the cities of Stockton, Lathrop, and Manteca. The General Plans for the cities of Stockton, Lathrop, Manteca, and their surrounding communities anticipate rapid growth for several decades to come. The anticipated growth will occur along both the I-5 and US-99 transit corridors in the east, and Highway 4 in the west.

Increased urbanization also is expected to result in increased wave action and propeller wash in San Joaquin River due to increased recreational boating activity. This potentially will degrade riparian and wetland habitat by eroding channel banks, thereby causing an increase in siltation and turbidity. Wakes and propeller wash also churn up benthic sediments thereby potentially resuspending contaminated sediments and degrading areas of submerged vegetation. This in turn would reduce habitat quality for the invertebrate forage base required for the survival of juvenile salmonids. Increased recreational boat operation on the San Joaquin River is anticipated to result in more contamination from the operation of engines on powered craft entering the river and its tributaries. In addition to recreational boating, commercial vessel traffic is expected to increase with the redevelopment plans of the Port of Stockton. Portions of this redevelopment plan have already been analyzed by NMFS for the West Complex (formerly Rough and Ready Island) but the redevelopment of the East Complex, which currently does not have a Federal action associated with it, will also increase vessel traffic as the Port becomes more modernized. Commercial vessel traffic is expected to create substantial entrainment of aquatic organisms through ship propellers as the vessels transit the shipping channel from Suisun Bay to the Port and back again. In addition, the hydrodynamics of the vessel traffic in the confines of the channel will create sediment resuspension, and localized zones of high turbulence and shear forces. These physical effects are expected to adversely affect aquatic organisms, including both listed salmonids and North American green sturgeon resulting in death or injury.

Global climate change is a broad-scale cumulative effect that is likely to affect the action area. The world is about 1.3 °F warmer today than a century ago and the latest computer models predict that, without drastic cutbacks in emissions of carbon dioxide and other gases released by the burning of fossil fuels, the average global surface temperature may raise by two or more degrees in the 21st century (Intergovernmental Panel on Climate Change (IPCC) 2001). Much of that increase will likely occur in the oceans, and evidence suggests that the most dramatic changes in ocean temperature are now occurring in the Pacific (Noakes 1998). Using objectively analyzed data Huang and Liu (2000) estimated a warming of about 0.9 °F per century in the Northern Pacific Ocean.

Sea levels are expected to rise by 0.5 to 1.0 m in the northeastern Pacific coasts in the next century, mainly due to warmer ocean temperatures, which lead to thermal expansion much the same way that hot air expands. This will cause increased sedimentation, erosion, coastal flooding and permanent inundation of low-lying natural ecosystems within the action area (*i.e.*, salt marsh, riverine, mud flats) affecting salmonid PCEs. Increased winter precipitation, decreased snow pack, and permafrost degradation could affect the flow and temperature of rivers and streams, with negative impacts on fish populations and the habitat that supports them.

Summer droughts along the South Pacific coast and in the interior of the northwest Pacific coastlines will mean decreased stream flow in those areas, decreasing salmonid survival and reducing water supplies in the dry summer season when irrigation and domestic water use are greatest. Global warming may also change the chemical composition of the water that fish inhabit: the amount of oxygen in the water may decline, while pollution, acidity, and salinity levels may increase. This will allow for more invasive species to over take native fish species and impact predator-prey relationships (Stachowicz *et al.* 2002, Peterson and Kitchell 2001).

An alarming prediction is that Sierra snow packs are expected to decrease 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 (CDWR 2006). 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 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 Shasta Lake and Lake Oroville, potentially could rise above thermal tolerances for juvenile and adult salmonids (*i.e.* Central Valley steelhead) that must hold below the dam over the summer and fall periods.

VII. INTEGRATION AND SYNTHESIS OF EFFECTS

This section integrates the current conditions described in the environmental baseline with the effects of the proposed action and the cumulative effects of future actions. The purpose of this synthesis is to develop an understanding of the likely short-term and long-term responses of listed species and critical habitat to the proposed project.

