UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
West Coast Region
650 Capitol Mall, Suite 5-100
Sacramento, California 95814-4700

APR 28 2016

Refer to NMFS No: WCR-2016-4492

James Smith
Project Lead
U.S. Fish and Wildlife Service
10950 Tyler Road
Red Bluff, California 96080

Re: Programmatic Endangered Species Act Section 7(a)(2) Biological Opinion, and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Response, for Fish Passage Improvement Projects on Mill and Deer creeks to improve upstream and downstream fish passage at Upper Dam on Mill Creek, Lower Deer Creek Falls, the Deer Creek Irrigation District's Diversion Dam, and Stanford Vina Irrigation District's Diversion Dams on Deer Creek.

Dear Mr. Smith:

Thank you for your letter from February 22, 2016, that we received on March 7, 2016, requesting initiation of consultation with NOAA's National Marine Fisheries Service (NMFS) pursuant to section 7 of the Endangered Species Act of 1973 (ESA), as amended (16 U.S.C. 1531 *et seq.*) for proposed fish passage improvement projects on Mill and Deer creeks.

The U.S. Fish and Wildlife Service (USFWS) is currently planning to fund and construct two fish passage projects in 2016 and 2017, Upper Dam on Mill Creek and Lower Deer Creek Falls on Deer Creek. Future actions are expected to improve fish passage on Deer Creek at Deer Creek Irrigation Diversion (DCID) Dam, Stanford Vina Ranch Diversion Dam, and Cone Kimball Diversion Dam. Funding has not been secured for all these future projects, but early planning is in the works. The NMFS 2014 Salmon and Steelhead Recovery Plan for the California Central Valley identifies fish passage at these facilities as high priority actions necessary to secure existing Central Valley (CV) spring-run Chinook salmon (*Oncorhynchus tshawytscha*), and California Central Valley (CCV) steelhead (*O. mykiss*). Therefore, this BO takes a programmatic approach to covering all of the remaining fish passage impediments on Mill and Deer creeks by specifically describing the construction process and effects of Upper Dam on Mill Creek and Lower Deer Creek Falls on Deer Creek. We programmatically describe the anticipated projects and effects at the other sites, but believe that the impacts are relatively predictable and similar to other projects completed, and that we have analyzed them accordingly. NMFS recognizes that funding could come through a number of different sources, but that the USFWS is likely to play a lead Federal role for permitting, environmental planning, or construction.

This letter transmits NMFS' biological opinion (BO), based on our review of the projects, on Mill and Deer creeks, in Tehama County, California, and their effects on federally listed species and 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.*). This BO is based on information provided in the biological assessments for Mill Creek Upper Dam and Lower Deer Creek Falls Fish Passage Improvement projects, submitted by UFSWS, discussions between NMFS and the USFWS staff, and a literature review completed by NMFS staff. We also reviewed BAs and BOs for the Ward Dam Fish Passage Improvement project on Mill Creek and preliminary design proposals for fish-way improvements at the DCID. A complete administrative record of this consultation is on file at the NMFS California Central Valley Area Office.

Based on the best available scientific and commercial information, the BO concludes that the proposed fish-way improvements are not likely to jeopardize the continued existence of federally listed threatened CV spring-run Chinook salmon and threatened CCV steelhead and are not likely to destroy or adversely modify their designated critical habitats. NMFS has also included an incidental take statement with reasonable and prudent measures and non-discretionary terms and conditions that are necessary and appropriate to avoid, minimize, or monitor incidental take of listed species associated with the project.

This letter also transmits NMFS's essential fish habitat (EFH) conservation recommendations for Pacific salmon as required by the Magnuson-Stevens Fishery Conservation and Management Act (MSA) as amended (16 U.S.C. 1801 et seq.; Enclosure 2). The document concludes that the proposed action would adversely affect the EFH of Pacific salmon in the action area and adopts the ESA reasonable and prudent measures and associated terms and conditions from the BO as the EFH conservation recommendations.

Please contact Howard Brown at: (916) 930-3608, or via e-mail at: Howard.Brown@noaa.gov if you have any questions concerning this section 7 consultation, or require additional information.

Sincerely,

for William W. Stelle, Jr.
Regional Administrator

Enclosures

CC: CHRON File (pdf): 151422WCR2016SA00224
Tricia Parker Hammelberg, U.S. Fish and Wildlife Service
Email: Tricia_Parker@fws.gov
Jason Roberts, California Department of Fish and Wildlife
Email: Jason.Roberts@wildlife.ca.gov

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Programmatic Endangered Species Act (ESA) Section 7(a)(2) Biological Opinion, Magnuson-Stevens Fishery Conservation and Management Act, and Essential Fish Habitat Consultation for Mill and Deer Creek Fish Passage Improvement Projects

NMFS Consultation Number: 151422-WCR2016-SA00224
Action Agency: U.S. Fish and Wildlife Service

Affected Species and NMFS' Determinations Table

ESA-Listed Species	Status	Is Action Likely to Adversely Affect Species or Critical Habitat?	Is Action Likely To Jeopardize the Species?	Is Action Likely To Destroy or Adversely Modify Critical Habitat?
CV spring-run Chinook salmon ESU (*Oncorhynchus tshawytscha*)	Threatened	Yes	No	No
California CV steelhead DPS (*O. mykiss*)	Threatened	Yes	No	No

Fishery Management Plan That Describes EFH in the Project Area	Does Action Have an Adverse Effect on EFH?	Are EFH Conservation Recommendations Provided?
Pacific Coast Salmon	Yes	Yes

Consultation Conducted By: National Marine Fisheries Service, West Coast Region

Issued By: Maria Rea
for William W. Stelle, Jr.
Regional Administrator

Date: APR 28 2016

1. INTRODUCTION

The U. S. Fish and Wildlife Service's (USFWS) Anadromous Fish Restoration Program (AFRP), in close coordination with the California Department of Fish and Wildlife (CDFW) and NOAA's National Marine Fisheries Service (NMFS) are working to restore fish passage on Mill and Deer creeks for federally listed salmonids. Additionally, several Technical Advisory Committees (TACs) have been established to address fish passage solutions on Mill and Deer Creeks, including the Mill Creek Fish Passage Restoration Project TAC and the Deer Creek Fish Passage Restoration TAC. These TACS include representatives from Federal and State fish and wildlife agencies including the USFWS, NOAAs National Marine Fisheries Service (NMFS), the California Department of Fish and Wildlife (CDFW), California Department of Water Resources (DWR), and multiple private landowners and several private consulting firms. Steve Thomas, NMFS Fish Passage Engineer, has provided expert engineering support to TAC during all phases of Project design and either Mr. Thomas, or another NMFS Fish Passage Engineer with similar qualifications are expected to participated in TACs for other fish-way improvements covered in this biological opinion (BO). The fish passage improvements considered here (Project), once completed, will meet the NMFS and CDFW criteria for fish passage.

Mill Creek is an eastside tributary to the Sacramento River that flows in a southwesterly direction for approximately 60 miles and its watershed drains 134 square miles. The creek originates near a thermal spring area in Lassen Volcanic National Park (LVNP) at an elevation of approximately 8,200 feet. The headwaters of Mill Creek initially flow through meadows and dense forests and then descend rapidly through a steep rock canyon into the Sacramento Valley. Upon emerging from the canyon, the creek flows 8 miles across the Sacramento Valley floor, entering the Sacramento River about 1 mile north of the town of Tehama, near Los Molinos, at an elevation of approximately 200 feet (DWR 2009).

Deer Creek is an eastside tributary to the Sacramento River that flows in a southwesterly direction for approximately 60 miles and the basin drains 134 square miles. Deer Creek originates near the summit of Butt Mountain at an elevation of approximately 7,320 feet. It initially flows through meadows and dense forests and then descends rapidly through a steep rock canyon into the Sacramento Valley. Upon emerging from the canyon, the creek flows 11 miles across the Sacramento Valley floor, entering the Sacramento River at approximately 1 mile west of the town of Vina, at an elevation of approximately 180 feet (DWR 2009).

Mill and Deer creeks are high value watersheds for a number of reasons. There are small diversion structures on the valley floor reaches of these streams, but there are no major water dams or impoundments. The only known streams that currently support self-sustaining populations of non-hybridized spring-run Chinook salmon in the Central Valley are Mill, Deer and Butte creeks (CDFG 1998). The Mill and Deer Creek populations are: (1) relatively small; (2) they have sharply declining trends in adult abundance; and (3) the demographic and genetic risks, due to small population sizes, are considered to be high risk.

The NMFS recovery plan for Central Valley salmon and steelhead (NMFS 2014) identifies fish passage in Mill and Deer creeks as one of the most significant stressors affecting the species. Fish passage impediments at dams and outdated ladders on the valley floor and in upper Deer

Creek can block or impede access to upstream spawning habitat. The recovery plan identifies fish passage improvements at these impediments to be some of the high ranking actions necessary to recovery the CV spring-run Chinook salmon and CCV steelhead in these watersheds. The NMFS recovery plan for Central Valley salmon and steelhead (NMFS 2014) also characterizes Mill and Deer creeks as Core 1 watersheds for CV spring-run Chinook salmon and CCV steelhead, meaning they possess the known ability or potential to support a viable population. For a population to be considered viable, it must meet the criteria for low extinction risk for Central Valley salmonids (Lindley *et al.* 2007). The criteria for extinction risk includes: population size, population decline, catastrophic decline and hatchery influence. Only a few of the Core 1 populations meet the long-term objective of low extinction risk; the remaining Core 1 populations have the potential to do so. The recovery plan includes a primary objectives of secure existing Core 1 populations by addressing key stressors. One of the goals of this programmatic biological opinion (BO) to provide a regulatory pathway through section 7(a)(2) of the ESA to achieve this objective.

1.1 Background, Authorities and Scope of Discretion

The National Marine Fisheries Service (NMFS) prepared this BO and incidental take statement (ITS) portions of this document in accordance with section 7(b) of the Endangered Species Act (ESA) of 1973 (16 USC 1531 et seq.), and implementing regulations at 50 CFR 402. We also completed an essential fish habitat (EFH) consultation on the proposed action, in accordance with section 305(b)(2) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA) (16 U.S.C. 1801 et seq.) and implementing regulations at 50 CFR 600.

We completed pre-dissemination review of this document using standards for utility, integrity, and objectivity in compliance with applicable guidelines issued under the Data Quality Act (section 515 of the Treasury and General Government Appropriations Act for Fiscal Year 2001, Public Law 106-554). The document will be available through NMFS' Public Consultation Tracking System https://pcts.nmfs.noaa.gov/pcts-web/homepage.pcts. A complete record of this consultation is on file at the NMFS California Central Valley Office.

Each Federal agency has an obligation to insure that any discretionary action it authorizes, funds, or carries out is not likely to jeopardize the continued existence of any endangered or threatened species or destroy or adversely modify its critical habitat unless that activity is exempt pursuant to the ESA (16 U.S.C. 1536(a)(2); 50 CFR 402.03). Furthermore, under Section 2 of the ESA, it is declared that all Federal agencies shall seek to conserve endangered species and threatened species and shall utilize their authorities in furtherance of the purposes of the ESA.

The funding for Project has either been dedicated or is expected to be provided through a number of sources including the Central Valley Improvement Act (CVPIA) Anadromous Fish Restoration Program (AFRP), the CVPIA Anadromous Fish Screen Program (AFSP), U.S. Bureau of Reclamation Supplemental Funds for Water and Related Resources, the CDFW "Drought Response Implementation Plan (DRIP) Grant Program, the California Proposition 1 Water Bond or the CDFW Fisheries Restoration Grant Program (FRGP).

Furthermore, USFWS's authority for the Project is limited to the funding and construction of the Project and as an administrator in the permitting and implementation of projects. USFWS does not have discretion over the water diversions associated with the Project. Incidental take exemptions under section 7 of the ESA, for listed anadromous fish affected by the Project, will only apply for aspects that USFWS has discretion over (namely the construction of the new fish ladder and upgrades to the fish screen and diversion facilities). Therefore, the ESA Incidental Take Statement (ITS) will be issued solely for those activities.

1.2 Consultation History

On February 22, 2016, NMFS received a written request from USFWS to initiate formal consultation on the Project. The request for consultation covered designed and funded actions for Upper Dam on Mill Creek and Lower Deer Creek Falls (LDCF) on Deer Creek, but also anticipated other fish passage improvements on Deer Creek, including those at the Deer Creek Irrigation District's (DCID) Diversion Dam and the Stanford Vina Ranch Irrigation Company's (SVRIC) Diversion Dam.

On March 9, 2016, NMFS received (1) and administrative draft biological assessment (BA) for LDCF, (2) 50 percent fish passage designs and project description information for DCID and (3) a preliminary description of potential fish passage improvements at SVRIC.

On March 30, 2016, NMFS received a Mill Creek Upper Dam Fish Passage Improvement BA.

On March 9, 2016, NMFS initiated programmatic consultation for the programmatic fish passage improvement actions on Mill and Deer Creeks, which will cover construction of actions at Upper Dam and LDCF in 2016, and future construction of fish passage improvements at DCID and SVRIC.

On April 7, 2016, NMFS received an amendment letter from USFWS that included changes to the proposed instream work window and the final BA for the LDCF action.

A complete administrative record of this consultation is on file at the NMFS West Coast Region office.

1.3 Proposed Action

This section summarizes the proposed action. The term "Action" means all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by Federal agencies (50 CFR 402.02). "Interrelated actions" are those that are part of a larger action and depend on the larger action for their justification. "Interdependent actions" are those that have no independent utility apart from the action under consideration (50 CFR 402.02). There are no interrelated or interdependent actions associated with the Project.

This programmatic BO addresses the remaining fish passage improvement actions that are reasonably certain to occur on Mill and Deer creeks, including improvements on Mill Creek at Upper Dam and improvements on Deer Creek at LDCF, the Deer Creek Irrigation District

(DCID) Diversion Dam, the SVRIC Diversion Dam and the Cone-Kimball Diversion Dam. Designs for Upper Dam and LDCF are complete and these actions are scheduled for construction in 2016. Designs for fish-way structures at DCID, SVRIC and Cone-Kimball are not complete and funding has not been secured for these project, nor are they scheduled for construction. However, NMFS considers these actions as reasonably certain to occur in the near future and that the general design parameters and effects associated with construction and maintenance are anticipated to be generally similar to other small fish passage projects that have been designed, constructed and consulted on through section 7(a)(2) of the ESA. Furthermore, these future actions are expected to meet NMFS and CDFW fish passage standards and / or engineering approval. Therefore, this BO also addresses, analyzes and provides incidental take exemption for future construction of fish passage actions at DCID, SVRIC and Cone Kimball.

1.3.1 Project Descriptions

Upper Dam Fish Passage Improvements on Mill Creek

The purpose of the proposed action is to improve upstream adult and juvenile passage and juvenile bypass for anadromous fish and other native aquatic species in Mill Creek. The upgrades and modifications to the fish ladder, fish screen and water diversion infrastructure will provide improved passage for adult and juvenile migration upstream and juvenile emigration downstream at Upper Dam.

The Project is located on private property, approximately four miles northeast of Los Molinos, in Tehama County, California. Specifically, the Project is located at the Upper Dam on Mill Creek, at approximately RM 5.4, upstream of the confluence with the Sacramento River, in Sections 35 and 36, Township 26 North, Range 2 West, Section 31, Township 26 North, Range 1 West, and Section 1, Township 25 North, Range 2 West Mount Diablo Base Meridian (MDBM), within the 7.5-minute U.S. Geological Service (USGS) Los Molinos quadrangle map. The Project occurs in the Hydrologic Unit Code USGS Cataloging Unit: 18020119 (Mill-Big Chico).

The Project will replace the existing fish ladder at Upper Dam with a new chute and pool fish ladder and improve the existing fish screen and diversion infrastructure to provide salmon and steelhead upstream and downstream passage over a larger range of flows than exists with the existing facilities. More specifically: (1) the fish ladder will be replaced; (2) the diversion channel and fish screens will be retro-fitted to improve flow distribution through the screens and to better route flow and sediment through the juvenile bypass return pipe; (3) the bypass return pipe will be replaced and relocated; (4) the intake head gate will be relocated upstream; and (5) a rock scour apron will be installed downstream of the Upper Dam. The constructed fish passage facilities will meet NMFS and CDFW fish passage criteria.

The Project will be completed in three phases that will include: (1) site preparation and grading, (2) instream improvements, and (3) finishing work. The phases are described in detail in the BA for Upper Dam and are summarized below:

Phase 1 - Site Preparation and Grading

- Temporary access road improvements
- Grading of staging area and streambanks
- Assembly of dewatering materials

Phase 2 - Instream Improvements

- Dewatering
- Demolition of existing fish ladder and sections of diversion headwall and diversion canal wall
- Construction of new fish ladder, diversion intake and canal wall
- Installation of the new headgate
- Installation of new fish screens / flumes / paddlewheel and brushes
- Installation of the new juvenile bypass pipe

Phase 3 - Finishing Work

- Removal of temporary diversion dam
- Finish grading of site
- Remove temporary access road improvements

During construction, Mill Creek will be dewatered from approximately 300 feet upstream of the dam, to approximately 500 feet downstream of the dam. A temporary diversion structure composed of gravel bags, a bladder dam or other appropriate materials will be placed across the channel about 300 feet upstream of the dam. High density polyethylene pipe will be used to route streamflow and diversion flow past the Project site. Some streamflow will bypass the construction site and discharge flow through pipes directly back into Mill Creek downstream of the construction area. These pipes will meet NMFS bypass return flow criteria. Some flow will be diverted and discharged into the diversion canal about 500 feet downstream of the dam, upstream of the existing fish screens. All diverted water will be screened throughout construction. Once diverted flows pass through the fish screens, they will continue down the canal to be used for irrigation. Some diverted flow will be returned to Mill Creek through the existing bypass return pipe.

