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

March 29, 2012

In response, refer to:
2009/06533

Edward Espinoza
Chief, Environmental Management Office
Department of Transportation
P.O. Box 496073
Redding, California 96049-6073

Dear Mr. Espinoza:

Enclosed is NOAA's National Marine Fisheries Service's (NMFS) biological opinion (BO) (Enclosure 1) for the proposed Mill Creek Bridge Scour Repair and Deck Rehabilitation project (Project) located in Tehama County, California, and its effects on federally listed threatened Central Valley (CV) spring-run Chinook salmon evolutionarily significant unit (*Oncorhynchus tshawytscha*) and threatened California CV steelhead distinct population segment (DPS) (*O. mykiss*) or any of their respective designated critical habitats, in accordance with section 7 of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531 *et seq.*). Your request for reinitiation of formal section 7 consultation on this Project was received on May 23, 2011.

This BO is primarily based on the biological assessment (BA) provided on December 7, 2009. The BA incorporated recommendations and addressed NMFS comments as discussed in correspondence and emails. Based on the best available scientific and commercial information, the BO concludes that the Project, as presented by the California Department of Transportation, is not likely to jeopardize the continued existence of the listed species or destroy or adversely modify designated or proposed critical habitat. NMFS anticipates that the proposed project will result in the incidental take of spring-run Chinook salmon and California CV steelhead. An incidental take statement that includes non-discretionary terms and conditions that are intended to minimize the impacts of the anticipated incidental take of CV spring-run Chinook salmon and California CV steelhead is included with the BO.

Also enclosed are NMFS' Essential Fish Habitat (EFH) conservation recommendations for Pacific salmon (*O. tshawytscha*) as required by the Magnuson-Stevens Fishery Conservation and Management Act as amended (16 U.S.C. 1801 *et seq.*; Enclosure 2). The document concludes that the Project will adversely affect the EFH of Pacific salmon in the action area and adopts

certain terms and conditions of the incidental take statement and the ESA conservation recommendations of the BO as the EFH conservation recommendations.

Please contact Dylan Van Dyne at (916) 930-3725, or via e-mail at Dylan.VanDyne@noaa.gov, if you have any questions regarding this response or require additional information.

Sincerely,

Kevin Chu

for Rodney R. McInnis
Regional Administrator

Enclosures (2)

cc: NMFS-PRD, Long Beach, CA
Copy to Administrative File: 151422SWR2009SA00570

Enclosure 1

BIOLOGICAL OPINION

ACTION AGENCY: California Department of Transportation (Caltrans)

ACTION: Mill Creek Bridge Scour Repair and Deck Rehabilitation Project

CONSULTATION CONDUCTED BY: Southwest Region, National Marine Fisheries Service (NMFS)

FILE TRACKING NUMBER: 151422SWR200900570 (T/N: 2009/06533)

DATE ISSUED: **March 29, 2012**

I. CONSULTATION HISTORY

Caltrans has initiated consultation in accordance to Section 7 of the Endangered Species Act (ESA) of 1973, as amended (16 USC 1531 *et seq*,) with the National Oceanic Atmospheric Administration National Marine Fisheries Service (NMFS) to evaluate the effects of the proposed bridge rehabilitation project on the Mill Creek Bridge (Bridge Number 08-0133) on State Route 36 in Tehama County, California.

On May 28, 2009, a telephone conversation was held between Monica Gutierrez (NMFS biologist) and Sharon Stacey (Caltrans) regarding technical assistance and the proposed project description.

On December 7, 2009, NMFS received a letter from Caltrans requesting section 7 formal consultation under the Endangered Species Act (ESA).

On January 6, 2010, Caltrans incorporates minor changes to conservation measures 4 and 8.

On February 17, 2010, NMFS acknowledged receipt of Caltrans formal consultation request letter, Biological Assessment (BA) and Essential Fish Habitat Assessment (EFHA), and that all information necessary to initiate consultation was either included with the submittal or could otherwise be obtained during the formal consultation process for our consideration and reference.

On June 2, 2010, Caltrans informed NMFS via email that hydraulic staff would reassess the scour mitigation plan which would likely result in a design change and a delay in construction. In effect, that correspondence suspended the consultation process until further notice would be received from Caltrans.

Enclosed with Caltrans January 12, 2011, letter to NMFS were two hydraulics reports that comprised the updated project design analysis.

A field review of the project site was conducted on February 9, 2011, with the California Department of Fish and Game (DFG), Caltrans, and NMFS representatives.

On May 23, 2011, NMFS received a letter from Caltrans reinitiating section 7 formal consultation that included an Addendum to the December 2009 BA and EFHA.

On October 5, 2011, NMFS received email correspondence regarding an updated conservation measure proposal to be included in the Addendum BA and EFHA.

II. DESCRIPTION OF THE PROPOSED ACTION

A. Project Location

Caltrans proposes to correct scour and rehabilitate the bridge deck at the Mill Creek Bridge on State Route (SR) 36 in Tehama County, California, at Post Mile (PM) 91.46 (Figure 1). The Mill Creek Bridge is located approximately eight miles east of the town of Mineral in Township 30N, Range 12E, Section 23, of the USGS 7.5-minute quadrangle (USGS 1976) (Figure 2).

The existing Mill Creek Bridge deck is a two-span, reinforced concrete girder structure with reinforced concrete abutments and a reinforced concrete pier wall, all on spread footings. The existing bridge deck is reinforced Portland cement concrete (PCC) with an asphalt concrete (AC) surface measuring 70 feet (ft) long and 34 ft wide and exhibits signs of deterioration due to wear and weathering.

B. Construction Activities

The purpose of the proposed project is to correct existing scour, prevent future scour at the abutments and pier and to rehabilitate the bridge deck. Work will include placing approximately 624 cubic yards (cy) of two-ton rock slope protection (RSP) and 133 cy of small rock at the foundations of the bridge abutments and center pier wall and an additional 226 cy of a mixture of Backing #1 and Backing #3 in lieu of filter fabric. The rock will also be placed at or below grade and will not reduce the current cross-sectional area of the channel. In addition, project will include construction of an access road, excavation and construction of a stream diversion, placing bridges over the diversion to access both sides of the creek, replacing the AC bridge deck surface with a polyester overlay, and adjusting the existing guard rail. Work within the wetted portion of the stream will be restricted to the period between July 1 and August 31. The proposed project is scheduled for construction in 2013.

An overhead telephone line that runs adjacent to the south side of the highway will be relocated to provide clearance for construction equipment. It is anticipated that the utility company will elect to relocate the telephone line underground on its present alignment, with the exception of where it crosses Mill Creek. The telephone line will be attached to the downstream side of the bridge deck. This work is scheduled for 2012 or in the year prior to bridge construction work.

Equipment capable of excavating and handling large RSP, such as an excavator or backhoe, will require access to the bridge foundations from each side of the creek. Access will be on the east

side of the creek on the north and south sides of the highway. Temporary stream crossing structures will be installed upstream and downstream of the highway bridge to provide access to the west side of the creek. The installation of RSP at the bridge foundations will require a temporary diversion of the stream channel to dewater the work area.

C. Construction Schedule

Construction will occur in three stages:

Stage 1

Prior to the commencement of any construction activities, temporary environmentally sensitive area fencing will be installed to protect areas adjacent to the work zone from encroachment and inadvertent impacts. In-stream work will not begin until July 1, and will go until August 31. Preparatory work will occur in upland areas and dry portions of the stream channel and will include construction of the equipment access roads, the southern stream crossing structure, staging areas, and material storage areas near the southeast and northeast quadrants of the bridge. Any large woody debris within the banks of Mill Creek that could interfere with construction will be temporarily stockpiled on dry land. An access road from SR 36 will be created on the north and south sides of the highway. Both access roads will be created with imported fill and will extend approximately 250 ft to the eastern stream bank. If the east side of the stream channel is dry, a stream crossing structure will be constructed immediately south of the highway bridge over the proposed diversion channel. The temporary crossing will consist of a horizontal deck, comprised of two ten-ft spans, utilizing a temporary concrete barrier rail (K-rail) section or similar material for a center support. The abutments will be constructed of clean, imported gravel. K-rail will be installed parallel with the creek to contain the cobble abutments. In addition, RSP will be placed at the east abutment and the east side of the center pier wall. A toe trench will be excavated to the depth of the top of the footings and the RSP placed accordingly.

Stage 2

A temporary stream crossing structure will be installed approximately 100 feet upstream of the highway bridge in order to gain access to the west side of the creek and place RSP at the west abutment and the west side of the center pier. The temporary crossing will be similar to the one constructed downstream of the highway bridge. As the temporary crossing is being constructed, a diversion channel will be excavated, beginning at the downstream end and working towards the stream diversion point upstream. The diversion channel will extend approximately 150 ft downstream and 150 ft upstream of the highway bridge and be no deeper than the thalweg of the active channel. A natural channel in the gravel bar exists downstream of the highway bridge, therefore, no work will at that locations will be required to prepare the channel. The balance of the proposed diversion channel, from the highway bridge to the diversion point upstream will require excavation. The volume of excavation will be roughly 251 cy of cobble, gravel, and silt material, which will be disposed of at an appropriate upland disposal site. Concrete K-rail will

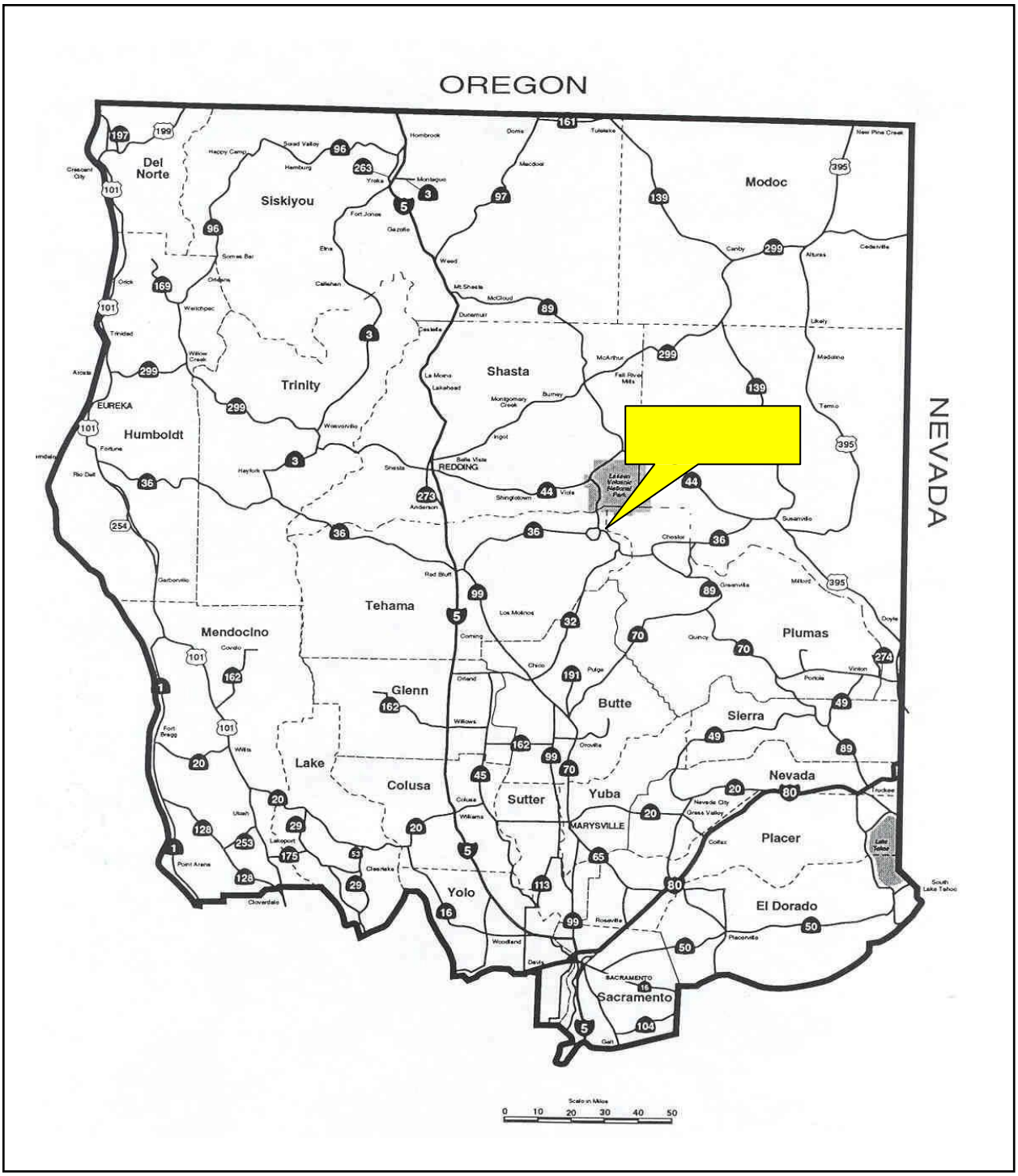


Figure 1. Project Vicinity Map. Box denotes proposed project location.

