UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
West Coast Region
501 West Ocean Boulevard, Suite 4200
LONG BEACH, CA 90802

Refer to NMFS ECO #: WCR- 2023-00637

July 30, 2024

Colonel Chad Caldwell
District Commander, Sacramento District
U.S. Army Corps of Engineers
1325 J Street
Sacramento, California 95814-2922

Re: Endangered Species Act Section 7(a)(2) Biological Opinion and Magnuson–Stevens Fishery Conservation and Management Act Essential Fish Habitat Response for the Operations and Maintenance of Existing Fish Passage Facilities at Daguerre Point Dam on the Lower Yuba River

Dear Colonel Caldwell:

Thank you for your letter of April 26, 2023, requesting initiation of consultation with NOAA's National Marine Fisheries Service (NMFS) pursuant to section 7 of the Endangered Species Act of 1973 (ESA) (16 U.S.C. 1531 *et seq*.) for the Operations and Maintenance of Existing Fish Passage Facilities at Daguerre Point Dam on the lower Yuba River.

Thank you, also, for your request for consultation pursuant to the essential fish habitat (EFH) provisions in Section 305(b) of the Magnuson–Stevens Fishery Conservation and Management Act [16 U.S.C. 1855(b)] for this action.

The biological opinion reviews the effects of the action on federally listed threatened Central Valley spring-run Chinook salmon (*Oncorhynchus tshawytscha*), threatened California Central Valley steelhead (*O. mykiss*), the threatened Southern distinct population segment of North American green sturgeon (*Acipenser medirostris*), Southern Resident killer whales (*Orcinus orca*), and their designated critical habitat in accordance with section 7(a)(2) of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531 *et seq*.).

Based on the best available scientific and commercial information, including our review of the biological assessment, this biological opinion concludes that implementation of the proposed action is likely to jeopardize the continued existence of Central Valley spring-run Chinook salmon, California Central Valley steelhead, Southern Resident killer whale, and adversely modify designated critical habitat for Central Valley spring-run Chinook salmon, California Central Valley steelhead, and Southern Resident killer whale. NMFS has included a reasonable and prudent alternative (RPA) that avoids jeopardizing the species. As required by section 7 of the ESA, we have provided an incidental take statement with the biological opinion. The incidental take statement describes reasonable and prudent measures that NMFS considers necessary or appropriate to minimize incidental take of the species associated with the proposed action, as modified by the RPA. The incidental take statement also includes terms and conditions that must be followed by the U.S. Army Corps of Engineers (USACE) in order to be exempt from the prohibitions of section 9 of the ESA. The incidental take statement has an expiration date 5 years from the issuance of this opinion. Prior to expiration of the take exemptions, USACE shall coordinate with NMFS to determine if reinitiation of this opinion is warranted.

The biological opinion also concludes that the analyzed project is not likely to jeopardize the continued existence of the threatened southern distinct population segment (DPS) of the North American green sturgeon (*Acipenser medirostris*), and is not likely to destroy or adversely modify designated critical habitat for sDPS green sturgeon.

Please contact Ellen McBride in the NMFS West Coast Region's California Central Valley Office at 916-930-3712 or via email at ellen.mcbride@noaa.gov if you have any questions concerning this consultation, or if you require additional information.

Sincerely,

Jennifer Quan
Regional Administrator

Enclosure

cc: ARN 151422-2023-SA0027

UNITED STATES DEPARTMENT OF COMMERCE
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Endangered Species Act (ESA) Section 7(a)(2) Biological Opinion [and Magnuson–Stevens Fishery Conservation and Management Act Essential Fish Habitat Response]

Operations and Maintenance of Existing Fish Passage Facilities at Daguerre Point Dam on the Lower Yuba River

NMFS Consultation ECO Number: WCR 2023-00637

Action Agency: U.S. Army Corps of Engineers

Affected Species and NMFS' Determinations:

ESA-Listed Species	Status	Is Action Likely to Adversely Affect Species?	If Likely to Adversely Affect, Is Action Likely To Jeopardize the Species?	Is Action Likely to Adversely Affect Critical Habitat?	If Likely to Adversely Affect, Is Action Likely To Destroy or Adversely Modify Critical Habitat?
Central Valley spring-run Chinook Salmon ESU *(Oncorhynchus tshawytscha)*	Threatened	Yes	Yes	Yes	Yes
California Central Valley steelhead DPS *(O. mykiss)*	Threatened	Yes	Yes	Yes	Yes
Southern DPS of North American green sturgeon *(Acipenser medirostris)*	Threatened	Yes	No	Yes	No
Southern Resident killer whale (*Orcinus orca*)	Endangered	Yes	Yes	Yes	Yes

Fishery Management Plan That Identifies 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:

Jennifer Quan
Regional Administrator

Date: **July 30, 2024**

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1. Introduction

This Introduction section provides information relevant to the other sections of this document and is incorporated by reference into Sections 2 and 3, below.

1.1. Background

The National Marine Fisheries Service (NMFS) prepared this biological opinion (opinion) and incidental take statement (ITS) portions of this document in accordance with section 7(b) of the Endangered Species Act (ESA) of 1973 (16 U.S.C. 1531 *et seq*.), as amended, and implementing regulations at 50 CFR part 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 part 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 (DQA) (section 515 of the Treasury and General Government Appropriations Act for Fiscal Year 2001, Public Law 106-554). The document will be available within 2 weeks at the NOAA Library Institutional Repository [https://repository.library.noaa.gov/welcome]. A complete record of this consultation is on file at the Sacramento NMFS Office.

1.1.1. Environmental Setting

The proposed action is located on the Yuba River in Yuba and Nevada counties, California. The Yuba River watershed is historical habitat for the threatened Central Valley (CV) spring-run Chinook salmon (*Oncorhynchus tshawytscha*) evolutionarily significant unit (ESU), threatened California Central Valley (CCV) steelhead (*O. mykiss*) distinct population segment (DPS), and the threatened southern DPS (sDPS) of North American green sturgeon (*Acipenser medirostris*). Within the Yuba River watershed, Englebright Dam at river mile [RM] 24.1 defines the present upstream extent of CV spring-run Chinook salmon and CCV steelhead. EFH for Chinook salmon extends above Englebright Dam into the Tahoe National Forest. Daguerre Point Dam (DPD) at RM 11.5 defines the present upstream extent of green sturgeon.

The California Debris Commission (CDC) was a federal commission created in 1893 by an act of Congress (33 U.S.C. Chapter 14 (§§ 661-683)) to regulate California streams that had been devastated by the sediment washed into them from gold mining operations upstream in the Sierra Nevada (USACE 2013 Appendix D). It was created to mitigate the damage to natural seasonal river flow and navigation, which had been caused by the extensive use of hydraulic mining from the 1850s to the 1880s. The commission consisted of three officers of the U.S. Army Corps of Engineers (USACE), appointed by the President, by and with the advice and consent of the Senate. The CDC operated under the supervision of the Chief of Engineers and under the direction of the Secretary of War, a position later renamed the Secretary of the Army. The Water Resources Development Act (WRDA) of 1986 eliminated the CDC as an agency, and transferred all functions and authorities to USACE (Appendix D in USACE 2013).

Several major hydroelectric power and water delivery projects are in the Yuba River watershed and influence operation and flows at Englebright Dam and flows at DPD. The hydroelectric projects are the (1) Yuba River Development Project (FERC Project No. 2246), (2) Narrows I Project (FERC License No. 1403), (3) the Yuba-Bear Project (FERC Project No. 2266), and (4) Drum-Spaulding Project (FERC Project No. 2310). There are three conjunctive-use irrigation diversions that utilize the elevated head created by DPD, or the influence of the dam in the prevention of additional river channel incision, to gravity-feed their canals from the DPD pool. The three diversions are the Hallwood-Cordua diversion, the South Yuba/Brophy diversion, and the Browns Valley Irrigation District (BVID) diversion.

1.2. Consultation History

In response to litigation brought in 2016 by Friends of the River (Case No. 2:16-00818-JAM-EFB) on the previous 2014 ESA consultations on Englebright and Daguerre Point Dams, USACE determined that sufficient new information had become available since 2014 to warrant reinitiation of consultation for USACE's ongoing operations and maintenance (O&M) activities at DPD. USACE and NMFS have previously engaged in and completed four separate ESA section 7 consultations regarding USACE's operation at DPD in 2002, 2007, and then O&M activities at DPD in 2012, and 2014. An extended overview of prior consultation and litigation overview referenced in Appendix A. USACE's compilation and analysis of the post-2014 data are included in a September 2021 report provided by HDR which includes, among other things, information on USACE land ownership and USACE outgrants to non-Federal entities for actions at DPD. NMFS also provided USACE with new information regarding sDPS green sturgeon presence and spawning in the lower Yuba River and potential effects of dam management on sDPS green sturgeon, which was considered in the decision to reinitiate.

- On February 14, 2022, USACE sent a letter notifying NMFS that USACE decided to reinitiate ESA section 7 formal consultation concerning USACE's ongoing O&M activities at DPD.
- On April 4, 2022, NMFS provided a written response to USACE's reinitiation request. NMFS agreed to the timeline for reinitiation that USACE suggested to the District Court, which would result in the transmittal of USACE's BA to NMFS during April 2023. To continue the coordination efforts under the remand, USACE and NMFS continued technical assistance in support of BA development.
- August 25, 2022 and March 17, 2023, NMFS received the draft BA from USACE and HDR as individual chapters over an eight-month period.
- On April 27, 2023, USACE provided NMFS with a consultation package and a request for the reinitiation of formal consultation under section 7 of the ESA for USACE's Authorized Operations and Maintenance of Existing Fish Passage Facilities at Daguerre Point Dam on the Lower Yuba River.
- On May 12, 2023, NMFS sent a letter requesting additional information on sediment removal, gravel augmentation, and consultation under the Magnuson-Stevens Fishery Conservation and Management Act, in order to initiate formal consultation.

- On June 23, 2023, USACE provided a response to NMFS' May 12, 2023, letter and an addendum to USACE's April 2023 BA.
- USACE provided a letter on July 21, 2023, requesting to reinitiate consultation on EFH under section 305(b)(2) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA) concurrently with ongoing ESA consultation.
- Upon receipt of the July 21, 2023, letter, NMFS considered USACE's consultation package to be complete and re-initiated formal consultation.

Updates to the regulations governing interagency consultation (50 CFR part 402) were effective on May 6, 2024 (89 Fed. Reg. 24268). We are applying the updated regulations to this consultation. The 2024 regulatory changes, like those from 2019, were intended to improve and clarify the consultation process, and, with one exception from 2024 (offsetting reasonable and prudent measures), were not intended to result in changes to the Services' existing practice in implementing section 7(a)(2) of the Act. 89 Fed. Reg. at 24268; 84 Fed. Reg. at 45015. We have considered the prior rules and affirm that the substantive analysis and conclusions articulated in this biological opinion and incidental take statement would not have been any different under the 2019 regulations or pre-2019 regulations.

1.3. Proposed Federal Action

Under the ESA, "action" means all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by federal agencies (see 50 CFR 402.02).

Under the MSA, "federal action" means any action authorized, funded, or undertaken, or proposed to be authorized, funded, or undertaken by a federal agency (see 50 CFR 600.910).

We considered, under the ESA, whether or not the proposed action would cause any other activities and determined that it would not.

USACE proposes to continue to operate and maintain fish passage facilities at DPD on the lower Yuba River, latitude 39.208496°, longitude -121.444039°, in Yuba County, California. USACE's proposed action is comprised of the following activities:

1. Operation and Maintenance of Fish Passage Facilities at Daguerre Point Dam
2. Planned Maintenance Activities at Daguerre Point Dam
3. Discretionary "Voluntary Conservation Measures"
4. Continued Administration of Outgrants at Daguerre Point Dam

As discussed above in Section 1.1.1, the decommissioning of the CDC in WRDA 1986 directed that "all authorities, powers, functions and duties of the California Debris Commission were transferred to the Secretary of the Army." Given that installation, operation and maintenance of the fish ladders were performed with the CDC authorities, NMFS considers these functions as discretionary authorities of the USACE. In the BA, USACE refers in many instances to coordination with CDFW on operations and maintenance of the fish ladders (USACE 2023). While the USACE may operate the fish ladders in coordination with CDFW, NMFS does not consider CDFW as having operational authority over the USACE and therefore the CDFW role will not pertain to this consultation. See Table 2-1 in the 2023 USACE BA for an abbreviated description of actions being proposed, as well as work windows and equipment expected to be used. Complete descriptions are discussed further in the sections below.

1.3.1. Operation and Maintenance of Fish Passage Facilities at Daguerre Point Dam

DPD is located on the lower Yuba River (LYR) approximately 11.5 RM upstream from the confluence of the Yuba and Feather Rivers and 12.6 miles downstream from Englebright Dam. Concrete fish ladders are located on both the north and south abutments of the dam. The older parts of the fish ladders contain 8-foot by 10-foot bays arranged in steps with approximately one-foot difference in elevation between steps (USACE 2023). In 1964, the fishways were extended. The extended part of the ladders contain 6-foot by 10-foot bays arranged similar to the prior fishway configuration (USACE 2023). Slide gates (upstream ladder control gates) were added to the upstream end of both fishways in 1965 (USACE 2023). Fish can enter the fishways through a stop-logged opening located in each wingwall of the spillway or through gated openings (gated ladder orifices) at progressively higher elevation in lower bays of the fishways (USACE 2023).

1.3.1.1 Fish Ladder Operations

Fish ladder operations consist of operating the upstream ladder control gates and the downstream fish ladder gated orifices. The upstream ladder control gates allow water to enter the fish ladders, while the gated orifices regulate the point where upstream migrating fish may most easily enter the ladders (USACE 2023).

Upstream Ladder Control Gates

USACE proposes to continue to operate the fish ladders at DPD to facilitate fish passage. For the purposes of reducing the potential for injury or harm to listed anadromous salmonids due to excessive water velocities within the fish ladders, as well as for protecting VAKI Riverwatcher™ (VAKI) equipment installed in the fish ladders, USACE's Proposed Action includes closing the ladders (by means of closing the upstream ladder control gates) when flows at the United States Geological Survey (USGS) Marysville Gage are forecasted to reach or exceed 30,000 cfs. USACE will reopen the upstream ladder control gates when flows have receded sufficiently for USACE staff to access the ladders (about 10,000 cfs). High flow ladder closures are expected to occur approximately every other year during the months of December through May, and are expected to extend for an average of approximately 9 days.

Additionally, USACE expects to temporarily close the upstream ladder control gates to facilitate maintenance and cleaning of the VAKI equipment in the uppermost bay of the North and South fish ladders at the request of the holder of the license for VAKI operation (currently YWA). This is expected to occur approximately 26-52 times per year for about an hour per closure. USACE also expects to periodically close the upstream ladder control gates for VAKI equipment repair or replacement. Such ladder closures may occur year-round approximately once every 4 to 5 years. Each closure event is expected to last up to 1 day. USACE will coordinate ladder closures for VAKI system repairs/replacement with NMFS and the VAKI license holder to minimize the potential for adverse effects to listed anadromous salmonids.

USACE will make other adjustments to the upstream ladder control gates to provide appropriate water surface levels within the ladders. The north ladder upstream control gate will be set so that the water level in the bay at the first 90-degree turn (*i.e.*, north ladder bay #4) does not exceed approximately 1 foot below the wall of the bay. The south ladder upstream control gate will be set so that the water level in the lower bays (*i.e.*, south ladder bays #9 and #12) does not overtop the wall or flow out of the grates on top of those bays. Typically, flow levels in the lower Yuba River at DPD during July through October are such that the above criteria are satisfied with the upstream ladder control gates fully open. From November through June, upstream control gate adjustments will be made weekly when flows at Marysville Gage are less than 4,200 cfs or daily when flows are 4,200 cfs or higher at Marysville Gage. The number of upstream control gate adjustments that USACE will make annually is highly dependent on flow conditions in the Yuba River. During extremely dry conditions, upstream control gate adjustments may be made on six or fewer occasions. During extremely wet conditions, upstream control gate adjustments may be made on a daily or weekly basis over a period of up to seven months. USACE will coordinate with NMFS regarding ladder control gate adjustments to minimize take.

Maintenance of the upstream ladder control gates also includes removal of accumulated debris. This is triggered when blockages, such as tree limbs or other materials, impede the functionality of the ladder intakes. A removal action will be completed by hand or using hand tools (*e.g.*, rakes, shovels, etc.) and would occur at the time of inspection or when safe to do so. Removal of accumulated debris is expected to occur up to six times per year per ladder, based on how frequent these activities have occurred within previous years.

Based on some extended closures (>24 hours) of each of the ladders in the past few years, USACE acknowledges and included in the BA that the potential exists for damage to ladder components (including the upstream control gates) from debris mobilized by high flow events. "Although not anticipated to occur as a result of USACE's O&M activities at DPD, the potential exists for damage to ladder components (including the upstream control gates) from debris mobilized by high flow events. Such damage could result in ladder closures. The timing and duration of ladder closures due to damage are unknown," (USACE 2023), but they are expected to be infrequent (*e.g*., USACE estimates once in 20 years; however, from the USACE BA (2023), extended closures from cleanings and damage (not high flows) have occurred slightly more frequently than once per year (9 times in 7 years; Table 3).

In the event of ladder damage leading to closure, USACE proposes to: (1) notify NMFS by the end of the day of initial observation of damage resulting in a ladder closure, (2) leave the upstream control gate in the fully open position during the interim between occurrence of damage and completion of repairs, if possible, and maintaining the other (non-damaged) ladder in operational condition during the time of closure, (3) coordinate with NMFS to identify and implement alternatives to restoring fish passage upstream of DPD if the damage results in a ladder closure and USACE determines that the damage cannot be repaired in a timely manner, and (4) contract for repair of damage as expeditiously as possible.

Within-Ladder Flashboards

USACE proposes to remove the single remaining flashboard in the south ladder from a set of previously installed boards. The one remaining board is in the lowermost bay and is currently buried in sediment. USACE will remove the last within-ladder flashboard when USACE dredges out the sediment upon receipt of dredging equipment ordered in 2020. USACE does not propose to carry out any further activities related to the within-ladder flashboards.

Downstream Fish Ladder Gated Orifices

Both the north and south ladders include three downstream gated ladder orifices, which serve as alternative ladder entry points for upstream migrating anadromous salmonids. These orifices are on the side walls of the ladders, upstream of the normal entry points. Gated orifices allow each of the alternative ladder entry points to be open or closed. The last reported opening of the downstream gated ladder orifices for a reason other than routine testing was to inspect for a potential obstruction in 2018. Operation of the downstream fish gated ladder orifices requires the use of an electric drill/driver or hand crank.

USACE intends to annually test the downstream gated ladder orifices for operability. USACE will cycle the gates open and closed and lubricate if necessary. Testing will take about one hour on a single day and will occur between June and August each year. Environmentally safe (*i.e.,* vegetable-based) lubricants will be used when testing for operability.

USACE proposes to not utilize the downstream gated ladder orifices unless directed to by NMFS.

Daguerre Point Dam Fish Ladder Operation and Debris Monitoring and Management Plan

USACE developed the draft Daguerre Point Dam Fish Ladder Operation and Debris Monitoring and Management Plan (FLOMP) (Appendix B in USACE 2023), which outlines the scope of operations-related activities within USACE's discretion and control to support fish passage through the ladders at DPD. The FLOMP further describes maintenance activities within USACE's discretion and control that are necessary to minimize fish passage delays due to debris, mechanical failure, and other phenomena that may affect fish passage at DPD. The FLOMP includes operational protocols for the control gates and ladders, maintenance guidance for debris removal and facility care, communication protocols, and security.

USACE developed an operational guidance document for the DPD fish ladder upstream control gates and downstream gated ladder orifices, that included identification of river flows for which ladder closure is appropriate for the protection of VAKI equipment and juvenile fish. The FLOMP is intended to be used to guide adjustments to the upstream control gates by reviewing river flows in near real-time. The FLOMP discusses incorporating ladder operations into the proposed reporting requirements. The FLOMP states authorities and responsibilities regarding control gate operations.