Post-project performance monitoring will occur to gauge the performance of the fish screens according to flow criteria. Adjustments to the screens will be made as needed until adjustments demonstrate that criteria are met. Additional observations of system performance will also be made, including assessments of flow in the fish-way.

Lower Deer Creek Falls Fish Ladder Improvement on Deer Creek

The purpose of the proposed project is to improve upstream adult passage for anadromous fish and other native aquatic species in Deer Creek. The upgrades and modifications to the fish-way will provide improved passage for adult migration upstream past LDCF.

The LDCF project is located on private property approximately six miles north of Butte Meadows, in Tehama County, California at LDCF on Deer Creek, at approximately river mile (RM) 42.5 upstream of the confluence with the Sacramento River. The geographic location for the project is located in Sections 25, 26, 27, 34, 35, and 36 in Township 27 North, Range 3 East and in Sections 29 and 30 in Township 27 North, Range 3 East MDBM, within the 7.5-minute USGS Onion Butte quadrangle map. The project occurs in the Hydrologic Unit Code USGS Cataloging Unit: 18020119 (Mill-Big Chico).

The Project will replace most of, and upgrade much of the existing fish-way to provide adult and juvenile fish upstream passage over a larger range of flows. As part of the alternative, the existing fish-way will be removed and replaced and a fish-way cover will be added. The proposed fish-way will have fifteen pool units separated by adjustable weirs. A summary of the proposed action is described below; details are included in the BA for the LDCF Fish Passage Improvement Project.

The design includes a pool-and-weir fish-way with an orifice (Half Ice Harbor style) and a switchback configuration. The fish-way will be six-to-ten feet wide, with a length of 10 feet between weirs and one-foot drop heights between pools. The Half Ice Harbor fish-way type is asymmetrical, with baffles on one side and weirs on the other. The weirs are located on the upslope side of the two parallel legs resulting in flow around the outside of the 90-degree turn and alignment of the passage route with the existing channel at the outlet of the tunnel. Flow will cross from one side to the other in the 180-degree bend, however the bend has a large enough volume for proper dissipation of energy. The alignment of the fish-way has been designed to optimize the amount of the lower portion of the fish-way to be founded in rock and to minimize the amount of rock excavation needed. The fish-way will be operated by adjusting the weirs periodically to account for changes in stream flows and associated headwater and tail-water conditions at the fish-way exit and entrance.

Pools at the bends are increased in volume due to the approximate six-foot-length between the inside corners and the adjacent weir locations, providing a distance of about 13 feet between the weirs and the end walls. The corners of the bends are mitered to reduce potential for dead zones and upwelling. The minimum weir height will be 3 feet, with 2.5 feet of adjustable height above the minimum. Approximately two feet of additional wall height is provided in the fish-way, and another two feet of jump freeboard is provided with a non-watertight panel above the wall, affixed to the frame for the fish-way cover.

The project will include several elements of instream work including dewatering around the fish-way, demolition of existing fish-way structures and construction of the new fish-way in two separate phases. Demolition of portions of the existing fish-way, diversion headwall and diversion canal wall will be required prior to construction of the new fish-way. This will be carried out with equipment such as expansive grout, equipment-mounted hydraulic breakers, hammer or grinders and jackhammers. Phase 1 will construct the higher elevation pool units. Phase 1 construction will occur in dry conditions on foundations excavated in rock and Phase 2 will cut the lower elevation work. The construction of the upper pool units first will allow them to be used for storage and settling treatment of water pumped from the excavations for the lower pool units to be constructed in Phase 2.

Prior to construction, the exit channel will be completely blocked from flow at the upstream end, with a barrier formed from gravel bags and plastic sheeting, or other materials approved by the project engineer. This will prevent any flows from entering the exit channel, tunnel and fish-way. All stream flows will be routed down the falls.

A fish rescue will take place in the existing fish-way prior to any construction and a fish exclusion device will be installed downstream of the project site. Within two weeks prior to the initiation of Phase 2 construction, a fish exclusion device similar to an Alaskan picket weir, will be installed downstream of LDCF, likely within the tail of the pool adjacent to the construction area and immediately downstream of the falls. The final determination of the location of the exclusion device will be made based on conditions during low-flow conditions and the best professional judgement of fish biologists in the field. The structure will be built to exclude all adult salmonids, including jacks from migrating upstream into the pool near the construction area.

At the completion of work and prior its commissioning, the fish-way will be cleaned of sediment and debris. Construction materials, temporary dewatering barriers, and other BMP features will be removed from the site and water will be allowed to enter the facility.

DCID Diversion Dam Improvements on Deer Creek

The purpose of the Project is to improve upstream and downstream passage at the diversion dam for adult and juvenile salmonids while meeting DCID's irrigation needs. The proposed Project will construct a roughened rock ramp downstream of the existing dam, re-profile the diversion canal, and reconstruct the fish screen diversion head-gates and diversion flow monitoring devise. The channel wide roughened rock ramp will provide better passage performance relative to a fish ladder, as it will be significantly less susceptible to debris clogging and are generally more efficient at passing a broader range fish and aquatic organism species and life stages than fish ladders. Re-profiling the diversion canal and lowering the fish screens will reduce the need for flashboards to be installed on the dam crest.

The DCID Diversion Dam is located just downstream of a steep laterally confined canyon where the channel reaches the flatter, less confined valley floor. The DCID Diversion Dam is the upstream most diversion dam on Deer Creek, approximately 10 miles upstream from the confluence with the Sacramento River. The DCID facility is located at latitude 40.011299°, longitude -121.954415° at an elevation of 497 ft. The dam can be identified on the United States Geological Survey, 7.5-minute series, Acorn Hollow quadrangle.

DCID has a maximum water right of 60 cubic feet per second (cfs) but no more than 1/3 of the total flow in Deer Creek. The District supplies about 6,600 acre-feet (AF) of water annually, including 5,400 AF of surface water diverted from Deer Creek, and 1,200 AF from groundwater. DCID has a water service area of approximately 2,200 acres, and delivers both surface and groundwater to irrigate 1,900 acres of agricultural lands within the District. Most of the irrigated lands in the District are in orchard production (58 percent), including almonds, walnuts and prunes, with the remainder in either pasture (37 percent) or annual grain crops (5 percent).

Roughened rock ramps provide a range of depths, velocities, and turbulence across the channel. The range of hydraulic conditions can provide numerous passage corridors for species of different swimming abilities. The presence of the existing dam upstream of the rock ramp is generally not preferred due to stability concerns. Ideally, the crest of a roughened rock ramp ties in with the existing bed. The presence of the uniform concrete crest will accelerate flow and potentially create a surface jet which will impact the top of the rock ramp. To limit the impact of this jet, roughness elements will be installed upstream of the dam crest. These roughness elements will likely be large boulders keyed into the existing bed with top elevations about 1 to 3 feet above the dam crest.

It is anticipated that a TAC comprised of USFWS, CDFW, NMFS and others (similar to the teams that have worked on the design and implementation of other similar fish passage projects on Mill and Deer creeks will coordinate on refining project specifications construction, operation, and resources protection.

SVRIC Diversion Dam Fish Passage Improvements on Deer Creek

The purpose of the proposed Project is to improve upstream adult and juvenile passage and juvenile bypass for anadromous fish and other native aquatic species in Deer Creek while meeting SVRIC's irrigation company. The Project will replace the existing fish ladders with a new fish ladder or other passage structure (rock ramp, bladder dam, etc.) that will be designed and constructed to meet NMFS and CDFW fish passage criteria. Similar to the situation at Upper Dam on Mill creeks, the landowner currently prefers a fish passage solution designed around leaving the existing dam but other alternatives may be. The final design and project will meet NMFS and CDFW fish passage criteria.

The SVRIC Diversion Dam is located approximately 5 miles upstream from the confluence with the Sacramento River. The diversion dam is approximately 10 feet tall, has two outdated fish ladders and two diversion points, one on the north side of the dam and one on the south. The north diversion has a capacity of 30 cfs, and the south diversion has a capacity of 100 cfs. Both diversion points are currently screened. The total diversion that can be withdrawn at any one time utilizing both diversions is 130 cfs. The SVRIC Diversion Dam is located in the southeast ¼ of section 01, township 24N, range 02W, MDBM (latitude 39.963230°, longitude -122.034273°).

The fish screens on the north and south side of Deer Creek will also be replaced. The proposed concept is to place a screen on the south side of the creek in an off-channel location, and install a siphon to move water to the north ditches. Another option could be to install a cone screen on the north diversion and a similar screen as mentioned above on the south side. Similar to the fish passage discussion above, some form of alternatives analysis must be conducted, which could change the overall design. Depending on the fish screening methodology selected, there could be bank stabilization work completed up to 200 yards above the current fish screen location.

It is anticipated that a TAC comprised of USFWS, CDFW, NMFS and others, similar to the teams that have worked on the design and implementation of other similar fish passage projects on Mill and Deer creeks, will coordinate on refining project specifications, construction, operations, and resources protections.

Cone-Kimball Diversion Dam on Deer Creek

The purpose of the proposed Project is to improve upstream adult and juvenile passage and juvenile bypass for anadromous fish and other native aquatic species in Deer Creek while meeting SVRIC's irrigation company's water needs. Specific designs have not been developed and there is currently no funding dedicated to making fish-way improvements, but it is anticipated that potential improvements could include a pool and chute fish ladder, a bladder dam, a rock-way fish ladder or some similar approach or combination of methods that will meet NMFS and CDFW fish passage criteria.

The Cone Kimball Diversion Dam is located approximately 11 miles upstream from the confluence with the Sacramento River on a north side channel of Deer Creek in the southeast one-quarter of section 33, township 25N, range 01W (latitude 39.978052°, longitude -121.983061°). The diversion consists of a submerged, screened 16-inch pipe with a propeller and meter.

1.4 Fish-related Resource Protection Measures

The descriptions for the above listed fish passage improvement projects include a number of resource protection measures that were developed to protect sensitive resources that could be potentially impacted by the Project and are hereby incorporated into the project descriptions and plans. Individual actions associated with the Project are designed with spatial and temporal avoidance measures to minimize temporary and permanent impacts to listed species and their habitats. For Upper Dam and LDCF, the resource protection measures are specific. For DCID, SVRIC and Cone Kimball, detailed measures have not been identified, but are likely to be most similar to those proposed for Upper Dam due to similarities in the timing of fish presence, general habitat types and habitat conditions and water quality standards.

Upper Dam on Mill Creek

1. Instream work can occur between July 1st and September 30th. Instream work could start sooner if CDFW determines that the adult CV spring-run Chinook salmon are no longer present based on environmental conditions and real time passage data. Instream work could be extended October 14th, if environmental conditions which would preclude juvenile steelhead and spring-run Chinook salmon emigration or adult steelhead and late-fall-run Chinook salmon immigration are expected to persist. Instream work outside of the July 1st to September 30th work window must be approved by CDFW and NMFS on a case-by-case basis with details on how take will be avoided and / or minimized;

2. For work within the channel and banks, fish rescue efforts (herding fish, netting, and seining) will be required prior to the onset of any dewatering of the area. This will be coordinated with CDFW;

3. All construction debris (concrete, metal etc.) from the fish passage improvement-related construction activities will be removed from the active stream channel post-construction;

4. The follow measure associated with the avoidance and restoration of riparian vegetation will be fully implemented:
   a. Disturbance to riparian vegetation will be avoided or minimized to the extent possible.
   b. A revegetation plan will be prepared in coordination with the landowner to replace impacted riparian wetlands and other disturbed vegetation by a measure of quantity and quality equal to or exceeding impacts of the project using appropriate native riparian trees and shrubs.
   c. Areas with woody vegetation that have been disturbed will be revegetated in accordance with the revegetation plan;

5. The follow measures associated with the CDFW's permit conditions for the project: associated with minimizing impacts to water quality will be fully implemented:
   a. Monitoring of water turbidity and settle-able materials shall be conducted in accordance with the Clean Water Act Section 401 Certification through consultation with CVRWQCB.
   b. All equipment and machinery that contains fuel, oil or other petroleum products used during construction-related activities shall be checked for petroleum leaks immediately prior to being mobilized to the project site and again each day prior to use.
   c. All equipment refueling and / or maintenance shall take place within a secondary containment structure.
   d. An emergency spill kit and absorbent oil booms will be onsite during construction activities;

6. Immediately prior to installation of temporary dam structures, a qualified fish biologist, in coordination with CDFW, will conduct snorkel surveys above and below the dam and diversion, to identify presence of salmonids. USFWS, in coordination with the contractor, and in consultation with NMFS and CDFW, will ensure that qualified fish biologists are onsite to implement fish rescue operations within the dewatered area through the use of herding, seining and / or electrofishing, if necessary. Best professional determination will be used to decide which method(s) of rescue is to be used and where the relocation of captured fish, either upstream or downstream of the temporary dams is to occur. Biologists will first try to haze and herd fish out of the fish exclusion area. If fish biologists determine that the use of electrofishing is necessary for the efficient and successful removal of fish, NMFS electrofishing guidelines will be strictly followed. The fish rescue team will be comprised of fishery biologists with professional experience using seines and electrofishing equipment. The same methodologies will be used during dewatering of the diversion ditch;

7. Adequate erosion and pollution control measures shall be taken to ensure that sediment, turbidity, petroleum products or other harmful chemicals do not enter Mill Creek as a result of construction activities. Standard Best Management Practices (BMPs) shall be incorporated into the project designs;

8. BMPs will be developed and implemented to ensure that wet concrete does not enter Mill Creek during construction;

9. All pumps used during dewatering for construction will be screened to meet CDFW and NMFS criteria;

10. All dewatering and re-watering activities will be conducted slowly, in order to minimize disturbance to fish. A qualified fisheries biologist will be onsite during these activities, and CDFW will be notified prior to these activities; and

11. For the duration of the project, all diverted water must be screened through the existing screens, which currently do not meet CDFW and NMFS criteria, however best professional judgement will be used to prevent harm to juvenile fish through frequent monitoring and site-specific modifications as needed. Furthermore, all water returned to the stream will comply with NMFS bypass return criteria, including consideration of the location of the bypass pipe exit (i.e. bypassed water will enter the watercourse and will not be of an excessive height, or empty onto rocks, etc.) for the duration of the bypass period.

Lower Deer Creek Falls on Deer Creek

1. Instream work can occur between July 1st and September 30th. Instream work could start sooner if CDFW determines that the adult CV spring-run Chinook salmon are no longer present based on environmental conditions and real time passage data. Instream work could be extended October 14th, if environmental conditions which would preclude juvenile steelhead and spring-run Chinook salmon emigration or adult steelhead and late-fall-run Chinook salmon immigration are expected to persist. Instream work outside of the July 1st to September 30th work window must be approved by CDFW and NMFS on a case-by-case basis with details on how take will be avoided and / or minimized;

2. For work within the channel and banks, fish rescue efforts (herding fish, netting, and seining) will be required prior to the onset of any dewatering of the area. This will be coordinated with CDFW;

3. All construction debris (concrete, metal etc.) from the fish passage improvement-related construction activities shall be removed from the active stream channel post-construction;

4. Measures associated with the avoidance and restoration of riparian vegetation shall be fully implemented:
    a. Disturbance to riparian vegetation will be avoided or minimized to the extent possible.
    b. A revegetation plan will be prepared to replace impacted riparian wetlands by a measure of quantity and quality equal to or exceeding impacts of the project using appropriate native riparian trees and shrubs.
    c. Herbicide treatment will not be allowed in the project area;

5. Measures associated with minimizing impacts to water quality will be fully implemented;
    a. Monitoring of water turbidity shall be conducted in accordance with the Clean Water Act Section 401 Certification through consultation with CVRWQCB.

b. All equipment and machinery that contains fuel, oil or other petroleum products used during construction-related activities shall be checked for petroleum leaks immediately prior to being mobilized to the project site and again each day prior to use.
c. All equipment refueling and / or maintenance shall take place within a secondary containment structure.
d. An emergency spill kit and absorbent oil booms will be onsite during construction activities;

6. CDFW will install a fish exclusion device downstream of the construction area, within two weeks prior to the initiation of instream channel-related construction work, to ensure fish are prevented from migrating upstream into the project area;

7. Immediately prior to construction, a qualified biologist, in coordination with CDFW, will conduct snorkel surveys above and below LDCF to identify presence of salmonids. The USFWS, in coordination with the contractor, and in consultation with NMFS and CDFW, will ensure that qualified fish biologists are onsite to implement fish rescue operations within the dewatered area, through the use of herding, seining and / or electrofishing, if necessary, in a manner that best ensures safety of staff. This will potentially include opening the fish exclusion device to herd fish further downstream. Best professional determination will be used to decide which method(s) of rescue and relocation of captured fish, either upstream or downstream of the construction area, are to be used. Biologists will first try to haze and herd fish downstream. If fish biologists determine that the use of electrofishing is necessary for the efficient and successful removal of fish, NMFS electrofishing guidelines will be strictly followed. The fish rescue team will be comprised of fishery biologists with professional experience using seines and electrofishing equipment;

8. Adequate erosion and pollution control measures should be taken to ensure that sediment, turbidity, petroleum products or other harmful chemicals do not enter Deer Creek as a result of construction activities. Standard BMPs should be incorporated into the project designs;

9. CDFW measures WATER-10 through WATER-14 will be implemented to ensure that wet or dry concrete does not enter Deer Creek during construction;

10. All water pumps used during construction shall be screened to meet CDFW and NMFS criteria, unless deemed unnecessary by CDFW and NMFS (i.e. if water was being diverted from an off-channel pool). If pumps are using fuel, they will be outfitted with a spill kit; and;

11. All dewatering and re-watering activities will be conducted slowly, in order to minimize disturbance to fish and will be coordinated with CDFW.