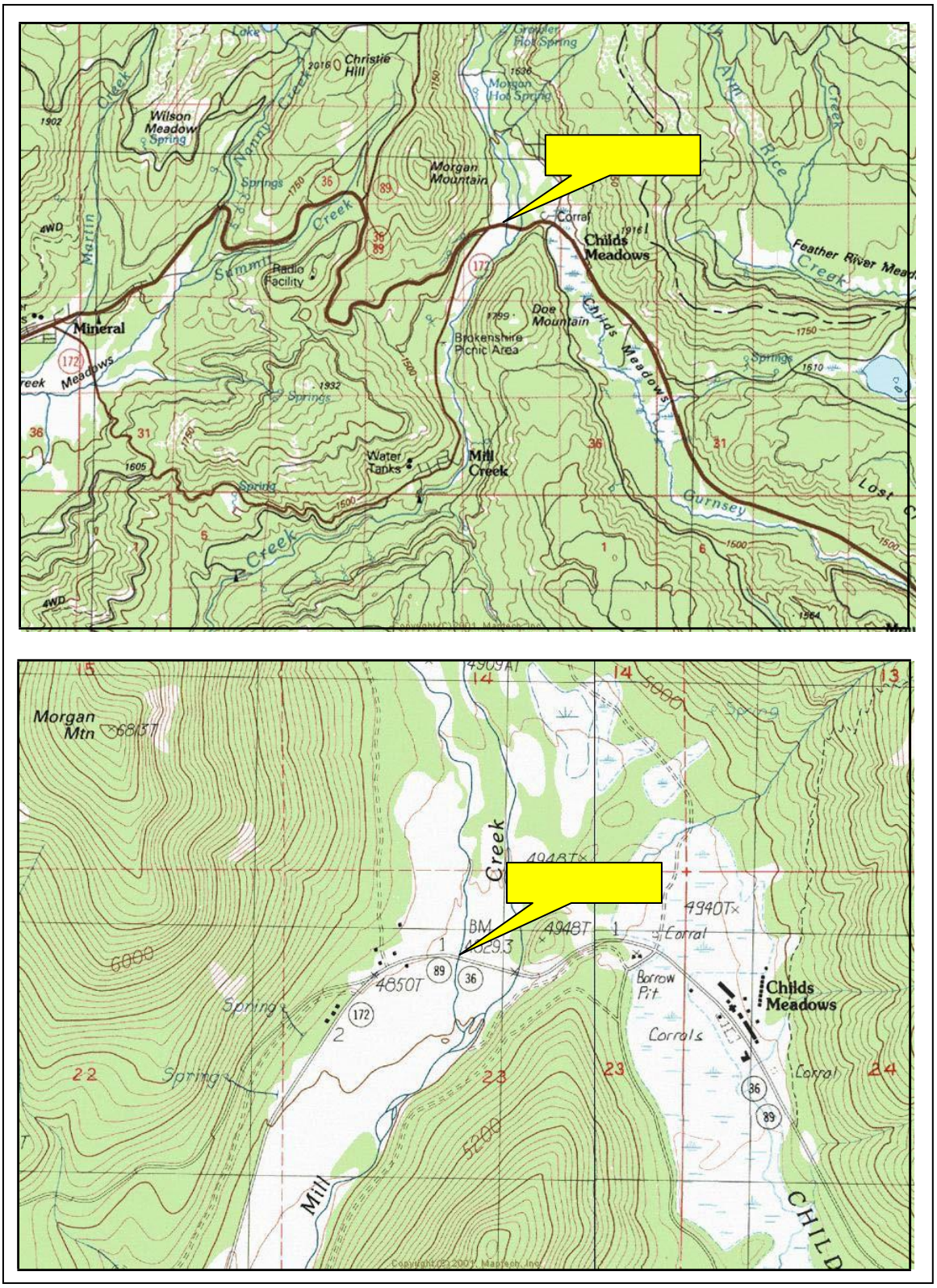


Figure 2. USGS 7.5-minute Quadrangle Maps. Boxes denote proposed project location.

be placed parallel with the stream channel between the live channel and the diversion channel from the diversion point to a point approximately 50 ft downstream of the south edge of the bridge. A layer of heavy gauge plastic sheeting will be placed against the K-rail and covered with fill to protect the western bank of the diversion channel from scour.

Stage 3

Once the temporary stream crossing structures are in place and the diversion channel is completed, the remaining fill at the north end of the diversion channel will be removed allowing the live stream to enter the diversion channel. Two small streams that flow into the west bank of Mill Creek north of the highway will also need to be diverted around the proposed project work area. It is anticipated that the two streams will be diverted through small diameter flexible pipes. Once the work area is dewatered, key trenches for the RSP will be excavated at the western bridge abutment and the west side of the center pier and the RSP will be placed. Following the placement of RSP, the western streambank will be restored as close as possible to pre-construction conditions. Mill Creek and the two tributary streams will be returned to their original channels. The upper portion of the temporary diversion channel will be filled with clean large rock and the temporary stream crossing structure north of the bridge will be dismantled. Gravel and cobbles used for the abutments of the temporary crossing structure will be spread over the stream banks in a manner that will not affect fish passage. The concrete K-rail used to reinforce the temporary diversion channel will be removed from the stream channel and the temporary crossing structure south of the highway bridge will be removed. The remaining cobbles from the temporary abutments will be spread throughout the streambed. Large woody debris that had been temporarily stockpiled will be placed downstream of the highway bridge on dry gravel bars within the stream channel. The eastern stream bank will then be restored as close as possible to pre-construction elevation and grade.

The deck rehabilitation will consist of removing the existing asphalt concrete (AC) surfacing and joint seals. Metal beam guardrail at the bridge approaches will be adjusted and upgraded as necessary to comply with modern highway design standards. A new polyester AC surface will be applied to the bridge deck. Polyester AC will seal the deck and provide superior protection of the underlying Portland cement concrete than traditional AC. New bridge deck joint seals will be installed and traffic striping will be applied to the deck surface.

D. Proposed Conservation Measures

The following conservation measures have been incorporated into the proposed project design to avoid and minimize potential adverse effects of the proposed project on federally listed fish species and their designated critical habitats.

(1) Protection of Environmentally Sensitive Areas. All areas not required for construction will be protected by establishing environmentally sensitive areas within the study limits. Installation of temporary environmentally sensitive areas fencing will be a first order of work in the construction contract. Placement of the fence will be inspected and approved by the California Department of Fish and Game (CDFG).

(2) Work Window for In-Stream Construction Activities. In-stream work will be allowed between July 1 and August 31 of the construction year to minimize impacts to listed salmonids. If a portion of the channel is dry prior to July 1, work may begin in that area. If any subsurface flow is encountered, measures must be taken to prevent turbid water from entering the channel downstream. Work in upland areas may begin prior to in-stream activities.

(3) Isolate the Work Area. No work will be allowed in flowing water except as required in the proposed project description. A temporary diversion will be constructed to dewater the work area and allow access to the west side of the stream. Two temporary bridges will be used in place of culverts to provide for fish passage. Abutments for the bridges will be constructed using clean washed uncrushed river-run gravel confined by K-rail. Although not anticipated to be present, the diversion channel will be constructed to allow passage of adult salmonids. The temporary diversion channel will be no deeper than the elevation of thalweg of the main stream channel.

Upon completion of the proposed project, the diversion shall be removed and flow returned to its original channel. Gravel from the temporary bridge abutments will be left in place and spread over the stream banks. The upper portion of the diversion channel will be filled with enough clean material to prevent the stream flow from returning to the diversion channel.

(4) Clean Washed Gravel. Gravel that is to be left in the stream shall be clean, pre-washed, uncrushed natural river rock. Gravel must be washed at least once and have a cleanness value of 85 or higher (California Test Number 227). Particle size shall be graded with 95-100 percent passing a 4- or 5-inch screen, 75-85 percent passing a 2-inch screen, 40-50 percent passing a 1-inch screen, 25-35 percent passing a ¾-inch screen, 10-20 percent passing a ½-inch screen, and 0-5 percent passing a ¼-inch screen (percent by dry weight) or approved by the CDFG. Gravel must be free of oils or any other petroleum based material, clay, debris, and other types of organic matter. Gravel may be stockpiled near the proposed project site, but mixing with any earthen material is prohibited.

(5) Water Diversion. Water from the highway ditch and landowner constructed ditch in the northwest quadrant will be diverted around the work area following Caltrans best management practice (BMP) NS-5 (Caltrans 2003), Clear Water Diversion.

(6) Fish Passage. Adult fish passage will be maintained at all times during construction. The diversion will consist of a constructed channel and temporary bridges that will allow fish to move upstream and downstream. Although the proposed project is timed to avoid adult spring-run and California CV steelhead, the channel is designed to allow adult fish to migrate through the proposed project area.

(7) Placement of RSP. RSP will be placed at or below the existing grade of the streambed, not above original ground.

(8) Fish Salvage and Relocation. It is anticipated that some fish may be stranded in the dewatered areas. A fish salvage operation will be conducted by a qualified biologist to reduce mortality. Fish stranded within the project limits by dewatering activities will be removed from the creek by seining or electro-fishing and immediately placed back into the creek downstream of the proposed project area.

(9) Enhance Juvenile Rearing Habitat. Habitat enhancement structures will be placed instream to improve rearing habitat for juvenile salmonids. Locations for individual structures will be identified by CDFG and NMFS. Structures will be designed by Caltrans and approved by CDFG and NMFS. Habitat enhancements may include, but are not limited to, bank stabilization, addition of large woody debris, or placement of boulder clusters. Limited access into environmentally sensitive areas on the southeast side of the proposed project will be allowed in order to build the enhancement structures. All work will be within the in-stream construction window of July 1 to August 31. Access will be directed by the Resident Engineer and Environmental Construction Liaison (ECL).

(10) Reduce Sediment into Mill Creek. Caltrans will enter into an agreement with the U.S. Forest Service to reduce sediment going into salmonid habitat in the upper Mill Creek drainage. Caltrans will contribute up to $50,000 to apply sediment reduction treatments to approximately 4.2 miles of Forest Service road 28N06 which runs parallel to Mill Creek south of Highway 172.

(11) Minimize Loss of Riparian Vegetation. Disturbance or removal of existing vegetation will not exceed the minimum necessary to complete the proposed project.

(12) Revegetation of Riparian Vegetation. All temporarily impacted riparian areas outside the active floodplain will be planted back with riparian species including white alder and willows from the local area. Riparian vegetation within the active floodplain will be trimmed to no lower than ground level to encourage rapid re-growth.

(13) Erosion and Sedimentation Control. Caltrans requires the contractor to prepare and implement a program to control water pollution on all activities during construction. A Storm Water Pollution Prevention Plan (SWPPP) will be prepared for this project. This plan includes the temporary BMPs that will be used during construction to control water pollution.

During construction, turbidity levels shall not be increased above the normal basin condition in accordance with the standard set by the Central Valley Regional Water Quality Control Board (CVWQCB). Activities shall not exceed the following turbidity criteria as stated in the basin plan:

- Where natural turbidity is between 0 and 5 Nephelometric Turbidity Units (NTUs), increases shall not exceed 1 NTU;
- Where natural turbidity is between 5 and 50 NTUs, increases shall not exceed 20 percent;

- Where natural turbidity is between 50 and 100 NTUs, increases shall not exceed 10 NTUs; and
- Where natural turbidity is greater than 100 NTUs, increases shall not exceed 10 percent.

Monitoring will be conducted per the 401 Certification. Should the standard be exceeded, proposed project operations contributing to excessive turbidity shall cease until the standard can be met again. This proposed project will be reviewed during construction for applicable BMPs to be used to reduce sediments. All construction areas will be stabilized prior to the onset of winter rains to prevent sediment loss into Mill Creek. Disturbed areas will be replanted or hydroseeded in order to reestablish the vegetation. The contractor shall use only certified weed-free erosion control materials to prevent the spread of non-native, weedy species.

(14) Prevention of Accidental Spills. A Spill Prevention Plan will be included in the SWPPP. This plan will outline the actions to be taken in the event of a leak or spill of petroleum products or hydraulic fluid within or adjacent to the creek channel. The plan for emergency clean-up of any spills will be available on-site and materials for spill cleanup will be maintained on-site. Construction vehicles and equipment shall be maintained to prevent contamination of soil or water from leaking hydraulic fluid, fuel, oil, and grease. Any equipment or vehicles operated within or adjacent to the stream channel shall be checked and maintained daily to prevent leaks of material that may be damaging to aquatic life or riparian vegetation.

In the event of any hazardous leak or spill within the channel, CDFG and NOAA Fisheries shall be notified immediately and all project activities that may affect listed salmonids or habitat shall cease. Work may resume after the agencies have reasonable assurances that no additional impacts will occur.

(15) Refueling. Re-fueling of vehicles and equipment shall take place outside of the stream channel at least 150 feet away from Mill Creek, unless this results in unsafe work conditions. NOAA Fisheries and CDFG shall approve the refueling area within 150 feet of the stream channel if required by work conditions.

(16) Parking. No overnight parking of equipment on the stream bank will be allowed.

(17) Water Drafting. Adequate screening will be required for any water trucks filling up at fish bearing streams to prevent impacts to salmonids.

(18) Other Regulatory Permits. The contractor shall follow the terms and conditions of the regulatory permits to be obtained from the CDFG, CVWQCB, and the United States Army Corps of Engineers (Corps).

(19) Construction Monitoring. The Caltrans ECL will monitor construction periodically during in-stream activities to ensure compliance with all of the requirements included in this BA.

E. Action Area

An action area is defined as areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR 402.02). For purposes of this consultation, the action area consists of two components. The terrestrial component of the action area is defined by: (1) the proposed project footprint, including all cleared areas, and staging areas; and (2) construction noise levels in excess of ambient conditions. The aquatic component of the action area is defined by: (1) the segment of Mill Creek at the bridge construction site and upstream and downstream of the bridge construction site; (2) construction-related water quality impacts in excess of ambient conditions; and (3) operational storm water quality impacts in excess of ambient conditions.

III. STATUS OF THE SPECIES AND CRITICAL HABITAT

The following federally listed species evolutionarily significant units (ESUs) or distinct population segments (DPSs) and designated or proposed critical habitat occur in the action area and may be affected by the proposed project:

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

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

California Central Valley steelhead DPS (*O. mykiss*)
threatened (January 5, 2006, 71 FR 834)

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

A. Species and Critical Habitat Listing Status

In 2005, NMFS completed an updated status review of 16 salmon ESUs, including Sacramento River winter-run Chinook salmon and Central Valley (CV) spring-run Chinook salmon, and concluded that the species' status should remain as previously listed (June 28, 2005, 70 FR 37160). On January 5, 2006, NMFS published a final listing determination for 10 steelhead DPSs, including California CV steelhead. The new listing concludes that California CV steelhead will remain listed as threatened (71 FR 834).