1.3.1.2 Fish Passage Facility Maintenance

USACE proposes to coordinate with NMFS and previously coordinated with CDFW to determine when maintenance at DPD is to be conducted, which is when it is least impactful to fish. USACE performs maintenance activities, including cleaning the bays of the fish ladders, cleaning the grates covering the fish ladder bays, and other minor maintenance activities.

USACE has determined that activities related to the O&M of the VAKI systems must be performed by the licensee or their designated representative. It is anticipated that VAKI cleaning will occur weekly or biweekly year-round and may involve opening and/or closing the upstream fish ladder control gates for approximately 1 hour. Repair or replacement of the VAKI systems could potentially occur once every 4-5 years and would require closing the upstream fish ladder control gates for approximately 8 hours. USACE will coordinate timing of closures of the upstream fish ladder control gates for large repairs or replacements of the VAKI system with the licensee and NMFS.

Maintenance-Related "Protective Conservation Measures"

USACE proposes maintenance-related "protective conservation measures" to implement three plans: (1) Daguerre Point Dam Fish Passage Sediment/Gravel Management Plan (Appendix C in USACE 2023), (2) the Long-Term Dam-Crest Flashboard Management Plan (Appendix D in USACE 2023), and (3) the ladder debris monitoring and management protocols and procedures identified in the draft FLOMP (Appendix B in USACE 2023). The Gravel Management Plan for fish ladder operations excludes the Gravel Augmentation Plan, which is a separate part of the proposed action (see Section 1.3.3: Discretionary "Voluntary Conservation Measures").

Daguerre Point Dam Fish Passage Sediment/Gravel Management Plan

As part of the proposed action, USACE routinely removes the gravel and sediment that accumulates immediately upstream of DPD. USACE developed a plan titled "Daguerre Point Dam Fish Passage Sediment/Gravel Management Plan" (Appendix C in USACE 2023) in coordination with CDFW, NMFS and the U.S. Fish and Wildlife Service (USFWS), which describes the methods used to manage the sediment/gravel that accumulates upstream of DPD.

USACE proposes to conduct visual inspections of the water depth in the channel immediately upstream of DPD during June or July of each year depending on flows. If USACE's inspections show that sediment/gravel has filled in the channel such that it is less than 30 feet wide and 3 feet deep, USACE will notify NMFS that upstream sediment removal will occur for that year in August. When deemed necessary, USACE proposes to excavate sediment/gravel over about one week during August. Based on previous years, USACE proposes to remove up to about 5,000 cubic yards of material per year. Placement of spoils material will occur in an upland area above the ordinary high-water mark on the south side of the Yuba River located about ¼ mile downstream of DPD.

In recent years, USACE has been conducting sediment/gravel removal from the south side of the river. If the south side becomes inaccessible, USACE will move back to accessing the channel from the north side of the river.

USACE considers excavation conducted upstream of DPD to be a conservation measure "because it is intended for the sole purpose of improving fish passage conditions and allowing anadromous salmonids a migratory corridor above DPD - it has no other purpose" (USACE 2023).

USACE proposes to implement a modified Daguerre Point Dam Fish Passage Sediment/Gravel Management Plan (Appendix C in USACE 2023), which represents an expansion and modification of the previous plan from 2011. The new plan reflects lessons learned from implementing the 2011 sediment management plan and also reflects recent technical assistance provided by NMFS. New components incorporated into the proposed sediment management plan are summarized as follows:

- The previous plans used depth measurements taken across the upstream face of the dam. These measurements were difficult to obtain due to safety concerns. Going forward, the water depth immediately upstream of DPD will be visually inspected annually in June to assess the depth of the channel across the face of the dam. When it appears to USACE that the sediment has encroached into the parameters of less than 30 feet from the sediment to the face of the dam and/or a depth of less than 3 feet, sediment will be removed. If flows during June are too high to make visual observations, they will be made as soon as conditions are adequate to make an effective assessment.

- According to the new plan, if the water depth observations indicate that sediment/gravel has encroached and the channel immediately upstream of DPD has filled in to less than 30 feet wide by 3 feet deep, then sediment/gravel removal will be conducted during the month of August. Sediment is planned to be removed annually, based on inspection, but the final determination of whether sediment removal is necessary in any given year will be made collaboratively by USACE and NMFS.

- In the past, the excavated sediment/gravel materials were placed on a gravel bar on the north bank of the LYR downstream of DPD, where USACE thought that the materials could be remobilized during subsequent high-flow events and transported downstream. Since the channel of the LYR shifted as a result of high winter flows during 2017, there is currently only one disposal option possible under existing conditions. The excavated materials are currently and will continue to be transported to an area located about ¼ mile downstream of DPD and placed in an upland area above the ordinary high-water mark on the south side of the lower Yuba River. If, in the future, the south side becomes no longer accessible, then USACE will move back to accessing the channel from the north side of the river, and excavated materials will be placed in an upland area above the ordinary high-water mark on the north side.

- The new plan (Appendix C in USACE 2023) was revised to make available the materials removed by USACE sediment management operations, which are stockpiled in the upland area on the south bank of the river, for future use in habitat restoration work.

- The plan contains explicit water quality monitoring protocols and procedures. Water quality monitoring will be performed every four hours during in-water work activities. Turbidity and settleable material will be monitored upstream of the project influence and 300 feet downstream of the active work area. Turbidity will be monitored with a Hydrolab™ DS5X multi-parameter sonde, or similar instrument. The turbidity probe on the sonde will be calibrated with manufacturer-approved 0.1 and 200 nephelometric turbidity units (NTU) standards. Settleable material will be measured using Imhoff cones, following section 2540F of the Standard Methods for the Examination of Water and Wastewater. A Secchi disk also will be available, if necessary. For quality control purposes, a total of four settleable solid grab samples (two at upstream locations and two at downstream locations) will be obtained every four hours during in-water work. In addition to turbidity and settleable material data, USACE staff will measure other parameters (*i.e.*, water temperature, dissolved oxygen, salinity, pH, conductivity) which may be important for reference. USACE staff also will visually monitor the size and duration of any sediment plume resulting from in-water work activities.

- The plan also incorporates best management practices (BMPs) related to the use of heavy equipment, as well as coordination and an annual report summarizing maintenance activities and associated monitoring. BMPs proposed include using environmentally safe hydraulic fluids, cleaning all machinery prior to entering the water, and checks for fluid leaks on all equipment.

Long-Term Dam-Crest Flashboard Management Plan

In some years, dam-crest flashboards have been used to direct some sheet flow from over the top of DPD into the fish ladders and water diversions. USACE issues a license to Cordua Irrigation District (CID to install, remove, and maintain the anchoring system, supporting brackets, and dam-crest flashboards. The most recent license was issued in 2021 (USACE 2021) and the next license is scheduled to be issued in 2026. CID must coordinate its activities with USACE and NMFS. USACE and NMFS will work with CID to direct the placement, timing, and configuration of the dam-crest flashboards to best manage flows to benefit fish.

Installation of flashboards will only occur when flows at the Marysville Gage approach 375 cfs. Maintenance and/or removal will only occur when flows are less than or equal to 1,000 cfs at Marysville Gage. Work will occur between April 15 and November 1 and will require about two days advance notice and five days of in-water work for installation or removal. Manual clearing of debris using hand tools (*e.g.*, rakes, shovels, etc.) will be conducted as needed, depending on flow conditions and the amount of debris.

Following installation of dam-crest flashboards, fish passage through the ladders will be closely monitored via the VAKI system installed in the DPD fish ladders for at least the first week following placement to evaluate whether the dam-crest flashboard installation improves fish passage. Monitoring will be coordinated with the Yuba River Management Team (RMT) and/or whatever contracted entity holds the VAKI (*i.e.*, YWA or their designee, such as Pacific States Marine Fisheries Commission (PSMFC)). Additionally, during the period that dam-crest flashboards are in place, monitoring and inspection will be conducted at least once per week to determine whether the dam-crest flashboards have collected debris that might contribute to juvenile fish injury or mortality. If observations indicate that debris accumulation has occurred, the appropriate parties (NMFS and CDFW) will be notified within 24 hours of initial observation. Further, the dam-crest flashboards will be manually cleared of any debris using hand tools immediately, if possible, or as soon as USACE determines that it is safe to clear them. The dam-crest flashboards will be adjusted such that the desired effects (*i.e.*, improved attraction flows and fish passage conditions) are being achieved to the extent possible. All adjustments will be coordinated with NMFS and USACE. Any recommended adjustments will be made by USACE within 24 hours of notification by NMFS, unless flow conditions prohibit them, in which case the adjustments will be made as soon as flow conditions allow.

USACE's Long-Term Dam-Crest Flashboard Management Plan was originally developed in 2011 and was modified and updated in 2022 for the current BA (Appendix D in USACE 2023). The current plan addresses the following considerations and is incorporated by reference:

- Purpose
- Responsibilities
- Conditions of dam-crest flashboard placement
- Period of placement
- Materials and method of placement
- Location of placement
- Monitoring and inspection
- Dam-crest flashboard adjustment
- Reporting requirements

USACE will update and adjust the Long-Term Dam-Crest Flashboard Management Plan presented in Appendix D as required and in coordination with NMFS based on new information generated through monitoring efforts.

Fish Ladder Debris Monitoring and Management Plan for Daguerre Point Dam

Appendix B of USACE's BA (2023) contains the updated draft FLOMP for Daguerre Point Dam. As described in the plan, when flow at Marysville Gage are less than 4,200 cfs, USACE will conduct weekly visual inspections of the fish ladder bays (excluding bays with VAKI systems) for surface and subsurface debris, inspect the upstream fish ladder control gates, and remove debris as needed. If necessary, USACE will conduct more detailed in-ladder inspections according to safety protocols using a probe or a probe with an underwater camera to assess debris loading in the ladder bays. USACE will notify NMFS within 24 hours of debris accumulation, if debris cannot be removed at the time of inspection. The VAKI contracted licensee or designated representative will remotely review the VAKI footage to evaluate VAKI equipment cleaning needs daily Monday through Friday. On-site inspection and cleaning of the VAKI equipment will occur weekly by the contracted licensee or designated representative and will include coordination with USACE.

USACE will begin daily (seven days per week) visual inspections of non-VAKI ladder bays when flow at Marysville Gage is 4,200 cfs or greater. If necessary, USACE will conduct more detailed in-ladder inspections according to safety protocols using a probe or a probe with an underwater camera to assess debris loading in the ladder bays. USACE will communicate daily with NMFS regarding ladder inspections and conditions. The VAKI contracted licensee or designated entity will begin daily Monday through Sunday remote access of VAKI footage for indications of potential blockage or cleaning needs, will report daily findings to the designated USACE representative, and will coordinate with USACE staff to schedule and conduct daily VAKI inspection (and cleaning, as necessary). When flows are below 4,200 cfs, any debris observed during a ladder inspection will be manually removed using hand tools (*e.g.*, gravel rakes, log pikes, peavies, or other log management tools) at the time of inspection. If debris cannot be removed at the time of inspection, USACE will manually remove the debris using hand tools as soon as possible. USACE's designated point of contact will notify NMFS' point of contact within 24 hours of the discovery of the debris accumulation. If USACE encounters debris of a type or quantity that USACE anticipates cannot be removed within one week following initial observation of the debris accumulation, USACE will notify NMFS within 24 hours to inform NMFS of the situation and to work with NMFS to identify an appropriate solution.

Daguerre Point Dam Fish Ladder Operation and Debris Monitoring and Management Plan

In addition to the operational protocols for the control gates and ladders identified in 1.3.1.1.1 and in section 2.3.3.1 of USACE's BA (2023), the new FLOMP also incorporates fish ladder debris monitoring and maintenance protocols and procedures, which have been updated to address the considerations described below:

- Delegation of responsibilities and response activities.

- Reporting requirements confirming inspections of the DPD fish ladders for surface and subsurface debris.

- Explicit communication protocols and procedures, including specification of individuals, points of contact, and allowable time frames for incident notifications. USACE will develop a Communications Protocol and Procedures Plan and include it as part of USACE's first annual report following implementation of this opinion.

- Specification of debris-clearing activities and timeframes within which they are to be completed, including utilization of a suction dredge for sediment removal from within the fish ladders. To expedite and more efficiently clear sediment out of the fish ladder bays, USACE purchased two 5-inch suction dredges in early 2020. Due to supply chain delays, USACE received this dredge/pump equipment in March 2024.

- If the measured sediment in any one fish ladder bay reaches an accumulated depth of one foot or greater, that ladder will be scheduled for dredging during the next August work window. If both the north and south ladders have accumulated sediment greater than one foot deep within the ladder bays, then both ladders will be scheduled to be dredged. Only a fish ladder with sediment accumulation to a depth of one foot or greater within the ladder bays will be dredged during any given year.

- USACE will conduct fish ladder maintenance activities associated with the cleaning of sediment out of the fish ladder bays by suction dredge during August concurrently with the upstream gravel removal.

- Identification of safety conditions affecting timeliness of response and contingency for debris-clearing activities during high-flow conditions. USACE will develop and implement ladder inspection safety protocols, which will be included as part of USACE's first annual report following implementation of this opinion.

- Adherence to USACE safety protocols and water quality monitoring in conjunction with monitoring being conducted for the upstream gravel excavation.

- Scheduling debris removal around known periods of adult Chinook salmon and steelhead upstream migration to minimize effects of such activities on fish passage.

- Maintain floating debris booms upstream and downstream of the north ladder and repair log booms as needed, pursuant to USACE safety protocols and procedures. Repairs will be conducted annually during June and July, based on inspections, and will be completed using hand tools (*i.e.*, wrenches, cordless drill drivers, etc.) in one day or less.

USACE will communicate with NMFS on the timing of sediment removal within the fish ladder bays based on river flows, human safety concerns, and fish presence. Coordination is important on the timing of fish ladder maintenance activities associated with the cleaning of sediment out of the fish ladder bays by suction dredge, because the upstream control gates at the north and south fish ladders will need to be temporarily closed during the maintenance periods. Maintenance periods are estimated to require two to ten days of in-water work during August for each ladder. Each time, USACE will confer with NMFS to determine disposition of dredge spoils. USACE will report to NMFS after within-ladder sediment has been removed and the upstream control gates have been reopened.

1.3.2. Planned Maintenance Activities at Daguerre Point Dam

In addition to O&M activities conducted at the DPD fish passage facilities, USACE also plans for and conducts routine maintenance activities that may arise as a result of annual and periodic inspections of the dam.

Planned maintenance items associated with DPD include: (1) clearing driftwood debris from near the north ladder to facilitate monitoring for changes in the condition of concrete spall, (2) clearing vegetation from embankment slopes, and (3) cleaning the uplift relief drains of the dam to maintain their functionality.

Minor concrete spall (*i.e.*, weathering) was identified on a portion of the north fish ladder during inspections conducted by USACE in 2019. Accumulation of driftwood impedes USACE's ability to monitor the condition of the spall (USACE 2023). USACE will remove driftwood debris in order to better monitor the condition of the spall.

USACE has identified a need to clear vegetation from the embankment slopes adjacent to DPD in order to prevent potential slope instabilities and to facilitate the ability to conduct inspections along the physical structure of the dam. Activities include mowing and removal of blackberry vines with hand tools. Herbicide applications will not be conducted due to the proximity to the Yuba River.

In all but very severe events, the clearing of debris and the clearing of vegetation will be performed manually by USACE using non-motorized hand tools (*e.g.*, shovels, rakes, etc.) and/or power trimmers. These types of maintenance activities are conducted from the land side of the dam structure and fishways. Because work activities will be conducted manually and do not involve in-water work, they have a low potential to introduce fine sediment or debris into the Yuba River.

In the rare instance where severe debris accumulation may occur, an excavator may be necessary to effectively remove the accumulated debris. Recognizing that the use of heavy machinery has the potential to introduce additional risks (*e.g.*, unintended leakage or accidental release of petroleum-based hydrocarbons or other contaminants into aquatic habitat), USACE will take the necessary precautions and implement BMPs to minimize or avoid the potential for such risks to occur (*e.g.*, use vegetable-based oil rather than petroleum-based hydrocarbons). The excavator will be cleaned of all oils and greases and will be inspected and re-cleaned daily, as necessary, to ensure that no contaminants are released into the Yuba River. All hydraulic hoses and fittings also will be inspected to ensure that there are no leaks in the hydraulic system. Heavy equipment will be used from the land side of the dam in the dry, and USACE will adhere to its standard hazardous materials plan and emergency response procedures. Therefore, the potential for a spill to occur and enter the waterway exists, but the implementation of BMPs will minimize or avoid the potential for such risks to result in adverse impacts to listed species or their habitat.

Section IV, Inspection and Maintenance, of the 1966 USACE O&M Manual (USACE 1966) states that the outlets of all drains are to be inspected when river stages permit access to them, and shall be cleaned a minimum of every five years or more often if required. At other times, the drainage manholes at either end of the overflow section are to be inspected and cleaned a minimum of every three years or more often if required. However, because hydrologic conditions have changed substantially since 1966, opportunities for USACE to clean the drains on the ogee section of the dam are extremely limited, because the flows presumed to be low enough to permit access have only occurred once since 2006. Cleaning the uplift relief drains in the ogee section of DPD is currently scheduled for 2030, subject to funding availability and when flows at Marysville Gage are less than or equal to 400 cfs.

Under the current flow regime, the uplift relief drains along the overflow section are not easily accessible for inspection or maintenance due to year-round flows (USACE 2023). Cleaning the uplift relief drains is a non-discretionary activity that has a discretionary component related to the timing and frequency of the cleaning. The uplift relief drains require cleaning when flow conditions allow for USACE personnel to safely access the drains. Cleaning is anticipated to occur during low-flow conditions (when flow conditions are low enough such that water is not flowing over the ogee section of the dam (USACE 2023)), which typically occur during September to early November before the winter rains start when there is dry land access on the non-overflow section of DPD.

New maintenance actions added to USACE's list of planned maintenance items that were identified during the 2022 pre-flood inspection include: (1) monitor seepage at the north side of the non-overflow section of DPD exiting from backfill above the fish ladder entrance, (2) monitor soil erosion near the concrete abutment of the left earth wing dam, and (3) clean the uplift relief drains in the ogee section of the dam (when flow conditions allow) to maintain their functionality (USACE 2023). Although the overflow spillway section is stable even under extreme flow conditions, the drains are still an integral design feature on a spillway and will be cleaned when funding is appropriated. The general procedure for cleaning the drains consists of placing air-lifting equipment into the drain to lift the debris out of the top of the drain, lowering a rotary drain-cleaning machine into the drain, followed by blowing compressed air through the drain to clear the remaining debris. Each drain will then be video-inspected to ensure all material is completely removed.

1.3.3. Discretionary "Voluntary Conservation Measures"

In their BA, USACE has pointed out that the "voluntary conservation measures" are subject to Congress appropriating funds (USACE 2023). NMFS proceeds on the assumption that these actions will be carried out. Therefore, NMFS' effects analysis is premised upon their implementation as part of the proposed action annually (if deemed needed), as USACE has been able to secure funding for all years it was requested in previously.

Gravel Injection in the Englebright Dam Reach of the Yuba River (Gravel Augmentation Plan)

Subject to funding availability, which has been secured every year since 2014, USACE will inject about 5,000 tons of gravel into the Englebright Dam Reach (EDR) of the Yuba River between July 15 through August 31 of each year using a sluicing injection method. The EDR is the reach of the LYR directly downstream from Englebright Dam and until the confluence with Deer Creek. USACE will coordinate with NMFS to decide the location of gravel injection and methods. If bathymetric survey monitoring and redd survey monitoring in the EDR suggest that alternative locations or gravel injection methods will be necessary in the future, then USACE will further update its methodology and gravel injection procedures accordingly to continue the long-term gravel augmentation program.