The San Joaquin River basin historically contained numerous independent populations of Central Valley steelhead and spring-run Chinook salmon (Lindley et al. 2006, 2007). Potentially, the Southern DPS of North American green sturgeon were also present in these watersheds prior to anthropogenic changes. The suitability of these watersheds to support these runs of fish changed with the onset of human activities in the region. Human intervention in the region initially captured mountain runoff in foothill reservoirs which supplied water to farms and urban areas. As demand grew, these reservoirs were enlarged or additional dams were constructed higher in the watershed to capture a larger fraction of the annual runoff. San Joaquin Valley agriculture created ever greater demands on the water captured by these reservoirs, diminishing the flow of water remaining in the region's rivers, and negatively impacting regional populations of anadromous fish. Reclamation actions eliminated vast stretches of riparian habitat and seasonal floodplains from the San Joaquin River watershed and Delta through the construction of levees and the armoring of banks with rock riprap for flood control. Construction of extensive water conveyance systems and water diversions altered the flow characteristics of the Delta region. These anthropogenic actions resulted in substantial degradation of the functional characteristics of the aquatic habitat in the watershed upon which the region's anadromous fish populations depended to maintain healthy populations.

Presently, Central Valley spring-run Chinook salmon have been functionally extirpated from the San Joaquin River basin. Populations of Central Valley steelhead in the San Joaquin River basin have been substantially diminished to only a few remnant populations in the lower reaches of the Stanislaus, Tuolumne, and Merced Rivers below the first foothill dams. The Southern DPS of

North American green sturgeon have not been documented spawning in the San Joaquin River, but human alterations, which have been ongoing for over 100 years in the watershed, may have extirpated local populations before accurate records were maintained. Since the viability of small remnant populations of Central Valley steelhead in the San Joaquin River basin is especially tenuous and such populations are susceptible to temporally rapid decreases in abundance and possess a greater risk of extinction relative to larger populations (Pimm *et al.* 1988, Berger 1990, Primack 2004), activities that reduce the quality and quantity of habitats, or that preclude the formation of independent population units (representation and redundancy rule cited by Lindley *et al*. 2007), are expected to drive the species towards extinction as individual populations within the larger metapopulation become extinct (McElhany *et al.* 2000). Therefore, activities having severe impacts on steelhead populations or destroying designated critical habitat, within these smaller population units have significant implications for the DPS as a whole.

Central Valley Steelhead

Estimates of adult escapement of steelhead to these watersheds are typically only a few dozen or so. This is reflected by the low number of smolts captured by monitoring activities throughout the year in different tributaries (*i.e.*, rotary screw traps on the Stanislaus, Tuolumne, Merced, and Calaveras Rivers, and the Mossdale trawls on the San Joaquin River below the confluence of these three east side tributaries) in which only a few dozen smolts to several hundred smolts are collected each year (Marston 2004, Cramer 2005). These capture numbers have been extrapolated to estimate an annual population of only a few thousand juvenile steelhead smolts basin-wide in the San Joaquin River region. The Stanislaus River weir, which is used to count adult steelhead passing through the counting chamber or dead carcasses floating back onto the weir, has only recorded a few adult fish each year it has been in use. This is indicative of the low escapement numbers for adult steelhead in this watershed (Cramer 2005). The other San Joaquin tributaries are thought to have similar or even lower numbers based on the superiority of the Stanislaus River in terms of habitat and water quality for Central Valley steelhead.

Under these low adult escapement conditions, the loss of one individual female's reproductive capacity through mortality can have a relatively high impact on a given watershed's potential population if the number of adults returning to each stream is low. Loss of one female with an expected egg capacity of 5,000 eggs represents approximately 50 to 100 smolts returning to the ocean (Good *et al*. 2005). Yet one must also consider the relative contribution of these San Joaquin Basin populations to the overall Central Valley steelhead DPS. While the geographic isolation of these populations helps to support the viability of the overall DPS, the extremely low juvenile production from the San Joaquin Basin, when compared to the Sacramento Basin, provides a very small contribution to the overall survival of the DPS. It is also likely that these small San Joaquin populations receive significant supplementation from the larger Sacramento River populations through straying by the overwhelmingly dominant Sacramento Basin populations, so that even though the loss of a few steelhead adults on either the San Joaquin River or Calaveras River watersheds could have significant impacts to future juvenile steelhead year classes in these systems, this is not expected to reduce the likelihood of survival and recovery of the Central Valley steelhead DPS overall.