1. <u>CV spring-run Chinook salmon</u>

NMFS listed the CV spring-run Chinook salmon ESU as threatened on September 16, 1999 (64 FR 50394). In June 2004, NMFS proposed that CV spring-run Chinook salmon remain listed as threatened (69 FR 33102). This proposal was based on the recognition that although CV spring-run Chinook salmon productivity trends are positive, the ESU continues to face risks from

having a limited number of remaining populations (*i.e.*, 3 existing independent populations from an estimated 17 historical populations), a limited geographic distribution, and potential hybridization with Feather River Hatchery (FRH) spring-run Chinook salmon, which until recently were not included in the ESU and are genetically divergent from other populations in Mill, Deer, and Butte creeks. On June 28, 2005, after reviewing the best available scientific and commercial information, NMFS issued its final decision to retain the status of CV spring-run Chinook salmon as threatened (70 FR 37160). This decision also included the FRH spring-run Chinook salmon population as part of the CV spring-run Chinook salmon ESU. Critical habitat was designated for CV spring-run Chinook salmon on September 2, 2005 (70 FR 52488). Designated critical habitat includes approximately 8,935 net miles (mi) of riverine habitat and 470 mi^2 of estuarine habitat (primarily in San Francisco-San Pablo-Suisun Bays) in California (70 FR 52488). Designated critical habitat for CV spring-run Chinook salmon occurs within the proposed project's action area.

2. California CV steelhead

California CV steelhead were originally listed as threatened 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, after a complete status review of the 26 west coast salmon DPSs, NMFS proposed that CV spring-run Chinook salmon remain listed as threatened (69 FR 33102), while the other Chinook salmon and steelhead were further reviewed. On June 28, 2005, after reviewing the best available scientific and commercial information, NMFS issued its final decision to retain the status of California CV steelhead as threatened (70 FR 37160). This decision also included the Coleman National Fish Hatchery and FRH 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. Critical habitat was designated for California CV steelhead on September 2, 2005 (70 FR 52488). Critical habitat includes the stream channels to the ordinary high water line within designated stream reaches 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 Sacramento-San Joaquin Rivers Delta (Delta). Designated critical habitat for California CV steelhead occurs within the proposed project's action area.

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

1. Chinook Salmon

General Life History

Chinook salmon exhibit two generalized freshwater life history types (Healey 1991). "Stream-type" Chinook salmon, enter freshwater months before spawning and reside in freshwater for a year or more following emergence, whereas "ocean-type" Chinook salmon spawn soon after entering freshwater and migrate to the ocean as fry or parr within their first year. Spring-run Chinook salmon exhibit a stream-type life history. Adults enter freshwater in the spring, hold over summer, spawn in fall, and the juveniles typically spend a year or more in freshwater before emigrating. Adequate instream flows and cool water temperatures are more critical for the

survival of Chinook salmon exhibiting a stream-type life history due to over summering by adults and juveniles.

Chinook salmon typically mature between 2 and 6 years of age (Myers *et al.* 1998). Freshwater entry and spawning timing generally are thought to be related to local water temperature and flow regimes. Runs are designated on the basis of adult migration timing; however, distinct runs also differ in the degree of maturation at the time of river entry, thermal regime and flow characteristics of their spawning site, and the actual time of spawning (Myers *et al.* 1998). Both spring-run and winter-run Chinook salmons tend to enter freshwater as immature fish, migrate far upriver, and delay spawning for weeks or months. For comparison, fall-run Chinook salmon enter freshwater at an advanced stage of maturity, move rapidly to their spawning areas on the mainstem or lower tributaries of the rivers, and spawn within a few days or weeks of freshwater entry (Healey 1991).

During their upstream migration, adult Chinook salmon require stream flows sufficient to provide olfactory and other orientation cues used to locate their natal streams. Adequate stream flows are necessary to allow adult passage to upstream holding habitat. The preferred temperature range for upstream migration is 38 degrees F to 56 degrees F (Bell 1991; CDFG 1998). Boles (1988) recommends water temperatures below 65 degrees F for adult Chinook salmon migration, and Lindley *et al.* (2004) report that adult migration is blocked when temperatures reach 70 degrees F, and that fish can become stressed as temperatures approach 70 degrees F. Reclamation reports that spring-run Chinook salmon holding in upper watershed locations prefer water temperatures below 60 degrees F; although salmon can tolerate temperatures up to 65 degrees F before they experience an increased susceptibility to disease.

Information on the migration rates of adult Chinook salmon in freshwater is scant and primarily comes from the Columbia River basin where information regarding migration behavior is needed to assess the effects of dams on travel times and passage (Matter and Sandford 2003). Keefer *et al.* (2004) found migration rates of Chinook salmon ranging from approximately 10 kilometers (km) per day to greater than 35 km per day and to be primarily correlated with date, and secondarily with discharge, year, and reach, in the Columbia River basin. Matter and Sandford (2003) documented migration rates of adult Chinook salmon ranging from 29 to 32 km per day in the Snake River. Adult Chinook salmon implanted with sonic tags and tracked throughout the Delta and lower Sacramento and San Joaquin rivers were observed exhibiting substantial upstream and downstream movement in a random fashion while on their upstream migration (California Bay-Delta Authority (CALFED) 2001). Adult salmonids migrating upstream are assumed to make greater use of pool and mid-channel habitat than channel margins (Stillwater Sciences 2004), particularly larger salmon such as Chinook salmon, as described by Hughes (2004). Adults are thought to exhibit crepuscular behavior during their upstream migrations; meaning that they primarily are active during twilight hours. Recent hydroacoustic monitoring showed peak upstream movement of adult CV spring-run Chinook salmon in lower Mill Creek, a tributary to the Sacramento River, occurring in the four-hour period before sunrise and again after sunset.

Spawning Chinook salmon require clean, loose gravel in swift, relatively shallow riffles or along the margins of deeper runs, and suitable water temperatures, depths, and velocities for redd

construction and adequate oxygenation of incubating eggs. Chinook salmon spawning typically occurs in gravel beds that are located at the tails of holding pools (USFWS 1995). The range of water depths and velocities in spawning beds that Chinook salmon find acceptable is very broad. The upper preferred water temperature for spawning Chinook salmon is 55 degrees F to 57 degrees F (Chambers 1956; Smith 1973; Bjornn and Reiser 1991; Snider 2001).

During the four to six week period when alevins remain in the gravel, they utilize their yolk-sac to nourish their bodies. As their yolk-sac is depleted, fry begin to emerge from the gravel to begin exogenous feeding in their natal stream. The post-emergent fry disperse to the margins of their natal stream, seeking out shallow waters with slower currents, finer sediments, and bank cover such as overhanging and submerged vegetation, root wads, and fallen woody debris, and begin feeding on zooplankton, small insects, and other micro-crustaceans. As they switch from endogenous nourishment to exogenous feeding, the fry's yolk-sac is reabsorbed, and the belly suture closes over the former location of the yolk-sac (button-up fry). Fry typically range from 25 mm to 40 mm during this stage. Some fry may take up residence in their natal stream for several weeks to a year or more, while others actively migrate, or are displaced downstream by the streams current. Once started downstream, fry may continue downstream to the estuary and rear, or may take up residence in river reaches along the way for a period of time ranging from weeks to a year (Healey 1991).

Rearing fry seek nearshore habitats containing beneficial aspects such as riparian vegetation and associated substrates important for providing aquatic and terrestrial invertebrates, predator avoidance, and slower velocities for resting (NMFS 1996). The benefits of shallow water habitats for salmonid rearing also have recently been realized as shallow water habitat has been found to be more productive than the main river channels, supporting higher growth rates, partially due to higher prey consumption rates, as well as favorable environmental temperatures (Sommer *et al.* 2001).

When juvenile Chinook salmon reach a length of 50 to 57 mm, they move into deeper water with higher current velocities, but still seek shelter and velocity refugia to minimize energy expenditures. In the mainstems of larger rivers, juveniles tend to migrate along the margins and avoid the elevated water velocities found in the thalweg of the channel. When the channel of the river is greater than 9 to 10 feet in depth, juvenile salmon tend to inhabit the surface waters (Healey 1982). Migrational cues, such as increasing turbidity from runoff, increased flows, changes in day length, or intraspecific competition from other fish in their natal streams may spur outmigration of juveniles when they have reached the appropriate stage of maturation (Kjelson *et al.* 1982; Brandes and McLain 2001).

Similar to adult movement, juvenile salmonid downstream movement is primarily crepuscular. Martin *et al.* (2001) found that the daily migration of juveniles passing Red Bluff Diversion Dam (RBDD) is highest in the four hour period prior to sunrise. Juvenile Chinook salmon migration rates vary considerably presumably depending on the physiological stage of the juvenile and hydrologic conditions. Kjelson *et al*. (1982) found fry Chinook salmon to travel as fast as 30 km per day in the Sacramento River and Sommer *et al.* (2001) found rates ranging from approximately 0.5 miles up to more than 6 miles per day in the Yolo Bypass. As Chinook salmon begin the smoltification stage, they prefer to rear further downstream where ambient

salinity is up to 1.5 to 2.5 parts per thousand (Healey 1980; Levy and Northcote 1981). Fry and parr may rear within riverine or estuarine habitats of the Sacramento River, the Delta, and their tributaries. In addition, CV Chinook salmon juveniles have been observed rearing in the lower reaches of non-natal tributaries and intermittent streams in the Sacramento Valley during the winter months (Maslin *et al.* 1997; Snider 2001). Within the Delta, juvenile Chinook salmon forage in shallow areas with protective cover, such as intertidal and subtidal mudflats, marshes, channels, and sloughs (McDonald 1960; Dunford 1975). Cladocerans, copepods, amphipods, and larvae of diptera, as well as small arachnids and ants are common prey items (Kjelson *et al.* 1982; Sommer *et al.* 2001; MacFarlane and Norton 2002). Shallow water habitats are more productive than the main river channels, supporting higher growth rates, partially due to higher prey consumption rates, as well as favorable environmental temperatures (Sommer *et al.* 2001). Optimal water temperatures for the growth of juvenile Chinook salmon in the Delta are between 54 to 57 degrees F (Brett 1952). In Suisun and San Pablo bays water temperatures reach 54 degrees F by February in a typical year. Other portions of the Delta (*i.e.*, South Delta and Central Delta) can reach 70 degrees F by February in a dry year. However, cooler temperatures are usually the norm until after the spring runoff has ended.

Within the estuarine habitat, juvenile Chinook salmon movements are dictated by the tidal cycles, following the rising tide into shallow water habitats from the deeper main channels, and returning to the main channels when the tide recedes (Levings 1982; Levy and Northcote 1982; Levings *et al.* 1986; Healey 1991). As juvenile Chinook salmon increase in length, they tend to school in the surface waters of the main and secondary channels and sloughs, following the tides into shallow water habitats to feed (Allen and Hassler 1986). In Suisun Marsh, Moyle *et al.* (1989) reported that Chinook salmon fry tend to remain close to the banks and vegetation, near protective cover, and in dead-end tidal channels. Kjelson *et al.* (1982) reported that juvenile Chinook salmon demonstrated a diel migration pattern, orienting themselves to nearshore cover and structure during the day, but moving into more open, offshore waters at night. The fish also distributed themselves vertically in relation to ambient light. During the night, juveniles were distributed randomly in the water column, but will school up during the day into the upper 3 meters of the water column. Available data indicate that juvenile Chinook salmon use Suisun Marsh extensively both as a migratory pathway and rearing area as they move downstream to the Pacific Ocean. Juvenile Chinook salmon were found to spend about 40 days migrating through the Delta to the mouth of San Francisco Bay and grew little in length or weight until they reached the Gulf of the Farallones (MacFarlane and Norton 2002). Based on the mainly ocean-type life history observed (*i.e.*, fall-run Chinook salmon) MacFarlane and Norton (2002) concluded that unlike other salmonid populations in the Pacific Northwest, CV Chinook salmon show little estuarine dependence and may benefit from expedited ocean entry.

2. Central Valley Spring-Run Chinook Salmon

Historically the spring-run Chinook salmon were the second most abundant salmon run in the CV (CDFG 1998). These fish occupied the 1,000 to 6,000 foot elevations of the San Joaquin, American, Yuba, Feather, Sacramento, McCloud and Pit rivers, with smaller populations in most tributaries with sufficient habitat for over-summering adults (Stone 1874, Rutter 1904, Clark 1929). The CV drainage as a whole is estimated to have supported spring-run Chinook salmon runs as large as 600,000 fish between the late 1880s and 1940s (CDFG 1998). Before the

construction of Friant Dam, nearly 50,000 adults were counted in the San Joaquin River alone (Fry 1961). Construction of other low elevation dams in the foothills of the Sierras on the American, Mokelumne, Stanislaus, Tuolumne, and Merced rivers extirpated CV spring-run Chinook salmon from these watersheds. Naturally spawning populations of CV spring-run Chinook salmon currently are restricted to accessible reaches of the upper Sacramento River, Antelope Creek, Battle Creek, Beegum Creek, Big Chico Creek, Butte Creek, Clear Creek, Deer Creek, Feather River, Mill Creek, and Yuba River (CDFG 1998). However, only Deer, Mill, and Butte creeks are considered to be independent spring-run Chinook populations. The other tributary populations are considered dependent populations, which rely on the three independent populations for continued existence at this time (Lindley *et al.* 2007).

Adult CV spring-run Chinook salmon leave the ocean to begin their upstream migration in late January and early February (CDFG 1998) and enter the Sacramento River between March and September, primarily in May and June (Table 1; Yoshiyama *et al.* 1998; Moyle 2002). Lindley *et al*. (2004) indicates adult CV spring-run Chinook salmon enter native tributaries from the Sacramento River primarily between mid-April and mid-June. Typically, spring-run Chinook salmon utilize mid- to high-elevation streams that provide appropriate temperatures and sufficient flow, cover, and pool depth to allow over-summering, while conserving energy and allowing their gonadal tissue to mature (Yoshiyama *et al.* 1998).