The proposed action includes continuation of annual, or as needed, gravel injections using the same methodology and ranges of gravel volumes used over the past 10 years, depending on flow and substrate transport conditions the previous year.

Redd surveys in the EDR will be conducted by USACE's contractor according to the methodology presented in Attachment E2 of Appendix E of USACE's BA (USACE 2023). New components and updates to implementation of the GAIP include salmonid redd surveys, topographic mapping, and water quality monitoring. The proposed action also includes salmonid redd surveys during the fall and winter after each gravel injection and continuation of topographic mapping before and after each gravel injection based on the methods described in recent annual redd survey reports. At NMFS' request and as an update to protocols and procedures, new attachments have been added to describe the methodology used for water quality monitoring (attachment E1 in USACE 2023) and the methodology used for redd surveys conducted in the EDR (attachment E2 in USACE 2023),

Although USACE's contractor has previously sought ESA 4(d) research authorization to conduct redd surveys in the EDR, discussions between USACE and NMFS concluded that it would be more appropriate for USACE to seek incidental take coverage for the monitoring-based redd surveys as part of the proposed action so that USACE can retain ESA coverage and have greater flexibility in the future if the contractors conducting the surveys were to change.

Long-Term Large Woody Material Management Plan

Regarding USACE's LWM management activities in the LYR, USACE: (1) refined the draft plan that was prepared in 2012 for the management of LWM, consistent with recreation safety needs; (2) incorporated results from the pilot study and use those results to inform program objectives, performance indicators and logistics for implementation of a long-term program; (3) described considerations for determining suitability and feasibility of LWM placement as part of a long-term program; (4) investigated potential methods for improving the functionality of LWM placed along the river by refining the draft plan to identify other potentially suitable locations and to evaluate the efficacy of placing LWM to modify local flow dynamics to increase cover and diversity of instream habitat for the primary purpose of benefiting juvenile salmonid rearing; (5) considered alternative sources of wood, including appropriate orchard species, of increased complexity (*i.e.*, crowns and/or root wads attached); and (6) developed a long-term Large Woody Material Management Plan (LWMMP) for implementation in the LYR (Appendix F in USACE 2023).

USACE will place LWM in the LYR between the Highway 20 Bridge and Hammon Bar between late August and December each year. USACE will coordinate with NMFS to determine the appropriate timing for placement of LWM if placement activities are anticipated to require in-water work. The quantity of LWM placed annually will be dependent on appropriated funds. Over the past ten years of this project, funding has been secured every year. On average, USACE secured funds for and has placed 430 cubic yards of LWM per year, but in a few years when wood from the previous year was still in place, the wood acquired in a given year was stockpiled for placement in the following year (Appendix F in USACE 2023). NMFS assumes that funding security and quantity of LWM acquired and placed will generally follow the trend of the past ten years. Specific placement locations and techniques of LWM placement will be identified in annual LWM implementation plans through USACE collaboration with NMFS. Other key elements of LWM placement activities include the following:

- All potential LWM placement sites along the lower Yuba River are located upstream of DPD.
- LWM placement sites must be legally and physically accessible by required equipment (*e.g.*, self-loading log trucks, excavators, end dumps, skidders, and dump trucks).
- All equipment will be staged in previously disturbed areas outside of the functional floodplain.
- LWM will be transported to placement sites via logging or dump trucks. Trucks will utilize existing roads and access sites.
- Specific methods of LWM placement will be identified through coordination with NMFS during initial implementation of the long-term LWMMP and in annual LWM implementation reports.
- USACE will conduct LWM placement activities between late August and December of each year.
- USACE will coordinate with NMFS to determine the appropriate timing for placement of LWM if placement activities are anticipated to require in-water work.

- Placement of LWM will occur when the river stage is low to ensure placement within the boundaries of the functional floodplain but not directly in the low-stage water. Placement is not anticipated to require the removal of existing vegetation or in-water excavation.

- Work will be conducted annually over two to six weeks during the late summer or fall, once sufficient LWM stockpiles have been collected. Work hours will be limited to weekdays, from 0800 to 1700.

- If in-water work is required, a turbidity curtain/fence will be placed and maintained around the work area to contain turbidity and suspended sediments generated. The turbidity curtain/fence would also serve as a fish exclusion curtain. USACE or its contracted designees will herd fish out of the area enclosed by the turbidity curtain/fence before initiation of work activities to minimize the potential for exposure of juvenile anadromous salmonids to increase turbidity and immediate work area disturbance. Specific fish herding techniques could be similar to those described for other non-USACE LWM enhancement projects (*e.g.*, YWA 2018) in the LYR, as described in Appendix F of USACE's BA (USACE 2023).

- The operation of motorized equipment at the LWM placement sites could increase the risk of discharging hazardous substances (*e.g.*, oil, diesel fuel, hydraulic fluids) into the river. The LWMMP includes BMPs that will be implemented to ensure that the risk of hazardous materials spills is minimized. The placement contractor will be properly trained to use standard spill prevention and cleanup equipment and techniques, including rapid deployment of onsite spill absorption and retention materials.

In 2021, USACE developed an updated document titled "U.S. Army Corps of Engineers Long-Term Woody Material Management Plan for the Lower Yuba River, CA," which takes into account the data gathered by USACE during seven years of LWMMP pilot program implementation, and provides a detailed methodology by which USACE will supply and manage LWM in the LYR for the benefit of juvenile salmonids and their rearing habitat. The updated long-term LWMMP (Appendix F in USACE 2023) is part of the proposed action and is incorporated by reference.

1.3.4. Continued Administration of Outgrants at Daguerre Point Dam

Issuance and Administration of a License to YWA for VAKI Operations at DPD

USACE has determined that activities related to the O&M of the VAKI systems must be performed by the contracted licensee or their designated representative. YWA applied to USACE for a new license to operate the VAKI devices after April 1, 2023, and USACE issued a new 5-year license to YWA for the period extending from April 1, 2023, through March 31, 2028. Similar to the previous licenses issued to CDFW, the new license to YWA includes a term that requires the contracted licensee to comply with regulations, conditions, or instructions that are in effect or prescribed by federal agencies.

Since YWA is the current license holder at the time of writing this opinion, YWA will be used for discussion of this license. However, if a different contracted licensee is designated following the expiration of this license they and/or their designee will perform the same functions as those assigned to YWA below.

YWA holds the license to operate and maintain the VAKI systems in the fish ladders at DPD. YWA's designated entity (*e.g.*, PSMFC) will remotely access the VAKI footage daily Monday through Friday to assess whether VAKI equipment needs cleaning (and more often during high-flow periods, see section 1.3.1.2. above). YWA's designated entity will coordinate with USACE staff to schedule and conduct weekly VAKI equipment inspection and cleaning, regardless of whether the need for cleaning is indicated by daily footage reviews.

The proposed action includes USACE's issuance of the new 5-year license to YWA, to replace the license previously held by CDFW. USACE does not intend to change the terms of the license for future 5-year renewals that would become effective in 2028, or for subsequent renewals in the future. At this time, subsequent renewals are anticipated to involve simply extending the duration of the license term for another 5-year period. If changes to specific license terms become necessary in the future, then USACE will consider whether the proposed changes had the potential to affect listed species and whether such changes would meet the triggers for reinitiation of ESA consultation regarding the license.

The license specifies that YWA shall pay the cost, as determined by USACE, of producing and/or supplying and utilities and other services furnished by the government or through government-owned facilities for the use of YWA, including YWA's proportionate share of the cost of operation and maintenance of the government-owned facilities by which such utilities or services are produced or supplied. The government is under no obligation to furnish utilities or services.

The license further specifies that any property of the United States damaged or destroyed by the grantee shall be promptly repaired or replaced by the grantee to a condition satisfactory to USACE.

USACE will administer the new license (including renewals) to YWA (or other entity) to operate the VAKI infrared and photogrammetric systems in the fish ladders at DPD in a manner that is the same as that which was conducted for the license previously issued to CDFW. Additional information on specific implementation details (*e.g.*, timing, frequency, etc.) associated with this component of the proposed action are presented in Table 2-1 in the 2023 USACE DPD BA.

Administration of a License Issued to Cordua Irrigation District (CID) for Dam-Crest Flashboard Installation, Removal, and Maintenance at DPD

The proposed action includes implementation of the Long-Term Dam-Crest Flashboard Management Plan (Appendix D in USACE 2023) through the administration of a license issued to CID. For further details on CID's actions on dam-crest flashboards see section 1.3.1. above.

As part of the terms of the new license issued to CID on February 1, 2021, and extending through January 31, 2026, CID is responsible for the following activities:

- Must follow USACE's Long-term Dam-Crest Flashboard Management Plan, which is included as Appendix D to the USACE BA (USACE 2023).

- Shall install and remove the dam-crest flashboards as directed by USACE.
- Shall inspect the dam-crest flashboards on a weekly basis to identify potential debris buildup that might contribute to juvenile salmonid mortality and remove any debris that is discovered.
- Shall monitor and notify USACE of the effects of the dam-crest flashboards on juvenile salmonids for the potential of direct mortality due to entrainment or concentrating juveniles in a manner that promotes predation.
- Shall record and provide to USACE the flows at the time of placement for potential use as future flow rate triggers for dam-crest flashboard placement.
- Shall operate in a manner compliant with the NMFS 2014 opinion (NMFS 2014a), included as Exhibit C to the license, and this opinion which supersedes the 2014 opinion.
- Shall provide USACE with an annual report capturing all of the activities undertaken at DPD (*i.e.*, flow data collection, dam-crest flashboard placement, adjustment, monitoring, and removal) during the period of the license.

In the event that NMFS issues an opinion subsequent to this 2024 opinion for the proposed action prior to the expiration of USACE's existing license to CID in 2026, then the existing license will be amended to include the updated Long-Term Dam-Crest Flashboard Management Plan (Appendix D USACE 2023) and terms and conditions included in the new NMFS opinion pertinent to dam-crest flashboard management. Provided that CID applies for a new license when the existing license expires on January 31, 2026, USACE will issue a new 5-year license for the period extending from February 1, 2026, through January 31, 2031.

2. Endangered Species Act: Biological Opinion and Incidental Take Statement

The ESA establishes a national program for conserving 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, each federal agency must ensure that its actions are not likely to jeopardize the continued existence of endangered or threatened species or to 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 provide an opinion stating how the agency's actions would affect listed species and their critical habitats. If incidental take is reasonably certain to occur, section 7(b)(4) requires NMFS to provide an ITS that specifies the impact of any incidental taking and includes reasonable and prudent measures (RPMs) and terms and conditions to minimize such impacts.

2.1. Analytical Approach

This opinion includes both a jeopardy analysis and an adverse modification analysis. The jeopardy analysis relies upon the regulatory definition of "jeopardize the continued existence of" a listed species, which is "to engage in an action that reasonably would 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.

This biological opinion also relies on the regulatory definition of "destruction or adverse modification," which "means a direct or indirect alteration that appreciably diminishes the value of critical habitat as a whole for the conservation of a listed species" (50 CFR 402.02).

The designations of critical habitat for CV spring-run Chinook salmon, CCV steelhead, and sDPS green sturgeon use the term primary constituent element (PCE) or essential features. The 2016 final rule (81 FR 7414; February 11, 2016) that revised the critical habitat regulations (50 CFR 424.12) replaced this term 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 PCEs, PBFs, or essential features. In this opinion, we use the term PBF to mean PCE or essential feature, as appropriate for the specific critical habitat.

The ESA section 7 implementing regulations define effects of the action using the term "consequences" (50 CFR 402.02). As explained in the preamble to the final rule revising the definition and adding this term (84 FR 44976, 44977; August 27, 2019), that revision does not change the scope of our analysis, and in this opinion we use the terms "effects" and "consequences" interchangeably.

We use the following approach to determine whether a proposed action is likely to jeopardize listed species or destroy or adversely modify critical habitat:

- Evaluate the rangewide status of the species and critical habitat expected to be adversely affected by the proposed action.

- Evaluate the environmental baseline of the species and critical habitat.

- Evaluate the effects of the proposed action on species and their critical habitat using an exposure–response approach.

- Evaluate cumulative effects.

- In the integration and synthesis, add the effects of the action and cumulative effects to the environmental baseline, and, in light of the status of the species and critical habitat, analyze whether the proposed action is likely to: (1) directly or indirectly 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; or (2) directly or indirectly result in an alteration that appreciably diminishes the value of critical habitat as a whole for the conservation of a listed species.

- If necessary, suggest a reasonable and prudent alternative to the proposed action.

Table 1. Decision-making steps for analyzing the effects of the proposed action on listed species.

Step	Apply the Available Evidence to Determine if…	True/False	Action
A	The proposed action is not likely to produce stressors that have adverse effects on the environment	True	End
		False	Go to B
B	Listed individuals are not likely to be exposed to one or more of those stressors or one or more of the effects of the proposed action	True	NLAA
		False	Go to C
C	Listed individuals are not likely to respond upon being exposed to one or more of the stressors produced by the proposed action	True	NLAA
		False	Go to D
D	Any responses are not likely to constitute "take" or reduce the fitness of the individuals that have been exposed.	True	NLAA
		False	Go to E
E	Any reductions in individual fitness are not likely to reduce the viability of the populations those individuals represent.	True	NLJ
		False	Go to F
F	Any reductions in the viability of the exposed populations are not likely to reduce the viability of the species.	True	NLJ
		False	LJ

Acronyms and abbreviations in the action column refer to not likely to adversely affect (NLAA) and not likely/likely to jeopardize (NLJ/LJ).

Table 2. Decision-making steps for analyzing the effects of the proposed action on designated critical habitat.

Step	Apply the Available Evidence to Determine if…	True/False	Action
A	The proposed action is not likely to produce stressors that have adverse effects on the environment	True	End
		False	Go to B
B	Areas of designated critical habitat are not likely to be exposed to one or more of those stressors or one or more of the effects of the proposed action	True	NLAA
		False	Go to C
C	The quantity or quality of any physical or biological features of critical habitat or capacity of that habitat to develop those features over time are not likely to be reduced upon being exposed to one or more of the stressors produced by the proposed action	True	NLAA
		False	Go to D
D	Any reductions in the quantity or quality of one or more physical or biological features of critical habitat or capacity of that habitat to develop those features over time are not likely to reduce the value of critical habitat for the conservation of the species in the exposed area	True	NLAA
		False	Go to E
E	Any reductions in the value of critical habitat for the conservation of the species in the exposed area of critical habitat are not likely to appreciably diminish the overall value of critical habitat for the conservation of the species	True	No D/AD MOD
		False	D/AD MOD

Acronyms and abbreviations in the action column refer to not likely to adversely affect (NLAA) and destruction or adverse modification of critical habitat (D/AD MOD).

2.2. Rangewide Status of the Species and Critical Habitat

This opinion examines the status of each species that is likely to 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' "reproduction, numbers, or distribution" for the jeopardy analysis. The opinion also examines the condition of designated critical habitat, evaluates the conservation value of the various watersheds and coastal and marine environments that make up the designated critical habitat, and discusses the function of the PBFs that are essential for the species' conservation.

2.2.1. Central Valley spring-run Chinook salmon

In 1999 (64 FR 50394), NMFS listed Central Valley (CV) spring-run Chinook salmon under the ESA and classified it as a threatened species. This initial classification was reaffirmed in 2005 when the Feather River Fish Hatchery (FRFH) population was added to the ESU (70 FR 37159). Critical habitat for CV spring-run Chinook salmon was later designated in 2005 (70 FR 52488).

On July 22, 2014 (79 FR 42504), NMFS completed the Recovery Plan for the Evolutionarily Significant Units of Sacramento River Winter-run Chinook Salmon and Central Valley Spring-run Chinook Salmon and the Distinct Population Segment of California Central Valley Steelhead (NMFS 2014b). In the 5-year review, it was recommended that the CV spring-run Chinook should remain listed as threatened (NMFS 2016; 81 FR 33468). The federally listed ESU of CV spring-run Chinook salmon and designated critical habitat occur in the action area and may be affected by the proposed action.

Life History

Generally, adult CV spring-run Chinook salmon fish migrate from the Pacific Ocean in a reproductively immature state and swim upstream into fresh water in the spring months (approximately March through June) using olfactory senses to locate their birth waters. The adult fish then hold over summer months (approximately June through September), and spawn in cold freshwater in the early fall months (approximately September through November). Larval fish, also known as 'alevins,' hatch from eggs and emerge from their gravel nests throughout the fall and early winter months (approximately October through December). Juvenile fish then rear and feed in freshwater from late fall through spring (approximately October through June); or may choose to rear for a full year (*i.e.*, October to subsequent October to December), and become 'yearling' juveniles when conditions are suitable.

As juvenile fish rear, they migrate downstream and eventually reach the Sacramento-San Joaquin River Delta, and then the San Francisco Bay estuary. Once juvenile fish have completed the physiological changes necessary to enter saltwater (called smoltification), they enter the Pacific Ocean and rear until adulthood for approximately three to four years, which is typical for Chinook salmon. Once adult fish are three or four years old, they migrate back upstream to freshwater to start the life cycle over again and create the next generation. All Chinook salmon are "semelparous" fish, meaning they reproduce once in their lifetime and then die shortly after spawning.

In general, wetter water years result in higher survival of juveniles out-migrating during the spring of the same year they emerged. In three to four years, the juvenile cohort that experienced wetter outmigration conditions, are more likely to result in a higher abundance of adults returning to freshwater to spawn. Drier water years generally result in low survival during spring outmigration and encourages a subset (roughly 10%) of juveniles to express the yearling life history strategy (Cordoleani *et al.* 2020). This results in a lower number of large juveniles out-migrating to the ocean much later in the year. When the dry condition cohort returns as adults, there are fewer adults because there was less survival during the large spring outmigration. Therefore, the number of adult spawners is likely to be lower from a juvenile cohort that experienced drought conditions in freshwater during their out-migration, in contrast to a juvenile cohort that experienced high river flows during a wet water year while out-migrating.

Viability status and trends

The viability of CV spring-run Chinook salmon has deteriorated since the NMFS 2016 status review, with weakening of all independent CV spring-run Chinook salmon populations (SWFSC 2022). The total estimated abundance of adult CV spring-run Chinook salmon for the Sacramento River watershed in 2019 was 26,553, approximately half of the population size in 2014 (N=56,023). Also, population sizes have hit decadal lows, of ~14,000 individuals recently (SWFSC 2023).

The CV spring-run Chinook salmon ESU includes all naturally spawned CV spring-run Chinook salmon originating from the Sacramento River and its tributaries (70 FR 37159, June 28, 2005). In 2014, FRFH broodstock was used to actively reintroduce CV spring-run Chinook salmon into the mainstem San Joaquin River as an ESA 10(j) experimental population (NMFS 2013, 78 FR 79622). Since 2019, adults have been observed returning to the San Joaquin River and successfully spawning within the San Joaquin River Restoration Program Restoration Area. There have also been observations of CV spring-run Chinook salmon returning to the San Joaquin River tributaries. This ESU does not include Chinook salmon that are designated as part of the San Joaquin River experimental population (SWFSC 2023).

The CV spring-run Chinook salmon ESU is composed of four Diversity Groups: Basalt and Porous Lava, Northwestern California, Northern Sierra Nevada, Southern Sierra Nevada. The Yuba River is within the Northern Sierra Nevada Diversity group. The Yuba River population is considered a Core 2 population, at moderate to high risk of extinction, and contains lower abundance, or amount and quality of habitat, and are often considered dependent on other larger/viable populations (*i.e.*, Core 1 populations). Recovery strategies outlined in the NMFS CV recovery plan (NMFS 2014b) are targeted on achieving, at a minimum, the biological viability criteria for each major diversity group in the ESU in order to have all four diversity strata at viable (low risk) status with representation of all the major life history strategies present historically, and with the abundance, productivity, spatial structure, and diversity attributes required for long-term persistence.

In order to meet the recovery criteria for this ESU and thereby delist the species, there must be at least nine populations at a low risk of extinction distributed throughout the Central Valley, as well as additional core 2 populations.