Southern DPS of North American Green Sturgeon

Little is known about the migratory habits and patterns of adult and juvenile green sturgeon in the San Joaquin watershed. The basic pattern described for adult green sturgeon migrations into the Delta region from the San Francisco Bay estuary is that fish enter the Delta region starting in late winter or early spring and migrate upstream towards the stretch of the Sacramento River between Red Bluff and Keswick Dam. After spawning, adults return downstream and re-enter the Delta towards late summer and fall (based on behavior of sturgeon in the Klamath and Rogue River systems). Juvenile and larval green sturgeon begin to show up in rotary screw trap catches along the Sacramento River starting in summer (Beamesderfer *et al.* 2004) and could be expected to reach the Delta by fall. The extent and duration of these fish entering and remaining in the San Joaquin River within the action area is unclear, but because of the habitat similarities and lack of barriers between the action area and documented sturgeon habitat in the Delta, NMFS believes that green sturgeon, including sub-adults, could be found during any month of the year within the action area. Therefore, both adult and juvenile green sturgeon have the potential to be adversely affected by exposure to noise due to the project. However, because the Southern DPS of North American green sturgeon are only known to spawn in the Sacramento River, a small proportion of the overall DPS are expected to occur in the San Joaquin River drainage and be exposed to the adverse effects of the project.

Designated Critical Habitat

The evidence presented in the Environmental Baseline section indicates that past and present activities within the San Joaquin River basin and waters of the South Delta have caused significant habitat loss and fragmentation. This has significantly reduced the quality and quantity of the remaining freshwater rearing sites and the migratory corridors within the lower valley floor reaches of the San Joaquin River and the South Delta for the Central Valley steelhead population. Alterations in the geometry of the South Delta channels, removal of riparian vegetation and shallow water habitat, construction of armored levees for flood protection, changes in river flow created by demands of water diverters, and the influx of contaminants from agricultural and urban dischargers have also substantially reduced the functionality of the region's waterways. Additional losses of freshwater spawning sites, rearing sites, and migratory corridors have occurred upstream of the action area in the tributaries of the San Joaquin and Sacramento River basins, but are outside of the action area of this consultation.

The Stockton DWSC currently experiences episodes of low DO in the channel's water column from Channel Point westwards to Turner and Columbia Cuts. These DO depressions can occur throughout the year, but are more likely in the late summer and early fall periods when temperatures are high and natural flow in the river is typically at its lowest. As cited by Hallock *et al.* (1970), the low DO levels are believed to act as barriers to salmonids migrating upstream into the San Joaquin River Basin in fall and have at other times of the year created "fish kills" in the DWSC due to the low ambient DO levels. Previous actions in the area include the ongoing installation of a fall barrier at the Head of Old river to redirect the majority of the San Joaquin River downstream past the Port of Stockton, rather than splitting the flow and having some of it enter into the South Delta. In addition, the fall release of additional water from San Joaquin River tributaries (the pulse flow) is intended to attract fish into the system and to reduce the

adverse water quality conditions found in the DWSC adjacent to the Port of Stockton. To further alleviate the poor DO conditions in the DWSC, an aerator has been operated at Channel Point for several years, first by the U.S. Army Corps of Engineers, and more recently by the Port of Stockton, in an attempt to mitigate for the additional dredging required to deepen the DWSC to minus 37 feet.

Summary

In general, the direct adverse effects to steelhead and green sturgeon in the San Joaquin River will be substantially attenuated by the work window proposed by Caltrans, which will greatly reduce the exposure of listed salmonids. Pile driving and in-water work activities are to be restricted to the period between June 1 and October 31. The proposed work window will avoid the majority of steelhead migration through the action area. In this area, adult and juvenile steelhead are primarily expected to begin entering the action area during late November and December, when cool and rainy weather is likely to promote upstream migration by adults, and downstream emigrating by juveniles through the action area in March and April. As a result, very few steelhead are expected to be exposed to the direct adverse effects of the project. Green sturgeon presence within the action area is considered to be year-round, with juveniles entering the Delta during the late summer and fall and potentially rearing there for several months to years before migrating to the ocean. However, because North American green sturgeon spawning populations occur in the Sacramento River drainage and not in the San Joaquin River drainage, relatively few fish from this DPS are expected to be exposed to the direct adverse effects of the project, and then only within 500 feet upstream and downstream of the Navy Drive Bridge.