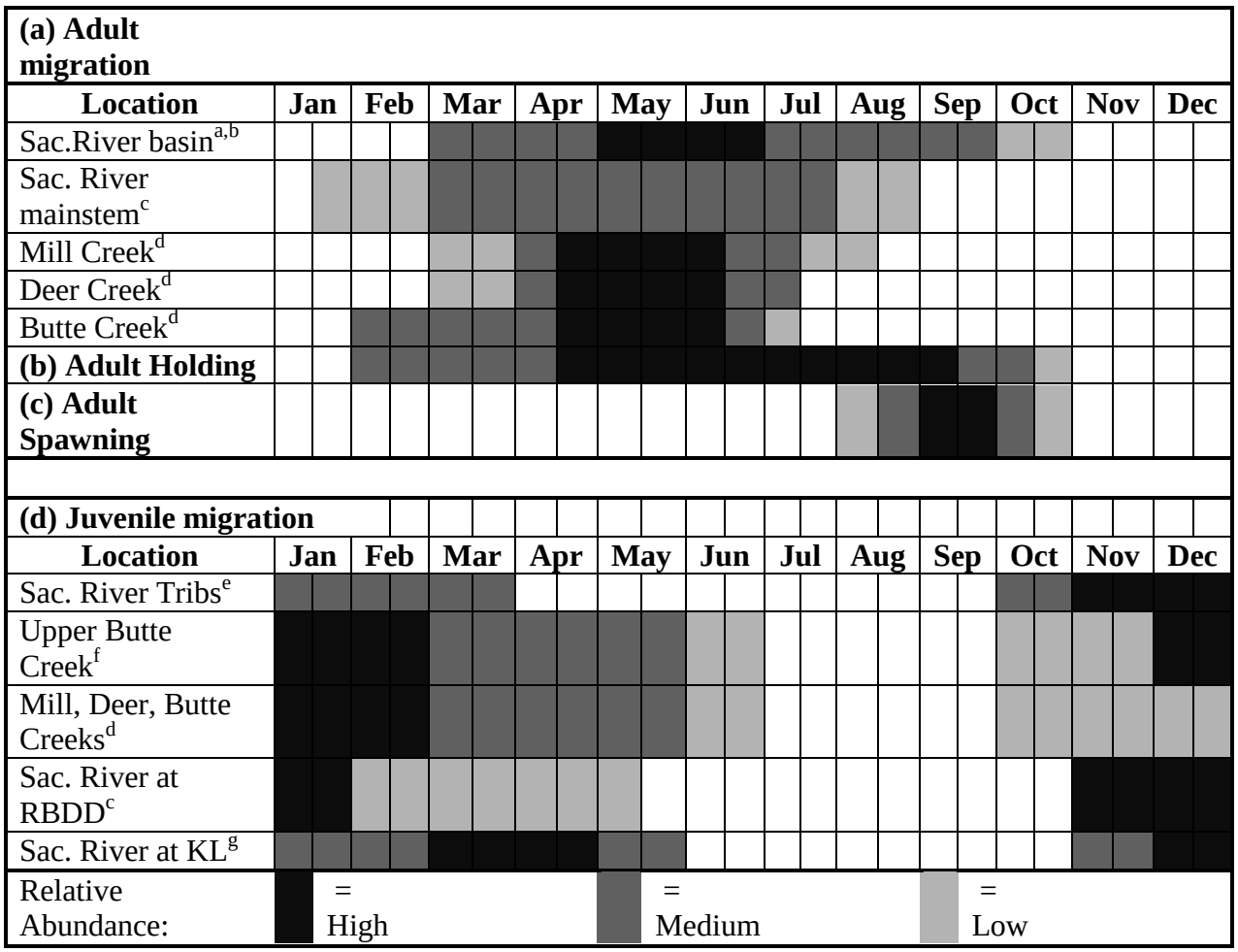
Spring-run Chinook salmon spawning occurs between September and October depending on water temperatures. Between 56 and 87 percent of adult spring-run Chinook salmon that enter the Sacramento River basin to spawn are 3 years old (Calkins *et al.* 1940, Fisher 1994).

Spring-run Chinook salmon fry emerge from the gravel from November to March (Moyle 2002) and the emigration timing is highly variable, as they may migrate downstream as young-of-the-year or as juveniles or yearlings. The modal size of fry migrants at approximately 40 mm between December and April in Mill, Butte, and Deer creeks reflects a prolonged emergence of fry from the gravel (Lindley *et al*. 2007). Studies in Butte Creek (Ward *et al*. 2002, 2003, McReynolds *et al*. 2005) found the majority of spring-run Chinook salmon migrants to be fry occurring primarily during December through and February; and that these movements appeared to be influenced by flow. Small numbers of CV spring-run Chinook salmon remained in Butte Creek to rear and migrated as yearlings during the following winter and spring. Juvenile emigration patterns in Mill and Deer creeks are very similar to patterns observed in Butte Creek, with the exception that Mill and Deer creek juveniles typically exhibit a later young-of-the-year migration and an earlier yearling migration (Lindley *et al*. 2007).

Once juveniles emerge from the gravel they initially seek areas of shallow water and low velocities while they finish absorbing the yolk sac and transition to exogenous feeding (Moyle 2002). Many also will disperse downstream during high-flow events. As is the case in other salmonids, there is a shift in microhabitat use by juveniles to deeper faster water as they grow larger. Microhabitat use can be influenced by the presence of predators which can force fish to select areas of heavy cover and suppress foraging in open areas (Moyle 2002). The emigration period for spring-run Chinook salmon extends from November to early May, with up to 69 percent of the young-of-the-year fish outmigrating through the lower Sacramento River and Delta during this period (CDFG 1998). Peak movement of juvenile CV spring-run Chinook

salmon in the Sacramento River at Knights Landing occurs in December, and again in March and April. However, juveniles also are observed between November and the end of May (Snider and Titus 2000). Based on the available information, the emigration timing of CV spring-run Chinook salmon appears highly variable (CDFG 1998). Some fish may begin emigrating soon after emergence from the gravel, whereas others over-summer and emigrate as yearlings with the onset of intense fall storms (CDFG 1998).

Table 1. The temporal occurrence of adult (a) and juvenile (d) Central Valley spring-run Chinook salmon in the Sacramento River. Darker shades indicate months of greatest abundance.



Note: Yearling spring-run Chinook salmon rear in their natal streams through the first summer following their birth. Downstream emigration generally occurs the following fall and winter. Young of the year spring-run Chinook salmon emigrate during the first spring after they hatch.

Sources: [a]Yoshiyama *et al*. (1998); [b]Moyle (2002); [c]Myers *et al*. (1998); [d]Lindley *et al*. (2004); CDFG (1998); [f]McReynolds *et al*. (2005); Ward *et al*. (2002, 2003); [g]Snider and Titus (2000)

On the Feather River, significant numbers of spring-run Chinook salmon, as identified by run timing, return to FRH. In 2002, FRH reported 4,189 returning spring-run Chinook salmon, which is 22 percent below the 10-year average of 4,727 fish. However, coded-wire tag (CWT) information from these hatchery returns indicates substantial introgression has occurred between fall-run and spring-run Chinook salmon populations within the Feather River system due to

hatchery practices. Because Chinook salmon are not temporally separated in the hatchery, spring-run and fall-run Chinook salmons are spawned together, thus compromising the genetic integrity of the spring-run and early fall-run Chinook salmon stocks. The number of naturally-spawning spring-run Chinook salmon in the Feather River has been estimated only periodically since the 1960s, with estimates ranging from 2 fish in 1978 to 2,908 in 1964. However, the genetic integrity of this population is questionable because of the significant temporal and spatial overlap with fall-run Chinook salmon (Good *et al.* 2005). For the reasons discussed above, the Feather River spring-run Chinook population numbers are not included in the following discussion of ESU abundance.

Although counts at the RBDD have been made to identify passage of spring-run Chinook, there are some concerns in using these numbers to establish ESU abundance. Some of these fish will continue into Clear Creek or Battle Creek (and will then be counted there under those tributaries) while others identified as spring-run based on temporal timing may actually be earlier returning fall-run Chinook salmon. Due to these factors, the discussion on historical abundance trends will focus on three tributary populations, Mill, Deer, and Butte creeks, as these are probably the best trend indicators for the CV spring-run Chinook ESU as a whole because they contain the primary independent populations within the ESU. Generally, these streams have shown a positive escapement trend since 1991. Escapement numbers are dominated by Butte Creek returns, which have averaged over 7,000 fish since 1995 (until 2005). During this same period, adult returns on Mill Creek have averaged 778 fish, and 1,463 fish on Deer Creek. Although recent trends (prior to 2005) had been positive, annual abundance estimates display a high level of fluctuation, and the overall number of CV spring-run Chinook salmon remains well below estimates of historic abundance. Additionally, in 2003, high water temperatures, high fish densities, and an outbreak of Columnaris disease (*Flexibacter columnaris*) and Ichthyophthiriasis (*Ichthyophthirius multifiis*) contributed to the pre-spawning mortality of an estimated 11,231 adult spring-run Chinook salmon (65% of the run) in Butte Creek, and 20-30% of the run in 2002. Most recently, returns on Butte, Mill and Deer creeks have been the lowest since prior to 2000, with the 2009 estimate on Butte Creek at 2,059, 210 on Mill Creek and 213 on Deer Creek (2008 was lower on Deer Creek at 140).

Lindley *et al.* (2007) concluded that Butte and Deer creek spring-run Chinook salmon are at low risk of extinction, according to their Population Viability Analysis (PVA) model and the other population viability criteria (population size, growth rate, hatchery influence, and catastrophic events). The Mill Creek population is at a low to moderate risk, satisfying some, but not all viability criteria. The Feather and Yuba River populations are data deficient and were not assessed for viability. However, because the existing CV spring-run Chinook salmon populations are spatially confined to relatively few remaining streams in only one of four historic diversity groups, the ESU remains vulnerable to catastrophic disturbance, and remains at a moderate to high risk of extinction. The ESU fails to meet the "representation and redundancy rule" since the Northern Sierra Nevada Diversity Group is the only diversity group that contains demonstrably viable populations out of at least three diversity groups that historically contained them.

Population Dynamics. The CV spring-run Chinook salmon ESU has displayed broad fluctuations in adult abundance, ranging from 1,403 in 1993 to 25,890 in 1982. The average

abundance for the ESU was 12,590 for the period of 1969 to 1979, 13,334 for the period of 1980 to 1990, 6,554 from 1991 to 2001, and 16,349 between 2002 and 2005. For the period of 2006 to 2008 the average abundance for the ESU fell to a low of 854 (CDFG 2009). Sacramento River tributary populations in Mill, Deer, and Butte creeks are probably the best trend indicators for the CV spring-run Chinook ESU as a whole because these streams contain the primary independent populations within the ESU. Generally, these streams have shown a positive escapement trend since 1991. Escapement numbers are dominated by Butte Creek returns, which have averaged over 7,000 fish since 1995 (until 2005). During this same period, adult returns on Mill Creek have averaged 778 fish, and 1,463 fish on Deer Creek. Although recent trends are positive, annual abundance estimates display a high level of fluctuation, and the overall number of CV spring-run Chinook salmon remains well below estimates of historic abundance. Additionally, in 2003 high water temperatures, high fish densities, and an outbreak of Columnaris Disease (*Flexibacter Columnaris*) and Ichthyophthiriasis (*Ichthyophthirius multifiis*) contributed to the pre-spawning mortality of an estimated 11,231 adult spring-run Chinook salmon in Butte Creek. Most recently, returns on Butte, Mill, and Deer creeks have been the lowest since prior to 2000, with the 2008 estimate on Butte Creek at 3,935, 362 on Mill Creek and 140 on Deer Creek.

Viable Salmonid Population Summary for Central Valley Spring-Run Chinook Salmon. The following provides the evaluation of the likelihood of viability for the threatened spring-run Chinook salmon ESU based on the viable salmonid population (VSP) parameters of abundance, productivity, spatial structure, and diversity.

Abundance. The CV spring-run Chinook salmon ESU has experienced a trend of increasing abundance in some natural populations, most dramatically in the Butte Creek population (Good *et al.* 2005). There has been more opportunistic utilization of migration-dependent streams overall. The Feather River Hatchery (FRH) spring-run Chinook salmon stock has been included in the ESU based on its genetic linkage to the natural population and the potential development of a conservation strategy for the hatchery program.

Productivity. The 5-year geometric mean for the extant Butte, Deer, and Mill creek spring-run Chinook salmon populations ranges from 491 to 4,513 fish (Good *et al.* 2005), indicating increasing productivity over the short-term and projected as likely to continue (Good *et al.* 2005). The productivity of the Feather River and Yuba River populations and contribution to the CV spring-run Chinook salmon ESU currently is unknown.

Spatial Structure. Spring-run Chinook salmon presence has been reported more frequently in several upper Central Valley creeks, but the sustainability of these runs is unknown. Butte Creek spring-run cohorts have recently utilized all available habitat in the creek; the population cannot expand further and it is unknown if individuals have opportunistically migrated to other systems. The spatial structure of the CV spring-run Chinook salmon ESU has been seriously compromised by the extirpation of all San Joaquin River basin spring-run Chinook salmon populations.