- One population in the Northwestern California Diversity Group at low risk of extinction
- Two populations in the Basalt and Porous Lava Diversity Group at low risk of extinction
- Four populations in the Northern Sierra Nevada Diversity Group at low risk of extinction
- Two populations in the Southern Sierra Nevada Diversity Group at low risk of extinction

None of the four diversity groups currently meet the number of viable/independent populations at a low risk of extinction needed to meet recovery criteria (SWFSC 2023).

Abundance & Productivity

Most Core 2 CV spring-run Chinook salmon populations have been experiencing continued and, in some cases drastic, declines. In 2015, CV spring-run Chinook salmon showed strong signs of repopulating Battle Creek, home to a historical independent population in the Basalt and Porous Lava diversity group that had been extirpated for many decades (NMFS 2016b, SWFSC 2023). Current viability metrics show a significant declining trend (23% decline per year) and low population size (N<250) for the Battle Creek spring-run Chinook salmon population, placing it at a high extinction risk (SWFSC 2023). Similarly, the CVSRC population in Clear Creek, previously identified as increasing in abundance, has experienced recent declines in population size (N=136) down from N=822 in 2015, placing it at a high risk of extinction (SWFSC 2023). Mill Creek and Deer Creek spring-run Chinook salmon populations reached low population sizes (N=590 and N=956, respectively) placing them at a moderate risk of extinction (SWFSC 2023). Yet, the low run sizes in consecutive years for Mill Creek spring-run Chinook salmon following the recent droughts (~150 individuals) and precipitous decline (16% over the decade) place Mill Creek at a high risk of extinction using the VSP criteria (SWFSC 2023). The highest risk score for any criterion determines the overall extinction risk for a given population. Recent declines of population size in all populations have been substantial and almost qualify as catastrophes under the criteria (>90% decline) with the main independent populations of CV spring-run Chinook salmon reaching all-time declines over one generation (Battle Creek = 77%, Butte Creek = 76%, Deer Creek = 84%, and Mill Creek = 68%) (SWFSC 2023).

Counteracting recent declines in the abundance of adults from dependent populations, CV spring-run Chinook salmon have continued to repopulate areas where they were once extirpated, including Battle and Clear Creeks, and more recently the San Joaquin River. Each of these watersheds have the potential to support independent and viable CV spring-run Chinook salmon populations (NMFS 2014b; Lindley *et al.* 2004) Central Valley spring-run Chinook salmon ESU populations have experienced a series of droughts over the past decade. From 2007–2009 and 2012–2016, the Central Valley experienced drought conditions and low river and stream discharges, which are strongly associated with lower survival of Chinook salmon (Michel *et al*. 2015).

A new emerging threat to the CVSRC populations includes thiamine deficiency, which was responsible for early life stage mortality of FRFH spring-run Chinook salmon in the hatchery in recent years, initially being diagnosed in 2019 (Mantua *et al.* 2021). Direct mortality or latent effects that would lead to increased mortality in that cohort would not be able to begin being detected until the dominant age class of 3-year-olds from the affected years return to spawn (starting in 2022), and further data can be analyzed for annual adult escapements to determine further effects on the population and viability. Starting in 2019, significant numbers of juvenile mortalities were observed in the Feather River rotary screw trap, early in the juvenile out-migration season, consistent with thiamine deficiency complex (TDC) observed in the hatchery. In fact, significantly fewer juveniles were observed in 2019 (N=1149) compared to 2018 (N=30,334), and 45% of juveniles in 2019 were found dead compared to 1% observed in 2018 (SWFSC 2022). It is unclear the extent to which this was a basin-wide nutritional deficiency for all CVSRC spawning in 2019.

Spatial Structure & Diversity

At the ESU level, the spatial diversity is increasing and spring-run Chinook salmon are present (albeit at low numbers in some cases) in all diversity groups. The reestablishment of CVSRC to Battle Creek and increasing abundance of CVSRC on Clear Creek observed in some years is benefiting the viability of CVSRC. Similarly, the reappearance of early migrating Chinook salmon to the San Joaquin River tributaries may be the beginning of natural dispersal processes into rivers where they were once extirpated. While the spatial diversity expanding is a positive indicator for the ESU, populations have still declined sharply in recent years to in most cases worryingly low levels of abundance.

The ESU is trending in a positive spatial direction towards achieving at least two populations in each of the four historical diversity groups necessary for recovery with the Northern Sierra Nevada region (NMFS 2014b). There have been recent observations of CV spring-run Chinook salmon returning to the San Joaquin River tributaries and creating redds. The ESU does not currently include Chinook salmon that are designated as part of the San Joaquin River experimental population. Continuing to monitor these populations will provide valuable data to evaluate the status of CV spring-run Chinook salmon in the San Joaquin River and its tributaries. This monitoring would also provide a basis for evaluating whether the ESU boundary should be modified to account for CV spring-run Chinook salmon populations repopulating the San Joaquin River Basin and/or in CV habitats upstream of currently impassable barriers.

Central Valley Spring-run Chinook salmon critical habitat

Critical habitat was designated for the Central Valley spring-run Chinook salmon ESU on September 2, 2005 (70 FR 52488). The geographical range of designated 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; and the Sacramento River downstream to the Delta, as well as portions of the northern Delta (70 FR 52488).

As a result of human-made migration barriers, especially the construction of major dams, CV spring-run Chinook salmon have been confined to lower elevation river mainstems that historically only were used for migration. The greatly reduced spawning and rearing habitat has resulted in declines in population abundances in these streams. Additionally, the remaining habitat is of lower quality, in particular because of higher water temperatures in late summer and fall, reduced gravel recruitment, and lack of instream large woody material (LWM).

The critical habitat designation for CV spring-run Chinook salmon lists the essential physical and biological features ((70 FR 52488); September 2, 2005), which include:

1. Freshwater spawning sites with water quantity and quality conditions and substrate supporting spawning, incubation and larval development,

2. Freshwater rearing sites with: (i) water quantity and floodplain connectivity to form and maintain physical habitat conditions and support juvenile growth and mobility; (ii) water quality and forage supporting juvenile development; and (iii) natural cover, such as shade, submerged and overhanging large wood, log jams and beaver dams, aquatic vegetation, large rocks and boulders, side channels, and undercut banks,

3. Freshwater migration corridors free of obstruction and excessive predation with water quantity and quality conditions and natural cover, such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, side channels, and undercut banks supporting juvenile and adult mobility and survival, and

4. Estuarine areas free of obstruction and excessive predation with: (i) water quality, water quantity, and salinity conditions supporting juvenile and adult physiological transitions between fresh- and saltwater; (ii) natural cover, such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, side channels; and (iii) juvenile and adult forage, including aquatic invertebrates and fishes, supporting growth and maturation.

The current condition of spring-run Chinook salmon critical habitat PBFs have been degraded from their historical condition within the action area. Although there are exceptions, the majority of streams and rivers in the ESU have impaired habitat. Additionally, critical habitat in the ESU often lacks the ability to establish essential features due to ongoing human activities. Large dams, like Englebright Dam on the Yuba River, stop the recruitment of spawning gravels, which impact both an essential habitat type (spawning areas) as well as an essential feature of spawning areas (substrate). Water utilization in many regions throughout the ESU reduces summer base flows, which limits the establishment of several essential features, such as water quality and water quantity.

In the Sacramento River and adjacent tributaries, bank armoring has significantly reduced the quantity of floodplain rearing habitat for juvenile salmonids and has altered the natural geomorphology of the river (NMFS 2014b) CV spring-run Chinook salmon are only able to access large floodplain areas, such as the Yolo Bypass, under certain hydrologic conditions which do not occur in drier years. Levee construction involves the removal of riparian vegetation, resulting in reduced habitat complexity and shading, making juveniles more susceptible to predation. Additionally, loss of riparian vegetation reduces aquatic macroinvertebrate recruitment resulting in decreased food availability for rearing juveniles (Anderson and Sedell 1979; Pusey and Arthington 2003).

Although the current conditions of CV spring-run Chinook salmon critical habitat are significantly degraded, the spawning habitat, migratory corridors, and rearing habitat that remain are considered to have high intrinsic value for the conservation of the species.

Summary of the CV spring-run Chinook salmon ESU Viability

To conclude, the viability of the CV spring-run Chinook salmon ESU has deteriorated since it was listed under the ESA (NMFS 2016b, SWFSC 2023). The largest impacts are likely due to the 2012-2015 and 2020-2022 freshwater drought conditions and unusually warm ocean conditions experienced by these cohorts. This ESU continues to face significant, unyielding threats that are likely to be exacerbated by the impacts of future climate change. Based on the previous 5-year review and more recent data, there has been a decrease in the viability and the ESU remains at a moderate to high risk of extinction (SWFSC 2023). The viability of the ESU has decreased, and the threats to the species' persistence remain high and are not improving (SWFSC 2023).

2.2.2. California Central Valley Steelhead

The California Central Valley (CCV) steelhead DPS includes CCV steelhead spawning naturally in the Sacramento and San Joaquin Rivers and their tributaries, as well as CCV steelhead that are part of the hatchery program at the Coleman National Fish Hatchery (CNFH) and FRFH (70 FR 37204).

In 1998, NMFS listed CCV steelhead under the ESA and classified it as a threatened species. In 2006, following the development of NMFS' Hatchery Listing Policy (70 FR 37204, June 28, 2005), we re-evaluated the status of this DPS and determined that the DPS continued to warrant listing as a threatened species. Furthermore, we determined that the CNFH and FRFH stocks of CCV steelhead should be part of the DPS.

On July 22, 2014 (79 FR 42504), NMFS completed the Recovery Plan for the Evolutionarily Significant Units of Sacramento River Winter-run Chinook Salmon and Central Valley Spring-run Chinook Salmon and the Distinct Population Segment of California Central Valley Steelhead (NMFS 2014b). In the following (2016) 5-year review it was recommended that CCV steelhead should remain listed as threatened (NMFS 2016a; 81 FR 33468). The 2023 SWFSC assessment indicates that the viability of CCV steelhead appears to be unchanged since the 2016 review (SWFSC 2023).

CCV steelhead historically occurred naturally throughout the Sacramento and San Joaquin River basins, although stocks have been extirpated from large areas in both basins. In 1988 the California Advisory Committee on Salmon and Steelhead reported a reduction in freshwater CCV steelhead habitat from 6,000 linear miles historically to 300 linear miles of stream habitat.

Life History

Steelhead exhibit perhaps the most complex suite of life-history traits of any species of Pacific salmonid. Members of this species can be anadromous or freshwater residents and, under some circumstances, members of one form can yield offspring of another form.

Adult migration from the ocean to spawning grounds occurs during much of the year, with peak migration occurring in the fall or early winter. Steelhead generally begin spawning in December, continuing through March/April. Based on all available information collected to date, the RMT (2013) identified the steelhead spawning period in the Yuba River to typically be focused from January through April.

CCV steelhead spawn downstream of dams on every major tributary within the Sacramento and San Joaquin River systems. Due to water development projects, most spawning is now confined to lower stream reaches below dams. In a few streams, such as Mill and Deer creeks, steelhead still have access to historical spawning areas (NMFS 2009a).

Spawning occurs mainly in gravel substrates (particle size range of about 0.2−4.0 inches). Adults tend to spawn in shallow areas (6−24 inches deep) with moderate water velocities (about 1 to 3.6 feet per second) (Hannon and Deason 2008). Unlike Chinook salmon, CCV steelhead may not die after spawning (McEwan and Jackson 1996). Some may return to the ocean and repeat the spawning cycle for two or three years. The percentage of adults surviving spawning is generally thought to be low for CCV steelhead, but varies annually and between stocks. Acoustic tagging of CCV steelhead kelts from the CNFH indicates survival rates can be high, especially for CCV steelhead reconditioned by holding and feeding at the hatchery prior to release. Some return immediately to the ocean and some remain and rear in the Sacramento River (NMFS 2009). Recent studies have shown that kelts may remain in freshwater for an entire year after spawning (Teo *et al*. 2013), but that most return to the ocean.

CCV adult steelhead eggs incubate within the gravel and hatch from approximately 19 to 80 days at water temperatures ranging from 60°F to 40°F, respectively (NMFS 2009). After hatching, the young fish (alevins) remain in the gravel for an extra two to six weeks before emerging from the gravel and taking up residence in the shallow margins of the stream.

Steelhead embryo incubation generally occurs from December through June in the Central Valley. The RMT (2013) identified the period of January through May as encompassing the majority of the steelhead embryo incubation period in the LYR.

Steelhead eggs reportedly have the highest survival rates at water temperature ranges of 44.6°F to 50.0°F (Myrick and Cech 2004). A sharp decrease in survival has been reported for *O. mykiss* embryos incubated above 57.2°F (Yuba RMT 2010). After hatching, alevins remain in the gravel for an additional two to five weeks while absorbing their yolk sacs, and emerge in spring or early summer (Barnhart 1986).

The newly emerged juveniles move to shallow, protected areas associated within the stream margin (McEwan 2001). Productive juvenile rearing habitat is characterized by complexity, primarily in the form of cover, which can be deep pools, woody debris, aquatic vegetation, or boulders. Cover is an important habitat component for juvenile steelhead both as velocity refugia and as a means of avoiding predation (Bugert *et al.* 1991). Older juveniles use riffles and larger juveniles may also use pools and deeper runs (Barnhart 1986 as cited in McEwan 2001). However, specific depths and habitats used by juvenile rainbow trout can be affected by predation risk. An upper water temperature limit of 65°F is preferred for growth and development of Sacramento River and American River juvenile steelhead (NMFS 2014b).

Most juvenile steelhead spend one to three years in fresh water before emigrating to the ocean as smolts (Shapovalov and Taft 1954). The primary period of steelhead smolt outmigration from rivers and creeks to the ocean generally occurs from January to June (NMFS 2009). Steelhead successfully smolt at water temperatures in the 43.7°F to 52.3°F range (Myrick and Cech 2001). In the Sacramento River, juvenile steelhead migrate to the ocean in spring and early summer at 1 to 3 years of age with peak migration through the Delta in March and April (NMFS 2009).

Viability status and trends

Good *et al.* (2005) found that the CCV steelhead DPS was in danger of extinction, with a minority of the Biological Review Team (BRT) viewing the DPS as likely to become endangered. The BRT's major concerns were the low abundance of natural-origin anadromous *O. mykiss,* the lack of population-level abundance data, and the lack of any information to suggest that the decline in steelhead abundance evident from 1967–1993 dams counts had stopped.

Using data through 2005, Lindley *et al*. (2007) found that data were insufficient to determine the viability 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 proportion of hatchery-origin fish in the Battle Creek returns averaged 29% over the 2002–2010 period, elevating the level of hatchery influence to a moderate risk of extinction. The Chipps Island midwater trawl dataset of USFWS indicated that the decline in natural production of steelhead had continued unabated through 2010, with the proportion of adipose fin-clipped steelhead reaching 95%. In 2015, population trend data showed significant increases in abundance of CNFH and FRFH populations, but data are still lacking to estimate trends in natural populations.

The Central Valley Salmon and Steelhead Recovery Plan (NMFS 2014b) includes biological recovery criteria based on the viable salmonid population concept. The Central Valley Salmon and Steelhead Recovery Plan includes the following recovery criteria:

DPS level criteria:

- One population in the Northwestern California Diversity Group at low risk of extinction
- Two populations in the Basalt and Porous Lava Diversity Group at low risk of extinction
- Four populations in the Northern Sierra Diversity Group at low risk of extinction
- Two populations in the Southern Sierra Diversity Group at low risk of extinction
- Maintain multiple populations at moderate risk of extinction

In order to meet the recovery criteria for this DPS and thereby delist the species, there must be at least nine populations at a low risk of extinction distributed throughout the Central Valley as outlined above, as well as additional populations at a moderate risk of extinction (NMFS 2014b). Currently, no CCV steelhead populations satisfy the low extinction risk criteria. For the 17 populations evaluated, 11 are at high extinction risk and 6 are at moderate extinction risk. The Yuba River population is considered at moderate risk of extinction (SWFSC 2023).

Abundance & Productivity

Population trend data remain extremely limited for the CCV steelhead DPS. The total hatchery populations from CNFH, FRFH, and MRH have significantly increased since the 2010 and 2015 viability assessments. In fact, CNFH returns have steadily increased 15% per year over the last decade.

The American River steelhead population has experienced a precipitous decline since 2003, resulting in a moderate risk of extinction. It should be noted that a significant proportion of steelhead redds on the American River are made by NH steelhead, which are not part of the DPS, and declined 8% per year over the last decade.

Looking broader than the individual population level, Chipps Island midwater trawl data provide information on the trend in abundance for the CCV steelhead DPS as a whole. Updated through 2019, the trawl data indicate that the production of natural-origin steelhead remains very low relative to hatchery production. The lack of improved natural production as estimated by juvenile migrants exiting the river systems at Chipps Island, and low abundances coupled with large hatchery influence is cause for concern.

Catch-per-unit effort has fluctuated and generally increased over the past decade, but the proportion of the catch that is adipose fin-clipped (100% of hatchery steelhead production have been adipose fin-clipped starting in 1998) has increased steadily, exceeding 90% in recent years and reaching 96% during the drought in 2015. This suggests that the vast majority of CCV steelhead out-migrating from the Sacramento-San Joaquin Delta (Delta) are of hatchery-origin.

Spatial Structure & Diversity

This DPS includes steelhead populations spawning in the Sacramento and San Joaquin rivers and their tributaries. Populations upstream of migration barriers remain excluded from this DPS. Hatchery stocks within the DPS include CNFH, FRFH, and Mokelumne River Hatchery (MRH). Genetic analysis showed that the steelhead stock propagated in the MRH was genetically similar to the steelhead broodstock in the FRFH (Pearse and Garza 2015), consistent with documentation on the recent transfers of eggs from the FRFH for broodstock at the MRH. The Nimbus Hatchery (NH) steelhead remain genetically divergent from the Central Valley DPS lineages, consistent with their founding from coastal steelhead stocks, and remain excluded from the DPS (Pearse and Garza 2015).

As overall data remain extremely limited for the CCV steelhead DPS, it is difficult to ascertain if their spatial distribution has changed. From recent monitoring data, steelhead are not noted to have had any substantial changes in spatial distribution or diversity. Hatchery influence continues to be a high threat to diversity of the DPS, and the out of basin stock at Nimbus Hatchery poses significant genetic threat to CCV steelhead (SWFSC 2022).

California Central Valley steelhead critical habitat

On February 16, 2000, (65 FR 7764), NMFS published a final rule designating critical habitat for CCV steelhead. This critical habitat includes all river reaches accessible to listed steelhead in the Sacramento and San Joaquin rivers and their tributaries in California, including the lower Yuba River upstream to Englebright Dam. NMFS proposed new critical habitat for CCV steelhead on December 10, 2004, (69 FR 71880) and published a final rule designating critical habitat for these species on September 2, 2005.

Critical habitat for CCV steelhead includes stream reaches, such as those of the Sacramento, Feather, and Yuba Rivers; Deer, Mill, Battle, and Antelope creeks in the Sacramento River basin; the San Joaquin River, including its tributaries; and the waterways of the Delta. Currently, the CCV steelhead DPS and critical habitat extends up the San Joaquin River up to the confluence with the Merced River. Critical habitat includes the stream channels in the designated stream reaches and the lateral extent as defined by the ordinary high-water line.

The critical habitat for CCV steelhead lists the essential PBFs ((70 FR 52488); September 2, 2005), which include:

1. Freshwater spawning sites with water quantity and quality conditions and substrate supporting spawning, incubation and larval development,

2. Freshwater rearing sites with: (i) water quantity and floodplain connectivity to form and maintain physical habitat conditions and support juvenile growth and mobility; (ii) water quality and forage supporting juvenile development; and (iii) natural cover, such as shade, submerged and overhanging large wood, log jams and beaver dams, aquatic vegetation , large rocks and boulders, side channels, and undercut banks,

3. Freshwater migration corridors free of obstruction and excessive predation with water quantity and quality conditions and natural cover, such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, side channels, and undercut banks supporting juvenile and adult mobility and survival, and

4. Estuarine areas free of obstruction and excessive predation with: (i) water quality, water quantity, and salinity conditions supporting juvenile and adult physiological transitions between fresh- and saltwater; (ii) natural cover, such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, side channels; and (iii) juvenile and adult forage, including aquatic invertebrates and fishes, supporting growth and maturation.