DCID Diversion Dam on Deer Creek

As described above, the specific measures have not been identified, but are likely to be most similar to those proposed for Upper Dam due to similarities in the timing of fish presence, general habitat types and habitat conditions and water quality standards. Specific measures will be developed by a technical advisory committee, with participation and guidance from NMFS, CDFW and the USFWS.

SVRIC Diversion Dam on Deer Creek

As described above, the specific measures have not been identified, but are likely to be most similar to those proposed for Upper Dam due to similarities in the timing of fish presence, general habitat types and habitat conditions and water quality standards. Specific measures will be developed by a technical advisory committee, with participation and guidance from NMFS, CDFW and the USFWS.

Cone-Kimball Diversion Dam on Deer Creek

As described above, the specific measures have not been identified, but are likely to be most similar to those proposed for the previously described projects to similarities in the timing of fish presence, general habitat types and habitat conditions and water quality standards. Specific measures will be developed by a technical advisory committee, with participation and guidance from NMFS, CDFW and the USFWS.

1.5 Action area

The regulations governing consultations under the ESA define *action area* as "all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action" (51 FR 19957). The action area should be determined based on all direct and indirect effects of the proposed action (50 CFR 402.02 and 402.14[b][2]).

For the purposes of this consultation, the action area encompasses the anadromous habitat of Mill and Deer Creek. The action area contains all of the anadromous habitat because fish passage improvements are expected to result in beneficial affects to CV spring-run Chinook salmon and CCV steelhead throughout their migratory, holding and spawning habitats in these streams. At a smaller scale, effects analysis will focus on the specific fish passage projects in each of these streams, including a buffer area that extends upstream and downstream of the projects for approximately 500 feet. The 500-foot buffer around the projects includes the staging areas and the upstream and downstream extent and the upstream and downstream boundaries where acoustic or turbidity effects are expected. For smaller streams, this 500-foot distance, is considered an adequate "mixing zone" which defines the area that sediment is suspended before it begins to drop out of the water column (Rowe et al. 2003), when adequate flows are present. This is the area that listed fish could be affected by potential increased sedimentation (from removal of the old facilities and construction of new structures).

2. ENDANGERED SPECIES ACT: BIOLOGICAL OPINION AND INCIDENTAL TAKE STATEMENT

The ESA establishes a national program for conserving and restoring threatened and endangered species of fish, wildlife, plants, and the habitat upon which they depend. As required by section 7(a)(2) of the ESA, Federal agencies must ensure that their actions are not likely to jeopardize the continued existence of endangered or threatened species, or adversely modify or destroy their designated critical habitat. Per the requirements of the ESA, Federal action agencies consult with NMFS and section 7(b)(3) requires that, at the conclusion of consultation, NMFS provides an opinion stating how the agency's actions will affect listed species and their critical habitat. If incidental take is expected, section 7(b)(4) requires NMFS to provide an ITS that specifies the impact of any incidental taking and includes non-discretionary reasonable and prudent measures and terms and conditions to minimize such impacts.

2.1 Analytical Approach

This BO includes both a jeopardy analysis and an adverse modification analysis. The jeopardy analysis relies upon the regulatory definition of "to jeopardize the continued existence of a listed species," which is "to engage in an action that will be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species" (50 CFR 402.02). Therefore, the jeopardy analysis considers both survival and recovery of the species. The adverse modification analysis considers the impacts of the Federal action on the conservation value of designated critical habitat. This BO 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.[1] We use the following approach to determine whether a proposed action is likely to jeopardize listed species or destroy or adversely modify critical habitat:

1. Identify the range-wide status of the species and critical habitat likely to be adversely affected by the proposed action;
2. Describe the environmental baseline in the action area;
3. Analyze the effects of the proposed action on both species and their habitat using an "exposure-response-risk" approach;
4. Describe any cumulative effects in the action area;
5. Integrate and synthesize the above factors to assess the risk that the proposed action poses to species and critical habitat;
6. Reach jeopardy and adverse modification conclusions; and
7. If necessary, define a reasonable and prudent alternative (or measure) to the proposed action.

[1] Memorandum from William T. Hogarth to Regional Administrators, Office of Protected Resources, NMFS (Application of the "Destruction or Adverse Modification" Standard Under Section 7(a)(2) of the Endangered Species Act) (November 7, 2005).

2.2 Range-wide Status of the Species and Critical Habitat

This BO examines the status of each species that will be adversely affected by the proposed action. The status is determined by the level of extinction risk that the listed species face, based on parameters considered in documents such as recovery plans, status reviews, and listing decisions. This informs the description of the species' likelihood of both survival and recovery. The species status section also helps to inform the description of the species' current "reproduction, numbers, or distribution" as described in 50 CFR 402.02. The BO also examines the condition of critical habitat throughout the designated area, evaluates the conservation value of the various watersheds and coastal and marine environments that make up the designated area. Previous designations of critical habitat use the terms primary constituent element or essential features. The new critical habitat regulations (81 FR 7414) replace these terms with physical or biological features (PBFs). The shift in terminology does not change the approach used in conducting a ''destruction or adverse modification'' analysis, which is the same regardless of whether the original designation identified primary constituent elements, physical or biological features, or essential features. This BO discusses the current function of the PBFs that characterize the conservation value of critical habitat. One factor affecting the range-wide status of CV spring-run Chinook salmon, CCV steelhead, and aquatic habitat at large is climate change.

The descriptions of the status of species and conditions of the designated critical habitats in this BO are a synopsis of the detailed information available on NMFS' West Coast Regional website. The table below lists the federally listed species ESUs or DPSs and designated critical habitat occur in the action area and may be affected by the proposed action. The website links to more detailed information about life history information, distribution and Federal Register Notices can be found on the website.

Species	ESU or DPS	Original Final FR Listing	Current Final Listing Status	Critical Habitat Designated
Chinook salmon (*Oncorhynchus tshawytscha*)	Central Valley spring-run ESU	9/16/1999 64 FR 50394 Threatened	6/28/2005 70 FR 37160 Threatened	9/2/2005 70 FR 52488
Steelhead (*O. mykiss*)	California Central Valley DPS	3/19/1998 63 FR 13347 Threatened	1/5/2006 71 FR 834 Threatened	9/2/2005 70 FR 52488

Detailed CV spring-run Chinook salmon ESU and critical habitat information:
http://www.westcoast.fisheries.noaa.gov/protected_species/salmon_steelhead/salmon_and_steelhead_listings/chinook/central_valley_spring_run/central_valley_spring_run_chinook.html

Detailed CCV steelhead DPS and critical habitat information:
http://www.westcoast.fisheries.noaa.gov/protected_species/salmon_steelhead/salmon_and_steelhead_listings/steelhead/california_central_valley/california_central_valley_steelhead.html

2.2.1 Central Valley Spring-run Chinook salmon

Summary of CV Spring-run Chinook salmon DPS Viability

Since the independent populations in Butte, Deer and Mill creeks are the best trend indicators for ESU viability, we can evaluate risk of extinction based on Viable Salmonid Population (VSP) parameters in these watersheds. Lindley, Schick et al. (2007) indicated that the spring-run Chinook salmon populations in the Central Valley had a low risk of extinction in Butte and Deer creeks, according to their population viability analysis (PVA) model and other population viability criteria (*i.e.*, population size, population decline, catastrophic events, and hatchery influence, which correlate with VSP parameters abundance, productivity, spatial structure, and diversity). The Mill Creek population of spring-run Chinook salmon was at moderate extinction risk according to the PVA model, but appeared to satisfy the other viability criteria for low-risk status. However, the CV spring-run Chinook salmon ESU failed to meet the "representation and redundancy rule" since there are only demonstrably viable populations in one diversity group (northern Sierra Nevada) out of the three diversity groups that historically contained them, or out of the four diversity groups as described in the NMFS Central Valley Salmon and Steelhead Recovery Plan. Over the long term, these three remaining 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 Chinook salmon populations in these three watersheds due to their close proximity to each other. One large event could eliminate all three populations.

In the 2011 status review of the CV spring-run Chinook salmon ESU, the authors concluded that the ESU status had likely deteriorated on balance since the 2005 status review and the Lindley *et al.* (2007) assessment, with two of the three extant independent populations (Deer and Mill creeks) of spring-run Chinook salmon slipping from low or moderate extinction risk to high extinction risk. Additionally, Butte Creek remained at low risk, although it was on the verge of moving towards high risk, due to the rate of population decline. In contrast, spring-run Chinook salmon in Battle and Clear creeks had increased in abundance since 1998, reaching levels of abundance that place these populations at moderate extinction risk. Both of these populations have likely increased at least in part due to extensive habitat restoration. The Southwest Fisheries Science Center concluded in their viability report (Williams, Lindley et al. 2011) that the status of CV spring-run Chinook salmon ESU has probably deteriorated since the 2005 status review and that its extinction risk has increased. The degradation in status of the three formerly low- or moderate-risk independent populations is cause for concern.

Critical Habitat: Physical and Biological Features for CV Spring-Run Chinook Salmon

Critical habitat was designated for CV spring-run Chinook salmon on September 2, 2005 (70 FR 52488). Critical habitat for CV spring-run Chinook salmon includes stream reaches of the Feather, Yuba and American rivers, Big Chico, Butte, Deer, Mill, Battle, Antelope, and Clear creeks, the Sacramento River, as well as portions of the northern Delta. Critical habitat includes the stream channels in the designated stream reaches and the lateral extent as defined by the ordinary high-water line. In areas where the ordinary high-water line has not been defined, the

lateral extent will be defined by the bank-full elevation (defined as the level at which water begins to leave the channel and move into the floodplain; it is reached at a discharge that generally has a recurrence interval of one to two years on the annual flood series) (Bain and Stevenson 1999; 70 FR 52488). Critical habitat for CV spring-run Chinook salmon is defined as specific areas that contain the Physical and Biological Features (PBFs) essential to the conservation of the species. Following are the inland habitat types used as PBFs for CV spring-run Chinook salmon.

1. Spawning Habitat

Freshwater spawning sites are those with water quantity and quality conditions and substrate supporting spawning, incubation, and larval development. Most spawning habitat in the CV for Chinook salmon is located in areas directly downstream of dams containing suitable environmental conditions for spawning and incubation. Spawning habitat for CV spring-run Chinook salmon occurs on the main-stem Sacramento River between RBDD and Keswick Dam and in tributaries such as Mill, Deer, and Butte creeks; as well as the Feather and Yuba rivers, Big Chico, Battle, Antelope, and Clear creeks. However, little spawning activity has been recorded in recent years on the Sacramento River main-stem for spring-run Chinook salmon. Even in degraded reaches, spawning habitat has a high conservation value as its function directly affects the spawning success and reproductive potential of listed salmonids. Even in degraded reaches, spawning habitat has a high conservation value as its function directly affects the spawning success and reproductive potential of listed salmonids.

2. Freshwater Rearing Habitat

Freshwater rearing sites are those with water quantity and floodplain connectivity to form and maintain physical habitat conditions and support juvenile growth and mobility; water quality and forage supporting juvenile salmonid development; and natural cover such as shade, submerged and overhanging LWM, log jams and beaver dams, aquatic vegetation, large rocks and boulders, side channels, and undercut banks. Both spawning areas and migratory corridors comprise rearing habitat for juveniles, which feed and grow before and during their outmigration. Non-natal, intermittent tributaries also may be used for juvenile rearing. Rearing habitat condition is strongly affected by habitat complexity, food supply, and the presence of predators of juvenile salmonids. Some complex, productive habitats with floodplains remain in the system (*e.g.*, the lower Cosumnes River, Sacramento River reaches with setback levees [*i.e.*, primarily located upstream of the City of Colusa]) and flood bypasses (*i.e.*, Yolo and Sutter bypasses). However, the channelized, leveed, and riprapped river reaches and sloughs that are common in the Sacramento-San Joaquin system typically have low habitat complexity, low abundance of food organisms, and offer little protection from piscivorous fish and birds. Freshwater rearing habitat also has a high intrinsic conservation value even if the current conditions are significantly degraded from their natural state. Juvenile life stages of salmonids are dependent on the function of this habitat for successful survival and recruitment.

3. Freshwater Migration Corridors

Ideal freshwater migration corridors are free of migratory obstructions, with water quantity and quality conditions that enhance migratory movements. They contain natural cover such as riparian canopy structure, submerged and overhanging large woody objects, aquatic vegetation, large rocks and boulders, side channels, and undercut banks which augment juvenile and adult mobility, survival, and food supply. Migratory corridors are downstream of the spawning areas and include the lower main-stems of the Sacramento and San Joaquin rivers and the Delta. These corridors allow the upstream passage of adults and the downstream emigration of juveniles. Migratory habitat condition is strongly affected by the presence of barriers, which can include dams (*i.e.*, hydropower, flood control, and irrigation flashboard dams), unscreened or poorly screened diversions, degraded water quality, or behavioral impediments to migration. For successful survival and recruitment of salmonids, freshwater migration corridors must function sufficiently to provide adequate passage. For adults, upstream passage through the Delta and much of the Sacramento River is not a problem, yet a number of challenges exist on many tributary streams. For juveniles, unscreened or inadequately screened water diversions throughout their migration corridors and a scarcity of complex in-river cover have degraded this PCE. However, since the primary migration corridors are used by numerous populations and are essential for connecting early rearing habitat with the ocean, even the degraded reaches are considered to have a high intrinsic conservation value to the species.

4. Estuarine Areas

Estuarine areas free of migratory obstructions with water quality, water quantity, and salinity conditions supporting juvenile and adult physiological transitions between fresh and salt water are included as a PCE. Natural cover such as submerged and overhanging LWM, aquatic vegetation, and side channels are suitable for juvenile and adult foraging.

The remaining estuarine habitat for these species is severely degraded by altered hydrologic regimes, poor water quality, reductions in habitat complexity, and competition for food and space with exotic species. Regardless of the condition, the remaining estuarine areas are of high conservation value because they provide factors which function to provide predator avoidance, as rearing habitat and as an area of transition to the ocean environment.

2.2.2 California Central Valley steelhead

Summary of CCV Steelhead DPS Viability

All indications are that natural CCV steelhead have continued to decrease in abundance over the past 25 years (Good et al. 2005; NMFS 2011a). The long-term trend remains negative. Hatchery production and returns are dominant over natural fish. Continued decline in the ratio between naturally produced juvenile steelhead to hatchery juvenile steelhead in fish monitoring efforts indicates that the wild population abundance is declining. Hatchery releases (100 percent adipose fin clipped fish since 1998) have remained relatively constant over the past decade, yet the proportion of adipose fin-clipped hatchery smolts to unclipped naturally produced smolts has steadily increased over the past several years.

Although there have been recent restoration efforts in the San Joaquin River tributaries, CCV steelhead populations in the San Joaquin Basin continue to show a decline, an overall low abundance, and fluctuating return rates. Lindley et al. (2007) developed viability criteria for CV salmonids. Using data through 2005, Lindley et al. (2007) found that data were insufficient to determine the status of any of the naturally-spawning populations of CCV steelhead, except for those spawning in rivers adjacent to hatcheries, which were likely to be at high risk of extinction due to extensive spawning of hatchery-origin fish in natural areas.

The widespread distribution of wild steelhead in the CV provides the spatial distribution necessary for the DPS to survive and avoid localized catastrophes. However, these populations are frequently very small, and lack the resiliency to persist for protracted periods if subjected to additional stressors, particularly widespread stressors such as climate change (NMFS 2011a). The most recent status review of the CCV steelhead DPS (NMFS 2011a) found that the status of the population appears to have worsened since the 2005 status review (Good et al. 2005), when it was considered to be in danger of extinction.