Diversity. The CV spring-run Chinook salmon ESU fails to meet the "representation and redundancy rule," since the Northern Sierra Nevada is the only diversity group in the CV spring-run Chinook salmon ESU that contains demonstrably viable populations out of at least 3

diversity groups that historically contained them. Independent populations of spring-run Chinook salmon only occur within the Northern Sierra Nevada diversity group. The Northwestern California diversity group contains a few ephemeral populations of spring-run Chinook salmon that are likely dependent on the Northern Sierra Nevada populations for their continued existence. The spring-run Chinook salmon populations that historically occurred in the Basalt and Porous lava, and Southern Sierra Nevada, diversity groups have been extirpated. Over the long term, the three remaining independent populations are considered to be vulnerable to catastrophic events, such as volcanic eruptions from Mount Lassen or large forest fires due to the close proximity of their headwaters to each other. Drought is also considered to pose a significant threat to the viability of the spring-run populations in the Deer, Mill and Butte creek watersheds due to their close proximity to each other. Feather River spring-run Chinook salmon have introgressed with the fall-run Chinook salmon, and it appears that the Yuba River Chinook salmon population may have been impacted by FRH fish straying into the Yuba River. Additionally, the diversity of the spring-run Chinook salmon ESU has been further reduced with the loss of the San Joaquin River basin spring-run Chinook salmon populations. Butte Creek and Deer Creek spring-run Chinook salmon are at low risk of extinction, satisfying both population viability analysis and other viability criteria. Mill Creek spring-run Chinook salmon are at moderate extinction risk according to the PVA, but appear to satisfy the other viability criteria for low risk status (Lindley *et al.* 2007). CV spring-run Chinook salmon fail the representation and redundancy rule for ESU viability, as their current distribution has been severely constricted. Therefore, CV spring-run Chinook salmon are at moderate risk of extinction over an extended period of time.

3. California Central Valley Steelhead

General Life History

Steelhead can be divided into two life history types, summer-run steelhead and winter-run steelhead, based on their state of sexual maturity at the time of river entry and the duration of their spawning migration, stream-maturing and ocean-maturing. Only winter-run steelhead are currently found in CV rivers and streams (McEwan and Jackson 1996), although there are indications that summer-run 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-run steelhead are found only in northern California coast drainages, mostly in tributaries of the Eel, Klamath, and Trinity river systems (McEwan and Jackson 1996).

California CV steelhead generally leave the ocean from August through April (Busby *et al.* 1996), and spawn from December through April, with peaks from January through March, in small streams and tributaries where cool, well oxygenated water is available year-round (Table 2; Hallock *et al.* 1961; McEwan and Jackson 1996). Timing of upstream migration is correlated with higher flow events, such as freshets or sand bar breaches, and associated lower water temperatures. 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). 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.

Spawning occurs during winter and spring months. The length of time it takes for eggs to hatch depends mostly on water temperature. Hatching of steelhead eggs in hatcheries takes about 30 days at 51 degrees F. Fry emerge from the gravel usually about 4 to 6 weeks after hatching, but factors such as redd depth, gravel size, siltation, and temperature can speed or retard this time (Shapovalov and Taft 1954). Newly-emerged fry move to the shallow, protected areas associated with the stream margin (McEwan and Jackson 1996) and they soon move to other areas of the stream and establish feeding locations, which they defend (Shapovalov and Taft 1954).

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. 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 refugia and as a means of avoiding predation (Meehan and Bjornn 1991).

Juvenile steelhead emigrate episodically from natal streams during fall, winter, and spring high flows. Emigrating California CV steelhead use the lower reaches of the Sacramento River and the Delta for rearing and as a migration corridor to the ocean. Juvenile California CV steelhead feed mostly on drifting aquatic organisms and terrestrial insects and will also take active bottom invertebrates (Moyle 2002).

Some juvenile California CV steelhead 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. 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. Nobriga and Cadrett (2003) have also verified these temporal findings based on analysis of captures at Chipps Island, Suisun Bay.

Historic California CV steelhead run sizes are difficult to estimate given the paucity of data, but may have approached 1 to 2 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 through the 1960s in the Sacramento River, upstream of the Feather River. Steelhead counts at 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.

Recent estimates from trawling data in the Delta indicate that approximately 100,000 to 300,000 (mean 200,000) smolts emigrate to the ocean per year, representing approximately 3,600 female

Central Valley steelhead spawners in the CV basin (Good *et al.* 2005). This can be compared with McEwan's (2001) estimate of 1 to 2 million spawners before 1850, and 40,000 spawners in the 1960s.

Existing wild steelhead stocks in the CV 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 2008) indicate that steelhead are present in Clear Creek (Giovannetti *et al.* 2008; Good *et al.* 2005) and in Battle Creek (CDFG 2010). Because of the large resident *O. mykiss* population in Clear Creek, steelhead spawner abundance has not been estimated.

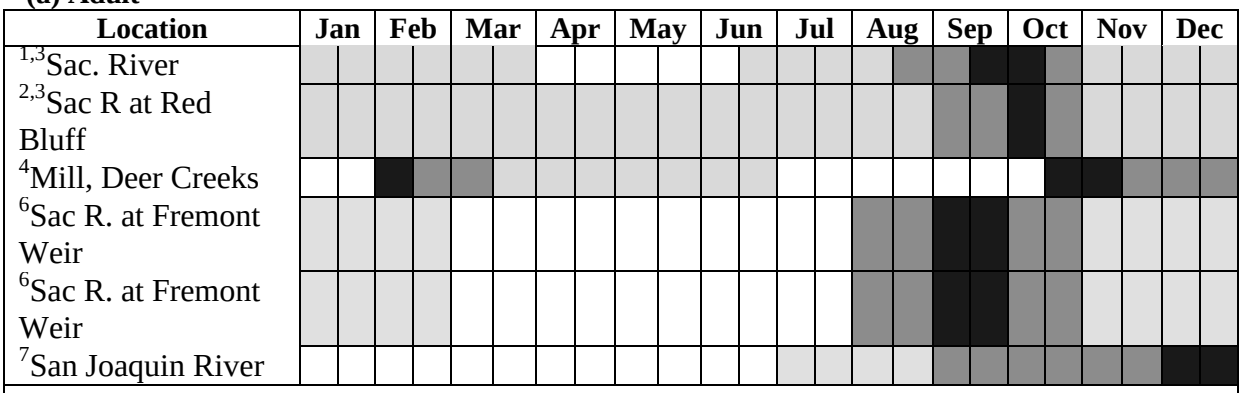
Until recently, California CV steelhead were thought to be extirpated from the San Joaquin River system. However, recent monitoring has detected small, self-sustaining populations of steelhead in the Stanislaus, Mokelumne, and Calaveras rivers, and other streams previously thought to be devoid of steelhead (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 (S.P. Cramer and Associates Inc. 2000).

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 have also occurred on the Tuolumne and Merced rivers during fall-run Chinook salmon monitoring activities, indicating that steelhead are widespread throughout accessible streams and rivers in the CV (Good *et al.* 2005). CDFG staff prepared juvenile migrant California CV steelhead catch summaries on the San Joaquin River near Mossdale, representing migrants from the Stanislaus, Tuolumne, and Merced rivers. Based on trawl recoveries at Mossdale between 1988 and 2002, as well as rotary screw trap efforts in all three tributaries, CDFG (2003) stated that it is "clear from this data that rainbow trout do occur in all the tributaries as migrants and that the vast majority of them occur on the Stanislaus River." The documented returns on the order of single fish in these tributaries suggest that existing populations of CV steelhead on the Tuolumne, Merced, and lower San Joaquin rivers are severely depressed.

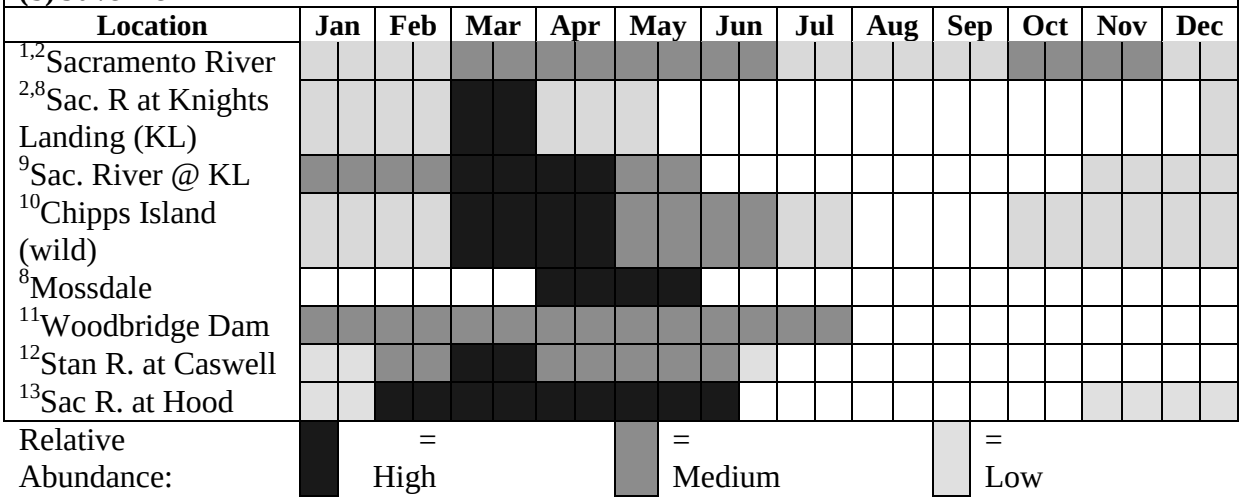
Good *et al.* (2005) indicated that population census estimates completed in the 1990s found that compared to most Chinook salmon populations in the CV California CV steelhead spawning population upstream of the RBDD had a fairly strong negative population growth rate and small population size; in addition, that this decline was continuing, as evidenced by new information (Chipps Island trawl data). California CV steelhead populations generally show a continuing decline, an overall low abundance, and fluctuating return rates. The future of California CV steelhead is uncertain due to limited data concerning their status. However, Lindley *et al.* (2007) concluded that there is sufficient evidence to suggest that the ESU is at moderate to high risk of extinction.

Table 2. The temporal occurrence of adult (a) and juvenile (b) Central Valley steelhead in the Central Valley. Darker shades indicate months of greatest relative abundance.

(a) Adult



(b) Juvenile



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

Population Dynamics. Historic California CV steelhead run sizes are 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 through the 1960s in the Sacramento River, upstream of the Feather River. 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.

Viable Salmonid Population Summary for Central Valley Steelhead. In order to determine the current likelihood of viability of the California CV steelhead DPS, we used the historical population structure of California CV steelhead presented in Lindley *et al*. (2006) and the concept of VSP for evaluating populations described by McElhany *et al.* (2000). While McElhany *et al.* (2000) introduced and described the concept of VSP, Lindley *et al*. (2007) applied the concept to the California CV steelhead DPS. The following provides the evaluation of the likelihood of viability for the threatened California CV steelhead DPS based on the VSP parameters of abundance, productivity, spatial structure, and diversity.

Abundance. All indications are that natural California CV 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 far greater than those of 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 CV 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 CV. The estimated ratio of non-clipped to clipped steelhead has decreased from 0.3 percent to less than 0.1 percent, with a net decrease to one-third of wild female spawners from 1998 to 2000 (Good *et al.* 2005).

Spatial Structure. Steelhead appear to be well-distributed where found throughout the CV (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 CV 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 California CV 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 California CV steelhead DPS.

Lindley *et al*. (2007) indicated that prior population census estimates completed in the 1990s found the California CV steelhead spawning population upstream of the RBDD had a fairly strong negative population growth rate and small population size. Good *et al.* (2005) indicated the decline was continuing as evidenced by new information (Chipps Island trawl data). California CV steelhead populations generally show a continuing decline, an overall low abundance, and fluctuating return rates. The future of California CV steelhead is uncertain due to limited data concerning their status. However, Lindley *et al.* (2007) concluded that there is sufficient evidence to suggest that the DPS is at moderate to high risk of extinction.

C. Factors Affecting the Species and Critical Habitat

Water development, water quality, over-harvesting, and disease and predation are some of the many issues affecting the decline of listed anadromous fish species in California. Hydropower, flood control, and water supply dams of the Federal CV Project (CVP), State Water Project (SWP), and other municipal and private entities have permanently blocked or hindered salmonid and green sturgeon access to historical spawning and rearing grounds. Clark (1929) estimated that originally there were 6,000 linear miles of salmon habitat in the CV system and that 80 percent of this habitat had been lost by 1928. Yoshiyama *et al.* (1996) calculated that roughly 2,000 linear miles of salmon habitat was actually available before dam construction and mining, and concluded that 82 percent is not accessible today.

As a result of migrational barriers, spring-run Chinook salmon, and steelhead populations have been confined to lower elevation mainstems that historically only were used for migration. Higher temperatures at these lower elevations during late-summer and fall are a major stressor to adult and juvenile salmonids. Thus, population abundances have declined in these streams due to decreased quantity and quality of spawning and rearing habitat. In particular, the RBDD blocked all access to the primary spawning habitat in the Sacramento River for many years under the old operational procedures, and continues to block a significant portion of the adult spawning run under current operational procedures.

The diversion and storage of natural flows by dams and diversion structures on CV waterways have depleted stream flows and altered the natural cycles by which juvenile and adult salmonids have evolved. Changes in stream flows and diversions of water affect spawning habitat, freshwater rearing habitat, freshwater migration corridors, and estuarine habitat primary constituent elements (PCEs). As much as 60 percent of the natural historical inflow to CV watersheds and the Delta have been diverted for human uses. Depleted flows have contributed to higher temperatures, lower dissolved oxygen levels, and decreased recruitment of gravel and instream woody material. More uniform flows year-round have resulted in diminished natural channel formation, altered food web processes, and slower regeneration of riparian vegetation. These stable flow patterns have reduced bedload movement, caused spawning gravels to become embedded, and decreased channel widths due to channel incision, all of which has decreased the available spawning and rearing habitat downstream of dams.

Water withdrawals for agricultural and municipal purposes have reduced river flows and increased temperatures during the critical summer months, and in some cases, have been of a sufficient magnitude to result in reverse flows in the lower San Joaquin River (Reynolds *et al.* 1993). Direct relationships exist between water temperature, water flow, and juvenile salmonid survival (Brandes and McLain 2001). High water temperatures in the Sacramento River have limited the survival of young salmonids.

The development of the water conveyance system in the Delta has resulted in the construction of more than 1,100 miles of channels and diversions to increase channel elevations and flow capacity of the channels (Mount 1995). Levee development in the CV affects spawning habitat, freshwater rearing habitat, freshwater migration corridors, and estuarine habitat PCEs. The

construction of levees disrupts the natural processes of the river, resulting in a multitude of habitat-related effects that have diminished conditions for adult and juvenile migration and survival.