Historically, CCV steelhead spawned in many of the headwaters and upstream portions of the Sacramento River and San Joaquin River basins. Passage impediments have contributed to substantial reductions in the populations of these species by isolating them from much of their historical spawning habitat. The current condition of CCV steelhead critical habitat PBFs have been degraded from their historical condition within the action area. The majority of streams and rivers in the DPS have impaired habitat. Additionally, critical habitat often lacks the ability to re-establish essential features due to ongoing human activities. Large dams, like Englebright Dam on the Yuba River, stop the recruitment of spawning gravels, which impacts both an essential habitat type (spawning areas), as well as an essential feature of spawning areas (substrate). Water utilization in many regions throughout the DPS reduces summer base flows, which limits the establishment of several essential features, such as water quality and water quantity.

Freshwater rearing and migration PBFs have been degraded from their historical condition within the action area. In the Sacramento and San Joaquin rivers, bank armoring has significantly reduced the quantity of floodplain rearing habitat for juvenile salmonids and has altered the natural geomorphology of the river (NMFS 2014b). Similar to winter-run Chinook salmon, CCV steelhead are only able to access large floodplain areas, such as the Yolo Bypass, under certain hydrologic conditions that do not occur in drier years. Levee construction involves the removal of riparian vegetation, resulting in reduced habitat complexity and shading, making juveniles more susceptible to predation. Additionally, loss of riparian vegetation reduces aquatic macroinvertebrate recruitment resulting in decreased food availability for rearing juveniles (Anderson and Sedell 1979; Pusey and Arthington 2003).

Although the current conditions of CCV steelhead critical habitat are significantly degraded, the spawning habitat, migratory corridors, and rearing habitat that remain in the Sacramento-San Joaquin River watershed and the Delta are considered to have high intrinsic value for the conservation of the species as they are critical to ongoing recovery efforts.

Summary of the California Central Valley (CCV) Steelhead Viability

Based upon the limited information available, the overall viability of the CV steelhead DPS appears to be unchanged since the NMFS 5-year review (NMFS 2016a). However, the majority (11 of 16) of populations for which data exists are at a high risk of extinction based on abundance and/or hatchery influence. No population is currently considered to be at a low risk of extinction. The lack of improved natural production estimates, and low abundances coupled with large hatchery influence are causes for continued concern (SWFSC 2023).

2.2.3. Southern Distinct Population Segment Green Sturgeon

The California Central Valley green sturgeon includes the genetically isolated southern Distinct Population Segment (sDPS) that naturally spawn within the Sacramento River and its tributaries (71 FR 17757). This listing does not include the northern Distinct Population Segment (nDPS) of green sturgeon that spawn north of the Russian River.

On April 7, 2006 (71 FR 17757), NMFS listed the sDPS green sturgeon under the ESA and classified it as a threatened species. This was followed by NMFS' designation of critical habitat for the sDPS green sturgeon on October 9, 2009 (74 FR 52300), as well as an updated ESA 4(d) ruling publishing final ESA protective regulations on June 2, 2010 (75 FR 30714).

On July 29, 2015, NMFS published a 5-year review status for the sDPS green sturgeon which concluded that the status of the sDPS green sturgeon should remain unchanged (NMFS 2015). On August 8, 2018, NMFS published recovery plan for the sDPS green sturgeon (NMFS 2018). The following 5-year review published on October 26, 2021 also determined no change to the species status (NMFS 2021a). The federally listed sDPS of North American green sturgeon and its designated critical habitat occur in the action area and may be affected by the proposed action.

Life History

The sDPS green sturgeon are genetically unique from the northern population due to their isolated breeding behavior endemic solely to the Sacramento River Basin. sDPS green sturgeon enter the San Francisco Bay Delta Estuary in late winter/early spring and migrate upstream to their spawning grounds in the Sacramento, Feather, and Yuba rivers. Since sDPS green sturgeon spawn during the summer months (April through July, peaking in May), mature adults must reach upper areas of the Sacramento River Basin where cooler temperatures persist during the hottest months (Moser and Lindley 2007). sDPS green sturgeon predominantly spawn between the Glenn-Colusa Irrigation Dam (GCID) area (river kilometer [rkm] 332.5) to Cow Creek (rkm 451) on the Sacramento River, from the fish barrier dam (rkm 108.5) to the Thermalito Afterbay Outlet (rkm 109) on the Feather River, and at the base of the DPD (rkm 19) on the Yuba River (NMFS 2018).

The eggs require water temperatures around 15°C to hatch successfully, and within 10 days will hatch and rapidly move downstream. It is unknown how long juveniles remain in upriver rearing habitats after metamorphosis. Based on length distribution data from salvage and recent upstream surveys, juveniles typically enter the Delta as sub-yearlings or yearlings to rear prior to ocean entry (NMFS 2018). After reaching sub adult sizes (approx. 91cm), sDPS green sturgeon will migrate into the ocean, traveling along the North American west coast for up to 15 years or until they reach sexual maturity (Erickson and Hightower 2006; Lindley *et al.* 2008, 2011).

Adult sDPS green sturgeon will spawn every 2-6 years on average, with higher returns upriver during high precipitation years (Erickson and Webb 2007, Heublein *et al.* 2009, NMFS 2018)

Viability status and trends

Although (McElhany *et al.* 2000) specifically addresses viable populations of salmonids, the science behind the concepts and viability parameters in (McElhany *et al.* 2000) is applicable to sDPS green sturgeon.

Abundance & Productivity

Trends in abundance of sDPS green sturgeon have historically been estimated from two long-term data sources: (1) salvage numbers at the State and Federal pumping facilities, and (2) incidental catch of green sturgeon by the CDFW's white sturgeon sampling/tagging program. Historical estimates from these sources are expected to be unreliable, as sDPS green sturgeon were likely not considered in incidental catch data, and salvage does not capture range-wide abundance in all water year types.

The sDPS of green sturgeon is composed of a single, independent population, which principally spawns in the mainstem Sacramento River (Israel and Klimley 2008), though spawning has now been documented in both the Feather and Yuba Rivers as well (NMFS 2018). Due to sparse monitoring data for juvenile, subadult and adult life stages in the Sacramento River and Delta, there are significant data gaps to describe the ecology of this species in the action area.

Recovery criteria for abundance requires the adult sDPS green sturgeon census population to remain at or above 3,000 for 3 generations (this equates to a yearly running average of at least 813 spawners for approximately 66 years). In addition, the effective population size must be at least 500 individuals in any given year and each annual spawning run must comprise a combined total, from all spawning locations, of at least 500 adult fish in any given year.

The NMFS 2021 5-year status review concluded that this criteria has not yet been met (NMFS 2021a). The estimated total population of southern DPS green sturgeon is 17,548 individuals, with an estimated 2,106 adults (Mora *et al*. 2018). Therefore, the adult population does not meet the criteria of a yearly average 3,000 adults. Reported annual spawner counts have also been less than 500 in the Sacramento River (NMFS 2021a). Currently, there are no reliable estimates for spawner counts for the Feather and Yuba Rivers.

The parameters of green sturgeon population growth rate and carrying capacity in the Sacramento Basin are poorly understood. Larval count data from incidental bycatch in rotary screw traps collected since the mid-90s at Red Bluff Diversion Dam and near the Glenn Colusa Irrigation District diversion show enormous variability between years. The highest count and density on record was over 30 green sturgeon per acre-feet of water volume sampled at Red Bluff in 2016, an order of magnitude higher than other years (USFWS 2016). In general, sDPS green sturgeon year class strength appears to be highly variable with overall abundance dependent upon a few successful spawning events (NMFS 2010). Other indicators of productivity, such as data for cohort replacement ratios and spawner abundance trends, are not currently available for sDPS green sturgeon.

Mora *et al.* (2018) demonstrated that sDPS green sturgeon spawning sites are concentrated into very few locations, finding that in the Sacramento River just three sites accounted for over 50 percent of the sDPS green sturgeon spawning activity documented in June of 2010, 2011, and 2012. This is a critical point with regards to the application of the spatial structure VSP parameter, which is largely concerned with the spawning habitat spatial structure, as well as other life history stages. A high concentration of individuals in just a few spawning sites, is more vulnerable to increased extinction risk due to stochastic events. Since 2014, new information has become available regarding green sturgeon presence in the Yuba River regarding successful spawning in the LYR below DPD.

Incidental catches of larval green sturgeon in the mainstem Sacramento River and of juvenile green sturgeon at the south Delta pumping facilities suggest that green sturgeon are successful at spawning, but that annual year class strength may be highly variable (Beamesderfer *et al*. 2007, Lindley *et al*. 2008). Continuous spawning has been reported in the Sacramento River since 1995 (Poytress *et al.* 2015, Voss and Poytress 2022). Although spawning has been reported in the Feather and Yuba rivers, continuous spawning in these rivers has not been observed (Seesholtz *et al*. 2015, Beccio, 2018, 2019). In general, the sDPS green sturgeon year class strength appears to be episodic with overall abundance dependent upon a few successful spawning events (NMFS 2010). It is unclear if the population is able to consistently replace itself. Demographic recovery criteria require that sDPS green sturgeon spawn successfully in at least two rivers within their historical range. Successful spawning will be determined by the annual presence of larvae for at least 20 years. That criterion has yet to be met for any watershed except for the Sacramento River mainstem.

The VSP concept requires that a population meeting or exceeding the abundance criterion for viability should, on average, be able to replace itself (McElhany *et al*. 2000). More research is needed to establish sDPS green sturgeon productivity.

Spatial Structure & Diversity

The sDPS of green sturgeon is composed of a single, independent population, which principally spawns in the mainstem Sacramento River (Israel and Klimley 2008, Poytress *et al.* 2015, Seesholtz *et al.* 2015), Beccio 2018) have observed spawning in the upper Sacramento River, Feather River, and Yuba River, respectively.

Historical green sturgeon spawning habitat may have extended up into the three major branches of the upper Sacramento River above the current location of Shasta Dam - the Little Sacramento River, the Pit River, and the McCloud River (NMFS 2009). Additional spawning habitat is believed to have once existed above the current location of Oroville Dam on the Feather River (NMFS 2009). According to NMFS (2009), the reduction of green sturgeon spawning habitat into one reach on the Sacramento River between Keswick Dam and Hamilton City has increased the vulnerability of this spawning population to catastrophic events.

Successful spawning of green sturgeon in other accessible habitats in the Central Valley (*i.e.*, the Feather and Yuba rivers) is limited, in part, by late spring and summer water temperatures and water flow. Similar to salmonids in the Central Valley, green sturgeon spawning in the major lower river tributaries to the Sacramento River are likely to be further limited if water temperatures increase over time. Dams and other barriers causing fragmentation and blocking access to suitable spawning grounds for migrating sturgeon is the leading threat in the decline of many sturgeon populations (Rochard *et al*. 1990, Auer 1996). Since 2014, NMFS has specifically identified the DPD on the Yuba River as a key barrier limiting sDPS green sturgeon recovery.

The VSP concept identifies a variety of traits that exhibit diversity within and among populations, and this variation has important effects on population viability (McElhany *et al.* 2000). For the sDPS of green sturgeon, such traits include, but are not limited to: fecundity, age at maturity, physiology, and genetic characteristics. Spawning habitat is used as a proxy for diversity, because diversity is closely tied with abundance, distribution, and productivity.

Within the sDPS of green sturgeon, diversity is not yet well documented. Little is known about how current levels of diversity (*e.g.*, genetic, life history) compare with historical levels. Further inquiry is needed to determine what, if any, genetic separation exists between those fish spawning within the Sacramento River, and those spawning elsewhere. NMFS (2021) concluded that there has been no net loss of sDPS green sturgeon diversity from previous levels, as spawning habitat available to sDPS has not increased.

Southern Distinct Population Segment Green Sturgeon critical habitat

Critical habitat for sDPS green sturgeon was designated on October 9, 2009 (74 FR 52300). The critical habitat includes: (1) the Sacramento River from the I-Street Bridge to Keswick Dam, including the Sutter and Yolo Bypasses and the American River to the highway 160 bridge (2) the Feather River up to the Fish Barrier Dam, (3) the Yuba River up to Daguerre Point Dam, (4) the Sacramento-San Joaquin Delta (as defined by California Water Code section 12220), but with many exclusions, (5) San Francisco Bay, San Pablo Bay, and Suisun Bay, but with many exclusions, and (6) coastal marine areas to the 60 fathom depth bathymetry line, from Monterey Bay, California to the Strait of Juan de Fuca, Washington.

The designated critical habitat for sDPS green sturgeon lists the essential PBFs ((74 FR 52300); October 9, 2009), which include the following for freshwater riverine and estuarine habitats:

Freshwater Riverine Habitats

1. Food resources. Abundant prey items for larval, juvenile, subadult, and adult life stages.
2. Substrate type or size (*i.e.*, structural features of substrates). Substrates suitable for egg deposition and development (*e.g.*, bedrock sills and shelves, cobble and gravel, or hard clean sand, with interstices or irregular surfaces to “collect” eggs and provide protection from predators, and free of excessive silt and debris that could smother eggs during incubation), larval development (*e.g.*, substrates with interstices or voids providing refuge from predators and from high water flow), and feeding of juveniles, subadults, and adults (*e.g.*, sand/mud substrates).
3. Water flow. A flow regime (*i.e.*, the magnitude, frequency, duration, seasonality, and rate-of-change of fresh water discharge over time) necessary for normal behavior, growth, and survival of all life stages.

4. Water quality. Water quality, including temperature, salinity, oxygen content, and other chemical characteristics, necessary for normal behavior, growth, and viability of all life stages.
5. Migratory corridor. A migratory pathway necessary for the safe and timely passage of all life stages within riverine habitats and between riverine and estuarine habitats (*e.g*., an unobstructed river or dammed river that still allows for safe and timely passage).
6. Depth. Deep (greater than or equal to five meters) holding pools for both upstream and downstream holding of adult or subadult fish, with adequate water quality and flow to maintain the physiological needs of the holding adult or subadult fish.
7. Sediment quality. Sediment quality (*i.e.,* chemical characteristics) necessary for normal behavior, growth, and viability of all life stages.

Estuarine Habitats

1. Food resources. Abundant prey items within estuarine habitats and substrates for juvenile, subadult, and adult life stages.
2. Water flow. Within bays and estuaries adjacent to the Sacramento River (*i.e.*, the Sacramento-San Joaquin Delta and the Suisun, San Pablo, and San Francisco bays), sufficient flow into the bay and estuary to allow adults to successfully orient to the incoming flow and migrate upstream to spawning grounds.
3. Water quality. Water quality, including temperature, salinity, oxygen content, and other chemical characteristics, necessary for normal behavior, growth, and viability of all life stages.
4. Migratory corridor. A migratory pathway necessary for the safe and timely passage of all life stages within estuarine habitats and between estuarine and riverine or marine habitats.
5. Depth. A diversity of depths necessary for shelter, foraging, and migration of juvenile, subadult, and adult life stages.
6. Sediment quality. Sediment quality (*i.e.*, chemical characteristics) necessary for normal behavior, growth, and viability of all life stages.

PBFs for sDPS green sturgeon have been significantly altered from their historical condition. Factors that lessen the quality of migratory corridors for juveniles include unscreened or inadequately screen diversions, altered flows in the Delta, mainstem Sacramento River, and tributaries, bank protection altering sediment types and depths, and presence of contaminants in sediment.

Although the current conditions of green sturgeon critical habitat are significantly degraded, the spawning habitat, migratory corridors, and rearing habitat that remain in both the Sacramento River watershed, the Delta, and nearshore coastal areas are considered to have high intrinsic value for the conservation of the species.

Summary of the Green Sturgeon Southern DPS Viability

The southern DPS of green sturgeon is at substantial risk of future population declines (NMFS 2021a). The principal threat to green sturgeon in the sDPS is the reduction in available spawning habitat due to the construction of barriers on Central Valley rivers. The potential threats faced by the green sturgeon include enhanced vulnerability due to the reduction of spawning habitat into one concentrated area on the Sacramento River, lack of good empirical population data, vulnerability of long-term cold water supply for egg incubation and larval survival, loss of juvenile green sturgeon due to entrainment at the project fish collection facilities in the South Delta and agricultural diversions within the Sacramento River and the Delta, alterations of food resources due to changes in the Sacramento River and Delta habitats, and exposure to various sources of contaminants throughout the basin to juvenile, sub-adult, and adult life stages.

Viability is defined as an independent population having a negligible risk of extinction due to threats from demographic variation, local environmental variation, and genetic diversity changes over a 100- year timeframe (McElhany *et al*. 2000). Evaluation of new information during the most recent 5-year status review did not suggest a significant change in the status of Southern DPS green sturgeon, therefore NMFS concluded that the sDPS of green sturgeon remains at a moderate to high risk of extinction (NMFS 2021a).

2.2.4. Southern Resident Killer Whale DPS

The SRKW DPS, composed of J, K, and L pods, was listed as endangered under the ESA on November 18, 2005 (70 FR 69903). A 5-year review under the ESA completed in 2021 concluded that SRKWs should remain listed as endangered and includes recent information on the population, threats, and new research results and publications (NMFS 2021b). The population has relatively high mortality and low reproduction, unlike other resident killer whale populations, which have generally been increasing since the 1970s (Carretta *et al*. 2023).

The factors limiting SRKW recovery as described in the final recovery plan included reduced prey availability and quality, high levels of contaminants from pollution, disturbances from vessels and sound, and the small population size (*i.e*., inbreeding), among others (NMFS 2008). This section summarizes the status of SRKW throughout their range and information taken largely from the recovery plan (NMFS 2008), the most recent 5-year review (NMFS 2021b), the PFMC SRKW Ad Hoc Workgroup's report (PFMC 2020), as well as new data that became available more recently.

Life History

Killer whales, including SRKWs, are a long-lived species and sexual maturity typically occurs around 10 years of age (NMFS 2008). Females produce a low number of surviving calves (n < 10, but generally fewer) over the course of their reproductive lifespan (Bain 1990; Olesiuk *et al.* 1990). Compared to Northern Resident killer whales (NRKWs), which are a resident killer whale population with a sympatric geographic distribution ranging from coastal waters of Washington State and British Columbia north to Southeast Alaska (SEAK), SRKW females appear to have reduced fecundity (Ward *et al.* 2013; Vélez-Espino *et al.* 2014), and all age classes of SRKWs have reduced survival compared to other fish-eating populations of killer whales in the Northeast Pacific (Ward *et al.* 2013).

SRKWs consume a variety of fish species (22 species) and one species of squid (Ford *et al.* 1998; Ford *et al.* 2000; Ford and Ellis 2006; Hanson *et al.* 2010b; Ford *et al.* 2016; Hanson *et al.* 2021), but salmon are identified as their primary prey. The best available information suggests an overall preference for Chinook salmon (*O. tshawytscha)* during the summer and fall. Chum salmon (*O. keta)*, Coho salmon (*O. kisutch)*, and steelhead (*O. mykiss*) may also be important in the SRKW diet at particular times and in specific locations.