Critical Habitat: Physical and Biological Features for CCV Steelhead

Critical habitat was designated for CCV steelhead on September 2, 2005 (70 FR 52488). Critical habitat for CCV steelhead includes stream reaches such as those of the Sacramento, Feather, and Yuba Rivers, and Deer, Mill, Battle, and Antelope creeks in the Sacramento River basin; the San Joaquin River, including its tributaries, and the waterways of the Delta. Critical habitat includes the stream channels in the designated stream reaches and the lateral extent as defined by the ordinary high-water line. In areas where the ordinary high-water line has not been defined, the lateral extent will be defined by the bank-full elevation (defined as the level at which water begins to leave the channel and move into the floodplain; it is reached at a discharge that generally has a recurrence interval of 1 to 2 years on the annual flood series) (Bain and Stevenson 1999; 70 FR 52488). Critical habitat for CCV steelhead is defined as specific areas that contain the PCE and physical habitat elements essential to the conservation of the species. Following are the inland habitat types used as PBFs for CCV steelhead. PBFs for CCV steelhead include:

1. <u>Freshwater Spawning Habitat</u>

Freshwater spawning sites are those with water quantity and quality conditions and substrate supporting spawning, incubation, and larval development. Most of the available spawning habitat for steelhead in the CV is located in areas directly downstream of dams due to inaccessibility to historical spawning areas upstream and the fact that dams are typically built at high gradient locations. These reaches are often impacted by the upstream impoundments, particularly over the summer months, when high temperatures can have adverse effects upon salmonids spawning and rearing downstream of the dams. Even in degraded reaches, spawning habitat has a high conservation value as its function directly affects the spawning success and reproductive potential of listed salmonids.

2. Freshwater Rearing Habitat

Freshwater rearing sites are those with water quantity and floodplain connectivity to form and maintain physical habitat conditions and support juvenile growth and survival; water quality and forage supporting juvenile development; and natural cover such as shade, submerged and overhanging LWM, log jams, aquatic vegetation, large rocks and boulders, side channels, and undercut banks. Both spawning areas and migratory corridors comprise rearing habitat for juveniles, which feed and grow before and during their outmigration. Non-natal, intermittent tributaries also may be used for juvenile rearing. Rearing habitat condition is strongly affected by habitat complexity, food supply, and the presence of predators of juvenile salmonids. Some complex, productive habitats with floodplains remain in the system (*e.g.*, the lower Cosumnes River, Sacramento River reaches with setback levees [*i.e.*, primarily located upstream of the City of Colusa]) and flood bypasses (*i.e.*, Yolo and Sutter bypasses). However, the channelized, leveed, and riprapped river reaches and sloughs that are common in the Sacramento-San Joaquin system typically have low habitat complexity, low abundance of food organisms, and offer little protection from either fish or avian predators. Freshwater rearing habitat also has a high conservation value even if the current conditions are significantly degraded from their natural state. Juvenile life stages of salmonids are dependent on the function of this habitat for successful survival and recruitment.

3. Freshwater Migration Corridors

Ideal freshwater migration corridors are free of migratory obstructions, with water quantity and quality conditions that enhance migratory movements. They contain natural cover such as riparian canopy structure, submerged and overhanging large woody objects, aquatic vegetation, large rocks and boulders, side channels, and undercut banks which augment juvenile and adult mobility, survival, and food supply. Migratory corridors are downstream of the spawning areas and include the lower main-stems of the Sacramento and San Joaquin rivers and the Delta. These corridors allow the upstream and downstream passage of adults, and the emigration of smolts. Migratory habitat condition is strongly affected by the presence of barriers, which can include dams (*i.e.*, hydropower, flood control, and irrigation flashboard dams), unscreened or poorly screened diversions, degraded water quality, or behavioral impediments to migration. For successful survival and recruitment of salmonids, freshwater migration corridors must function sufficiently to provide adequate passage. For this reason, freshwater migration corridors are considered to have a high conservation value even if the migration corridors are significantly degraded compared to their natural state.

4. Estuarine Areas

Estuarine areas free of migratory obstructions with water quality, water quantity, and salinity conditions supporting juvenile and adult physiological transitions between fresh and salt water are included as a PCE. Natural cover such as submerged and overhanging LWM, aquatic vegetation, and side channels, are suitable for juvenile and adult foraging. Estuarine areas are considered to have a high conservation value as they provide factors which function to provide predator avoidance and as a transitional zone to the ocean environment.

2.2.3 Climate Change Impacts

One factor affecting the range-wide status of CCV steelhead and CCV spring-run Chinook and their associated aquatic habitats at large is climate change. In the last six decades, the Earth has experienced a significant increase in average surface temperatures. This increase is likely a result of increased in anthropogenic greenhouse gas emissions resulting from increasing populations, industrial activity and fossil fuel consumption, among other sources. A warming climate has profound implications for stream ecosystems as hydrologic conditions are likely to become highly altered from their current and historical states. Other physical factors such as air temperature and changes to terrestrial ecosystems will likely play a role as well in ecosystem health long term.

Cayan et al 2008, using the Parallel Climate Model (PCM) (Washington et al. 2000) and the NOAA Geophysical Fluid Dynamics Laboratory model (GFDL) (Stouffer et al 2006) found California's temperatures to rise by 1.7 to 3.0° Celsius (C) in the lower range of projections, 3.1 to 4.3°C in the medium range, and 4.4 to 5.8°C in the high range between 2000 and 2100. One consequence that will result even in the lower range of projections is a decrease in the Snow Water Equivalent (SWE) in the region. SWE is a measurement of stored water that is available from snowpack. In the low and medium-level projections, SWE is expected to decrease in the Sacramento, San Joaquin and Trinity drainages between -32 and -79% of historical averages (1961 – 1990). Using the PCM model, Dettinger et al. (2003) also projected a decrease in SWE, increased winter flood events and low flows in summer months in the Merced, Carson and American River basins by the end of the 21st century. Similar results were found by Miller et al. (2003) using two General Circulation Models (GCM).

Stream flow is a highly important variable and driving mechanism in fluvial ecosystems and climate has been identified as a landscape-scale driver of flow rates (Minshall 1988). Multiple climatological and hydrologic model predictions indicate that flows in the Central Valley rivers will decrease throughout the 21st century as warming trends continue. Salmonids in the Sacramento River Basin and its tributaries will likely face a decrease in flows, resulting in potentially lethal or sub-lethal water temperatures in summer months, impaired migration and decreased egg to fry/larvae recruitment. In addition to altered flow regimes, some other aspects of stream systems that are particularly sensitive to changes in climate are sediment transport/channel alterations, nutrient loading and rates of nutrient cycling, fragmentation and isolation of cold water habitats, altered exchanges with the riparian zone and life history characteristics of many aquatic insects (Meyer et al. 1999). Current warming trends and model predictions indicate that it is likely that climate change will result in some direct and indirect adverse effects to salmonids in the Sacramento River Basin during the 21st century.

2.3 Environmental Baseline

The "environmental baseline" includes the past and present impacts of all Federal, state, or private actions and other human activities in the action areas, the anticipated impacts of all proposed Federal projects in the action areas 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).

2.3.1 Status of the Species in Mill Creek

CV Spring-Run Chinook Salmon

a. Life History

Adult CV spring-run Chinook begin their migration in late February from the ocean to the upper watershed of Mill Creek, where they hold in cooler water before spawning. Figure 1 illustrates this upstream migration occurs between late February through June, with peak migration occurring in April and May, (CDFW unpublished data 2012) (Lindley 2004). CV spring-run spawning occurs generally from mid-September through to mid-October (Flosi *et. al.* 2010). The variation in elevation where spawning occurs can have an effect on egg incubation timing in the watershed. A key factor in "emergence timing" is elevation of spawning, due to this variation and other factors, CV spring-run Chinook fry may emerge over a 6 month period, from November through the following May. After emergence, juvenile emigration generally occurs from November through March (Moyle *et. al.* 1989, Vogel and Marine 1991).

Not all CV spring-run from Mill Creek out-migrate after emergence. There appears to be a second emigration period for juveniles that over-summer and out-migrate in the fall during high flow events. These emigrants have been indicated through trapping (Harvey 1995). Also, Snider and Titus (2000) observed that up to 69 percent of CV spring-run Chinook salmon juveniles emigrate during the first migration phase between November and early January. The remainder of the CV spring-run juveniles emigrate during subsequent phases extending through May or into the fall during high flow events.

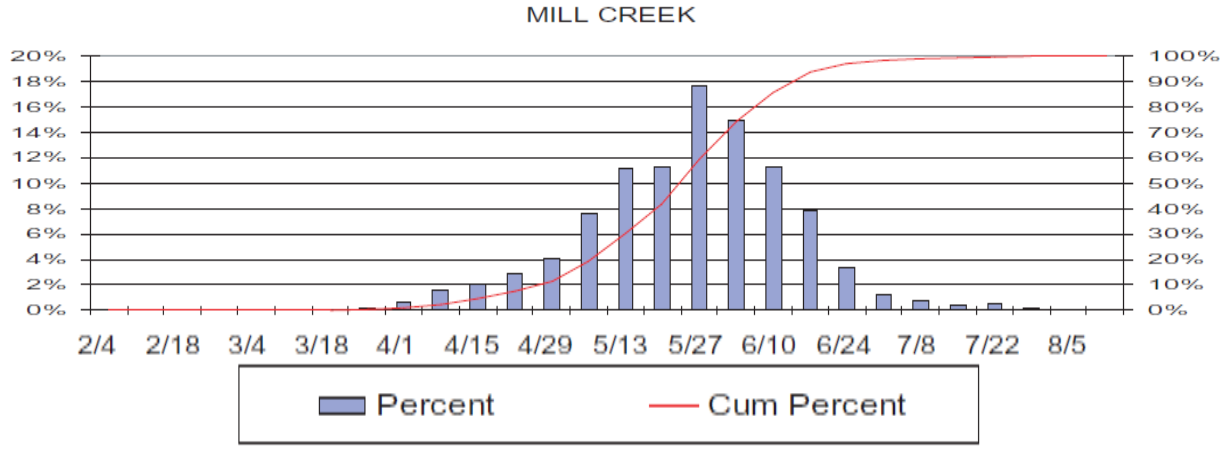

Figure 1. Weekly migration of CV spring-run Chinook salmon into Mill Creek. The bars show the percentage of migrants migrating in that week; the line shows cumulative percent migration. (Source: Lindley et. al., 2004)

b. Habitat use

CV spring-run salmon utilize the headwater reaches of Mill Creek for holding, spawning and rearing. Mill Creek spring-run Chinook salmon spawning habitat extends from near the Little Mill Creek confluence (River Mile 15) upstream to within 0.5 miles of the LVNP boundary, a

distance of 48 miles extending from 1,200 to 5,200 ft. in elevation. Little Mill Creek is upstream of the Upper Dam's action area. The action area is used as a rearing area for juveniles, and as a migratory corridor for both adult and juveniles.

Mill Creek spring-run Chinook salmon juveniles typically use the upper portions of Mill Creek to rear; the temperatures in the summer are cool enough to support feeding and growth. High water temperatures reduce summer rearing potential for juvenile Chinook salmon in the action area in the reach where Upper Dam (NHC 2015) is located. Water temperatures may reach daily maximums of 78-80° Fahrenheit (F) at this location during mid-summer. This temperature range not ideal for juvenile Chinook salmon (Cech *et al.* 1998), as it inhibits their growth and development. The ability for juveniles to tolerate warm temperatures is a function of exposure time, with an inverse relationship between exposure time and tolerance (Cech *et al*. 1998). Therefore, the warmer it gets, the more susceptible rearing salmonids are to stress and and increased stress can lead to mortality.

An upstream-impassable, high-velocity chute is located 1.93 miles in the Mill Creek channel itself, above the Upper Dam. This chute is 3.5 ft. wide and has an approximately 4.5 foot vertical drop. The entire volume of Mill Creek is funneled through this natural stream-bed feature under normal base flow conditions and, according to CDFW and NMFS criteria, is considered impassable for upstream juveniles (CDFW 2010). Once juveniles pass downstream of this feature, they cannot go back upstream to rear, so if they pass this section during late outmigration, they either continue to emigrate through to the Sacramento River, or they remain in lower Mill Creek where, if it is late enough in the year, water temperatures are not always optimal for their growth and survival.

Habitat use in lower Mill Creek is reduced during agriculture diversion season due to the fact that the creek becomes almost completely dewatered from active diversions below Ward Dam during July, August and September. Flows below Upper Dam downstream to Ward Dam are typically reduced to little or no flow, compared to unimpaired flow. During normal years, these are the baseline conditions and Mill Creek water temperatures downstream of Ward Dam, if there is any water left at all, are at lethal levels for fish. Habitat use in the action area of Upper Dam project action area by CV spring-run Chinook salmon, is not be expected to occur in dry years, during the period from July 1 – September 30, or until agricultural diversions cease for the growing season. Small numbers of juvenile spring-run may occur in Project area July 1 – September 30, in normal-to-wet water years when water temperatures will stay cooler through summer due to increased recharge to the system in better water years.

c. Abundance

Mill Creek's salmonid populations are important for the survival and recovery of salmon and steelhead in Northern California's Central Valley. Of the 19 independent spring-run Chinook salmon populations that historically occurred in the Central Valley, the Mill Creek population is one of the last of a small group of naturally-produced populations remaining. Mill Creek is identified in the Central Valley Salmon and Steelhead Recovery Plan as a Core 1 population for CV spring-run Chinook salmon and steelhead (NMFS 2014). Preserving and restoring Core 1 populations is the foundation of the recovery strategy, because Core 1 populations are considered

to have the greatest potential to support independent viable populations. Table 1 shows 20 years of CV spring-run escapement numbers for Mill Creek from 1994-2015 (CDFW Grandtab 1997-2015). CV spring-run Chinook salmon population numbers were historically higher. Therefore, protection and recovery of these remaining independent populations is critical to the recovery of the species.

Table 1. CV spring-run Chinook Population, 1994-2014. Source CDFW Grandtab 2016.

Year	**Mill Creek**
1994	723
1995	320
1996	253
1997	202
1998	424
1999	560
2000	544
2001	1,104
2002	1,594
2003	1,426
2004	996
2005	1,150
2006	1,002
2007	920
2008	362
2009	220
2010	482
2011	366
2012	768
2013	600
2014	679
2015	127

<u>CCV Steelhead in Mill Creek</u>

a. Life History

Adult upstream migration patterns for CCV steelhead in Mill Creek is very limited and based primarily on two studies; one from Hallock and another ongoing study by Matt Johnson at CDFW. Adult steelhead ascend Mill Creek October through June (Figure 2). Peak migration periods are characterized by fall entry (October through early December) and winter entry (late December through February). Adult steelhead continue to migrate upstream into early June, especially in

wetter water years. Adult steelhead spawning has been observed late winter through spring in Mill Creek (CDFW Red Bluff unpublished data). Adult steelhead are expected to move through the action area during fall and early winter, with the peak of upriver immigration expected mainly from October through November (Bailey 1954, Hallock *et al*. 1957). The historic and current distribution of steelhead spawning in Mill Creeks is thought to coincide with the range of spring-run salmon which have been observed holding and spawning in Mill Creek from Little Mill Creek (approximately 9.5 miles upstream of Upper Dam) to approximately 0.5 miles downstream of the LVNP boundary (USFS 1999).

Juvenile steelhead emigrate through Mill Creek, and the action area, to the Sacramento River (and then out to the Pacific Ocean) from late fall to early June. Snider and Titus (2000) observed that juvenile steelhead emigrate primarily between November and May at Knights Landing. By June, emigration of juvenile steelhead has essentially ended.

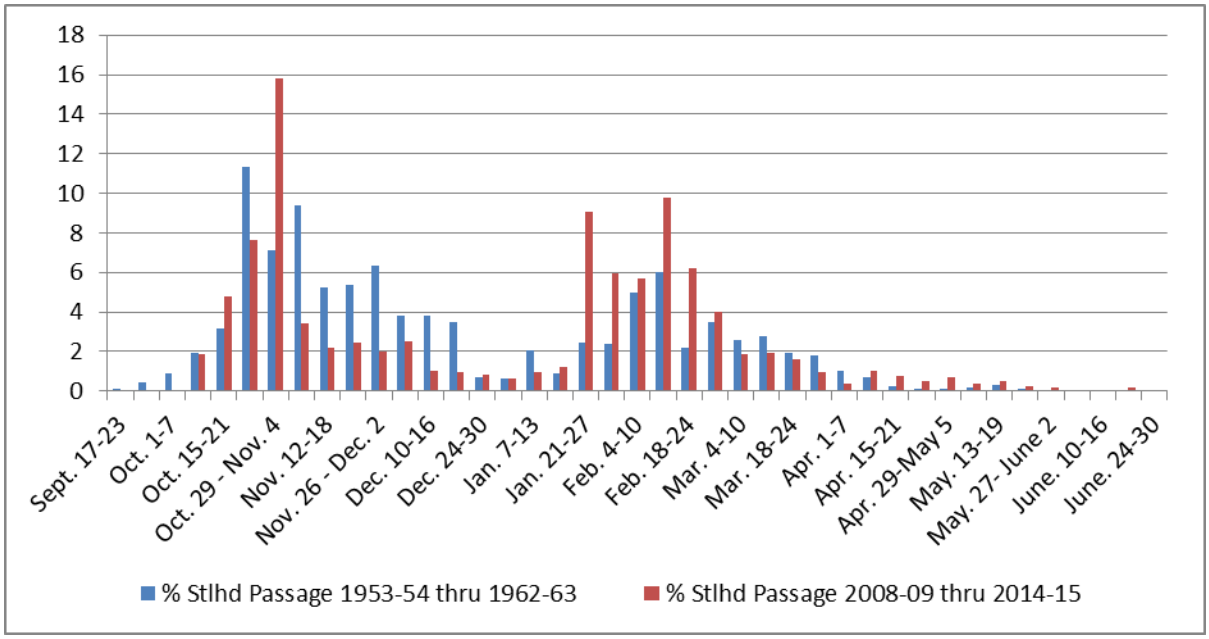

Figure 2. Percent steelhead passage by week comparing the Hallock study from 1953 to 1963 and the ongoing Matt Johnson study from 2008 to present. Source: Matt Johnson, unpublished data.

b. Habitat use

CCV steelhead utilize Mill Creek for holding, spawning, and rearing. The action area is used as a migratory corridor for both adult and juvenile CCV steelhead, and occasionally as a rearing area for juvenile CCV steelhead. Adult steelhead do not spawn in the action area, but are found spawning upstream in Mill Creek, at least 12 miles above the action area (CDFW 1998).