A. Effects of the Proposed Action on Listed Species

Under the proposed Navy Drive Bridge Replacement project, adverse impacts to listed species stemming from loss of riparian vegetation, increased sedimentation, and periods of high turbidity are expected to occur. These impacts may cause physiological stress to the extent that the normal behavior patterns (*e.g.*, feeding, sheltering and migration) of affected individuals may be disrupted. Overall, the changes in turbidity and suspended sediment associated with this project are expected to adversely affect listed species primarily by low-level, short-term alteration of habitat conditions, which may reduce feeding or increase predation rates for juveniles. The potential for the increase in suspended sediment to adversely affect adult green sturgeon is unclear. However, because sturgeon are demersal fish closely associated with the bottom substrate, feed by taste and feel with their barbels, and even shovel up sediment with their snouts when searching for food, it is likely that they would be unaffected by the levels and duration of turbidity expected to be produced by the proposed project. Potential impacts are expected to be minimized by meeting Regional Water Quality Control Board water quality objectives, Caltrans water pollution specifications, implementing “best management practices” for erosion control, staging equipment outside of the riparian corridor, limiting the amount of riparian vegetation removal, and restoring lost riparian habitat values at the project site.

Pile driving activities are scheduled to occur between June 1 and October 31. The elevated noise levels around the pile driving activities may cause temporary behavioral changes and/or loss or

reduction of hearing in affected fish. These impacts will be partially mitigated by the seasonal use of the equipment which will avoid the primary migration periods of juvenile and adult Central Valley steelhead and North American green sturgeon. Migrating fish are expected to avoid the elevated noise of the pile driving operations by swimming around the area with the highest noise levels or holding outside of the high noise areas until there is a break in the pile driving activities. There is a potential for these fish to suffer a temporary loss of hearing sensitivity at the expected noise levels generated by the pile drivers. Loss of hearing sensitivities in juvenile fish will expose them to higher risks of predation. Fish with impacted hearing capacities will have a lower ability to detect predators and may be unable to maintain position in the water column (inner ear equilibrium factors).

Noise from pile driving may also cause startling and/or avoidance of habitat by fish in the immediate vicinity of the project site. The startling of fish can cause harm by temporarily disrupting normal behaviors that are essential to growth and survival such as feeding, sheltering, and migrating. Disruption of these behaviors may occur for specific periods between June 1 and October 31 during daylight operation hours of the pile driving hammer. Construction lapses, including daily breaks and nighttime non-working periods, as well as long periods when no pile driving is scheduled to occur, will allow fish to migrate through the action area and minimize the extent of impacts to populations.

B. Effects of the Proposed Action on Listed Species Likelihood of Survival and Recovery

1. Central Valley Steelhead

NMFS anticipates that the proposed project will result in the exposure of a small number of adult and juvenile Central Valley steelhead to increased levels of turbidity and suspended sediment, as well as noise from pile driving activities. The exposure to noise in particular is expected to adversely affect a small number of individuals. Noise may delay or impede fish migration causing increased energy expenditure by affected individuals, but as sound pressure levels are not expected to exceed 208 dB, no direct mortality of juvenile or adult fish is expected. 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. Even so, given the relatively small contribution to juvenile production that the San Joaquin Basin provides to the overall population numbers for the Central Valley steelhead DPS, the uncertain nature of the actual effects of the proposed project on steelhead in the action area, and the adherence to a seasonal in-water work window that minimizes the exposure of vulnerable life stages to those effects, it is expected that these short-term effects, when considered in the context of the current baseline and likely future cumulative effects, would not appreciably reduce the likelihood of survival and recovery of the Central Valley steelhead DPS throughout it's range.