The diet data suggest that SRKWs are consuming mostly larger (*i.e.*, generally age 3 and up) Chinook salmon. Chinook salmon is their primary prey, despite the much lower abundance in comparison to other salmonids in some areas and during certain time periods. Factors of potential importance include the Chinook salmon's large size, high fat and energy content, and year-round occurrence in the SRKW geographic range. Chinook salmon have the highest value of total energy content compared to other salmonids because of their larger body size and higher energy density (kilocalorie per kilogram (kcal/kg))(O'Neill *et al.* 2014). For example, in order for a killer whale to obtain the total energy value of one Chinook salmon, they would need to consume, on average, approximately 2.7 Coho, 3.1 chum, 3.1 sockeye, or 6.4 pink salmon (O'Neill *et al*. 2014). Research suggests that killer whales are capable of detecting, localizing, and recognizing Chinook salmon through their ability to distinguish Chinook salmon echo structure as different from other salmon (Au *et al.* 2010). Though SRKW don't only consume Chinook salmon, the degree to which killer whales are able to or willing to switch to non-preferred prey sources from their primary prey (*i.e*., Chinook salmon) in all times and locations is unknown and likely variable depending on time and location.

In an effort to prioritize recovery efforts, such as habitat restoration, and help inform efforts to use fish hatcheries to increase the SRKW prey base, NMFS and WDFW developed a priority stock report identifying the important Chinook salmon stocks along the West Coast (NOAA Fisheries and WDFW 2018). The list was created using information on (1) Chinook salmon stocks found in SRKW diet through fecal and prey scale/tissue samples, (2) SRKW body condition over time through aerial photographs, and (3) SRKW spatial and temporal overlap with Chinook salmon stocks ranging from SEAK to California. Extra weight was given to the salmon runs that support SRKWs during times of the year when the whales' body condition is more likely reduced and when Chinook salmon may be less available (*i.e.*, winter months). This priority stock report will be updated over time as new data become available. The report was designed only to prioritize recovery actions for SRKW; currently, stock-specific abundance estimates have not been factored into the report, therefore it is not intended to assess fisheries actions or prey availability by area. The first 15 salmon stocks on the priority list include fall, spring, and summer Chinook salmon runs (including CV spring-run and fall and late-fall Chinook) in rivers spanning from British Columbia to California, including the Fraser, Columbia, Snake, and Sacramento Rivers, as well as several rivers in Puget Sound watersheds (NOAA Fisheries and WDFW (2018), and see Table 11 replicated in NMFS 2021c).

Viability status and trends

The NWFSC continues to evaluate changes in fecundity and survival rates, and has updated population viability analyses conducted for the 2004 Status Review of Southern Resident Killer Whales (Krahn *et al.* 2004), the science panel review (Hilborn *et al.* 2012; Ward *et al.* 2013), and previous 5-year status reviews (NMFS 2011; NMFS 2016c).

The scenario using the most recent (2017-2021) survival and fecundity rates may be a more reliable estimation if current levels of survival and poor reproduction continue. This predicted downward trend in the model is driven by the current age and sex structure of young animals and number of older animals in the population. The range of population trajectories reflects the endangered status of the SRKWs and variable periods of decline experienced over the long and short term and is based on a limited data set for the small population. The analysis does not link population growth or decline to any specific threat, but reflects the combined impacts of all past threats. A recent population viability analysis supports these projected declines (Williams *et al.* 2024). As a long-lived species with a low reproductive rate, it will take time for SRKWs to respond to a reduction in threats. It will be difficult to link specific actions to potential future improvements in the population trajectory.

Another factor to consider is the potential effects of inbreeding (generally a risk for any small population). Recent genomic analyses indicate that the SRKW population has greater inbreeding and carries a higher load of deleterious mutations than do Alaska resident or transient killer whales, and that inbreeding depression is likely impacting the survival and growth of the population (Kardos *et al.* 2023). These factors likely contribute to the SRKW's poor status.

Abundance & Productivity

Since the early 1970s, annual summer censuses have occurred in the Salish Sea using photo-identification techniques (Bigg *et al.* 1990; CWR 2023). The population of SRKW was at its lowest known abundance (n = 67) in the early 1970s following live-captures for aquaria display and highest recorded abundance (98 animals) in 1995. Subsequently, the population declined from 1995-2001 (from 98 whales in 1995 to 81 whales in 2001). Although the population experienced growth between 2001 and 2006 and a brief increase from 78 to 81 whales as a result of multiple successful pregnancies (n = 9) in 2013 and 2014, the population has been declining since 2006. At the time of the 2023 summer census, the Center for Whale Research reported 75 SRKWs in the population, including two calves that were born in 2023 (CWR 2023). Since the 2023 census, one adult male is presumed dead, bringing the population size to 74. The previously published historical estimated abundance of SRKWs was 140 animals (NMFS 2008), which included the number of whales killed or removed for public display in the 1960s and 1970s (summed across all years) added to the remaining population at the time the captures ended.

Spatial Structure & Diversity

SRKWs occur throughout the coastal waters off Washington, Oregon, and Vancouver Island, Canada and are known to travel as far south as central California and as far north as SEAK (NMFS 2008; Hanson *et al.* 2013; Carretta *et al.* 2023), though there has only been one sighting of a SRKW in SEAK. SRKWs are highly mobile and can travel up to 86 miles (160 km) in a single day (Erickson 1978; Baird 2000), with seasonal movements likely tied to the migration of their primary prey, salmon. During the spring, summer, and fall months, the whales spend a substantial amount of time in the inland waterways of the Strait of Georgia, Strait of Juan de Fuca, and Puget Sound (Bigg 1982; Ford *et al.* 2000; Krahn *et al.* 2002; Olson *et al.* 2018; NMFS 2021d; Ettinger *et al.* 2022; Thornton *et al.* 2022). During fall and early winter, SRKWs, and J pod in particular, expand their routine movements into Puget Sound, likely to take advantage of chum, Coho, and Chinook salmon runs (Osborne 1999; Hanson *et al.* 2010b; Ford *et al.* 2016; Olson *et al.* 2018). K and L pods spend more time in coastal waters during this time, including as far south as California (NMFS 2021b). Although seasonal movements are somewhat predictable, there can be large inter-annual variability in arrival time and days present in inland waters from spring through fall (Olson *et al.* 2018; NMFS 2021b), with late arrivals and fewer days present in recent years (NMFS 2021d; Ettinger *et al.* 2022).

Southern Resident Killer Whale DPS critical habitat

Critical habitat for the SRKW DPS was first designated on November 29, 2006, (71 FR 69054) in inland waters of Washington State. NMFS published a final rule to revise SRKW critical habitat in 2021 (86 FR 41668; August 2, 2021). This rule, which became effective on September 1, 2021, maintains the previously designated critical habitat in inland waters of Washington (see 71 FR 69054; November 29, 2006) and expands it to include six additional coastal critical habitat areas off the coast of Washington, Oregon, and California (an additional approximately 15,910 sq. mi.). Critical habitat includes approximately 2,560 square miles of inland waters of Washington in three specific areas: 1) the Summer Core Area in Haro Strait and waters around the San Juan Islands; 2) Puget Sound; and 3) the Strait of Juan de Fuca, as well as 15,910 square miles (mi^2) (41,207 square kilometers (km^2)) of marine waters along the U.S. west coast between the 20-feet (ft) (6.1-m) depth contour and the 656.2-ft (200-m) depth contour from the U.S. international border with Canada south to Point Sur, California. Based on the natural history of SRKWs and their habitat needs, NMFS identified the following physical or biological features essential to conservation for critical habitat: (1) Water quality to support growth and development; (2) Prey species of sufficient quantity, quality and availability to support individual growth, reproduction and development, as well as overall population growth; and (3) Passage conditions to allow for migration, resting, and foraging.

Summary of the Southern Resident Killer Whale DPS Viability

The overall viability of the SRKW DPS is highly dependent on their prey populations. In the absence of sufficient food supply, adult females may not successfully become pregnant or give birth and juveniles may grow more slowly. Any individual may lose vitality, succumb to disease or other factors as a result of decreased fitness, and subsequently die or not contribute effectively to future productivity of offspring necessary to avoid extinction and promote recovery of a population. Population estimates, including data from the most recent five years (2017-2021), project a downward trend over the next 25 years. The declining trend is, in part, due to the changing age and sex structure of the population (the sex ratio at birth was estimated in the model at 55% male and 45% female following current trends), but also related to the relatively low fecundity rate observed from 2017 to 2021. Though these fecundity rates are declining, average SRKW survival rates estimated by the NWFSC have been slowly increasing since the late 1990s. The population projection indicates the strongest decline if future fecundity rates are assumed to be similar to 2017-2021, and higher but still declining if average fecundity and survival rates over all years (1985-2021) are used. The projection using the highest fecundity and survival rates (1985-1989) shows some stability and even a slight increase over the next decade before severely declining. A 25-year projection was selected because as the model projects out over a longer time frame (*e.g.*, 50 years), there is increased uncertainty around the estimates (also see Hilborn *et al.* (2012)). A recent population viability analysis also predicted a consistent decline in the SRKW population (Williams *et al*. 2024), but the exact contribution of the threat factors is unclear.

2.2.5. Global Climate Change

One major factor affecting the rangewide status of the threatened and endangered anadromous fish in the Central Valley and aquatic habitat at large is climate change. Warmer temperatures associated with climate change reduce snowpack and alter the water temperatures, seasonality, and volume of seasonal hydrograph patterns (Cohen *et al.* 2000; Dettinger *et al*. 2016). Central California has shown trends toward warmer winters since the 1940s (Dettinger and Cayan 1995, Sun *et al.* 2016). Projected warming is expected to affect Central Valley Chinook salmon. Because the runs are restricted to low elevations as a result of impassable rim dams, if climate warms by 5°C (9 degrees Fahrenheit [°F]), it is questionable whether any Central Valley Chinook salmon populations can persist (Williams 2006).

CV spring-run Chinook salmon adults are especially vulnerable to climate change, because they over-summer in freshwater streams before spawning in autumn (Thompson *et al*. 2012; NMFS 2014b). CV spring-run Chinook salmon spawn primarily in the tributaries to the Sacramento River, and those tributaries without cold water refugia (usually input from springs) will be more susceptible to impacts of climate change.

Although CCV steelhead will experience similar effects of climate change to Chinook salmon, as they are also blocked from the vast majority of their historic spawning and rearing habitat, the effects may be even greater in some cases, as juvenile steelhead need to rear in the stream for one to two summers prior to emigrating as smolts. In the Central Valley, summer and fall temperatures below the dams in many streams already exceed the recommended temperatures for optimal growth of juvenile steelhead, which range from 14°C to 19°C (57°F to 66°F).

Climate change effects to sDPS green sturgeon primarily come from altered water temperatures and altered prey base (NMFS 2018). In the Sacramento River Basin altered water temperatures pose a medium risk to eggs, a high risk to larvae and juveniles, and a high risk to adults (NMFS 2018). In coastal bays and estuaries there is a very high risk to adults and subadults from altered water temperature, and a high risk to adults and subadults from altered water temperature in the nearshore marine (NMFS 2018). The altered prey base presents a high risk to larvae and juveniles and a medium risk to adults in the Sacramento River Basin (NMFS 2018). In the San Francisco Bay Delta Estuary there is a high risk to juveniles, adults, and subadults from the altered prey base (2018). There is a high risk to adults and subadults due to an altered prey base in both coastal bays and estuaries and the nearshore marine (2018).

Formal predictions on the direct effects of climate change on SRKW have not been made, and evaluating these impacts is highlighted as a research need in the SRKW recovery plan (NMFS 2008). SRKW will be vulnerable to the impacts of climate change due to the reduction in availability of their preferred prey, Chinook salmon (NMFS 2008). It is expected that changes in weather and oceanographic conditions will have consequences for whales (NMFS 2008). Consequences could include changes in geographical range to avoid warmer water or seek cooler water. For example, a reduction in sea ice in the Arctic has led to a growing number of killer whales in the region (Garroway *et al*. 2024).

In summary, observed and predicted climate change effects are generally detrimental to the species (NMFS 2021b; McClure 2011, Wade *et al*. 2013, NMFS 2018, NMFS 2008), so unless offset by improvements in other factors, the status of the species and critical habitat is likely to decline over time. The climate change projections referenced above cover the time period between the present and approximately 2100. While there is uncertainty associated with projections, which increases over time, the direction of change is relatively certain (McClure *et al*. 2013).

2.3. Action Area

"Action area" means all areas to be affected directly or indirectly by the federal action and not merely the immediate area involved in the action (50 CFR 402.02).

USACE's BA (2023) includes maintenance activities occurring directly upstream and downstream of DPD, as well as activities that occur in other locations on the Yuba River. Excavation of sediment is proposed immediately upstream of DPD, and disposal of the removed material in an upland area located about ¼ mile downstream and on the south side of DPD. Large woody material (LWM) placement is proposed from the Highway 20 Bridge downstream to Hammon Bar. Gravel placement is proposed within an area starting at approximately 1,600 feet downstream of Englebright Dam, or about 115 feet downstream of the Narrows 1 Powerhouse.

As a result of the gravel augmentation and LWM placement, the action area for this proposed action extends from 1,600 feet below Englebright Dam downstream to DPD and continuing down 11.5 miles to the confluence with the Feather River as a result of the effects of the proposed action on ESA-listed species and critical habitat. In addition, effects to SRKW extend the action area further to include the Sacramento–San Joaquin Delta, San Francisco Bay, and nearshore Pacific Ocean coastal areas off California, Oregon, and Washington, where there is co-occurrence of CV Chinook salmon and SRKWs.

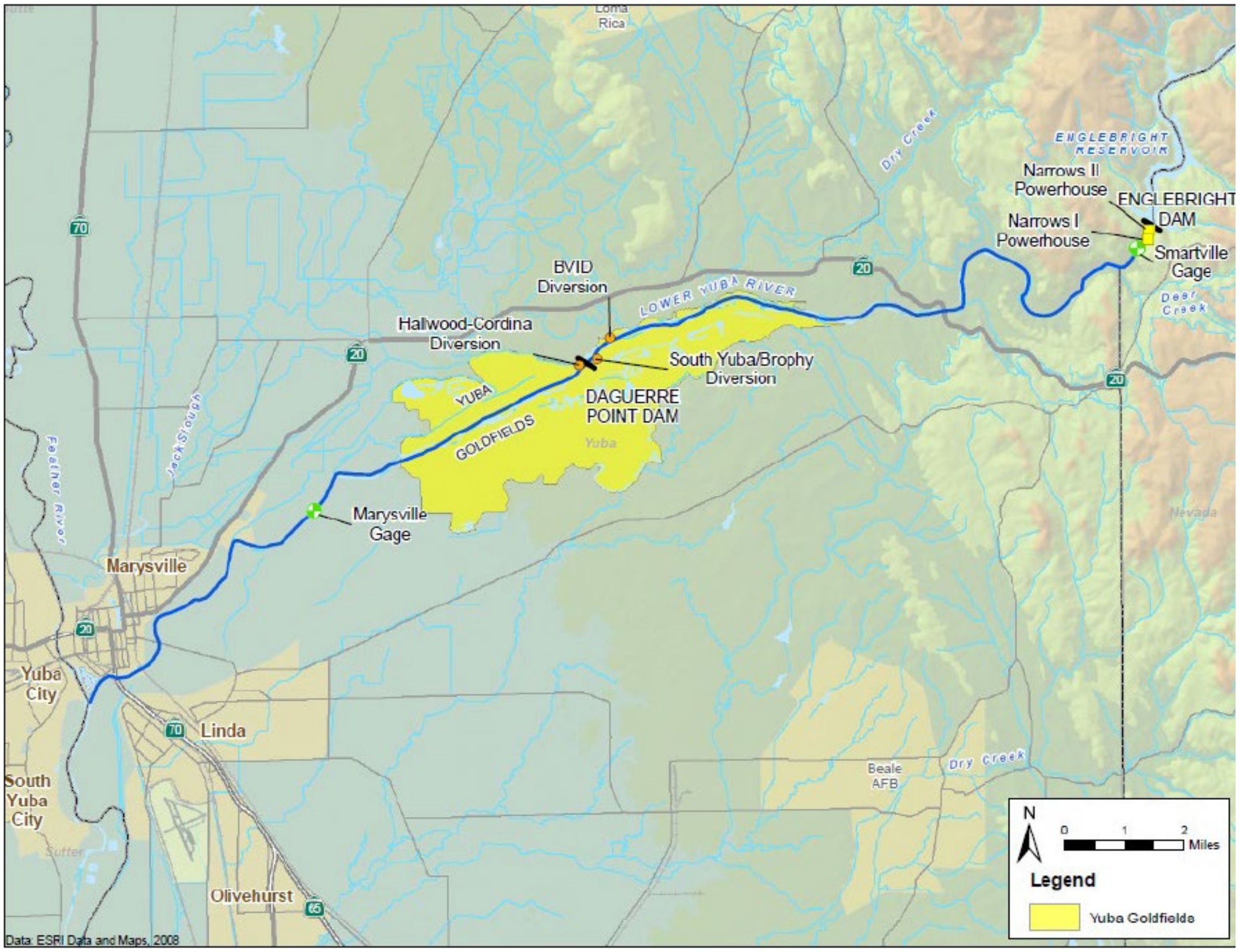

Figure 1. Map of lower Yuba River with main action area highlighted in blue (excluding SRKW portion of action area).

2.4. Environmental Baseline

The "environmental baseline" refers to the condition of the listed species or its designated critical habitat in the action area, without the consequences to the listed species or designated critical habitat caused by the proposed action. The environmental baseline includes the past and present impacts of all federal, state, or private actions and other human activities in the action area, the anticipated impacts of all proposed federal projects in the action area that have already undergone formal or early section 7 consultations, and the impact of State or private actions which are contemporaneous with the consultation in process. The impacts to listed species or designated critical habitat from federal agency activities or existing federal agency facilities that are not within the agency's discretion to modify are part of the environmental baseline (50 CFR 402.02).

Multiple factors affect the water quality and quantity of the LYR, including historic gold mining activities, re-alignment of the Yuba River, construction of numerous dams and reservoirs in the upper watershed, sediment/timber/debris management, and flow regulations related to hydroelectric power generation and diversion for water supply. The LYR, above and below DPD, provides spawning, rearing, and migration habitat for CV spring-run Chinook salmon, CCV steelhead, and sDPS green sturgeon. CV spring-run Chinook salmon and CCV steelhead are able to reach the cooler, enhanced, and restored habitats above DPD and below Englebright Dam through the ladders at DPD at times of specific flows (USACE 2023) with proper maintenance and operations of the dam and ladders. DPD is a complete passage barrier to sDPS green sturgeon due to the older design of the existing ladders.

2.4.1. Watershed Characteristics

The Yuba River is a tributary to the Feather River in the northern portion of the California Central Valley and drains an approximately 1,300 square mile (mi^2) (3,367 square kilometer [km^2]) watershed. The Yuba River has three forks (north, middle, and south), which each originate in the Sierra Nevada mountain range. Elevations in the watershed range from 9,148 feet (2,788 meters [m]) on Mt. Lola at the crest of the Sierra Nevada to 60 feet (18 m) at the confluence with the Feather River. The LYR begins below Englebright Dam and flows for approximately 24 miles before joining the Feather River near Marysville. The LYR has two major tributaries: Deer Creek, which flows into the Yuba River approximately 1 mile below Englebright Dam; and Dry Creek, which flows into the Yuba River downstream of Long Bar near Hammon Grove Park. The watershed receives a portion of its annual precipitation as snow at higher elevations, with the remainder falling as rain at lower elevations.

2.4.1.1 Sediment Management and Flow Regulations

Typical of many Central Valley rivers, historic gold and gravel mining following European expansion into the west greatly altered geomorphic and hydraulic conditions under which salmonids evolved. Gold was discovered on the Yuba River in 1848, and the subsequent influx of thousands of miners forever changed the physical attributes of the Yuba River, adversely impacting native species and displacing indigenous peoples. Relevant changes include:

- *Vast influx of hydraulic mining sediment*: It is estimated that from 1849-1909, the Yuba River received roughly 685 million cubic yards (yd^3) of sediment, more than the upper Feather, Bear, and American Rivers combined (Gilbert 1917). By 1860 the banks had risen to fifteen to twenty feet above the original channel at low water, and the river was severely degraded by the immense amount of mining debris (Yoshiyama *et al.* 2001). By 1876 the channel of the Yuba River had become completely filled (Yoshiyama *et al.* 2001). Flooding in Marysville in 1875 prompted the prohibition of in-stream disposal of hydraulic mining sediments.