Many of these levees use angular rock (riprap) to armor the bank from erosive forces. The effects of channelization and riprapping include the alteration of river hydraulics and cover along the bank as a result of changes in bank configuration and structural features (Stillwater Sciences 2006). These changes affect the quantity and quality of nearshore habitat for juvenile salmonids and have been thoroughly studied (USFWS 2000; Schmetterling *et al.* 2001; Garland *et al.* 2002). Simple slopes protected with rock revetment generally create nearshore hydraulic conditions characterized by greater depths and faster, more homogeneous water velocities than occur along natural banks. Higher water velocities typically inhibit deposition and retention of sediment and woody debris. These changes generally reduce the range of habitat conditions typically found along natural shorelines, especially by eliminating the shallow, slow-velocity river margins used by juvenile fish as refuge and escape from fast currents, deep water, and predators (Stillwater Sciences 2006).

Natural changes in the freshwater and marine environments play a major role in salmonid abundance. Recent evidence suggests that marine survival among salmonids fluctuates in response to 20- to 30-year cycles of climatic conditions and ocean productivity (Hare *et al.* 1999, Mantua and Hare 2002). This phenomenon has been referred to as the Pacific Decadal Oscillation. In addition, large-scale ocean temperature shifts, such as El Niño, appear to change ocean productivity, and can have significant effects on rainfall in the CV.

Another key factor affecting many West Coast fish stocks has been a general 30-year decline in ocean productivity. The mechanism whereby stocks are affected is not well understood, partially because the pattern of response to these changing ocean conditions has differed among stocks, presumably due to differences in their ocean timing and distribution. NMFS presumes that survival is driven largely by events occurring between ocean entry and recruitment to a subadult life stage. One indicator of early ocean survival can be computed as a ratio of coded wire tag (CWT) recoveries from subadults relative to the number of CWTs released from that brood year.

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

Finally, the unusual drought conditions in 2001 warrant additional consideration. Flows in 2001 were among the lowest flow conditions on record. The available water in the Sacramento and San Joaquin river watersheds was 70 percent and 66 percent of normal, according to the Sacramento River Index and the San Joaquin River Index, respectively. The juveniles that passed downriver during the 2001 spring and summer out migration were likely affected, and this, in turn, likely affected adult returns primarily in 2003 and 2004, depending on the stock and

species.

According to NMFS' (2005b) Critical Habitat Analytical Review Team (CHART) report, the major categories of habitat-related activities affecting CV salmonids include: (1) irrigation impoundments and withdrawals, (2) channel modifications and levee maintenance, (3) the presence and operation of hydroelectric dams, (4) flood control and streambank stabilization, and (5) exotic and invasive species introductions and management. All of these activities affect PCEs via their alteration of one or more of the following: stream hydrology, flow and water-level modification, fish passage, geomorphology and sediment transport, temperature, dissolved oxygen levels, nearshore and aquatic vegetation, soils and nutrients, physical habitat structure and complexity, forage, and predation (Spence *et al.* 1996). According to the CHART report (NMFS 2005b), the condition of critical habitat varies throughout the range of the species. Generally, the conservation value of existing spawning habitat ranges from moderate to high quality, with the primary threats including changes to water quality, and spawning gravel composition from rural, suburban, and urban development, forestry, and road construction and maintenance. Downstream, river and estuarine migration and rearing corridors range in condition from poor to high quality depending on location. Tributary migratory and rearing corridors tended to rate as moderate quality due to threats to adult and juvenile life stages from irrigation diversion, small dams, and water quality. Delta (*i.e.*, estuarine) and mainstem Sacramento and San Joaquin river reaches tended to range from poor to high quality, depending on location. In the alluvial reach of the Sacramento River between Red Bluff and Colusa, the PCEs of rearing and migration habitat are in good condition because, despite the influence of upstream dams, this reach retains natural, and functional channel processes that maintain and develop anadromous fish habitat. The river reach downstream from Colusa and including the Delta is poor in quality due to impaired hydrologic conditions from dam operations, water quality from agriculture, degraded nearshore and riparian habitat from levee construction and maintenance, and habitat loss and fragmentation.

IV. ENVIRONEMENTAL BASELINE

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

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

1. Status of the Species within the Action Area

a. *CV spring-Run Chinook salmon*

The only streams in the CV known to support consistently spawning wild populations of spring-run Chinook salmon are Mill, Deer, and Butte creeks (Moyle 2002). These streams have cool water in the higher altitudes for salmon to hold over through the summer. Adults typically enter freshwater from April through June when flows are high enough for them to reach high elevation

spawning and rearing habitat (NMFS 1998a). In the CV, summer water temperatures are suitable for spring-run Chinook salmon holding habitat only above 500 – 1,640 foot elevations (Good *et al.* 2005). After reaching higher elevations, they hold over for the summer in deep, cool pools (Lindley *et al.* 2004). Spawning occurs in the fall between late August and early October (NMFS 1998a). Fry emergence of spring-run occurs from March through June, and then juveniles emigrate to the ocean after three to fifteen months in freshwater (Yoshiyama *et al.* 1998).

Mill Creek supports self-sustaining populations of spring-run Chinook salmon and steelhead (Table 3). Historically and today, 44 miles of the creek are accessible to these species (NMFS 2000).

Table 3. Salmonid Presence at the Mill Creek Bridge Project Area.[1]

Species/Run	Adult Migration	Downstream Migration	Spawning	Rearing	Critical Habitat
Spring-run Chinook	Yes	Yes	Yes	Yes	Yes
Steelhead	Yes	Yes	Yes	Yes	Yes

[1] based on information from CDFG and NMFS.

The upper limit of the spring-run Chinook salmon migration on Mill Creek is Morgan Hot Springs, approximately two miles upstream of SR 36 (Yoshiyama 1996). Spawning and rearing occurs primarily from two miles upstream of SR 36 to 24 miles downstream (NMFS 2000). Spring-run Chinook salmon have been observed spawning at an elevation of 5,300 feet in Mill Creek, the highest known spawning activity in California (CDFG 1996). Four per cent of spring-run Chinook salmon spawn from SR 36 to the end of their habitat and redds occur in the bridge vicinity (Harvey-Arrison 2009). Spring-run Chinook salmon access is mainly affected by low flows due to diversions, but a new Water Exchange Agreement enhancing water flows in lower Mill Creek has improved access (DWR 2005). The average spring-run Chinook salmon Annual adult escapement in Mill Creek from 1960 to 2003 was 882 fish. The 2003 Annual adult escapement was estimated at 1,426 fish (GrandTab CDFG, Red Bluff Office, contact Colleen Harvey-Arrison, 2004).

b. *California CV steelhead*

Much of the information on historical abundance and stock characteristics that exists for California CV steelhead is derived from an intensive CDFG research program conducted in the 1950s (McEwan 2001). Steelhead populations in Mill Creek are very low (Johnson *et al.* 2009). According to records of cumulative totals of steelhead counted during the 1954-1963 time period, adult steelhead spawners migrated into Mill Creek during all months from September through June although slightly more than 90 percent of the cumulative total migrated between the second week in October and mid-March. Two peak periods of migration occurred: (1) between the last week in October through the second week in November (accounting for 28 percent of the run) and (2) approximately the first half of February (accounting for 11 percent of the run). The average annual run size during the 10 year period was 1,160 adults (McEwan 2001).

2. Status of Critical Habitat within the Action Area

The upper limit of critical habitat for spring-run Chinook in Mill Creek is approximately two miles upstream of the SR 36 crossing. The upper limit of critical habitat for steelhead is approximately one mile upstream of the SR 36 crossing.

NMFS has developed a list of six PCEs based on the life history of salmon and steelhead that are essential to the conservation of these ESUs (NMFS 2005a). Three of these elements pertain to the freshwater portion of salmonids life history:

(1) Freshwater spawning sites with water quantity and quality conditions and substrate supporting spawning, incubation and larval development.
(2) Freshwater rearing sites with: a) water quantity and floodplain connectivity to form and maintain physical habitat conditions and support juvenile growth and mobility; b) water quality and forage supporting juvenile development; and c) natural cover such as shade, submerged and overhanging large wood, log jams and beaver dams, aquatic vegetation, large rocks and boulders, side channels, and undercut banks.
(3) Freshwater migration corridors free of obstruction and excessive predation with water quantity and quality conditions and natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, side channels, and undercut banks supporting juvenile and adult mobility and survival.

All three critical habitats freshwater PCEs exist at the project site at Mill Creek:

(1) Spawning sites. Redds occur in the bridge vicinity (Harvey-Arrison 2009).
(2) Rearing sites. There is adequate water quantity all year, food, and cover for rearing juveniles. Mill Creek is used by both spring-run Chinook and steelhead for rearing.

(3) Migration corridors. There are no barriers to fish passage and adequate water quality, quantity, and natural cover are present for migration. Adult spring-run Chinook and steelhead migrate through the project area to spawn. Juvenile spring-run Chinook and steelhead migrate through the area when returning to the ocean.

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

Natural flows at Mill Creek are altered by diverting water at three dams: Ward Dam, Upper Diversion Dam, and Clough Dam. These dams have historically diverted most of the natural stream flow from Mill Creek, particularly during dry years. These dams are located downstream of the project area and therefore only impact migration to the project site and not flows at the project site. The pattern of discharge in Mill Creek has created migration issues for listed salmonids. Late spring and early summer diversions resulted in in-stream flows low enough to block access for late-migrating adults. Low flows may also prevent downstream migrating smolts from reaching the Sacramento (CDFG, 1996). Data shows that increases in discharge coincide with increases in daily passage of fish (Johnson *et al.* 2009). In addition, recent evaluations of Sacramento Valley anadromous fishery resources (USFWS 1995; CDFG

1996) have consistently identified limited flows in the reaches of Mill Creek as one factor limiting anadromous fish production in the watersheds. Other factors affecting Mill Creek include land use activities such as agricultural practices, grazing, and forestry.

Very little is known about the application of herbicides in the watersheds. They have been used on Forest Service lands, and more extensively on lands managed by Sierra Pacific Industries over the past few decades. On Lassen National Forest lands, herbicide use is considered for use in plantations to increase survival or growth of seedlings. Plantations resulted from regeneration harvesting prescribed in the 1970's and 1980's and from wildfires with stand replacing intensity. As the regional population grows, there will be increased demand for conversion of agricultural lands to residential development in the lower watersheds. The impact of conversion of lands below the canyon mouths from agricultural to residential uses on the fisheries of the creeks is uncertain.

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 Mill Creek Bridge project on California CV steelhead and spring-run Chinook salmon and their designated critical habitat. The proposed project is likely to adversely affect listed species and critical habitat by diverting water in Mill Creek and by loss of riparian vegetation. In the *Description of the Proposed Action* section of this biological opinion, NMFS provided an overview of the action. In the *Status of the Species* and *Environmental Baseline* sections of this Opinion, NMFS provided an overview of the threatened and endangered species and critical habitat that are likely to be adversely affected by the activity under consultation.

Regulations that implement section 7(b)(2) of the ESA require NMFS to evaluate the direct and indirect effects of Federal actions and actions that are interrelated with or interdependent to the Federal action to determine if it would be reasonable to expect them to appreciably reduce listed species' likelihood of both surviving and recovering in the wild by reducing their reproduction, numbers, or distribution (16 U.S.C. §1536; 50 CFR 402.02). Section 7 of the ESA also requires NMFS to determine if Federal actions would appreciably diminish the value of critical habitat for the conservation of listed species (16 U.S.C. §1536). This biological opinion does not rely on the regulatory definition of "destruction or adverse modification" of critical habitat at 50 CFR 402.02. Instead, we have relied upon the statutory provisions of the ESA to complete the following analysis with respect to critical habitat.

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 (these effects include direct impacts to a species habitat; 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' likelihood and extent of exposure to any adverse effects caused by the action (*i.e.* the extent of spatial and temporal overlap between the species and the effects of the action). Once NMFS has identified the level of exposure that a species will have to the effects of the action, the available evidence is evaluated to identify the species' probable response, including physical and 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, previous biological opinions, documents evaluating the effects of underwater noise from pile driving, 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.

The potential adverse effects to listed species resulting from the proposed construction of the Mill Creek Bridge project and the implementation of the minimization measures are primarily associated with dewatering and placement of the rock slope protection. However, other potential impacts to California CV steelhead, spring-run Chinook salmon, and designated critical habitat include turbidity resulting from ground disturbance for areas associated with bridge construction and mitigation.

The information used in this assessment includes *Status of the Species* and *Environmental Baseline* sections of this biological opinion, studies and accounts of the impacts of construction activities on anadromous fish.

B. Effects Analysis

The proposed project includes actions that may adversely affect several life stages of listed fish species. Adverse effects to these species and their habitat may result from changes in water quality from construction activities and loss of riparian vegetation from construction activities. The project includes integrated design features to avoid and minimize these potential impacts.

Adult and juvenile CV spring-run Chinook salmon and California CV steelhead use the action area primarily as a migration corridor (see the *Status of the Listed Species and Critical Habitat* and *Environmental Baseline* sections). In-channel construction activities will occur from July 1 through August 31. The effects of construction activities as well as the exposure of each listed salmon and steelhead based on life stage to each activity is described further below.

1. Dewatering Activities and Fish Salvage

Approximately 0.46 acres of stream habitat will be dewatered. Dewatering is likely to strand and isolate juvenile fish. Implementation of a fish salvage operation within the closed cofferdams will reduce potential mortality associated with entrapment and subsequent dewatering of the dammed area. Any fish salvaged from the coffer dammed area will be relocated to the main stream channel.