2. Southern DPS of North American Green Sturgeon

Due to the lack of general abundance information regarding the Southern DPS of North American green sturgeon, a variety of estimates must be utilized to determine the range of

potential effects resulting from the take of a small number of green sturgeon due to the proposed action. Compared to the estimated population sizes suggested by the CDFG tagging efforts (CDFG 2002b), juvenile and sub-adult captures passing Red Bluff Diversion Dam, and past IEP sampling efforts, the low level of take estimated from the proposed project would impact a very small proportion of the adult and sub-adult North American green sturgeon DPS in the Sacramento River watershed. Ratios of tagged white to green sturgeon in San Pablo Bay have generated population estimates averaging 12,499 sub-adult and adult green sturgeon. Captures of juvenile and sub-adult green sturgeon passing Red Bluff Diversion Dam have exceeded 2,000 individuals in some years. Incidental take of both adult and juvenile North American green sturgeon is expected to represent a very small proportion of the standing population and is not expected to appreciably reduce the likelihood of survival and recovery of the Southern DPS of North American green sturgeon.

C. Effects of the Proposed Action on Critical Habitat

The PCEs of critical habitat that will be adversely affected include freshwater rearing sites for juveniles and freshwater migration corridors for both juveniles and adults. Up to 0.06 acres of riparian vegetation would be disturbed as a result of construction activities as well as temporary occupation of the riverbed and water column by work trestles. The majority of these impacts are expected to be temporary due to the fact that all disturbed areas outside the actual footprint of the new bridge would be restored to their preconstruction conditions and any impacted riparian vegetation would be replaced with the planting of an appropriate assemblage of native riparian vegetation before the onset of the rainy season. Additionally, implementation of the proposed project would result in a permanent net increase of riverine habitat since this project would result in fewer piers being located within the channel than are there currently.

These effects to the PCEs of critical habitat may result in a temporary redistribution of some individual fish, primarily rearing juvenile steelhead; however, due to the temporary nature of these effects and the long-term improvement expected from reducing the number of piers in the main channel, the adverse effects that are anticipated to result from the proposed project are not of the type, duration, or magnitude that would be expected to adversely modify critical habitat to the extent that it could lead to an appreciable reduction in the function and conservation condition of the affected habitat. NMFS expects that nearly all of the adverse effects to critical habitat from this project will be of a short-term nature and will not affect future generations of listed fish beyond the construction period of the project.

VIII. CONCLUSION

After reviewing the best available scientific and commercial information, the current status of Central Valley steelhead, the Southern DPS of North American green sturgeon, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, it is NMFS' biological opinion that the Navy Drive Bridge Replacement project, as proposed, is not likely to jeopardize the continued existence of threatened Central Valley steelhead or the threatened Southern DPS of North American green sturgeon, and is not likely to destroy or adversely modify the conservation condition of their designated critical habitat.

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 the purpose of, the agency action is not considered to be prohibited taking under the ESA provided that such taking is in compliance with the terms and conditions of this incidental take statement.

The listing of the Southern DPS of North American green sturgeon became effective on July 7, 2006, and some or all of the ESA section 9(a) prohibitions against take will become effective upon the future issuance of protective regulations under section 4(d). Because there are no section 9(a) prohibitions at this time, the incidental take statement, as it pertains to the Southern DPS of North American green sturgeon, does not become effective until the issuance of a final 4(d) regulation, as appropriate.

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

A. Amount or Extent of Take

NMFS anticipates incidental take of Central Valley steelhead and North American green sturgeon in the San Joaquin River through construction-related impacts at the project site. Specifically, NMFS anticipates that juvenile and adult steelhead and green sturgeon may be killed, injured, or harassed during construction activities. NMFS does not anticipate take of fry.

NMFS cannot, using the best available information, specifically quantify the anticipated amount of incidental take of individual Central Valley steelhead and North American green sturgeon because of the variability and uncertainty associated with the response of listed species to the effects of the project, the varying population size of each species, annual variations in the timing

of spawning and migration, and individual habitat use within the project area. However, it is possible to designate ecological surrogates for the extent of take anticipated to be caused by the project, and to monitor those surrogates to determine the level of take that is occurring. The two most appropriate ecological surrogates for the extent of take caused by the project are the amount and duration of pile driving conducted during project construction and the level of instream turbidity created by construction activities associated with the project.