- *Shifting and confinement of the river's course*: In the early 1900s, the California Debris Commission sanctioned the re-alignment of the LYR to the north of the historic alignment and the construction of large linear "training walls" consisting of steeply mounded mine tailing piles in the center and along both banks of the straightened river corridor. The training walls were piled to substantial heights above the 100-year flood elevation and with dramatically varying top widths of up to 500 feet (AECOM 2014). The makeshift training walls were intended to laterally confine the river to allow for additional widespread dredging operations (gold mining) of the naturally occurring and mining derived sediments deposited in the valley.

- *River regulation and coarse sediment control*: In 1906, Daguerre Point Dam was constructed as a partial sediment barrier and base-level control point. Englebright Dam was constructed in 1941, and was designed to keep upstream hydraulic mining debris out of the lower river (James 2005). Bullards Bar Dam was built in 1924 and replaced in 1970 as New Bullards Bar (RMT 2013) for water supply and flood control (Pasternack 2009). As a result, the influx of sediment and the major flood events have both been significantly altered, affecting the hydrologic regime and the movement of sediment in the system. The small amount of woody material that passes over Englebright Dam is often greatly weathered or simplified from residence time in the reservoirs upstream and through passage over the 260 ft dam (*i.e.*, canopy and rootwad materials removed). This most likely reduces the ability of the woody material to provide significant habitat value within the LYR channel. Though the natural sediment load of the LYR has been decreased by the addition of numerous dams in the watershed, such as New Bullards Bar and Englebright Dams, the gravel augmentation combined with the naturally high level of fine sediments that occurs due to natural geomorphic processes, and the ample storage of mining sediment in banks, bars, and dredge spoils gravel berms, adds to the sediment load potential for the LYR. While gravel augmentation is beneficial to fish in the Englebright Dam Reach, it is then mobilized further downstream. The high sediment load available within the LYR drives the need for continued sediment removal immediately upstream of DPD, the adjacent diversions, and within the fish ladders.

- Despite the presence of several significant dams in the upper watershed (*e.g.*, New Bullards Bar and Englebright Dam), the LYR still experiences moderate and major floods capable of inducing natural and significant geomorphic changes.

In 2007, instream flow requirements were established by the Lower Yuba River Accord (YWA 2007) to maintain suitable habitat in the LYR for fish and wildlife. Flow schedules with minimum flow requirements are listed in Figure 2, ranging from schedule 1 occurring in high water years to schedule 6 occurring in low water years. In years of critically low water, conference with stakeholders occurs to determine how to manage flows on a case-by-case basis. At the time of the 2007 agreement, schedule 1 was predicted to occur 56% of the time, schedule 2 22% of the time, schedule 3 7% of the time, schedule 4 5% of the time, schedule 5 5% of the time, schedule 6 4% of the time, and conference 1% of the time (YWA 2007). The flows presented in Figure 2 are the minimum flows required and actual flows are usually higher than the listed values. These prescribed flows may change with the issuance of a new Federal Energy Regulatory Commission (FERC) license for Englebright Dam.

Schedule	OCT		NOV	DEC	JAN	FEB	MAR	APR		MAY		JUN		JUL	AUG	SEP	Total Annual Volume (AF)
	1-15	16-31	1-30	1-31	1-31	1-29	1-31	1-15	16-30	1-15	16-31	1-15	16-30	1-31	1-31	1-30	
1	500	500	500	500	500	500	700	1000	1000	2000	2000	1500	1500	700	600	500	574200
2	500	500	500	500	500	500	700	700	800	1000	1000	800	500	500	500	500	429066
3	500	500	500	500	500	500	500	700	700	900	900	500	500	500	500	500	398722
4	400	400	500	500	500	500	500	600	900	900	600	400	400	400	400	400	361944
5	400	400	500	500	500	500	500	500	600	600	400	400	400	400	400	400	334818
6	350	350	350	350	350	350	350	350	500	500	400	300	150	150	150	350	232155

* Indicated flows represent average volumes for the specified time period. Actual flows may vary from the indicated flows according to established criteria.

* Indicated Schedule 6 flows do not include an additional 30 TAF available from groundwater substitution to be allocated according to established criteria.

Figure 2. Yuba River flow requirements (in cfs) at Marysville gage (YWA 2007)

Due to mining, associated sediment deposition, and flood control projects, the LYR has been largely converted from a multi-channel system to a single constricted channel, and functional floodplain features and other off-channel salmonid rearing habitat are reduced. Most of the floodplain habitat and side channels present in the LYR (excluding some recent restoration projects discussed below) only inundate at extremely high flows, with a few deep backwater pools created by dredge mining that connect perennially at the downstream end of remnant side channels via subsurface flow. Instream habitats within the LYR have been modified or converted for uses, such as agriculture, gravel and gold mining, water impoundments, water diversions, and levees. These major actions and other events have led to the deterioration of riparian and aquatic habitat conditions. The LYR is largely disconnected from historic floodplains, providing little opportunity for seasonally inundated terrestrial vegetation and off-channel areas that are important for juvenile salmonids. Rearing habitat is generally considered a limiting factor in the Yuba River (Yoshiyama *et al*. 1996, Lindley *et al*. 2009). In some reaches of the LYR, instream cover is very limited. Several restoration projects (discussed below) that have occurred within the past few years (*e.g.,* Hallwood, Long Bar) have increased floodplain habitat and increased channel complexity.

2.4.1.2 Water Diversions

DPD is the primary diversion point for water entering the Hallwood-Cordua Canal and the South Yuba/Brophy Canal, which supply the water districts located north and south of the LYR, respectively.

Hallwood-Cordua Diversion

The Hallwood-Cordua Diversion, a gravity flow diversion facility located on the north bank of the LYR at Daguerre Point Dam, has a diversion capacity of 625 cfs (SWRCB 2001). The diversion was originally screened in 1972, and later modified in 1977 (CALFED and YCWA 2005). The original design and operation of the Hallwood-Cordua fish screen resulted in the losses of significant numbers of fish (SWRCB 2001). During some years, the fish screen was not operated at all, which resulted in occasions when reportedly up to a million juvenile salmonids were entrained in the diversion (CALFED and YCWA 2005). When operational, the Hallwood-Cordua fish screen was reported to be effective in preventing the entrainment and impingement of juvenile salmonids, but salmonid losses reportedly did occur as a result of predation in the intake channel between Daguerre Point Dam and the fish screen. In addition, predation resulted from the removal of the screen by CDFW during the emigration period of juvenile steelhead (YCWA *et al.* 2000).

SWRCB (2001) reported that an analysis of the daily north canal fish screen trap records for 1972 to 1991 by the USFWS showed that the number of juvenile salmonids entering the trap was directly related to the percent of river flow diverted. Fish losses also occurred at the fish trapping facility that returned fish from the diversion canal to the river. The long distance between the diversion channel intake and the fish screen, low bypass flows, and excessive handling of the fish stopped by the screen all contributed to the loss of salmonids at the Hallwood-Cordua fish screen (SWRCB 2001).

In 1999, CDFW began an outmigration study of juvenile salmonids using a rotary screw trap located in the LYR near Hallwood Boulevard. CDFW reported that significant numbers of juvenile Chinook salmon, including CV spring-run Chinook salmon, were captured in the traps, and recently emerged CCV steelhead also were present throughout the summer months (SWRCB 2001). CCV steelhead as small as 24 mm were observed in July, with 27 and 37 mm fish observed during August and September. Based on the size and numbers of juvenile steelhead and Chinook salmon present throughout the year, it was determined that large numbers of fish were vulnerable to entrainment at the Hallwood-Cordua Diversion. CDFW recommended installation of an updated fish screen at the Hallwood-Cordua diversion that meets the criteria established by NMFS and CDFW for protection of juvenile Chinook salmon and steelhead (SWRCB 2001).

In 2001, the Hallwood-Cordua fish screen was replaced with a screen that more closely conforms to CDFW and NMFS criteria. The fish screen is operated for the entire diversion season and includes a juvenile bypass to return fish back into the river below DPD (NMFS 2002).

South Yuba/Brophy Diversion

The South Yuba/Brophy Canal was constructed in 1985 and is owned and operated by YWA. It is located in the Yuba River Goldfields on the south bank of the river within the impoundment of DPD. The Brophy Diversion is an off-stream diversion that diverts a portion of river flow entering the impoundment created by DPD into a side channel which has a rock gabion separating the side channel from a large head pond. Water diverted from the river flows into the side channel, through the rock barrier and into the head pond, with a portion of flow returning to the river via a short fish bypass channel downstream of the rock barrier.

The Brophy intake has required frequent in-river diversion channel maintenance work both prior to the start of the irrigation season and after diversions have begun. When the project began operation in 1985, the main channel of the Yuba River through the impoundment was located along the north bank of the river, as it is today, so a long entrance channel across the upstream end of the impoundment was required to bring water to the Brophy intake on the south bank.

The major flooding of January 1997 shifted the main channel of the Yuba River through the impoundment to the south bank, where it remained until record-breaking precipitation and flooding in winter 2016/2017 severely damaged the diversion facility. Extensive emergency repairs were completed during the summer of 2017.

Additional maintenance work was completed in 2019 to remove deposited cobble and gravel and reopen the channel entrance. During the winter of 2021/2022, the river again blocked the entrance to the south channel creating a water supply emergency. Following expedited consultation with resource agencies, YWA reopened the diversion channel and restored flow to the south channel of the river and to the Brophy diversion. YWA is expected to seek long-term maintenance permitting for ongoing sediment removal and maintenance. YWA received permitting in 2023 to continue annual maintenance for five years while developing a long-term solution.

2.4.1.3 Yuba River Habitat Enhancement and Restoration

Over the past decade, many restoration partners led by South Yuba River Citizens League (SYRCL) and including USFWS, CDFW, YWA, State of California Wildlife Conservation Board (WCB), California Natural Resources Agency (CA NRCA), Cramer Fish Sciences, Teichert Aggregates, CBEC Eco Engineering, and Silica Resources Inc., have redeveloped side-channel habitat for juvenile fish in the lower Yuba River (Figure 3). The Lower Long Bar Restoration project completed construction in 2022 and provides an additional 100+ acres of side-channel and floodplain rearing habitat. The multi-phased Hallwood Side Channel Restoration Project began in 2020 and was completed in 2023. This project removed several large training walls and enhanced habitat for listed fish. Over the four year project, the Hallwood Side Channel Restoration Project removed a total of 3,093,000 cubic yards of coarse sediment, recontoured channels to create and enhance 89 acres of floodplain, and created about 4.5 miles of perennial/seasonal side channels and alcove channels (Cramer Fish Sciences 2021, 2022, 2023, 2024). The Upper Long Bar Restoration Project (42 acres), which is expected to be constructed in the next few years, will further restore lost floodplain rearing habitat.

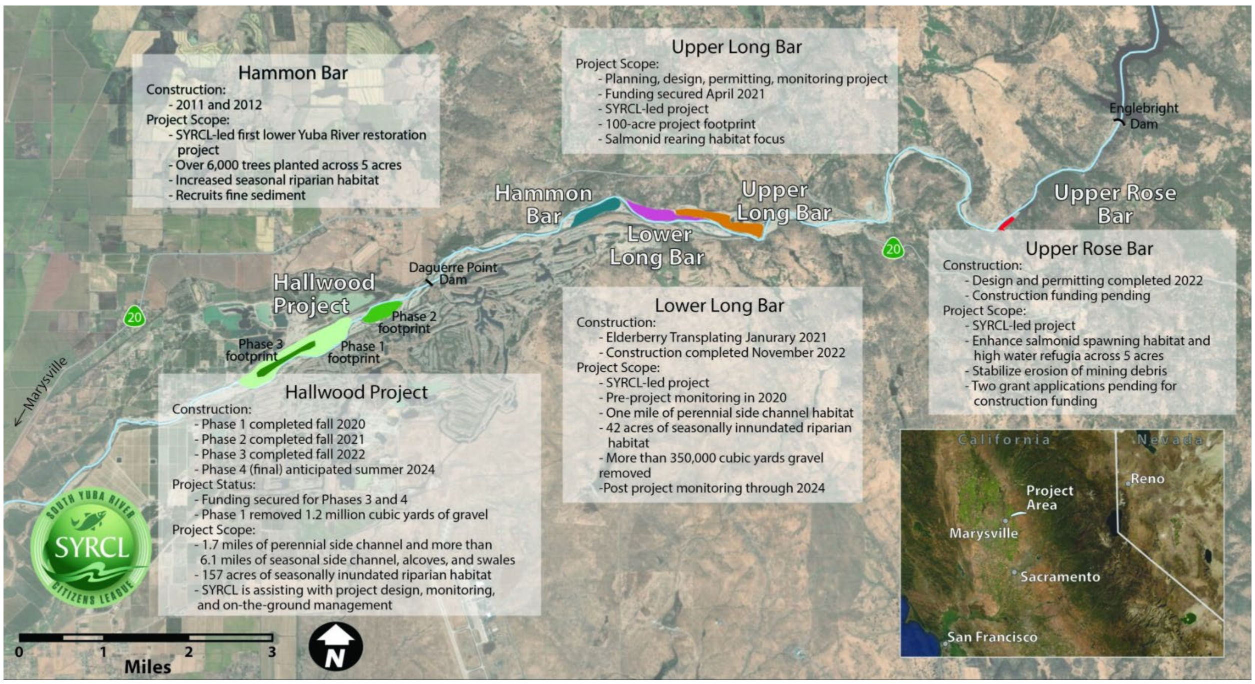

Figure 3. Lower Yuba River Restoration projects identified by SYRCL in 2011

In addition to these restoration efforts, two major LWM enhancement projects have occurred above DPD: 1) USACE LWMMP pilot study (2014-2022), and 2) YWA's Narrows 2 FERC mitigation project (2019-2022). As part of the LWMMP pilot study, USACE has placed pieces of LWM on Lower Gilt Edge Bar and/or Upper Gilt Edge Bar, with approximately 3,870 cubic yards placed from 2014 through 2022 (Table 5-4 USACE 2023). After ten years of implementing the pilot study, USACE (2022) has concluded that LWM reintroduction is practical and sustainable with incorporation of two key recommendations: 1) coordinate with NMFS to transition from pilot program to implementation with an expanded effort to evaluate the effectiveness of the LWM placement methods and locations; and (2) continue transitioning towards developing the long-term LWMMP to provide clarification of the scope of the project and the benefits achieved by the LWMMP. YCWA's Narrows 2 LWM mitigation project involved the installation of LWM in the lower Yuba River. As mitigation for a minimum instream flow deviation that occurred during 2015, YWA was required by FERC to improve habitat for anadromous fish. YWA placed a total of 30 pieces of LWM distributed among three locations during September 2019. During monitoring conducted in 2022, an average of 99.8%

and 98.4% of all fish observations (including CV spring-run Chinook and CCV steelhead) occurred within 0.5 m of instream cover during February and June, respectively (YCWA 2022), suggesting the importance of LWM for listed species in this system..

USACE began its gravel augmentation project in 2007, with 13 separate gravel injection efforts (2007, 2010/2011, and 2012-2022) placing approximately 78,000 tons of gravel/cobble into the EDR. Post-flood flow mapping conducted in 2019 shows that winter flows triggered movement of approximately 9,300 of the 10,000 tons of gravel placed in the EDR during the summer of 2018 (USACE 2023). Gravel injections from USACE's program appear to have mobilized sufficiently downstream of the injection area to accumulate in other portions of the LYR. The gravel injected, along with native sediment transported through the Yuba River, results in a large sediment load moving through the LYR. USACE annually removes sediment accumulated at DPD indicating additional sediment mobilization throughout the LYR.

2.4.2. Fish Passage at Daguerre Point Dam

After its construction, DPD was reported to be a partial or complete barrier to salmon and steelhead for many years because of the lack of functional fish ladders (Mitchell 2010). Although the dam impeded passage for spawning Chinook salmon and steelhead, salmon reportedly did pass in occasional years, as evidenced by large numbers of Chinook salmon observed in the North Yuba River at Bullards Bar during the early 1920s (Yoshiyama *et al*. 2001). Two fishways were constructed at DPD in the 1920s (Clark 1929, CDFW 1991). The fish ladders were then destroyed in the floods of 1927-1928, and were not replaced until 1938 (CDFW 1991). During this 10-year period, fish passage was completely blocked, and the drought of 1928 -1934, raised water temperatures below DPD to levels beyond those tolerated by Chinook salmon (NMFS 2012). These conditions likely contributed to the extirpation of CV spring-run Chinook salmon from the LYR (NMFS 2012). On the southern end of the dam, a fish ladder was constructed in 1938; however, it was generally ineffective (Sumner and Smith 1939). Two fish ladders were installed in 1951 by the State of California.

The flood of February 1963, estimated at about 120,000 cfs, washed out a section of DPD between the mid-stream stations. Repairs were made in 1964 to DPD and to the south fish ladder, but before modifications could be made to the north fish ladder, the flood of December 1964 washed out a portion of the dam that had not been reconstructed and eroded the underlying rock foundation to an estimated depth of 15 to 25 feet (USACE 2007a). The floods of 1964 also washed out nearly all of the sediments and debris that had accumulated behind the dam up to that time. The flood of December 1964, estimated at about 180,000 cfs, also washed out the retaining walls of the Hallwood-Cordua diversion structure, completely destroyed the fish ladder headwork on the north, as well as a large part of the original fish ladder, but the portion of the fish ladder completed with the rehabilitation from the 1963 floods of the dam was still intact (USACE 2013b).

Temporary repairs of the damage were made in February and March 1965. Extensions to the fish ladders were added, and slide gates, which also permit the passage of fish, were added to both upstream ends of the ladders in 1965 (USACE 2007a). The 1965 extensions of the fishways consist of 6-ft. by 10-ft. bays arranged in a manner similar to the prior fishway configuration. Fish can enter the fishways through a stop-logged opening located in each training berm of the spillway, or through gated openings at progressively higher elevations in lower bays of the fishways (USACE 1966).

The following are other notable changes that USACE or others have made to or near DPD or the ladders since the 1965 ladder construction:

- In 2003, USACE first installed a log boom upstream of the north ladder exit to divert debris away from the ladder.
- In 2010, emergency gravel clearing of the YWA box culvert that resulted from high flows during the winter and spring of 2010/2011.
- In 2011, USACE installed locking metal grates on 33 unscreened bays of the DPD fish ladders in response to the interim remedy order issued by the Court on July 25, 2011.
- In November 2019, USACE personnel and their contractor installed the new north ladder control gate stem after damage caused by a high water event in February 2019.
- In 2020, an unauthorized third party constructed a boat ramp immediately downstream of the north ladder at DPD .

Many closures of the control gates for the fish ladders have occurred recently causing fish passage delays/blockages. Additional blockages or passage delays occur from deposition of sediment in the ladder bays from high flows. Reduced passage is currently occurring as sediment has not been removed since 2022. Table 3 indicates some of the recent closures, reasons for the closures, and the length of each gate closure. Many gate closures were due to high flows, which generally coincides with adult CCV steelhead migration season. High flows that occur later in the spring into March and April may also delay adult CV spring-run Chinook migration. The extended gate closure of the north fish ladder gate spanned the entire CV spring-run Chinook migration period and into their spawning period in September.