Fish salvage operations will take place early in the day, prior to thermal warming. A qualified fisheries biologist will use seining and electrofishing methods to conduct the fish salvage. Fish caught in the seine will be immediately transferred to buckets containing oxygenated stream water and material such as twigs or leafy branches to provide cover. The buckets will also be shaded and will not be allowed in the sun. Captured fish from each seine haul will be released prior to another pass. If all fish cannot be captured using a seine then electrofishing will be used to capture the remaining individuals. Electrofishing efforts will begin with voltage, pulse width, and pulse rate set at minimum values needed to capture fish. Settings will be increased only to immobilize fish for capture. Fish immediately captured and netted will be placed in the same buckets used for seining. All captured fish will be released at least 100 feet downstream of the project.

There is potential for listed juvenile fish to be directly killed or injured as a result of the fish salvage. A low mortality rate (expected to be less than 10 percent if consistent with the results of fish handling in similar fish salvage efforts) is expected from capturing and handling. Fish that are captured and released may temporarily become startled or stressed.

2. Impacts to Critical Habitat

RSP and Removal of Riparian Vegetation on Critical Habitat

Approximately 0.01 acres of salmonid habitat will be permanently impacted by placement of the RSP. Additional areas will be temporarily impacted by placement of temporary bridge abutments and K-rail to direct water into the diversion channel. The width and depth of the

stream channel will be altered by construction. Placement of RSP will narrow the channel by about five feet at the abutment and center pier. This is not expected to significantly affect depth or velocity of the creek.

Approximately 0.16 acres of montane riparian scrub and 0.36 acres of black cottonwood riparian forest will be temporarily impacted by construction. Riparian areas perform many beneficial functions for fish including providing shade to prevent elevated stream temperatures, contributing to the food supply, providing cover from predators and high flows, contributing large woody debris to the creek, and reducing sediment by reducing stream bank erosion. None of the vegetation to be temporarily impacted hangs over the creek to provide shade, but it does contribute food and stabilizes the stream bank. All disturbed riparian areas will have the vegetation cut at ground level to encourage re-sprouting. Impacted riparian areas that are outside of the active floodplain will be re-planted with riparian species.

3. Effects on Designated Critical Habitat Primary Constituent Elements (PCEs)

The basic premise to the conservation value of an overall critical habitat designation is the sum of the values of the components that comprise the habitat. For example, the conservation value of listed salmonid critical habitat is determined by the conservation value of the watersheds that make up the designated area. In turn, the conservation value of the components is the sum of the value of the PCEs that make up the area. PCEs are specific areas or functions, such as spawning or rearing habitat, that support different life history stages or requirements of the species. The conservation value of the PCE is the sum of the quantity, quality, and availability of the essential features of that PCE. Essential features are the specific processes, variables or elements that comprise a PCE. Thus, an example of a PCE will be spawning habitat and the essential features of that PCE are conditions such as clean spawning gravels, appropriate timing and duration of certain water temperatures, and water quality free of pollutants.

Therefore, reductions in the quantity, quality, or availability of one or more essential feature reduce the value of the PCE, which in turn reduces the function of the sub-area (*e.g.*, watersheds), which in turn reduces the function of the overall designation. In the strictest interpretation, reductions to any one essential feature or PCE will equate to a reduction in the value of the whole. However there are other considerations. We look to various factors to determine if the reduction in the value of an essential feature or PCE will affect higher levels of organization. For example:

- The timing, duration and magnitude of the reduction
- The permanent or temporary nature of the reduction
- Whether the essential feature or PCE is limiting (in the action area or across the designation) to the recovery of the species or supports a critical life stage in the recovery needs of the species (for example, juvenile survival is a limiting factor in recovery of the species and the habitat element supports juvenile survival).

In our assessment, we combine information about the contribution of constituent elements of critical habitat (or of the physical, chemical, or biotic phenomena that give the designated area value for the conservation of listed species) to the conservation value of those areas of critical

habitat that occur in the action area, given the physical, chemical, biotic, and ecological processes that produce and maintain those constituent elements in the action area. We use the conservation value of those areas of designated critical habitat that occur in the action area as our point of reference for this comparison. For example, if the critical habitat in the action area has limited current value or potential value for the conservation of listed species that limited value is our point of reference for our assessment of the consequences of the added effects of the proposed action on that conservation value.

a. Freshwater Migratory Corridor

Safe and unobstructed migratory pathways are necessary for adult salmonids to migrate to and from spawning habitats, and for larval and juveniles to migrate downstream from spawning and rearing habitats within freshwater rivers to rearing habitats within the estuaries.

The scour and rehabilitation to Mill Creek Bridge will not obstruct the migratory pathway for exposed fish. In addition, the water diversion channel will be temporary and will be designed to still allow fish passage during construction. Fish that use the action area as a migratory corridor will be able to continue using the channel during and after construction of the proposed action.

b. Freshwater Rearing Habitat

The project area of Mill Creek is composed of montane riparian scrub, montane black cottonwood riparian forest, wet montane meadow, and dry montane meadow. The riparian community occurs in a narrow strip along the stream and consists of black cottonwood (*Populus balsamifera* ssp. *trichocarpa*), white alder (*Alnus rhombifolia*) and willows (*Salix lucida* ssp. *lasiandra* and *Salix lucida* ssp. *landra*).

Freshwater riparian habitats support juvenile growth and mobility. In addition, riparian vegetation supports food communities for juveniles. Freshwater riparian habitat provide natural cover, such as shade, submerged and overhanging large wood, and aquatic vegetation to support refuge for juveniles from predators. Rearing habitat condition is strongly affected by habitat complexity, food supply, and presence of predators of juvenile salmonids. Freshwater rearing habitats have a high intrinsic value to salmonids, as the juvenile life stages are dependent on the function of this habitat for successful survival and recruitment.

Approximately 0.52 acres of riparian vegetation will be temporarily impacted by construction. The vegetation that will be temporarily impacted does not hang over the creek to provide shade; however, it does contribute to the food supply and stabilizes the stream bank. All disturbed riparian areas will have the vegetation cut at ground level to encourage re-sprouting. Impacted riparian areas that are outside of the active floodplain will be re-planted with riparian species. Removal of the existing vegetation will not exceed the minimum necessary to complete operations.

The remaining cobbles from the temporary abutments of the proposed Mill Creek Bridge project will be spread through the streambed. In addition, large woody debris that had been temporarily

stockpiled will be placed downstream of the highway bridge on dry gravel bars within the stream channel to enhance rearing habitat.

c. Summary of PCEs in the Action Area

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. Impacts to existing vegetation shall be avoided to the extent practicable. Up to 0.52 acres of riparian vegetation will be removed as a result of construction activities. 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 will be restored to their preconstruction conditions and any impacted riparian vegetation will be replaced with the planting of an appropriate assemblage of native riparian vegetation. 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.

In addition, the armoring and revetment of stream banks (in the form of RSP) tends to narrow rivers, creeks, and other similar waterways, reducing the amount of habitat per unit channel length (Sweeney *et al*. 2004). As a result of creek narrowing, benthic habitat decreases and the number of benthic aquatic macroinvertebrates per unit channel length decreases affecting salmonid food supply.

VI. CUMULATIVE EFFECTS

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

Cumulative impacts can result from individually minor, but collectively substantial impacts taking place over a period of time. Cumulative impacts to resources in the project area may result from residential, commercial, industrial, and highway development, as well as agricultural development and the conversion to more intensive types of agricultural cultivation. These land use activities can degrade habitat species diversity through consequences such as displacement and fragmentation of habitats and populations, alteration of hydrology, contamination, erosion, sedimentation, disruption of migration corridors, changes in water quality, and introduction or promotion of predators.

There are no specific plans for development within the action area of the proposed project. Therefore, further cumulative effects beyond those described above are not expected.

VII. INTEGRATION AND SYNTHESIS

This section integrates and adds the current conditions described in the status of the species and the environmental baseline for the action area with the effects of the proposed action and the cumulative effects of future actions. The purpose of this synthesis is to review the effects of the action in addition to the environmental baseline to understand how the action will affect the likelihood of the species' continued survival.

A. Summary of Status of the Species and Environmental Baseline

1. CV spring-run Chinook salmon

Historically, the majority of spring-run Chinook in the CV were produced in the Southern Sierra Nevada Diversity Group, which contains the San Joaquin River and its tributaries. All spring-run Chinook salmon populations in this diversity group have been extirpated (Lindley *et al*. 2007).

Lindley *et al*. (2007) determined that perhaps 15 of the 19 historical populations of spring-run Chinook salmon are extinct, with their entire historical spawning habitats behind various impassable dams. Those authors only considered Butte, Deer, and Mill creeks as watersheds with persistent populations of Chinook salmon known as spring-run, although they recognized that phenotypic spring-run Chinook salmon persist within the Feather River Hatchery population spawning in the Feather River downstream of Oroville Dam and in the Yuba River downstream of Englebright Dam. All of those population fall within the Northern Sierra Nevada diversity group. Butte and Deer creek spring-run Chinook salmon populations are at low risk of extinction, and the Mill Creek population is at either a moderate or low risk (Lindley *et al*. 2007). Viable CV spring-run Chinook salmon populations occur in only one of four diversity groups that historically contained them, and therefore fail the representation and redundancy rule for ESU viability (Lindley *et al.* 2007) Because the CV spring-run Chinook salmon ESU is spatially confined to relatively few remaining streams they continue to display broad fluctuations in abundance, and a large proportion of the population (*i.e.*, in Butte Creek) faces the risk of high mortality rates, the ESU remains at a moderate to high risk of extinction.

Past and present impacts within the Sacramento River basin have caused significant loss of habitat. Populations have declined drastically over the last century, and some subpopulations have been extirpated. The construction of dams has limited access to a large and significant portion of historical spawning and rearing. Dam operations have changed downstream flow patterns, effecting stream dynamics (*i.e.* geomorphology, habitat configuration, *etc*.), and affected available habitat through changes in water temperature characteristics, limiting gravel recruitment to available spawning reaches and limiting the introduction of large woody material which contributes to habitat diversity.

The value of the Mill Creek basin as a migratory corridor, and the presence of spawning and rearing habitat make it an important node of habitat for the survival and recovery of the species.

2. California CV steelhead

California CV steelhead historically were well-distributed throughout the Sacramento and San Joaquin rivers (Busby *et al.* 1996) and were found from the upper Sacramento and Pit river systems (now inaccessable due to Shasta and Keswick Dams) south to the Kings and possibly the Kern River systems, and in both east- and west-side Sacramento River tributaries (Yoshiyama *et al.* 1996). Lindley *et al*. (2006) estimated that historically there were at least 81 indpendant California CV steelhead populations distributed primarily throughout the eastern tributaries of

the Sacramento and San Joaquin rivers. This distribution has been greatly affected by dams (McEwan and Jackson 1996). Presently, impassable dams block access to 80 percent of historically available habitat, and block access to all historical spawning habitat for about 38 percent of historical populations (Lindley *et al*. 2006).

Existing wild steelhead stocks in the CV 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 (March to November 2008) indicate that steelhead are present in Clear Creek (Newton 2002). Because of the large resident *O. mykiss* population in Clear Creek, steelhead spawner abundance has not been estimated.

Spatial structure for steelhead is fragmented and reduced by elimination or significant reduction of the major core populations (*i.e*. Sacramento River, Feather River, American River) that provided a source for the numerous smaller tributary and intermittent stream populations like Dry Creek, Auburn Ravine, Yuba River, Deer Creek, Mill Creek, and Antelope Creek. Tributary populations can likely never achieve the size and variability of the core populations in the long-term, generally due to the size and available resources of the tributaries.

Lindley *et al*. (2007) indicated that prior population census estimates completed in the 1990s found the CV steelhead spawning population upstream of the RBDD had a fairly strong negative population growth rate and small population size. Good *et al.* (2005) indicated the decline was continuing as evidenced by new information (Chipps Island trawl data). California CV steelhead populations generally show a continuing decline, an overall low abundance, and fluctuating return rates. The future of California CV steelhead is uncertain due to limited data concerning their status. However, Lindley *et al.* (2007) concluded that there is sufficient evidence to suggest that the DPS is at moderate to high risk of extinction.

The value of the Mill Creek basin as a migratory corridor, and the presence of spawning and rearing habitat make it an important node of habitat for the survival and recovery of the species.

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

Under the proposed Mill Creek Bridge project, adverse impacts to listed species stemming from dewatering activities 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. These impacts are primarily low-level, short-term alterations of habitat conditions.

The project impacts will result in the exposure of a small percentage of juvenile California CV steelhead and CV spring-run Chinook salmon to construction activities. These adverse effects will affect a very small proportion of the standing population and will not appreciably reduce the likelihood of survival and recovery of the California CV steelhead and CV spring-run Chinook salmon. Given the low level of exposure expected to result from adherence to the limited seasonal and diurnal in-water work windows, the limited adverse response expected from the few

individuals of the Mill Creek population that are exposed to these adverse effects, and the relatively small contribution to juvenile production that the Mill Creek population provides to the overall population numbers for the California CV steelhead DPS and CV spring-run Chinook salmon ESU, it is expected that the effects of the proposed project, when considered in the context of the current baseline and likely future cumulative effects, will not appreciably reduce the likelihood of survival and recovery of the California CV steelhead DPS and CV spring-run Chinook salmon throughout their ranges.

C. Summary of Effects of the Proposed Action on Critical Habitat

The effects of the proposed Mill Creek Bridge project is expected to have minimal adverse effects upon the functionality and conservation value of the freshwater rearing and migratory corridors designated as critical habitat in Mill Creek. Impacts to the designated critical habitat within the action area that are related to the construction actions are temporary, lasting only as long as the bridge construction activities. The construction actions should never impede or prevent salmonid migration in the channel of Mill Creek due to numerous factors, including: timing of work and protective measures implemented to minimize impacts to the creek during construction (*i.e.*, BMPs and SWPPP). Temporary loss of foraging and rearing habitat is minimal, given the small footprint of the pile driving compared to the available habitat and replacement of riparian vegetation at onsite and offsite locations.