1. Ecological Surrogates

- The analysis of the effects of the proposed project anticipates that the construction of the temporary trestle would require driving 42 steel H-piles over roughly six days (approximately 10 minutes driving time per pile, with 7 piles driven during an 8 hour work day), and the installation of the new bridge's substructure will require driving 10 CISS piles over a period of 5 to 10 days (approximately 30 minutes driving time per pile, with 1 or 2 piles driven during an 8 hour work day), adding up to a total of between 11 and 16 days of pile driving over a period of 5 months (June 1 through October 31).

- The analysis of the effects of the proposed project anticipates that turbidity levels will remain within the RWQCB standards referenced in the Description of the Proposed Action section, and that increased turbidity from project construction activities will be limited to the instream work window of June 1 through October 31, and may extend downstream as far as 600 meters.

If the specific parameters of these ecological surrogates are exceeded, the proposed project will be considered to have exceeded anticipated take levels, triggering the need to reinitiate consultation on the project.

B. Effect of the Take

NMFS has determined that the level of take resulting from the construction of the proposed project is not likely to jeopardize the continued existence of Central Valley steelhead or the Southern DPS of North American green sturgeon, and is not likely to destroy or adversely modify designated critical habitat for Central Valley 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 fish.

1. Measures shall be taken to minimize the amount and duration of pile driving and its potential impacts on listed salmonids, and to monitor the range and magnitude of compression shock waves generated by pile driving operations.

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

D. Terms and Conditions

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

1. Measures shall be taken to minimize the amount and duration of pile driving and its potential impacts on listed salmonids, and to monitor the range and magnitude of compression shock waves generated by pile driving operations.

    a. Caltrans and the Port of Stockton shall conduct acoustic monitoring within the water column and substrate of the San Joaquin River to determine the range and magnitude of compression shock waves generated by pile driving operations at the Navy Drive Bridge Replacement project. Acoustic monitoring must be designed to detect if, and at what range, pile driving activities generate noise levels found to be lethal to juvenile salmonids (208 dB).

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

    a. Caltrans/Port of Stockton shall provide an annual report summarizing construction activities, species status within 200 yards upstream and downstream of the bridge site, avoidance and/or minimization measures taken, the results of acoustic monitoring, and any observed incidents of take of listed species. These summary reports shall be submitted to NMFS by December 31 of each construction year.

    b. If a listed species is observed injured or killed by project activities, Caltrans/Port of Stockton shall contact NMFS within 48 hours at 650 Capitol Mall, Suite 8-300, Sacramento, CA 95815. Notification shall include species identification, the number of fish, and a description of the action that resulted in take. If possible, dead individuals shall be collected, placed in an airtight bag, and refrigerated with the aforementioned information until further direction is received from NMFS.

Updates and reports 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 CA 95814
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. These conservation recommendations include discretionary measures that Caltrans and the Port of Stockton can implement to avoid or minimize adverse effects of a proposed action on a listed species or critical habitat or regarding the development of information. NMFS provides the following conservation recommendations that would avoid or reduce adverse impacts to listed salmonids:

1. Caltrans should continue to work cooperatively with other State and Federal agencies, private landowners, governments, and local watershed groups to identify opportunities for cooperative analysis and funding to support salmonid habitat restoration projects within the San Joaquin River.

To be kept informed of actions minimizing or avoiding adverse effects, or benefiting listed and proposed 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 Navy Drive Bridge Replacement project. Reinitiation of formal consultation is required if: (1) the amount or extent of take 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

<u>Magnuson-Stevens Fishery Conservation and Management Act</u>

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 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 San Joaquin Delta (Delta) hydrologic unit (*i.e.*, number 18040003). Sacramento River winter-run Chinook salmon (*Oncorhynchus tshawytscha*), Central Valley spring-run Chinook salmon (*O. tshawytscha*), and Central Valley fall-/late fall-run Chinook salmon (*O. tshawytscha*) are species managed under the Salmon Plan that occur in the San Joaquin Delta hydrologic unit.