Adult CCV steelhead migrate through the Upper Dam action area in order to reach their spawning grounds. Juveniles migrate through the action area again to return to the ocean. Likewise, all CCV steelhead year-1 and year-2 steelhead will also have to pass through the action area during their emigration to the ocean.

Older juvenile steelhead (age 1+ and older), occupy a wide range of hydraulic conditions. They occupy deeper water during summer and have been observed to use deep pools near the thalweg, in areas with ample cover, as well as higher velocity rapid and cascade habitats (Bisson et al. 1982). Juvenile steelhead use upper Mill Creek for rearing where temperatures are cooler than the valley floor where lower Mill Creek resides. As described earlier, the passage barrier on Mill Creek above the upper dam, may cause some juveniles to be trapped downstream of this feature during the summer months. CDFW has recorded a very few, both live and dead juvenile salmonids in lower Mill Creek during July and August (CDFW 2013).

Because full diversion (baseline conditions) results in Mill Creek becoming completely dewatered during summer months, any salmonids that are below Ward Dam, once full diversion has been started, are not expected to survive. Juveniles could/can survive below Upper Dam, but conditions are not favorable for survival because so much water is diverted at Upper Dam during July and August. Therefore, Mill Creek water temperatures downstream of the Upper dam, in July, August and September, during baseline conditions, are expected to be sub-optimal for fish, even if there is flow in the channel in a higher than normal water year. A review of temperature effects on steelhead by Cech and Myrick (1998) suggested an upper lethal temperature threshold for juvenile salmonids in the Central Valley of 29°C. Summer temperatures in the action area of Mill Creek often exceed this during July and August when the Project is to be implemented.

c. Abundance

Abundance information for CCV steelhead in Mill Creek is very limited and based primarily on two studies; one from Hallock and another ongoing study by Matt Johnson at CDFW. CCV steelhead stocks have declined substantially from their historic numbers and now are at a fraction of their historical abundance. The Hallock study from, 1953 to 1963, counted adult steelhead passing over Clough Dam, and observed a range of abundance from a low of 417 fish in the 1959-1960 water year to a high of 2,269 fish in the 1962-1963 water year, with a 10 year average of 1,160 fish (Figure 3). The Matt Johnson study, from 2008 to present has observed a range of abundance from a low of 56 in the 2015 to 2016 water year (although this number only accounts for the 2015 fall-run season) to a high of 247 in the 2015-2015 water year, with an 8 year average of 147 fish (Figure 4).

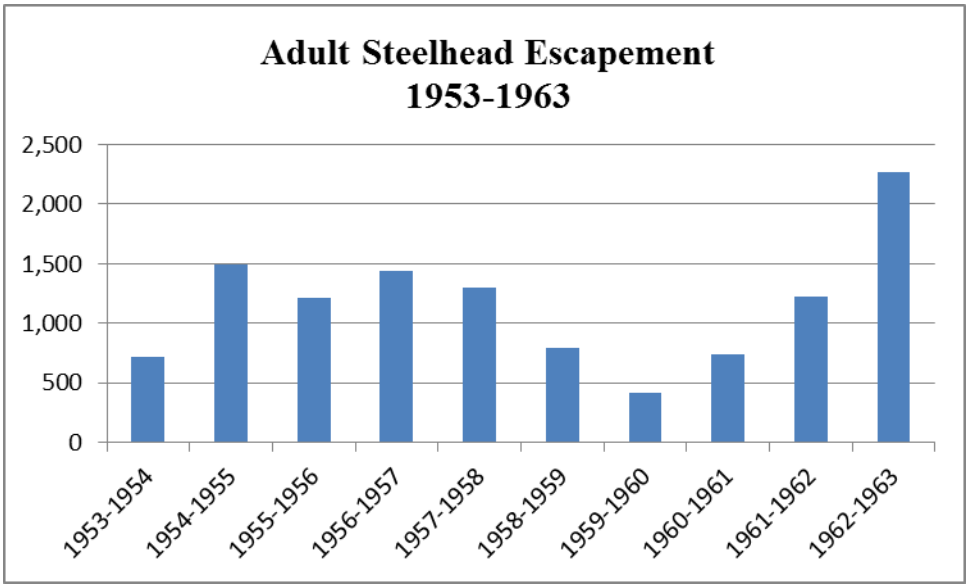

Figure 3. Adult steelhead escapement into Mill Creek as counted at Clough Dam from 1953 to 1963. Source: Hallock 1989.

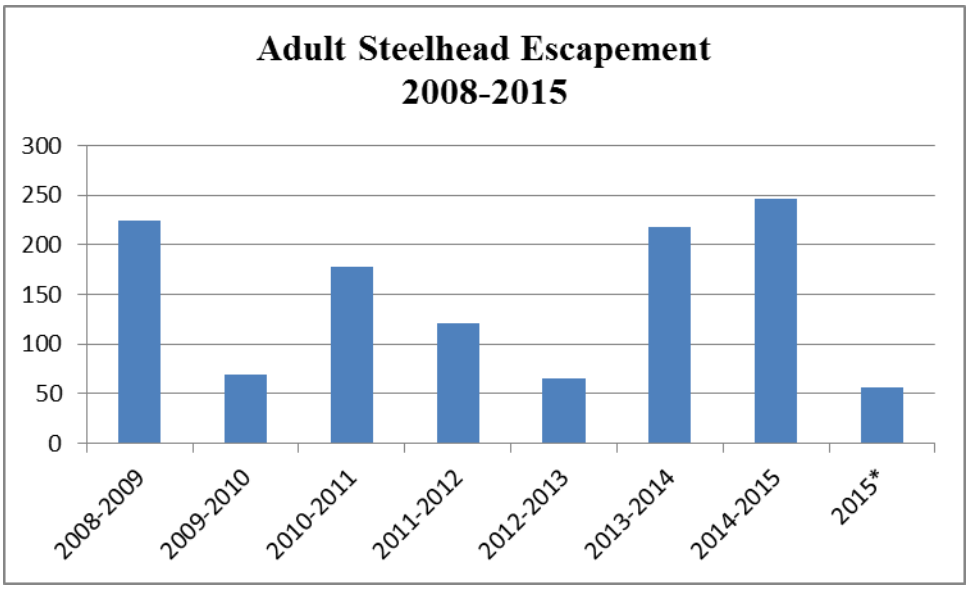

Figure 4. Adult steelhead escapement into Mill Creek as counted at Ward Dam. Source: Matt Johnson, CDFW.

2.3.2 Status of Critical Habitat in Mill Creek

<u>CCV Steelhead and CV Spring-Run Chinook Salmon</u>

The action areas are within designated critical habitat for CV spring-run Chinook salmon and CCV steelhead. Habitat requirements for these species are similar. The PBFs of CV spring-run

Chinook salmon and CCV steelhead habitat within the action area are the same, and include: freshwater rearing habitat, freshwater migration corridors, and spawning habitat. PBFs along the valley floor reaches include freshwater rearing and freshwater migration corridors. PBFs along the valley floor are degraded by altered stream flows and passage conditions at agricultural diversion dams an appurtenant facilities, but still maintain a high conservation value because the entire populations of Mill Creek spring-run Chinook salmon and steelhead must pass through this reach. Upstream PBFs include freshwater rearing habitat, freshwater migration corridors and spawning habitat. Upstream PBFs generally are in excellent condition but are modified from historic conditions by timber management, road building and increased fire frequency and severity.

2.3.3 Status of the Species in Deer Creek

CV Spring-Run Chinook Salmon

a. Life History

Adult CV spring-run Chinook salmon begin their upstream migration from late February through mid- to late June (Figure 5) with peak migration occurring in April and May (Lindley 2004). March/April time frame will likely be the earliest date that CV spring-run will reach the project sites after entering Deer Creek (M. Johnson pers. comm. 2016). Figure 4 shows the Mill Creek run-timing data from the same period and corresponds closely to the Deer Creek spring-run timing. USFS has reported spring-run Chinook spawning to occur in Deer Creek from late August through October, with adults dying soon after (U.S. Forest Service 1999, Johnson and Merrick 2012).

Deer Creek spawn in the upper reaches of the watershed. The variation in elevation where adult CV spring-run spawn in Deer Creek occurs, has an effect on egg incubation timing in the watershed. As a result, depending upon the elevation at which an adult female spawned, CV spring-run Chinook fry may emerge over a 6 month period, from November through the following May. After CV spring-run Chinook salmon spawn in the upper watershed, fry emerge from the spawning gravels, and may immediately begin migrating downstream or may remain in the stream from several months to more than a year (USFS 1999). Therefore juvenile spring-run are expected to be rearing within the LDCF project area year-round (M. Johnson pers. comm. 2016), and possibly yearlings may occur in the lower Deer Creek project areas year-round. In Deer Creek, October 3 was the date at which the first yearling Chinook was detected at the Deer Creek rotary screw traps from 1994 through 2009 (Johnson and Merrick 2012). The Deer Creek rotary screw trap data set shows that yearling spring-run Chinook juveniles out-migrate from October through June, beginning with the first fall rains (M. Johnson pers. comm. 2016) and in greatest numbers from October through December continuing at lesser rates through the winter and spring (Johnson and Merrick 2012).

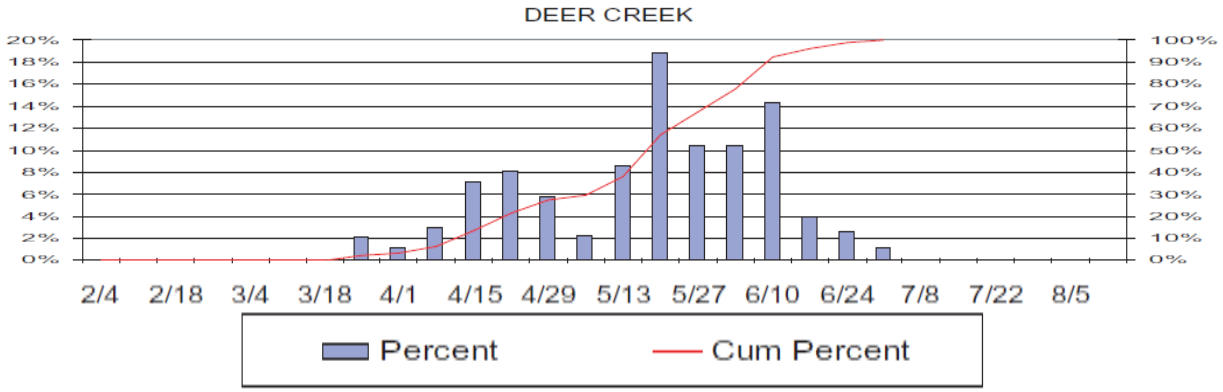

Figure 5. Weekly migration of CV spring-run Chinook salmon into Deer Creek. The bars show the percentage of migrants migrating in that week; the line shows cumulative percent migration. Source: Lindley et. al., 2004

b. Habitat use

Deer Creek contains 38 miles of high value holding, spawning and rearing habitat for CV spring-run Chinook salmon, and has intrinsic potential for increasing the spawning populations of spring-run Chinook salmon because of its nearly pristine habitats that are still accessible by adult salmonids. Deer Creek has several unique habitat features that make it an important resource for anadromous fish in the Sacramento Valley. The upper watershed, where CV spring-run Chinook salmon spawn and rear is above 3,000 feet and flows out of a geological formation that enables abundant cold water storage which creates a thermal refuge for CV spring-run Chinook salmon spawning and their early life stages.

Spring-run Chinook salmon utilize Deer Creek the valley floor habitat for rearing and migration, and they use the upper Deer Creek habitats for migration, holding, spawning and rearing. Deer Creek adult spring-run Chinook salmon are generally believed to hold and spawn from Upper Deer Creek Falls, downstream to below Dillon Cove (Arrison 1999, Johnson and Merrick 2012, M. Johnson pers. comm. 2016), approximately 30 river miles, however the downstream extent of spawning is unknown and could vary with stream flow and water temperature from year-to-year (M. Johnson pers. comm. 2016). Most salmon holding and spawning upstream of LDCF, do so within the upper two miles of habitat downstream of Upper Deer Creek falls to Potato Patch Campground. Spring-run Chinook salmon in Deer Creek spawn from a range of approximately 1,200 to 3,800 feet in elevation (Johnson and Merrick 2013, M. Johnson pers. comm. 2016).

Redds in Deer Creek are only found in the upper project area (LDCF), and are typically found in pool tails or scattered pockets of gravel rather than riffles, which typically have larger substrate due to the steepness of the stream. Spring-run Chinook redds are typically observed in the pool tail at the base of LDCF within the uppermost project area during annual fall spawning surveys conducted by USFS (C. Mayes pers. comm. 2016). The next available spawning habitat downstream of this pool tail is approximately 200 meters downstream and is

only occasionally utilized by spring-run based on surveys conducted since 1992 (C. Mayes pers. comm. 2016). Potential spring-run spawning habitat exists above LDCF, however there were no salmon or redds detected during the 2015 summer and fall holding and spawning surveys conducted by USFS (C. Mayes pers. comm. 2016).

Upper Deer Creek Falls has been reported to be a barrier to all upstream migration by spring-run Chinook (Cramer and Hammack 1952, The Habitat Restoration Group 1998, Marcotte 1984, Johnson and Merrick 2013). Although habitat above Upper Deer Creek falls has not been considered suitable for spring-run given the creeks small size and lack of deep holding pools, (Hanson et al. 1940 as cited in USFS 1999); reports indicate that occasional anadromous fish have been observed upstream of the Upper Falls (USFS 1999). Anadromous fish (including spring-run Chinook salmon) have been observed above Upper Falls (USFS 1999) in some years, however habitat appeared to be utilized only rarely by a few hardy fish capable of passing the falls under suitable conditions (USFS 1999). A fish ladder was built at Upper Deer Creek falls in the early 1950's, however it was apparently never effective in passing spring-run salmon and has remained closed during their migration period (USFS 1999) for the past 20 years, also the closure was in part to maintain the put and take fishery (M. Johnson pers. comm. 2016).

c. Abundance

Table 2 shows CV spring-run escapement numbers for Deer Creek from 1994-2015 (CDFW Grandtab 1997-2015). CV spring-run Chinook salmon population numbers were historically higher. Therefore, protection and recovery of these remaining independent populations is critical to the recovery of the species**.**

Table 2. CV spring-run Chinook Population, 1994-2015. CDFW Grandtab 2016.

Year	Deer Creek
1994	485
1995	1295
1996	614
1997	466
1998	1879
1999	1591
2000	637
2001	1,622
2002	2195
2003	2795
2004	804
2005	2,239
2006	2,432
2007	644
2008	140
2009	213
2010	262
2011	271
2012	734
2013	708
2014	830
2015	268

CCV Steelhead in Deer Creek

a. Life History

Steelhead life history information in Deer Creek is very limited, but likely follows similar trends as Mill Creek. It is likely that CCV steelhead begin migration upstream into Deer Creek during the late fall and winter in typical years, when flows increase from storms (The Habitat Restoration Group 1998) and end migration when stream flows become too low (Hallock 1989) as irrigation diversions begin in the spring (M. Johnson pers. comm. 2016). More recent reports indicate that adult steelhead migrate into Deer Creek from October through April, with peak migration periods characterized by a fall entry from October through early December, and a winter entry from late December through February (Johnson and Merrick 2012). A smaller, less organized migration occurs in the spring, with fish ascending Deer Creek from April through early May during high water years (CDFG Red Bluff unpublished data as cited in Johnson and Merrick 2012, M. Johnson pers. comm. 2016).