NMFS expects that nearly all of the adverse effects to critical habitat from this proposed 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 the California CV steelhead and CV spring-run Chinook salmon and their designated critical habitat, the environmental baseline for the action area, the effects of the proposed Mill Creek Bridge project, and the cumulative effects, it is NMFS' biological opinion that the action, as proposed, is not likely to jeopardize the continued existence of the California CV steelhead or CV spring-run Chinook salmon, and is not likely to destroy or adversely modify 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 measures described below are non-discretionary, and must be undertaken by Caltrans, 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 any contractors to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to any contract, permit or grant documents, 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 incidental take statement [50 CFR §402.14(i)(3)].

A. Amount or Extent of Take

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

1. Take in the form of mortality of stranded juvenile California CV steelhead and CV spring-run Chinook salmon during the dewatering activities from July 1 to August 31. Take will be a small percentage of the relocated (salvaged) California CV steelhead and CV spring-run Chinook salmon juveniles. There is potential for listed juvenile fish to be directly killed or injured as a result of the fish salvage. A low mortality rate (expected to be less than 10 percent if consistent with the results of fish handling in similar fish salvage efforts) is expected from capturing and handling. Fish that are captured and released may temporarily become startled or stressed. Fish salvage operations should minimize the number of juveniles lost, but it is anticipated that some mortality may occur.

2. The analysis of the effects of the proposed project anticipates that take in the form of injury and death from predation will result from construction-related turbidity that will extend into areas along the length of Mill Creek. Specifically the shoreline that is a part of the proposed project action area and downstream until any increase in turbidity is unnoticed compared to baseline levels. The analysis of the effects of the proposed project anticipates that the turbidity levels produced will not exceed those permitted under the project SWPPP and that if turbidity levels approach or exceed the acceptable

criteria established by the CVWQCB, construction activities will be halted until turbidity levels return to within acceptable levels. Refer to the **Proposed Conservation Measures** section and Conservation Measure number 13 for specific NTU requirements.

B. Effect of 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 California CV steelhead or the CV spring-run Chinook salmon, and is not likely to destroy or adversely modify designated critical habitat for California CV steelhead or CV spring-run Chinook salmon.

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 California CV steelhead and CV spring-run Chinook salmon from the Mill Creek Bridge scour repair and deck rehabilitation project. These reasonable and prudent measures also will minimize adverse effects on designated critical habitat.

(1) Measures shall be taken to minimize incidental take of California CV steelhead and CV spring-run Chinook salmon during closure of cofferdams.

(2) Measures shall be taken to minimize incidental take of listed anadromous fish by restricting the in-water work to avoid vulnerable life stages.

(3) Measures shall be taken to minimize the effect of temporary habitat loss of riverine and riparian habitat.

(4) Caltrans shall report any incidence of take to NMFS.

(5) Measures shall be taken to validate that erosion, sediment, and turbidity controls and contingency measures are effective.

(6) Measures shall be taken to enhance salmonid juvenile rearing habitat in the proposed action area.

D. Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the ESA, Caltrans must comply with the following terms and conditions, which implement the RPMs described above and outline required reporting and monitoring requirements. These terms and conditions are non-discretionary:

(1) Measures shall be taken to minimize incidental take of California CV steelhead and CV spring-run Chinook salmon during closure of cofferdams.

Conditions: Fish salvage operations will take place early in the day, prior to thermal warming. A qualified fisheries biologist will use seining and electrofishing methods to conduct the fish salvage. Fish caught in the seine will be immediately transferred to buckets containing oxygenated stream water and material such as twigs or leafy branches to provide cover. The buckets will also be shaded and will not be allowed in the sun. Captured fish from each seine haul will be released prior to another pass. If all fish cannot be captured using a seine then electrofishing will be used to capture the remaining individuals. Electrofishing efforts will begin with voltage, pulse width, and pulse rate set at minimum values needed to capture fish. Settings will be increased only to immobilize fish for capture. Fish immediately captured and netted will be placed in the same buckets used for seining. All captured fish will be released at least 100 feet downstream of the project. Caltrans will include a report of the number of fish relocated throughout the duration of the project and submit it per the guidelines in Term and Condition (6) below.

(2) Measures shall be taken to minimize incidental take of listed anadromous fish by restricting the in-water work to avoid vulnerable life stages.

Conditions: Any construction work occurring in the channel will occur between July 1 and August 31. However, if the channel is dry prior to July 1, work can commence in the dry areas.

(3) Measures shall be taken to minimize the effect of temporary habitat loss of riverine and riparian habitat.

Conditions: To the extent possible, Caltrans will avoid disturbance to any riparian vegetation. However, any disturbed vegetation will be planted back with native riparian species, specifically willows and white alder. Any replanting will occur at a 3:1 ratio for all the trees lost or injured. All replantings shall be noted in the monitoring report that will be submitted to NMFS on December 31 of each construction season. Caltrans shall maintain all riparian plantings for five years, and provide replacement plantings as necessary to insure full and rapid recovery of disturbed riparian habitat features.

(4) Caltrans shall report any incidence of take to NMFS.

Conditions: Be reminded take includes all relocated fish. If a listed species is observed injured or killed by project activities, Caltrans shall contact NMFS within 48 hours at 650 Capitol Mall, Suite 5-100, Sacramento, CA, 95814, and via phone at (916) 930-3600. Submit a report to NMFS at the end of each month during every construction season detailing non-lethal and lethal forms of take (i.e. fish capture or mortality). 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.

(5) Measures shall be taken to validate turbidity controls and contingency measures are effective.

Conditions: Caltrans shall obtain all appropriate permits through the CVWQCB and have on file an SWPPP. Caltrans shall follow the turbidity protocols described in the Proposed Conservation Measures of this biological opinion. Specifically conservation measure number 13.

(6) Measures shall be taken to enhance salmonid juvenile rearing habitat in the proposed action area.

Conditions: Habitat enhancement structures will be placed in Mill Creek to improve rearing habitat for juvenile salmonids. Locations for individual structures will be identified by CDFG and NMFS and the structures will be designed by Caltrans and approved by CDFG and NMFS. Habitat enhancements may include, but are not limited to, bank stabilization, addition of large woody debris, or placement of boulder clusters. All work will be within the in-stream construction window of July 1 to August 31.

Additionally, Caltrans shall maintain, monitor, and adaptively manage all conservation measures throughout the life of the project to ensure their effectiveness. For example, assurances shall be taken to ensure the success of revegetation efforts. Caltrans, for the purposes of agency review and approval, shall provide the finalized project plans to NMFS at least 14 days prior to implementation, which will include the following:

(1) Confirmation of in-water work window from July 1 to August 31;
(2) Use details for any chemically-treated substances that will be used during the instream construction window; and
(3) Compliance to SWPPP and other CVWQCB requirements.

Measures shall be taken to ensure the continued participation of Caltrans and its contractors for the duration of the proposed project.

Annual updates and reports required by these terms and conditions shall be submitted by December 31 of each year during the construction period to:

Supervisor
Central ValleyOffice
National Marine Fisheries Service
650 Capitol Mall, Suite 5-100
Sacramento CA 95814-4607
FAX: (916) 930-3629
Phone: (916) 930-3600

X. CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to

minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

1. For five years, Caltrans shall provide irrigation and fertilization as necessary to insure full and rapid recovery of disturbed riparian habitat features.

2. NMFS recommends that Caltrans incorporate concepts of bio-engineering into the RSP such as adding soil and planting willows in the RSP.

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

XI. REINITIATION NOTICE

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

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

EFH is defined as those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity. For the purpose 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 action area of Mill Creek Bridge Scour Repair and Deck Rehabilitation on State Route 36 in Tehama County, California, is within the area identified as EFH for Pacific Coast Salmon species identified in Amendment 14 of the Pacific Salmon FMP [Pacific Fishery Management Council (PFMC) 1999].

PFMC (1999) has identified and described EFH, and has identified adverse impacts and recommended conservation measures for salmon in amendment 14 to the Pacific Coast Salmon FMP. Freshwater EFH for Pacific salmon in the California Central Valley (CV) includes waters currently or historically accessible to salmon within the CV ecosystem as described in Myers *et al.* (1998). Sacramento River winter-run Chinook salmon (*Oncorhynchus tshawytscha*), CV spring-run Chinook salmon (*O. tshawytscha*), and CV fall-/late fall-run Chinook salmon (*O. tshawytscha*) are species managed under the Pacific Coast Salmon FMP that occur in the CV.

The enclosed biological opinion (Enclosure 1) thoroughly addresses the species of Chinook salmon listed both under the Endangered Species Act (ESA) and the MSA which potentially will be affected by the proposed action. This includes the CV spring-run Chinook salmon. Therefore, this EFH consultation will concentrate primarily on the CV fall/late fall-run Chinook salmon which is covered under the MSA, although not listed under the ESA.

Historically, CV fall-run Chinook salmon generally spawned in the CV and lower foothill reaches up to an elevation of approximately 1,000 feet. Much of the historical fall-run spawning habitat was located downstream of existing dam sites and the run therefore was not as severely affected by water projects as other runs in the CV.

Although fall-run Chinook salmon abundance is relatively high, several factors continue to affect their habitat conditions in Mill Creek, including loss of fish to unscreened agricultural diversions and other agricultural practices, grazing, predation by non-native fish species, lack of rearing habitat, regulated river flows, and high water temperatures.

A. Life History and Habitat Requirements

General life history information for CV fall-/late fall-run Chinook salmon is summarized below. Further detailed information on Chinook salmon evolutionarily significant units (ESU) 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 (March 9, 1998, 63 FR 11482).

Central Valley fall-/late fall-run

Adult CV fall-run Chinook salmon enter the Sacramento River and San Joaquin River from July through December and spawn from October through December, while adult CV 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 (USFWS) 1998].

Chinook salmon will spawn in water that ranges from a few centimeters to several meters deep provided that there is suitable sub-gravel flow (Healey 1991). Spawning typically occurs in gravel beds that are located in marginally swift riffles, runs and pool tails with water depths exceeding one foot and velocities ranging from one to 3.5 feet per second. Preferred spawning substrate is clean loose gravel ranging from one to four inches in diameter with less that 5 percent fines (Reiser and Bjornn 1979).

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.

II. PROPOSED ACTION

Caltrans proposes to correct scour and rehabilitate the bridge deck at the Mill Creek Bridge on State Route 36 in Tehama County, California, at Post Mile 91.46. The existing Mill Creek Bridge deck is a two-span, reinforced concrete girder structure with reinforced concrete abutments and a reinforced concrete pier wall, all on spread footings. The existing bridge deck is reinforced Portland cement concrete with an asphalt concrete surface measuring 70 feet long and 34 feet wide and exhibits signs of deterioration due to wear and weathering. The proposed

action is described in detail in the *Description of the Proposed Action* section of the preceding biological opinion (Enclosure 1).

III. EFFECTS OF THE PROPOSED ACTION

The effects of the proposed action on Pacific Coast salmon EFH would be similar to those discussed in the *Effects of the Proposed Action* section of the preceding biological opinion (Enclosure 1) for threatened CV spring-run Chinook salmon and threatened CV steelhead. A summary of the effects of the proposed action on CV fall-/late fall-run Chinook salmon and effects on Chinook salmon habitat are discussed below.

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.

Fuel spills or use of toxic compounds during project construction could release toxic contaminants into Mill Creek. Adherence to best management practices that dictate the use, containment, and cleanup of contaminants will minimize the risk of introducing such products to the waterway because the prevention and contingency measures will require frequent equipment checks to prevent leaks, will keep stockpiled materials away from the water, and will require that absorbent booms are kept on-site to prevent petroleum products from entering Mill Creek in the event of a spill or leak.

EFH will be adversely affected by the disturbance of up to 0.52 acres of riparian vegetation as a result of construction activities. The majority of these impacts are expected to be temporary, as all disturbed areas outside the actual footprint of the new bridge will be restored to preconstruction conditions and any areas of disturbed vegetation will be replanted with native riparian vegetation. Additionally, all disturbed riparian areas will have the vegetation cut at ground level to encourage re-sprouting.

These effects to EFH may result in a temporary redistribution of some individuals, primarily migrating 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.

As discussed above, EFH protections apply to all ESUs of Pacific Chinook salmon, so the adverse operation effects that will impact the habitat occupied by spring-run Chinook salmon are also considered adverse effects on EFH. Those effects are thoroughly detailed in the biological opinion for the Mill Creek Bridge Scour Repair and Deck Rehabilitation Project (Enclosure 1).

The loss of riparian vegetation is an indirect effect of creating and maintaining access points to the creek. Riparian vegetation provides cover for aquatic habitat (shade) and a source of terrestrial macroinvertebrates (i.e. grasshoppers and ants) for juvenile salmonids. The loss of riparian vegetation can therefore increase predation rates and reduce feeding rates for juveniles.

Overall, the amount of riparian vegetation that would be lost is small. Therefore, 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.

IV. CONCLUSION

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

However, the proposed action includes adequate measures (described in the preceding biological opinion and the EFH conservation recommendations below) to avoid, minimize, or otherwise offset the adverse effects to EFH).

V. EFH CONSERVATION RECOMMENDATIONS

As the habitat requirements of CV fall-run Chinook salmon within the action area are similar to those of the federally listed species addressed in the enclosed biological opinion (Enclosure 1), NMFS recommends that all Terms and Conditions as well as all the Conservation Recommendations in the incidental take statement prepared for CV steelhead and CV spring-run Chinook salmon 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. ACTION AGENCY STATUTORY REQUIREMENTS

Section 305(b)(4)(B) of the MSA and Federal regulations (50 CFR § 600.920) to implement the EFH provisions of the MSA require Federal action agencies to provide a detailed written response to NMFS, within 30 days of its receipt, responding to the EFH conservation recommendations. The response must include a description of measures adopted by the Agency for avoiding, mitigating, or offsetting the impact of the project on Pacific salmon EFH. In the case of a response that is inconsistent with NMFS' recommendations, the Agency must explain their 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, mitigate, or offset such effects (50 CFR 600.920(k)).

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