Factors limiting salmon populations in the San Joaquin River include periodic reversed flows due to high water exports (drawing juveniles into large diversion pumps), loss of fish into unscreened agricultural diversions, predation by introduced species, and reduction in the quality and quantity of rearing habitat due to channelization, pollution, riprapping, *etc*. (Dettman *et al.* 1987; California Advisory Committee on Salmon and Steelhead Trout 1988, Kondolf *et al.* 1996a, 1996b).

A. Life History and Habitat Requirements

1. Pacific Salmon

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

Egg incubation occurs from October through March (Reynolds *et al.* 1993). Shortly after emergence from their gravel nests, most fry disperse downstream towards the Delta and into the San Francisco Bay and its estuarine waters (Kjelson *et al.* 1982). The remaining fry hide in the gravel or station in calm, shallow waters with bank cover such as tree roots, logs, and submerged or overhead vegetation. These juveniles feed and grow from January through mid-May, and emigrate to the Delta and estuary from mid-March through mid-June (Lister and Genoe 1970). As they grow, the juveniles associate with coarser substrates along the stream margin or farther from shore (Healey 1991). Along the emigration route, submerged and overhead cover in the form of rocks, aquatic and riparian vegetation, logs, and undercut banks provide habitat for food organisms, shade, and protect juveniles and smolts from predation. These smolts generally spend a very short time in the Delta and estuary before entry into the ocean. Whether entering the Delta or estuary as fry or larger juveniles, Central Valley Chinook salmon depend on passage through the Delta for access to the ocean.

II. PROPOSED ACTION

The proposed action is described in section II (*Description of the Proposed Action*) of the preceding biological opinion for threatened Central Valley steelhead (*Oncorhynchus mykiss*), threatened Southern Distinct Population Segment of North American green sturgeon (*Acipenser medirostris*), and designated 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.*, Central Valley steelhead) 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.

Effects to EFH stemming from construction activities that may contribute sediment and increase turbidity will be avoided or minimized by meeting Regional Water Quality Board objectives, Caltrans water pollution specifications, implementing applicable BMPs, staging equipment outside of the riparian corridor, limiting the amount of riparian vegetation removal, and replacing lost riparian vegetation at the project site.

EFH will be adversely affected by the disturbance of up to 0.06 acres of riparian vegetation as a result of construction activities as well as the occupation of the riverbed and water column by temporary work trestles and the columns of the new bridge's substructure. The majority of these impacts are expected to be temporary, as all disturbed areas outside the actual footprint of the new bridge would be restored to preconstruction conditions and any areas of disturbed vegetation would be replanted with native riparian vegetation. Additionally, implementation of the proposed project would result in a permanent net increase of riverine habitat since this project would result in fewer piers being located within the channel.

These effects to EFH may result in a temporary redistribution of some individuals, primarily migrating adult and rearing juvenile salmonids, but, due to the temporary nature of these disturbances, the adverse effects that are anticipated to result from the proposed project are not of the type, duration, or magnitude that would be expected to adversely modify EFH to the extent that it could lead to an appreciable reduction in the function and conservation role of the affected habitat. NMFS expects that nearly all of the adverse effects to EFH from this project will be of a short term nature and will not affect future generations of Pacific salmon beyond the construction period of the project.

IV. CONCLUSION

Based on the best available information, and upon review of the effects of the proposed Navy Drive Bridge Replacement project, NMFS believes that the construction and operation of the project features will have temporary adverse effects on EFH of Pacific salmon protected under MSA.

V. EFH CONSERVATION RECOMMENDATIONS

As the habitat requirements of Central Valley fall-run Chinook salmon within the action area are similar to those of the federally listed species addressed in the attached biological opinion, NMFS recommends that reasonable and prudent measures numbers 1 and 2 and their respective implementing terms and conditions listed in the incidental take statement prepared for Central Valley steelhead and the Southern DPS of North American green sturgeon in the associated biological opinion, be adopted as EFH conservation recommendations. Those terms and conditions which require the submittal of reports and status updates can be disregarded for the purposes of this EFH consultation as there is no need to duplicate those submittals.

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 lead agency must explain its reasons for not following the recommendations, including the scientific justification for any disagreement with NMFS over the anticipated effects of the proposed action and the measures needed to avoid, minimize, or mitigate such effects.

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