Deer Creek steelhead spawn shortly after migration during the late winter through spring (Johnson and Merrick 2012) from early December into May (M. Johnson pers. comm. 2016). Steelhead have been observed spawning downstream of LDCF at the U.S. Forest Road 27N08 road crossing, approximately 1.2 miles downstream of the falls (C. Mayes pers. comm. 2016) as well as approximately 0.5 miles downstream of LDCF, however adult steelhead are not be expected to spawn near LDCF at or upstream of the LDCF's project site during the period of construction (M. Johnson pers. comm. 2016).

Most naturally produced CCV steelhead rear for 2 years before emigrating (McEwan 2001). For ocean-maturing steelhead in the Sacramento River and its tributaries, 32 percent of juveniles emigrate after 1 year in freshwater, and 68 percent emigrate after 2 years in freshwater (Busby P.J. et al. 1996). Those CCV steelhead that emigrate after 2 years, are presumed to rear in upper Deer Creek, because their rearing requirements will be met there year-round. The lower Deer Creek Watershed summer water temperatures are not optimal for juveniles, and therefore juvenile steelhead presence in lower Deer Creek during July, August through mid-September is not be expected, or will be very limited.

b. Habitat use

CCV steelhead utilize Deer Creek for migration, holding, spawning, and rearing. The action areas in the lower watershed are used as a migratory corridor for both adult and juvenile CCV steelhead, and occasionally as a rearing area for juvenile CCV steelhead. Adult steelhead use the upper watershed for migration, holding, spawning, and juveniles use it for rearing. It has been reported that the upper extent of adult steelhead migration is Upper Deer Creek Falls (Marcotte and Airola 1982, California Department of Water Resources 1964).

Adult CCV steelhead migrate through the action areas in the lower watershed in order to reach their spawning grounds. Juveniles migrate through these lower watershed action areas again to return to the ocean. Likewise, all CCV steelhead year-1 and year-2 steelhead will also have to pass through the action areas during their emigration to the ocean. Juvenile steelhead mainly use upper Deer Creek for rearing where temperatures are cooler than the valley floor where lower Deer Creek resides, and are therefore any year-1 or year-2 steelhead are expected to be present during LDCF Project implementation. Summer temperatures in the action areas of lower Deer Creek often exceed optimal limits for rearing steelhead. However, if temperatures remain non-lethal, it is expected that CCV steelhead could be in the action areas of the lower Deer Creek watershed during the construction windows for DCID and SVRIC project implementation.

c. Abundance

Adult abundance information for CCV steelhead in Deer Creek is much more limited than Deer Creek. CCV steelhead stocks have declined substantially from their historic numbers and now are at a fraction of their historical abundance. There are several factors that contribute to these declines, including: overfishing, loss of freshwater and estuarine habitat, hydropower development, poor ocean conditions, and hatchery practices. Deer Creek's CCV steelhead populations are considered a subset of the CCV stocks, and mirror the general population decline (CDFW pers. Comm. With M. Johnson 2016). In the 2014-2015 water year, video stations at Stanford Vina Dam counted

96 adult steelhead. Final Deer Creek video station counts for 2015 adult fall-entry steelhead between October 23 and December 12, 2015 were 8 fish.

2.3.4 Status of Critical Habitat in Deer Creek

CCV Steelhead and CV Spring-Run Chinook Salmon

The action areas are within designated critical habitat for CV spring-run Chinook salmon and CCV steelhead. Habitat requirements for these species are similar. The PBFs of CV spring-run Chinook salmon and CCV steelhead habitat within the action area are the same, and include: freshwater rearing habitat, freshwater migration corridors, and spawning habitat. PBFs along the valley floor reaches include freshwater rearing and freshwater migration corridors. Similar to Mill Creek, PBFs along the valley floor of Deer Creek are degraded by altered stream flows and passage conditions at agricultural diversion dams an appurtenant facilities, but still maintain a high conservation value because the entire populations of Deer Creek spring-run Chinook salmon and steelhead must pass through this reach. Upstream PBFs include freshwater rearing habitat, freshwater migration corridors and spawning habitat. Upstream PBFs generally are in excellent condition but are modified from historic conditions by timber management, road building and increased fire frequency and severity.

2.3.5 NMFS' Salmon and Steelhead Recovery Plan Action Recommendations

The NFMS recovery plan that includes both CCV steelhead and CV spring-run Chinook salmon (NMFS 2014), identifies recovery goals for the Mill Creek Watershed / Population which includes the Project area. Recovery efforts are focused on addressing several key stressors including: (1) elevated water temperatures affecting adult migration and holding; (2) low flows and poor fish passage facilities, affecting attraction and migratory cues of migrating adults; and (3) possible catastrophic events (e.g. fire or volcanic activity). Recovery actions identified in the recovery plan are few and localized, but are recognized as having a high likelihood of restoring or maintaining good fish passage conditions. The recommended recovery actions include a comprehensive hydraulic fish passage evaluation and monitoring plan that leads to improving diversion structures to meet adult and juvenile fish passage criteria. It also includes the development of a water exchange agreement already in being put in place between CDFW, LMMWC and water users on Mill Creek that will helps improve flows when listed salmonids need them for passage and rearing.

2.4 Effects of the Action

Under the ESA, "effects of the action" means the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated or interdependent with that action, that will be added to the environmental baseline (50 CFR 402.02). Indirect effects are those that are caused by the proposed action and are later in time, but still are reasonably certain to occur.

This BO assesses the effects of the proposed action on endangered threatened CV spring-run Chinook salmon and CCV steelhead and the designated critical habitat for these listed anadromous fish species, respectively.

In the *Description of the Proposed Action* section of this BO, NMFS provided an overview of the action. In the *Status of the Species and Critical Habitat* section and in the *Environmental Baseline* section of this BO, NMFS provided an overview of the threatened and endangered species and critical habitats that are likely to be adversely affected by the activity under consultation.

2.4.1 Potential Effects at Upper Dam, DCID Diversion Dam, SVRIC Diversion Dam and Cone-Kimball Diversion Dam

The following sections (2.4.1 and 2.4.2) evaluate the potential effects of the Project. The effects at Upper Dam, DCID Diversion Dam, SVRIC Diversion Dam and Cone-Kimball Diversion Dam are analyzed in section 2.4.1 because these Projects are on the valley floor, where fish are not present during the summer and the potential impacts tend to be similar. LDCF is analyzed in section 2.4.2 because it is located 42.4 miles upstream from the confluence of the Sacramento River in an area where listed fish are present in the action area throughout the year.

<u>Effects to Individuals</u>

Because of the location of these projects on the valley floor, and similarities in the timing of fish presence and abundance, project effects at each site are expected to be quite similar. The design of DCID varies from Upper Dam and SVRIC Diversion Dam, but effects are still likely to be similar, mainly because construction will occur during summer months when the abundance of federally-listed fish species is expected to be low. Similarly, at Cone-Kimball, a specific design has not been explored but is likely to be similar to at least one of the other proposed actions and the effects will be similar, although probably less because the diversion is on a side-channel to Deer Creek and not as many fish are expected to be present during construction. Project elements that have the potential for adverse effects to CV spring-run Chinook salmon and CCV steelhead are related to fish rescue and protection measures and construction activities. Potential construction-related impacts are primarily due to temporary increases in turbidity from in-channel work.

The work window for in-water construction is July 1 to September 30, with a possibility of extending to October 14 of the construction year depending on the specific conditions described in the proposed action. This work window reduces the chance of construction effects to listed fish. CV spring-run Chinook salmon and CCV steelhead are either not using the action area for migration and/or rearing during this work window. There is a very low possibility that adults could still be migrating through the action area and that some juveniles may still be emigrating through the action. The abundance of these fish will be in very low numbers, and will be relocated either upstream (adults) or downstream (juveniles) in the preconstruction fish rescue.

Dewatering and Fish Relocation: As part of the fish relocation effort, and before channels are dewatered, a fish exclusion zone upstream and downstream of the construction areas, will be

established prior to the onset of any instream construction activities. After the fish exclusion zone is created, a crew will herd fish into an area where they can be captured with seines or dip nets. All captured fish will be held in buckets filled with stream water for a period only long enough to transport them to an appropriate release site upstream or downstream of the Project site. It is anticipated that fish capture/relocation will not last more than one day. If additional capture / relocation is needed, it will occur over several additional days, if additional fish are observed within the exclusion zone as a result of daily monitoring.

Based upon CDFW snorkel surveys in lower Mill and Deer creeks, and from fish rescue efforts carried out at Ward Dam on Mill Creek, it is estimated that juvenile fish could be present and subject to collects and handling. A small number of these fish may be injured or killed. The estimated number of fish that may be captured, handled, injured or killed are shown in Tables 3-6 below.

Table 3. Number of fish that may be captured and handled and injured or killed at Upper Dam on Mill Creek.

Species and Life Stage	**Number Captured or Handled**	**Number Injured or Killed**
CCV Steelhead Juveniles	20	2
CV Spring-run Chinook Juveniles	10	1
CV Spring-run Chinook Adults	1	0

Table 4. Number of fish that may be captured and handled and injured or killed at DCID Diversion on Deer Creek.

Species and Life Stage	**Number Captured or Handled**	**Number Injured or Killed**
CCV Steelhead Juveniles	50	3
CV Spring-run Chinook Juveniles	30	2
CV Spring-run Chinook Adults	1	0

Table 5. Number of fish that may be captured and handled and injured or killed at SVRIC Diversion Dam on Deer Creek.

Species and Life Stage	**Number Captured or Handled**	**Number Injured or Killed**
CCV Steelhead Juveniles	20	2
CV Spring-run Chinook Juveniles	10	1
CV Spring-run Chinook Adults	1	0

Table 6. Number of fish that may be captured and handled and injured or killed at Cone-Kimball Diversion Dam on Deer Creek.

Species and Life Stage	**Number Captured or Handled**	**Number Injured or Killed**
CCV Steelhead Juveniles	20	2
CV Spring-run Chinook Juveniles	10	1
CV Spring-run Chinook Adults	1	0

Other direct effects: Other direct effects could occur during the final tasks associated with construction of the fish-ways, reconstruction of the new fish ladder, retrofitting the fish screens and components (canal and bypass pipe) or installation of water diversion control infrastructure improvements and include effects due to delays in migration.

Diverted flows will be screened through the existing screens before being used as irrigation water or flows will be returned to the creek through the bypass return pipes. If juvenile and / or adult salmonids are present in the immediate area of construction, and are present in the diverted flows which flow into the canal, they will be screened from the canal and will be returned to the creek through a bypass return pipe. During late-September, and early October, early-run adult steelhead may attempt to migrate through the action area and may be temporarily delayed from a few hours to a few days until construction is complete. These fish are not expected to be injured or killed and will be able to successfully swim upstream to reproduce.

Water quality effects: During re-watering, a plume of turbidity is anticipated immediately following construction activities as the channel immediately begins to adjust to the new conditions. This turbidity and small amount of suspended sediment is likely persist in the water column for several hours until channel conditions stabilize; however, re-watering activities will occur slowly, in order to prevent and minimize turbid conditions in Mill Creek. Turbidity and settleable matter are not expected to exceed the likely conditions in the Clean Water Act Section 401 Certification issued by the CVRWQCB. If juvenile adult or juvenile CCV steelhead or juvenile CV spring-run Chinook salmon are present in the immediate area of construction, it is believed that the number of fish affected will be few and most will volitionally leave the Project area until activities cease or turbidity diminishes. Juvenile fish should be able to escape to available refugia near the area, a non-lethal behavioral response. Because the work will occur downstream of the known spawning areas, no steelhead redds are expected to be affected. However, there is a potential that some fish may injured through non-lethal effects that are within a 500 foot long plume. It is difficult to quantify the exact number of fish that will be affected, but it is likely to be low since the peak of downstream migration is triggered by fall and winter-rain events that trigger pulse flow events and the re-watering is most likely to occur prior to the onset of rain and outmigration. The number of adult steelhead that could be affected is also difficult to estimate, but in 2015, adult steelhead were not counted in Mill Creek until the last week of October and in Deer Creek until the last week of November, so exposure to increased turbidity by adult steelhead should be low to non-existent.

Additional Water Quality Effects: NMFS expects that adherence to the Project's conservation measures including the implementation of a SWPPP, and including erosion control measures and BMPs for construction activities, will reduce potential impacts to listed fish species and habitat resulting from sedimentation and other potential negative water quality effects generated during construction of the new fish-way facilities. These measures will also minimize the risk of introducing petroleum products or pollutants other than sediment to the waterway because the prevention and contingency measures will require frequent equipment checks to prevent leaks, will keep stockpiled materials at least one mile away from the water, and will require that absorbent booms are kept onsite to prevent petroleum products from entering the river in the event of a spill or leak. Therefore, potentially harmful effects to listed salmonid are considered insignificant and not likely to reach the scale where take will occur.

Effects from Operation and Maintenance: Operation and maintenance of the new fish-way facilities should not result in take of listed adult juvenile salmonids in the form of impaired upstream passage, impingement, entrapment, or entrainment. Each project will include an "Operations and Maintenance Plan" (OMP) which will be developed by CDFW and the owner of the diversion facilities and will be fully implemented following construction. The OMP will contain measures for adaptively managing the facility to meet the needs of the listed species and the owner of the diversion, as new information informs managers how to best operate the system to avoid adverse effects to fish. Therefore, potentially harmful effects from fish ladder, diversion and fish screen operations and maintenance for listed salmonid are considered insignificant and not likely to reach the scale where take will occur.

Effects to Critical Habitat

Critical habitat PBFs for CV spring-run Chinook salmon, CCV steelhead in the action area are freshwater rearing and migration. The Project may have short-term and temporary impacts to the migratory corridor, but emigrating fish will be able to migrate through the bypass and the adults will only be affected for a short period of time in September and possibly early October. The critical habitat for the CV spring-run Chinook salmon in the action will be temporarily affected by the Project, such as a temporary reduction in migration corridor access through sedimentation plumes obfuscating portions of the channel. These effects are expected to be temporary (less than 3 hrs.) and localized (less than 500 feet in distance downstream). Riparian impacts associated with entry points and construction of fish-way structures will be avoided, minimized and re-established at a vegetation ratio of 3:1, to the extent that they occur. The Project will replace damaged or removed riparian habitat at a 3:1 ratio. The replacement of riparian habitat will restore natural cover. Therefore effects to critical habitat, related to freshwater migration are expected to be insignificant and not reach the scale where the conservation value of critical habitat will be diminished. After construction, the conservation value of the migration corridor and upstream spawning habitat will be improved due to improved passage conditions and the likelihood that adult fish will have better access to upstream holding and spawning habitat.

2.4.2 Potential Effects at Lower Deer Creek Falls on Deer Creek

Effects to Individuals

The location, environmental conditions, and potential effect to individuals and critical habitat at LDCF differ from the other fish-way facility projects and are therefore analyzed separately. Both juvenile and adult fish may be present year round, however, the fish-way is not located in the main channel, so the potential for exposure and adverse effects are reduced.

Dewatering and Fish Relocation: At the beginning of construction, the fish ladder exit will be blocked and the existing fish-way will be dewatered. Before the fish-way is completely dewatered, CDFW personnel will conduct a snorkel survey and will remove any remaining fish with seines, dipnets or electrofishing. Electrofishing will only occur if there are no adults present. Captured fish will be held in buckets long enough to relocate them either upstream or downstream of the project site. A small number of these fish may be injured or killed. The number of fish that are expected to be present and rescued are based on previous observations of

fish present in the existing fish-way conducted by CDFW and NMFS personnel. The estimated number of fish that may be captured, handled, injured or killed are shown in Table 7 below.

Table 7. Number of fish that may be captured and handled and injured or killed at Lower Deer Creek Falls on Deer Creek.

Species and Life Stage	**Number Captured or Handled**	**Number Injured or Killed**
CCV Steelhead Juveniles	10	1
CV Spring-run Chinook Juveniles	20	2
CV Spring-run Chinook Adults	1	0

At the downstream extent of the project the entrance to the fishway intersects a large holding pool below LDCF. Adult and juvenile CCV spring-run Chinook salmon and CV steelhead hold and rear in this pool. CDFW personnel will attempt to herd any fish in this pool, downstream in to a large complex of holding pools and an adult fish exclusion device, likely an Alaskan picket weir, will be installed downstream of the construction area. Once the fishway is blocked, juvenile fish will be able to migrate downstream by swimming over LDCF and through fish exclusion device. Potential effects to herded fish are considered discountable and they are not expected to be injured or killed. Due to the complex hydrologic and habitat conditions in the LDCF pool, it is extremely unlikely that all fish will be herded downstream, however, the remaining fish are not expected to be adversely affected by the adjacent construction of the new fish way because there is an extensive amount of habitat refugia in the form of deep water, bedrock ledges and turbulent bubble curtains that fish can use as cover. Therefore potential impacts to remaining fish are considered discountable and extremely unlikely to occur.

The construction will commence at the end of the adult upstream migration season and any fish that are confined downstream of the adult exclusion device will be holding in pool complex that is large enough to support a very large number of fish. Downstream of the pool there are extensive reaches of spawning habitat capable of supporting large numbers of fish. Therefore, potential impacts to these fish are considered discountable and extremely unlikely to occur.

Potential Effects Related to Helicopters: Due to the remote location of LDCF, helicopters will be used to deliver construction material to the Project site. Helicopter use during construction activities will cause an increase in wind, surface water turbulence and wave action. Equipment used near the creek, could leak or spill hazardous materials into the creek near embryos, juveniles or adults if they were present near the activities, and instream turbidity could increase due to construction.

Fish exposed to helicopter activity are expected find seek cover and are not expected to be adversely affected by the noise or disturbance because there is an extensive amount of refugia in the form of deep water, bedrock ledges and turbulent bubble curtains that fish can use as cover. Therefore potential impacts to from helicopter activity are considered discountable and extremely unlikely to occur.

BMPs will be implemented to minimize or avoid the potential for equipment spills or leaks and the potential for hazardous materials to enter Deer Creek are considered discountable and extremely unlikely to occur

Turbidity from construction activities will be minimal due to a lack of significant instream disturbance and will be addressed through implementation of BMPs including turbidity and sediment barriers depicted in the designs and described in the preliminary Dewatering Plan. Any turbidity that reaches the stream will be very small, settle quickly and the potential for turbidity-related impacts is considered insignificant and extremely unlikely to reach a level where take will occur.

Effects from Operation and Maintenance of Fish-way Facilities: Operation of the new fish-way facilities itself should not result in take of listed juvenile salmonids in the form of impaired upstream passage. The facility will include an OMP which will be developed by CDFW and will be fully implemented following construction, should help to prevent take at the upgraded facility (once completed). The OMP will contain measures for adaptively managing the facility to meet the needs of the listed species. Therefore, potentially harmful effects from fish ladder, diversion and fish screen operations and maintenance for listed salmonid are considered insignificant and not likely to reach the scale where take will occur.

Effects to Critical Habitat

Critical habitat PBFs for CV spring-run Chinook salmon, CCV steelhead in the action area are freshwater rearing habitat, freshwater migration corridors, spawning habitat. A small amount of freshwater holding and spawning habitat will be temporarily blocked during the construction period starting on July 1. The impact will be temporary and any fish excluded from the area are expected to successfully hold and spawn downstream. Once the construction is complete, the exclusion device will be removed and adults will be able to hold and spawn in the pool will be blocked by construction. Therefore effects to critical habitat are small and will not reach the scale where the conservation value of critical habitat will be reduced. After construction, the conservation value of the migratory corridor and spawning habitat will be greatly improved.

2.5 Cumulative Effects

For purposes of the ESA, cumulative effects are defined as the effects of future State or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation (50 CFR §402. 02). Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultations pursuant to section 7 of the ESA.

Agricultural practices in the Mill Creek Watershed may adversely affect riparian and wetland habitats through upland modifications of the watershed that lead to increased siltation or reductions in water flow in stream channels flowing into Mill Creek. Unscreened agricultural diversions upstream of the Project's action area entrain fish including juvenile salmonids. Grazing activities from cattle operations can degrade or reduce suitable critical habitat for listed salmonids by increasing erosion and sedimentation as well as introducing nitrogen, ammonia, and other nutrients into the watershed, which then flow into the receiving waters of the

Sacramento River. Irrigation discharges related to both agricultural and urban activities contain numerous pesticides and herbicides that may adversely affect salmonid reproductive success and survival rates.

There are several watershed restoration projects that have been implemented by the Mill Creek Conservancy, LMMWC, CDFW and / or the USFWS over the past approximately 25 years. These projects include but are not limited to, development of a water exchange program, fish passage restoration, development of conservation easements, riparian habitat restoration, outdoor education, pasture restoration, agricultural and timber preservation zoning, streambank stabilization, non-native vegetation control and fuels management.

There are several watershed restoration projects that have been implemented by the Deer Creek Conservancy, USFS, CDFW and / or the USFWS over the past approximately 25 years. These projects include but are not limited to, development of a watershed plan and strategy, flow enhancement activities, implementation of a groundwater exchange pilot program, fish passage and instream flow studies, development of conservation easements, riparian habitat restoration and conservation, flood management, levee and bank protection, timber preservation zoning, streambank stabilization, water quality and quantity monitoring and aquatic habitat, fisheries and amphibian surveys.

Additionally, there are two irrigation diversion structures, the SVRIC diversion and the DCID diversion downstream of LDCF which are upcoming potential fish passage projects; however, these projects are currently unfunded.

2.6 Integration and Synthesis

The integration and synthesis is the final step in our approach to the risk posed to species and critical habitat as a result of implementing the proposed action. This section is based on analyses provided in the *Status of the Species*, the *Environmental Baseline*, and the *Effects of the Proposed Action*. In our *Status of the Species* section, NMFS summarized the current likelihood of extinction of each of the listed species. The *Integration and Synthesis* will consider all of the factors added together to determine the proposed action's influence on the likelihood of both the survival and recovery of the species, and on the conservation value of designated critical habitat.

<u>Central Valley spring-run Chinook salmon</u>

a. Baseline Status and Viability of Species

As indicated in the *Status and Critical Habitat* section for CV spring-run Chinook salmon, Lindley *et al*. (2007) posit that the spring-run population of Chinook salmon in the Central Valley had a moderate risk of extinction in Mill creek, according to their PVA model and the other population viability criteria (*i.e.*, population size, population decline, catastrophic events, and hatchery influence). Even though the Mill Creek population of spring-run Chinook salmon is at moderate extinction risk according to the PVA model, it appears to satisfy the other viability criteria for low-risk status.

The CV spring-run Chinook salmon population fails to meet the "representation and redundancy rule" (Lindley *et al*. 2007), since there is only one viable population out of the three diversity groups that historically contained them. The CV spring-run population is only represented by the group that currently occurs in the northern Sierra Nevada Diversity Group. The populations that formerly occurred in the basalt and porous-lava region (the Pit River, the Upper Sacramento River and the McCloud River) and southern Sierra Nevada region have been extirpated. The northwestern California region contains a few ephemeral populations of spring-run Chinook salmon that are likely dependent on the Northern Sierra Diversity Group populations for their continued existence. Over the long term, these remaining 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 Chinook salmon populations in these three watersheds due to their close proximity to each other.

The NMFS 2011 5-year status review describes the biological "state" of CV spring-run Chinook salmon (which includes parameters for viability and extinction risk) as still precarious and worsening; the authors recommend that an additional review be conducted by NMFS Southwest Fisheries Science Center (SWFSC) within two to three years, as opposed to waiting another five years for a status review, if the population does not respond positively to improvements in environmental conditions and management actions.

The 2011 CV spring-run status review (NMFS 2011b) reports that progress is being made in the form of programs that are implementing restoration projects such as: the Battle Creek Salmon and Steelhead Restoration Project, actions required by NMFS' CVP-SWP BO, and the San Joaquin River Restoration Program. Other key actions that are benefitting CV spring-run Chinook salmon are being formally discussed (e.g., Upper Yuba River reintroduction) or planned (e.g., Bay Delta Conservation Plan). Some conservation measures have already recently helped CV spring-run Chinook now, such as the removal of Wildcat Diversion Dam on Battle Creek, and flow/export related actions in the Delta. Some of the restoration programs that will benefit CV spring-run Chinook salmon are having and will have a positive effect on the VSP parameters of abundance, production and spatial structure, which will in turn have a positive effect on genetic diversity.

b. Summary of the Effects of the Proposed Action on CV spring-run Chinook salmon

The adverse effects of the Project on CV spring-run salmon are related fish capture and handling at all project locations. These effects are expected to be localized at the project site and relatively small. Other potential effects are expected to be either insignificant of discountable as described in the Section 2.1 *Effects of the Action.* Following construction, the effects are expected to be beneficial and will improve the upstream and downstream migration conditions and survival of adults and juveniles.

c. Summary of the Effects of the Proposed Action on the CV spring-run Chinook salmon ESU

Completion of these projects and their long-term operations are expected to be beneficial because they implement priority 1 recovery actions for CV spring-run Chinook salmon and will

improve both upstream and downstream migration success and survival and are expected to appreciably improve the likelihood of survival and recovery of the CV spring-run Chinook salmon ESU in the wild by improving the spatial structure, diversity, abundance, and productivity of the ESU.

d. Status of CV spring-run Chinook Salmon Critical Habitat

Critical habitat for CV spring-run Chinook salmon is composed of PBFs that are essential for the conservation of the species including, but not limited to, spawning habitat, rearing habitat, migratory corridors, and estuarine areas. Most of the historic spawning and rearing habitat for spring-run Chinook salmon is above impassable dams as is the case for the Sacramento, Feather, Yuba, American, Mokelumne, Stanislaus, Tuolumne, Merced, and San Joaquin rivers.

CV spring-run Chinook salmon critical habitat in Mill and Deer creeks has a high conservation value because many of the necessary PBFs such as high quality freshwater migration, rearing and holding habitat are present. These values are degraded on the valley floor due to irrigation practices that reduce the amount of water in the streams during certain periods of the year. The upper watersheds of these CV spring-run Chinook salmon streams in the Central Valley are in relatively good condition, and are critical to the survival of CV spring-run Chinook salmon long term. Critical habitat for CV spring-run Chinook salmon, although degraded in certain areas, has a high conservation value necessary for the survival and recovery of the species.

e. Project Effects on CV spring-run Chinook Salmon Critical Habitat

The critical habitat for the CV spring-run Chinook salmon in the action will be temporarily affected by the Project, such as a temporary reduction in migration corridor access through sedimentation plumes obfuscating portions of the channel. These effects are expected to be temporary (less than 3 hrs.) and localized (less than 500 feet in distance downstream). Riparian impacts associated with entry points and construction of fish-way structures will be avoided, minimized and re-established at a vegetation ratio of 3:1, to the extent that they occur. Other potential effects to critical habitat PBFs are expected to be either insignificant of discountable as described in the Section 2.1 *Effects of the Action.*

The fish-way improvements will improve the migratory success and survival of fish that are passing upstream to holding and spawning habitat and downstream through freshwater migration and rearing habitat.

f. Summary of the Risk to the Conservation Value of CV spring-run Chinook salmon Critical Habitat

The proposed action will improve the conservation value of PBFs for freshwater rearing, freshwater migration and spawning habitats PBFs in the action area. Therefore, we determine that PBFs of critical habitat, including freshwater rearing habitat, freshwater migration habitat and spawning habitat will improve conditions necessary to meet the biological requirements of the species, and any short-term impacts will occur in a manner that does not appreciably diminish the value of critical habitat for the conservation of a listed species.

California Central Valley Steelhead

a. Baseline Status and Viability of Species

Over the past 30 years, the naturally-spawned steelhead populations in the upper Sacramento River and Mill Creek have declined substantially. Current CCV steelhead population trend data remain extremely limited (Williams *et al.* 2011). The best population-level data come from Battle Creek where Coleman National Fish Hatchery (NFH) operates a weir that blocks upstream movement of fish (Williams *et al.* 2011). However, changes in hatchery policies and transfer of fish over the years complicate the interpretation of these data. For example, starting in 2005, Coleman NFH stopped transferring all ad-clipped (hatchery-origin) steelhead above the weir resulting in a large decrease in the overall numbers of fish passing the weir in subsequent years. Coleman NFH also transferred about 1,000 ad-clipped fish to Keswick Reservoir in 2003 and these fish are not included in the data. As a result, the only unbiased time series for Battle Creek is the number of unclipped (wild) steelhead returning since 2001. These data show a slight decline over the last ten years, in part due to the high returns observed in 2002 and 2003.

Lindley *et al*. (2006) indicated that prior population census estimates completed in the 1990s found the CCV steelhead spawning population above 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). CCV steelhead populations generally show a continuing decline, an overall low abundance, and fluctuating return rates. The future of CCV steelhead is uncertain due to limited data concerning their status. However, Lindley *et al.* (2007), citing evidence presented by Yoshiyama *et al.* (1996), McEwan (2001), and Lindley *et al.* (2006), concluded that there is sufficient evidence to suggest that the DPS is at moderate to high risk of extinction. Mill Creek steelhead are also showing low counts in the RTS data (CDFW 2010) from 2006-2010.

The NMFS 2011 status review of CCV steelhead describes a steelhead population that is still declining, and is in peril. The review report states that the DPS is still in danger of extinction (Williams *et al.* 2011). Analysis of catch data from the Chipps Island monitoring program suggests that natural steelhead production has continued to decline and that hatchery origin fish represent an increasing proportion of the juvenile production. Information from the Delta salvage facilities also suggests a general decline in the natural production of steelhead. Hatchery populations (Coleman NFH and Feather River Hatchery) data also suggests that hatchery populations have declined in the last several years perhaps in response to poor freshwater and ocean habitat conditions.

b. Summary of the Effects of the Proposed Action on CCV Steelhead

The adverse effects of the Project on CCV steelhead are related fish capture and handling at all project locations. These effects are expected to be localized at the project site and relatively small. Other potential effects are expected to be either insignificant of discountable as described in the Section 2.1 *Effects of the Action.* Completion of these projects and their long-term operations are expected to be very beneficial because they implement priority 1 recovery actions

for CV spring-run Chinook salmon and will improve both upstream and downstream migration success and survival.

c. Summary of the Effects of the Proposed Action on the CCV steelhead DPS

Completion of these projects and their long-term operations are expected to be beneficial because they implement the NMFS Salmon and Steelhead Recovery Plan priority 1 recovery actions for CCV steelhead and will improve both upstream and downstream migration success and survival and are expected to appreciably improve the likelihood of survival and recovery of the CCV steelhead DPS in the wild by improving the spatial structure, diversity, abundance, and productivity of the DPS.

d. Status of CCV steelhead Critical Habitat

Critical habitat for CCV steelhead is composed of PBFs that are essential for the conservation of the species including, but not limited to, spawning habitat, rearing habitat, migratory corridors, and estuarine areas. Most of the historic spawning and rearing habitat for CCV steelhead is above impassable dams as is the case for the Sacramento, Feather, Yuba, American, Mokelumne, Stanislaus, Tuolumne, Merced, and San Joaquin rivers.

CCV steelhead critical habitat in Mill and Deer creeks has a high conservation value because many of the necessary PBFs such as high quality freshwater migration, rearing and holding habitat are present. These values are degraded on the valley floor due to irrigation practices that reduce the amount of water in the streams during certain periods of the year. The upper watersheds of these CV spring-run Chinook salmon streams in the Central Valley are in relatively good condition, and are critical to the survival of CCV steelhead long term. Critical habitat for CCV steelhead, although degraded in certain areas, has a high conservation value necessary for the survival and recovery of the species.

e. Project Effects on CCV steelhead Critical Habitat

The critical habitat for the CCV steelhead in the action will be temporarily affected by the Project, such as a temporary reduction in migration corridor access through sedimentation plumes obfuscating portions of the channel. These effects are expected to be temporary (less than 3 hrs.) and localized (less than 500 feet in distance downstream). Riparian impacts associated with the creation of entry points and construction of fish-way structures will be avoided, minimized or re-established at a vegetation ratio of 3:1.

The fish-way improvements will improve the migratory success and survival of fish that are passing upstream to holding and spawning habitat and downstream through freshwater migration and rearing habitat.

f. Summary of the Risk to the Conservation Value of CCV steelhead Critical Habitat

The proposed action will improve the conservation value of PBFs for freshwater rearing, freshwater migration and spawning habitats PBFs in the action area. Therefore, we determine

that PBFs of critical habitat, including freshwater rearing habitat, freshwater migration habitat and spawning habitat will improve conditions necessary to meet the biological requirements of the species, and any short-term impacts will occur in a manner that does not appreciably diminish the value of critical habitat for the conservation of a listed species.

2.7 Conclusion

After reviewing and analyzing the current status of the listed species and critical habitat, the environmental baseline within the action area, the effects of the proposed action, any effects of interrelated and interdependent activities, and cumulative effects, it is NMFS' biological opinion that the proposed action is not likely to jeopardize the continued existence of CV spring-run Chinook salmon or destroy or adversely modify their designated critical habitat.

2.8 Incidental Take Statement

Section 9 of the ESA and Federal regulations pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without a 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 regulation to include significant habitat modification or degradation that actually kills or injures fish or wildlife by significantly impairing essential behavioral patterns, including breeding, spawning, rearing, migrating, feeding, or sheltering (50 CFR 222.102). "Incidental take" is defined by regulation as takings that result from, but are not the purpose of, carrying out an otherwise lawful activity conducted by the Federal agency or applicant (50 CFR 402.02). Section 7(b)(4) and section 7(o)(2) provide that taking that is incidental to an otherwise lawful agency action is not considered to be prohibited taking under the ESA if that action is performed in compliance with the terms and conditions of this incidental take statement.

2.8.1 Amount or Extent of Take

NMFS anticipates incidental take of juvenile salmonids in the Action Area through fish rescue activities and injury from temporary increases in turbidity associated with re-watering the channel after construction. NMFS, cannot, based on the best available information, quantify the number of fish that will be affected by turbidity. We therefore are applying an ecological surrogate to describe the amount and extent of take. The turbidity effects are only expected at Upper Dam, DCID, and SVRIC sites. Turbidity increases are not expected at LDCF due to water containment measures.

Take from Capture or Relocation

Upper Dam on Mill Creek.

Species and Life Stage	**Number Captured or Handled**	**Number Injured or Killed**
CCV Steelhead Juveniles	20	2
CV Spring-run Chinook Juveniles	10	1
CV Spring-run Chinook Adults	1	0

Lower Deer Creek Falls on Deer Creek.

Species and Life Stage	**Number Captured or Handled**	**Number Injured or Killed**
CCV Steelhead Juveniles	10	1
CV Spring-run Chinook Juveniles	20	2
CV Spring-run Chinook Adults	1	0

DCID on Deer Creek.

Species and Life Stage	**Number Captured or Handled**	**Number Injured or Killed**
CCV Steelhead Juveniles	50	3
CV Spring-run Chinook Juveniles	30	2
CV Spring-run Chinook Adults	1	0

SVRIC on Deer Creek.

Species and Life Stage	**Number Captured or Handled**	**Number Injured or Killed**
CCV Steelhead Juveniles	20	2
CV Spring-run Chinook Juveniles	10	1
CV Spring-run Chinook Adults	1	0

Cone-Kimball on Deer Creek.

Species and Life Stage	**Number Captured or Handled**	**Number Injured or Killed**
CCV Steelhead Juveniles	20	2
CV Spring-run Chinook Juveniles	10	1
CV Spring-run Chinook Adults	1	0

Take Limits Using Ecological surrogates for Suspended Sediment

NMFS cannot, using the best available information, specifically quantify the anticipated amount of incidental take of individual fish from indirect effects of suspended sediments because of the variability and uncertainty associated with the response of listed salmonids, to the effects of the Project, the timing of these actions, the varying population size of each species, and individual habitat use within the Project area. However, it is possible to designate ecological surrogates for the extent of take anticipated to be caused by the Project, and to monitor those surrogates to determine the level of take that is occurring. The most appropriate ecological surrogate for the

extent of take caused by the Project is the level of in-stream turbidity created by construction activities in proportion to baseline turbidity.

Measuring turbidity in the field is typically done using measurements in NTUs. NTUs can be accurately and consistently measured in the field with proper instrumentation, thus providing a quantifiable metric for determining potential incidental take of listed fish during the Project implementation. NMFS is applying an ecological surrogate of increased turbidity related to dewatering the channel in Mill and Deer creeks for a distance of 500 feet downstream from the Upper Dam, DCID Dam, SVRIC Dam and Cone-Kimball Dam sites. Adverse effects are expected to cause fish to move out of the area or experience temporary distress while turbidity is high, which is expected to be for no more than one hour at each site.

2.8.2 **Effect of the Take**

NMFS has determined that the level of take resulting from the implementation of the actions analyzed in this BO are not likely to result in jeopardy to the species or destruction or adverse modification of critical habitat

2.8.3 Reasonable and Prudent Measures

"Reasonable and prudent measures" are nondiscretionary measures that are necessary or appropriate to minimize the impact of the amount or extent of incidental take (50 CFR 402.02).

1. Measures shall be taken to provide NMFS with the status of project construction.

2. Measures shall be taken to coordinate with NMFS during project design and engineering.

3. Measures shall be taken to monitor all Project elements and conservation measures throughout the life of the Project to ensure their effectiveness.

2.8.4 Terms and Conditions

The terms and conditions described below are non-discretionary, and the USFWS or any applicant must comply with them in order to implement the reasonable and prudent measures (50 CFR 402.14). The USFWS or any applicant has a continuing duty to monitor the impacts of incidental take and must report the progress of the action and its impact on the species as specified in this incidental take statement (50 CFR 402.14). If the entity to whom a term and condition is directed does not comply with the following terms and conditions, protective coverage for the proposed action will likely lapse.
The following terms and conditions implement RPM #1: "*Measures shall be taken to provide NMFS with the status of project construction.*"

a. Project notification will be made to NMFS at least 30 days before start of construction.
b. Project notification will be made to NMFS within 30 days of project completion.
c. Fish salvage information will be provided to NMFS within 7 days of any fish salvage activities.

d. A project summary report will be submitted to NMFS within 90 days of project completions.
e. The report shall be sent to NMFS address below:

Assistant Regional Administrator
Central Valley Area Office
National Marine Fisheries Service
650 Capitol Mall, Suite 5-100
Sacramento, California 95814

The following terms and conditions implement RPM #2 "*Measures shall be taken to coordinate with NMFS during project design and engineering.*"

a. USFWS shall coordinate with the NMFS engineering team to develop and finalize project designs to ensure they are consistent with NMFS design criteria for fish passage and fish screens or otherwise approved by the NMFS engineering team.
b. USFWS shall convene an annual coordination meeting with NMFS and CDFW to discuss previous year construction and plan for out-year construction. Annual operations and maintenance shall also be discussed to ensure operations and maintenance are being carried out to ensure successful passage and survival of fish past fish-way facilities.

The following terms and conditions implement RPM #3 "*Measures shall be taken to monitor all Project elements and conservation measures throughout the life of the Project to ensure their effectiveness.*"

a. A detailed Operations and Maintenance Plan shall be developed and submitted to NMFS within 90 days of the completion of each project. If modifications are made to any plan, NMFS shall be consulted on the modifications before they are finalized.

2.9 Conservation Recommendations

Section 7(a)(1) of the ESA directs Federal agencies to utilize their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations include discretionary measures that USFWS can take to minimize or avoid adverse effects of a proposed action on a listed species or critical habitat.

1. USFWS should continue to work cooperatively with other State and Federal agencies, private landowners, governments, and local watershed groups to identify opportunities for cooperative analysis and funding to support salmonid habitat restoration projects on Mill and Deer creek to benefit the above listed species.

2. USFWS should conduct or fund studies to help reduce impacts of diversion flow losses in Mill and Deer creeks through use of conjunctive use wells, as well as the development of efficiency in water use in agricultural settings in the Mill Creek Watershed.

2.10 Re-initiation of Consultation

This concludes the formal consultation on the proposed action. As provided in 50 CFR §402. 16, re-initiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded, (2) new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not previously considered, (3) the identified action is subsequently modified in a manner that causes an effect to listed species or critical habitat that was not considered in the BO, or (4) a new species is listed or critical habitat designated that may be affected by the identified action. In instances where the amount or extent of incidental take is exceeded, formal consultation shall be reinitiated immediately.

3. MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT ESSENTIAL FISH HABITAT CONSULTATION

Fish-way Improvements on Mill and Deer Creek

The Magnuson-Stevens Fishery Conservation and Management Act (MSA), as amended (U.S.C. 180 *et seq.*), requires that Essential Fish Habitat (EFH) be identified and described in Federal fishery management plans (FMPs). Section 305(b) of the MSA directs Federal agencies on any activity which they fund, permit, or carry out that may adversely affect EFH, to consult with NMFS. NMFS is required to provide EFH conservation and enhancement recommendations to the Federal action agencies.

EFH is defined as those waters and substrates necessary to fish for spawning, breeding, feeding, or growth to maturity. For the purposes of interpreting the definition of EFH, “waters” includes aquatic areas and their associated physical, chemical, and biological properties that are used by fish, and may include areas historically used by fish where appropriate; “substrate” includes sediment, hard bottom, structures underlying the waters, and associated biological communities; “necessary” means habitat required to support a sustainable fishery and a healthy ecosystem; and, “spawning, breeding, feeding, or growth to maturity” covers all habitat types used by a species throughout its life cycle. Freshwater EFH for salmon consists of four major components: spawning and incubation habitat; juvenile rearing habitat; juvenile migration corridors; and adult migration corridors and adult holding habitat [Pacific Fishery Management Council (PFMC) 2003]. Important components of EFH for spawning, rearing, and migration include suitable substrate composition; water quality (e.g., dissolved oxygen, nutrients, temperature); water quantity, depth and velocity; channel gradient and stability; food; cover and habitat complexity (e.g., LWM, pools, channel complexity, aquatic vegetation); space; access and passage; and floodplain and habitat connectivity (PFMC 2003). The proposed project site is within the region identified as EFH for Pacific salmon in Amendment 14 of the Pacific Salmon FMPs.

The Pacific Fishery Management Council (PFMC) has identified and described EFH, Adverse Impacts and Recommended Conservation Measures for salmon in Amendment 14 to the Pacific Coast Salmon FMP (PFMC 1999). Freshwater EFH for Pacific salmon in the California Central Valley includes waters currently or historically accessible to salmon within the Central Valley

ecosystem as described in Myers *et al.* (1998). Sacramento River winter-run Chinook salmon (*Oncorhynchus tshawytscha*), Central Valley spring-run Chinook salmon (*O. tshawytscha*), and Central Valley fall-/late fall-run Chinook salmon (*O. tshawytscha*) are species managed under the Pacific Coast Salmon FMP that occur in the Central Valley. Fall-run Chinook salmon comprise the largest population of Chinook salmon in the Mill Creek watershed; additionally a smaller spring-run Chinook salmon population persists as well.

Factors limiting salmon populations in the Mill and Deer Creek watersheds include flow conditions affecting juvenile rearing and outmigration, water temperatures and water quality affecting adult immigration, holding, spawning and embryo incubation.

This analysis is based, in part, on the EFH assessment provided by the USFWS and descriptions of EFH for Pacific coast salmon (PFMC 2014) contained in the fishery management plans developed by the Pacific Fishery Management Council and approved by the Secretary of Commerce.

3.1 Essential Fish Habitat Affected by the Project

The Project action area is within the region identified as EFH for Pacific salmon in Amendment 14 of the Pacific Salmon FMPs. 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 fishery management plan that occur within the proposed action area. Factors limiting salmon populations in the Mill Creek Watershed include flow conditions affecting adult upstream migration, juvenile rearing and outmigration, water temperatures and water quality affecting juvenile rearing.

3.1.1 Life History

General life history information for CV spring-run Chinook salmon is outlined in the *Status of the Species* section of the enclosed biological opinion (BO) as part of this consultation. CV fall-/late fall-run Chinook salmon is summarized below. Further detailed information on Chinook salmon ESU are available in the NMFS status review of Chinook salmon from Washington, Idaho, Oregon, and California (Myer *et al.* 1998), and the NMFS proposed rule for listing several ESUs of Chinook salmon (March 9, 1998, 63 FR 11482).

Adult CV fall-run Chinook salmon enter the Sacramento and San Joaquin rivers 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 (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 than 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 toUppers 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.

The *proposed action* is described in detail in Section 1.3 of the BO.

3.1.2 Habitat Areas of Particular Concern

Habitat areas of particular concern (HAPCs), as designated under this FMP, include (1) complex channels and floodplain habitats, (2) thermal refugia, (3) spawning habitat, (4) estuaries, and (5) marine and estuarine submerged aquatic vegetation. HAPCs present in the action area include complex channels, and floodplain habitats and spawning habitat.

3.2 Adverse Effects on Essential Fish Habitat

EFH for Chinook salmon in the action will be temporarily affected by the Project short-term impacts from sedimentation plumes obfuscating portions of the channel. These effects are expected to be temporary (less than 3 hrs.) and localized (less than 500 feet in distance downstream). Riparian impacts associated with entry points and construction of fish-way structures will be avoided, minimized and re-established at a vegetation ratio of 3:1, to the extent that they occur. Other potential effects to critical habitat PBFs are expected to be either insignificant of discountable as described in the Section 2.1 *Effects of the Action.*

A small amount of freshwater holding and spawning habitat will be temporarily blocked at LDCF during the construction period between July 1 and September 30, with the potential for impact to extend to October 15. The impact will be temporary and any fish excluded from the area are expected to successfully hold and spawn downstream. Once the construction is complete, the exclusion device will be removed and adults will be able to hold and spawn in the pool will be blocked by construction. Therefore effects to EFH are small and short term in nature. Following construction, the EFH values will be greatly improved. The fish-way improvements will improve the migratory success and survival of fish that are passing upstream to holding and spawning habitat and downstream through freshwater migration and rearing habitat.

3.3 Essential Fish Habitat Conservation Recommendations

Adverse effects to EFH associated with the Project will occur in critical habitat utilized by the federally listed species addressed in the enclosed BO. The proposed action included sufficient

measures to avoid, minimize and mitigate for any potential impacts. Therefore, NMFS does not provide any additional conservation recommendations.

3.4 Statutory Response Requirement

As required by section 305(b)(4)(B) of the MSA, USFWS must provide a detailed response in writing to NMFS within 30 days after receiving an EFH Conservation Recommendation. Such a response must be provided at least 10 days prior to final approval of the action if the response is inconsistent with any of NMFS' EFH Conservation Recommendations unless NMFS and the Federal agency have agreed to use alternative time frames for the Federal agency response. The response must include a description of measures proposed by the agency for avoiding, mitigating, or offsetting the impact of the activity on EFH. In the case of a response that is inconsistent with the Conservation Recommendations, the Federal agency must explain its reasons for not following the recommendations, including the scientific justification for any disagreements with NMFS over the anticipated effects of the action and the measures needed to avoid, minimize, compensate, or offset such effects (50 CFR 600.920(k)(1)).

In response to increased oversight of overall EFH program effectiveness by the Office of Management and Budget, NMFS established a quarterly reporting requirement to determine how many conservation recommendations are provided as part of each EFH consultation and how many are adopted by the action agency. Therefore, we ask that in your reply to the EFH portion of this consultation, you clearly identify the number of conservation recommendations accepted.

3.5 Supplemental Consultation

The USFWS must reinitiate EFH consultation with NMFS if the proposed action is substantially revised in a way that may adversely affect EFH, or if new information becomes available that affects the basis for NMFS' EFH Conservation Recommendations (50 CFR 600.920(l)).

4. FISH AND WILDLIFE COORDINATION ACT

The purpose of the FWCA is to ensure that wildlife conservation receives equal consideration, and is coordinated with other aspects of water resources development (16 USC 661). The FWCA establishes a consultation requirement for Federal agencies that undertake any action to modify any stream or other body of water for any purpose, including navigation and drainage (16 USC 662(a)), regarding the impacts of their actions on fish and wildlife, and measures to mitigate those impacts. Consistent with this consultation requirement, NMFS provides recommendations and comments to Federal action agencies for the purpose of conserving fish and wildlife resources, and providing equal consideration for these resources. NMFS' recommendations are provided to conserve wildlife resources by preventing loss of and damage to such resources. The FWCA allows the opportunity to provide recommendations for the conservation of all species and habitats within NMFS' authority, not just those currently managed under the ESA and MSA.

The following recommendations apply to the proposed action and are in addition to the conservation measures found in the Project Description section or the Terms and Conditions of the enclosed BO:

(1) Use a soil-rock mixture to facilitate re-vegetation in areas where rip-rap is placed above water. A ratio of rock to soil of 70:30 is recommended. We suggest the addition of soil on top of the soil-rock mixture to allow to emulate natural streambank conditions.

(2) USFWS should continue to implement high priority actions in the NMFS Central Valley Salmon and Steelhead Recovery Plan (NMFS 2014) to the maximum extent feasible.

The action agency must give these recommendations equal consideration with the other aspects of the proposed action so as to meet the purpose of the FWCA. This concludes the FWCA portion of this consultation.

5. DATA QUALITY ACT DOCUMENTATION PRE-DISSEMINATION REVIEW

The Data Quality Act (DQA) specifies three components contributing to the quality of a document. They are utility, integrity, and objectivity. This section of the BO addresses these DQA components, documents compliance with the DQA, and certifies that this BO has undergone pre-dissemination review.

Utility

Utility principally refers to ensuring that the information contained in this consultation is helpful, serviceable, and beneficial to the intended users. The intended users of this BO are the USFWS. Other interested users could include the LMMWC. Individual copies of this BO were provided to USFWS. This BO will be posted on the Public Consultation Tracking System web site https://pcts.nmfs.noaa.gov/pcts-web/homepage.pcts. The format and naming adheres to conventional standards for style.

Integrity

This consultation was completed on a computer system managed by NMFS in accordance with relevant information technology security policies and standards set out in Appendix III, 'Security of Automated Information Resources,' Office of Management and Budget Circular A-130; the Computer Security Act; and the Government Information Security Reform Act.

Objectivity

Information Product Category: Natural Resource Plan

Standards: This consultation and supporting documents are clear, concise, complete, and unbiased; and were developed using commonly accepted scientific research methods. They adhere to published standards including the NMFS ESA Consultation Handbook, ESA

regulations, 50 CFR 402.01, et seq., and the MSA implementing regulations regarding EFH, 50 CFR 600.

Best Available Information: This consultation and supporting documents use the best available information, as referenced in the References section. The analyses in this BO and the Essential Fish Habitat Consultation contain more background on information sources and quality.

Referencing: All supporting materials, information, data and analyses are properly referenced, consistent with standard scientific referencing style.

Review Process: This consultation was drafted by NMFS staff with training in ESA and MSA implementation, and reviewed in accordance with West Coast Region ESA quality control and assurance processes.

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B. Personal Communications

NMFS, 2015-16. Steve Thomas, Habitat Division Fish Screen designer.
CDFW, 2015-16. Matt Johnson, Fisheries Division, Redd Bluff, California.
USFS, 2016. Chris Mayes, Fisheries Biologist. Almanor Ranger District, Lassen National Forest.