Table 3. DPD Recent Extended (>24 Hours) Fish Ladder Gate Closures (USACE 2023)

Dates	Days Closed	Ladder(s)	Closure Reason	Notes
1/6/17-1/13/17	7	North	High flows	
1/6/17-1/25/17	19	South	High flows and access issues	
2/7/17-2/28/17	21	North	High flows	
2/7/17-3/3/17	24	South	High flows	
3/21/18-3/27/18	6	Both	High flows	the dates of opening and closure listed in the 2018 reports overlap so there is some uncertainty on when gates were closed
4/6/18-4/9/18	3	Both	High flows	the dates of opening and closure listed in the 2018 reports overlap so there is some uncertainty on when gates were closed
2/13/19-2/16/19	3	South	High flows	
2/13/19-9/10/19	209	North	damage	Damage discovered on 2/16/19
10/29/20-11/3/20	5	South	Vaki cleaning and accidental closure	Ladder gate inadvertently left mostly closed
Various dates in 2020	unknown	Both	Cleaning for sediment, woody debris or VAKI	8 different occurrences where ladders were closed for cleaning, but not documented if they had been reopened.
10/25/21-10/26/21	1	Both	High flows	

2.4.3. Species in the Action Area

The LYR provides spawning, rearing, and migration habitat for CV spring-run Chinook salmon, CCV steelhead, and sDPS green sturgeon. CV spring-run Chinook salmon and CCV steelhead are able to reach Englebright Dam through the ladders at DPD at times of specific flows (USACE 2023) and with proper maintenance and operations of the dam and ladders. DPD serves as a complete passage barrier to green sturgeon. Green sturgeon are not able to ascend the ladders due to ladder design and are therefore limited to habitat below DPD. SRKW prey upon CV Chinook salmon when they are in the ocean, so the oceanic portions of the action area include the habitat SRKW share with CV Chinook.

The value of the habitat in the action area is high as its entire length is used year-round by federally listed fish species. The PBFs of critical habitat for salmonids within the action area include: freshwater spawning habitat, freshwater rearing habitat, and freshwater migration corridors, containing attributes, such as adequate substrate, water quality, water quantity, water temperature, water velocity, shelter, food, riparian vegetation, space, and safe passage conditions. The PBFs of critical habitat for green sturgeon within the action area include: food resources, substrate type or size, water flow, water quality, migratory corridor, depth, and sediment quality. These features have been affected by human activities such as water management, presence of dams, irrigation, water diversions, flood control, agriculture, and urban development throughout the action area (which are discussed in the Cumulative Effects section). Englebright Dam prevents much of the natural input of woody material and cobble that the river needs to replenish to maintain healthy riparian corridors, rearing habitat, and spawning habitat. The PBF for SRKW critical habitat within the action area is: prey species of sufficient quantity, quality, and availability to support individual growth, reproduction, and development, as well as overall population growth.

2.4.3.1 CV Spring-run Chinook Salmon and Critical Habitat

The Yuba River is designated critical habitat for CV spring-run Chinook salmon up to Englebright Reservoir. The action area encompasses the whole LYR, which includes spawning, rearing, and migration habitat for adult and juvenile CV spring-run Chinook salmon. Adult CV spring-run Chinook salmon have been documented to hold over the summer in the pool below DPD (RMT 2013). Adults start migration into the Yuba in March and April typically, before holding in deep pools throughout the river all summer prior to spawning in September. CV spring-run Chinook salmon spawning occurs, primarily upstream of DPD (NMFS 2014b). Surveys have demonstrated that up to 96% of CV spring-run Chinook salmon spawn upstream of DPD when the ladders are operational (Yuba RMT 2013, USFWS 2007). The recovery plan for CV spring-run Chinook salmon identifies the LYR as a "core 2" population, which means it meets or has potential to meet biological recovery standards for moderate extinction risk. The watersheds supporting core 2 populations have lower potential to support viable populations, due to lower abundance, or amount and quality of habitat. They are important to providing increased life history diversity and support nearby core 1 populations (*e.g.*, Mill, Deer, Butte Creeks). According to the most recent viability report, the population size from VAKI counts within the Yuba River, ranging from a few hundred to a few thousand, meets the low extinction risk criterion for abundance, though hatchery influence likely puts the Yuba River population for CV spring-run Chinook salmon at a high extinction risk (SWFSC 2023). Table 4 below shows the annual returns of CV spring-run Chinook into the Yuba from 2004 to 2021. While Yuba returns do tend to be on the lower side, in some years where other populations have low returns, Yuba can make up a large percentage of the central valley ESU.

Research suggests that the practice of trucking hatchery fish from FRFH downstream to the Delta and Bay for release, rather than on-site releases, increases returning adult straying (Huber and Carlson 2015). Prolonged influx of FRFH spring-run Chinook salmon strays to other spring-run Chinook salmon populations even at levels <1% is undesirable and can cause the receiving population to shift to a moderate risk after four generations of such impact (Lindley *et al.* 2007). Beginning in 2014, all FRH spring-run Chinook salmon have been released in the Feather River, likely reducing straying to watersheds outside of the Feather River (California HSRG 2012;

Huber and Carlson 2015; Palmer-Zwahlen *et al.* 2019; Sturrock *et al.* 2019). Prior to 2014, the Yuba River received frequent strays from the FRFH populations of CV spring-run Chinook salmon into the Yuba River (Lindley *et al.* 2007).

The Yuba River has a medium to high value for the conservation of the CV spring-run Chinook salmon, because it supports several life stage functions. The upper Yuba River (upstream of Englebright Dam) is also a top priority candidate for reintroduction efforts of CV spring-run Chinook salmon (NMFS 2014b). Given planned pilot studies supporting reintroduction of CV spring-run Chinook salmon above Englebright Dam beginning in the fall of 2024, maintaining a Yuba River spring-run Chinook salmon population and high quality habitat within the LYR will be even more important to support reintroduction pilot work and the migration and rearing of an expected greater number of fish.

Table 4. Yuba River annual returns for CV spring-run Chinook compared to Central Valley wide returns spring-run Chinook ESU returns (USACE 2023, raw VAKI data PSMFC 2019-2024, CDFW GrandTab).

Year	Yuba Spring-run return	CV Spring-run ESU total return	% of total CV production
2004	1618	14556	11.12%
2005	5274	26593	19.83%
2006	1456	12181	11.95%
2007	353	9581	3.68%
2008	1320	13247	9.96%
2009	2616	6073	43.08%
2010	3737	6701	55.77%
2011	2360	8167	28.90%
2012	2289	20977	10.91%
2013	4046	23562	17.17%
2014	2021	9154	22.08%
2015	235	1844	12.74%
2016	N/A	N/A	N/A
2017	N/A	N/A	N/A
2018	281	3128	8.98%
2019	N/A	N/A	N/A
2020	1337	3077	43.45%
2021	1669	27264	6.12%

The Lower Yuba River is one of the few watersheds that has adequate water temperatures during CV spring-run Chinook summer holding periods. It is also predicted to be one of the only remaining accessible habitats that will be able to withstand the 2 to 5 degree Celsius water temperature increase predicted with climate change to occur in the Central Valley by the year 2100 (Lindley *et al.* 2007). The only other watersheds in the Sacramento Basin that may have the thermal capacity to maintain CV spring-run Chinook salmon are all currently above impassable barriers (Lindley *et al.* 2007). As climate change causes water temperatures to slowly rise, the value of the LYR habitat is going to increase, as it is going to be one of the few refuges for CV spring-run Chinook salmon. Chinook salmon are currently limited to habitat in the LYR below Englebright Dam, which for CV spring-run Chinook is downstream of their historical adult holding, spawning, incubation, and initial rearing habitat, and now completely overlaps with fall-run Chinook habitat (Cummins *et al.* 2008; Lindley *et al.* 2007). The confining of these two species into similar areas has created stressors, such as super-imposition of redds, and hybridization/genetic introgression between CV spring-run and fall-run Chinook salmon runs that did not occur historically (NMFS 2014b).

Chinook salmon exhibit preferential use of the north ladder at DPD (USACE 2023). Data from January 2019-January 2024 indicates that more than 95% of all Chinook that passed DPD passed through the north ladder (raw VAKI data PSMFC 2019-2024). This pattern holds for all times of the year for all runs of Chinook salmon in the Yuba River.

As shown in Table 4, the ladders at DPD have been closed several times, often for days or weeks. The timing of these closures has impacted species, as demonstrated by a seven-month closure of the north ladder in response to gate failure beginning in February 2019. Because this closure coincided with the majority of the CV spring-run adult migration period, hundreds of Chinook salmon held below the dam until the north ladder was reopened (raw VAKI data PSMFC 2019). Most, if not all, of these Chinook salmon are believed to have been CV spring-run Chinook salmon based on the migration timing and the successful migration of fish after the ladder was opened (raw VAKI data PSMFC 2019). This closure is believed to have caused significant issues, such as delays in fish reaching their preferred spawning grounds, potential straying into other watersheds, and physiological effects, including pre-spawn mortality. This timeframe also overlaps with fall-run Chinook salmon migration, causing a higher risk for issues, such as redd superimposition and genetic hybridization of the two runs from CV spring-run Chinook delaying their spawning.

The diversions at DPD present additional risk to CV spring-run Chinook salmon. A study performed in 2021 resulted in documentation that 1 in 4 juvenile salmonids were in poor condition or dead upon exit from the Hallwood-Cordua juvenile fish return pipe (PSMFC presentation of raw data at RMT meeting 5-4-2021). The risk of juvenile injury or mortality documented at the Hallwood-Cordua diversion causes a chronic strain on the juvenile population's survival during outmigration. The South Yuba/Brophy Diversion does not have estimates of juvenile impingement on the current rock gabion style barrier, but has been documented to not meet protective criteria for juvenile fish (PSMFC presentation of raw data at RMT meeting 5-4-2021). The South Yuba/Brophy Diversion can also be over-topped in high flow years, risking entrainment in the head pond with no way to return to the river. As these diversions are on either side of the river at DPD, juvenile outmigration survival is reduced on an annual basis.

2.4.3.2 CCV Steelhead and Critical Habitat

CCV steelhead are well-distributed throughout the Central Valley below the major rim dams (Good *et al*. 2005). The Yuba River is designated as CCV steelhead critical habitat up to Englebright Reservoir. The action area encompasses the whole LYR, which includes spawning, rearing, and migration habitat for adult and juvenile CCV steelhead. CCV steelhead spawning may occur within the action area near DPD, but 95% of spawning occurs upstream of DPD when the ladders are fully operational (NMFS 2014b); therefore, unobstructed access upstream of DPD is essential for spawning success. The Yuba River within the action area is also used by juvenile CCV steelhead for rearing and migration. The recovery plan for CCV steelhead identifies the Yuba River below Englebright as a core 2 population (NMFS 2014b). Core 2 populations are expected to have the potential to meet the moderate risk of extinction criteria, and are important for life history diversity and to support Core 1 populations in nearby watersheds of Deer, Mill, and Butte creeks.

CCV steelhead generally migrate upstream past DPD starting in December and continuing through April. Spawning can begin in December and continue into April. As steelhead can spawn multiple times before dying, post-spawn adults may hold for a time before migrating back to the ocean. Juvenile CCV steelhead typically start their emigration downstream as early as February and continue through May (NMFS 2014b). Table 5 below shows CCV steelhead returns in the Yuba River from 2019 to 2023.

Table 5. Adult steelhead returning to the Yuba River by year (unpublished VAKI data, PSMFC 2019-2023).

Year	# of CCV steelhead adults
2019	481
2020	593
2021	772
2022	462
2023	942

The Yuba River has a medium to high value for the conservation of CCV steelhead, because it supports several life stage functions. The upper Yuba River (upstream of Englebright Dam) is a top priority candidate for reintroduction efforts (NMFS 2014b).

The lower Yuba River is the only remaining accessible watershed that does not regularly struggle with high temperatures during summer juvenile steelhead rearing and migratory periods. The LYR is predicted to be one of the only remaining accessible habitats that will be able to withstand the 2 to 5-degree Celsius water temperature increase predicted with climate change to occur in the Central Valley by the year 2100 (Lindley *et al.* 2007). The only other watersheds in the Sacramento Basin that may have the thermal capacity to maintain salmonids during summer months are all currently above impassable barriers. As water temperatures slowly rise, the habitat within the LYR will exponentially increase as one of the few refuges for CCV steelhead juveniles to rear in freshwater.

As shown in Table 4, the ladders at DPD have been closed several times, often for days or weeks, and in 2019, for several months. Closures lasting for weeks to months are likely to have significant delays on fish reaching the preferred spawning grounds, potential straying into other watersheds, and physiological effects, including pre-spawn mortality.

Unlike Chinook, steelhead do not seem to have a clear preference of north or south ladder. From January 2019-January 2024, approximately 1800 CV steelhead used both the north ladder and the south ladder fairly evenly (raw VAKI data PSMFC 2019-2024).

The diversions at DPD present additional risk to CCV steelhead. A study performed in 2021 resulted in documentation that 1 in 4 juvenile salmonids were in poor condition or dead upon exit from the Hallwood-Cordua juvenile fish return pipe (PSMFC presentation of raw data at RMT meeting 5-4-2021). The risk of juvenile injury or mortality documented at the Hallwood-Cordua diversion causes a chronic strain on the juvenile population's survival during outmigration (Add CDFW study citation). The South Yuba/Brophy Diversion does not have estimates of juvenile impingement on the current rock gabion style barrier, but has been documented to not meet protective criteria for juvenile fish (PSMFC presentation of raw data at RMT meeting 5-4-2021). The South Yuba/Brophy Diversion can also be over-topped in high flow years, risking entrainment in the head pond with no way to return to the river. As these diversions are on either side of the river at DPD, juvenile outmigration survival is reduced on an annual basis.

2.4.3.3 sDPS Green Sturgeon and Critical Habitat

Green sturgeon generally migrate upstream into the Yuba River from February through April. Spawning can occur through spring and into early summer. Larval sturgeon have been documented in the Yuba River during summer months, with juveniles being observed at all times of the year. Adults may choose to leave the Yuba River right after spawning, or stay and hold the rest of the year until winter flows trigger them to outmigrate. Like most existing fish ladders in the Central Valley, which were designed for salmonids, DPD is impassible to adult sDPS green sturgeon and blocks access to historical upstream sDPS green sturgeon spawning habitat (Mora *et al*. 2009).

Adults and juvenile sDPS green sturgeon have been detected in the LYR during all times of the year. Adult sDPS green sturgeon have been observed in the pool downstream of DPD in several years, and they were documented spawning in 2018 (NMFS 2018). Eggs collected in 2018 were determined to be green sturgeon eggs, confirming that green sturgeon spawn in the Yuba River (NMFS 2018). The pool below DPD may be the only currently accessible location in the Yuba River where depth, substrate type, substrate size, and water flow is conducive to green sturgeon spawning. The rest of the Yuba River below DPD has been highly modified by anthropogenic activities and likely only serves as a migratory corridor for sDPS green sturgeon.

Evidence of spawning immediately downstream of DPD (river mile [RM] 11.5) in the DPD "plunge pool" in 2018 and 2019, as well as visual observations of green sturgeon in the pool in 2011, 2016 and 2017, suggest that the Yuba River has the potential to support at least periodic reproduction of sDPS green sturgeon. Approximately 270 eggs were collected on a single egg mat in June 2018 (Beccio 2019). No eggs were collected in 2019, but early stage juvenile green sturgeon were observed and captured by hand that year in edgewater habitat 200 meters downstream of DPD, suggesting that a spawning event likely occurred immediately downstream of the dam (Beccio 2019). It is possible that sDPS spawned in the Yuba River over four consecutive years (2016 through 2019) as adults were documented holding there each year (Beccio 2019). In June 2023, five larval green sturgeon were captured in a rotary screw trap on the Yuba River, indicating successful spawning for that year (Pers. Comm. Kassie Hickey, Environmental Scientist, DWR, July 10, 2023).

Adult sDPS green sturgeon are frequently observed holding immediately downstream of DPD during the spawning window on the Yuba River (Mora *et al*. 2018; NMFS 5-Year Status Review

2021), including in 2016, when CDFW observed at least eight adult sDPS green sturgeon holding in the pool immediately below the dam (Beccio 2019); in 2017, when CDFW observed adult green sturgeon in the pool (Beccio 2019); in 2020, when DFW observed at least five green sturgeon and in 2021, when CDFW observed five of the six adult green sturgeon tagged in the summer of 2020 (Pers. Comm. Marc Beccio, Environmental Scientist, CDFW, June 8, 2021). It appears that sturgeon mostly hold on the deeper north side of the pool, and in years of lower flow, they may hold over or remain in the Lower Yuba River rather than outmigrate after spawning (Pers. Comm. Marc Beccio, Environmental Scientist, CDFW, June 2, 2021).

The Yuba River has a medium to high value for the conservation of sDPS green sturgeon, because it supports several life stage functions, including serving as the only known spawning area other than the Sacramento and Feather Rivers (NMFS 2018). Designated critical habitat for sDPS green sturgeon ends at DPD. Providing volitional passage upstream of DPD is a priority recovery action and would likely improve the ability of green sturgeon to spawn annually in the Yuba River (NMFS 2018).

2.4.3.4 Southern Resident Killer Whales

As described in the status of the species (section 2.2.4) and assessed in the SRKW recovery plan (NMFS 2008a), the three major threats to SRKW include (1) quantity and quality of prey, (2) toxic chemicals that accumulate in top predators, and (3) impacts from sound and vessels. Other threats identified include oil spills, disease, inbreeding and the small population size, and other ecosystem-level effects (NMFS 2008a). It is likely that multiple threats act together to impact the whales, rather than any one threat being primarily responsible for the declining status of SRKWs. The 5-year review (NMFS 2021b) documents the latest progress made on understanding and addressing threats to SRKW. These threats affect the species' status throughout their geographic range, including the action area, as well as their critical habitat within the action area.

Prey Availability

Chinook salmon are the primary prey of SRKW throughout their geographic range, which includes the action area. The abundance, productivity, spatial structure, and diversity of Chinook salmon are affected by a number of natural and human actions, and these actions also affect prey availability for SRKWs. As discussed in the status of the species, the abundance of Chinook salmon now is significantly less than historic abundance due to a number of human activities. The most notable human activities that cause adverse effects on ESA-listed and non-ESA-listed salmon include land use activities that result in habitat loss and degradation, hatchery practices, harvest, and hydropower systems. ESA-listed CV spring-run Chinook salmon have been demonstrated to be an important prey item to SRKW (NMFS and WDFW 2018), as well as fall and late fall-run (NMFS and WDFW 2018; Hanson *et al.* 2021).

Assessing Baseline Prey Availability and Metabolic Needs

Recent work by Couture *et al.* (2022) estimated that annual SRKW consumption of Chinook salmon ranged from 166,000 to 216,300 fish between 1979-2020 across the Salish Sea and west coast of Vancouver Island (WCVI) from April-October each year. While SRKWs were not estimated to be prey limited in most years, Couture *et al.*'s (2022) work suggested that SRKW experienced an energetic deficit (in those months in those locations only) in six of the last 40 years, three of which were the most recent in the time series (2018-2020). The authors estimated various parameters that were factored into the novel model they used, including prey species diet proportion as a function of abundance, search efficiency, and prey handling time, which influence prey requirements and may partially explain our different results (Couture *et al.* 2022).

In summary, though abundance of Chinook salmon available at the beginning of a year (pre-fishing and natural mortality) is substantially greater than the required amount of salmon needed by SRKWs, there is likely competition between SRKWs and other predators, and mortality of Chinook salmon may be high, further reducing Chinook salmon availability to SRKWs. Although some of these predators are likely consuming smolts, prey availability to SRKWs in the action area would be reduced in subsequent years based on dietary needs of other marine mammals as well as other predators (*e.g.,* pelagic fish, sharks, and birds). In addition, the available information suggests coastwide prey availability is substantially lower in the winter than summer in coastal waters and opposite in inland waters.

Prey Quality

Contaminants enter marine waters and sediments from numerous sources, but are typically concentrated near populated areas of high human activity and industrialization. Freshwater contamination is also a concern, because it may contaminate salmon that are later consumed by the whales in marine habitats. Chinook salmon contain higher levels of some contaminants than other salmon species, however levels can vary considerably among populations. Mongillo *et al.* (2016) reported data for salmon populations along the west coast of North America, from Alaska to California, and found marine distribution was a large factor affecting persistent pollutant accumulation. They found higher concentrations of persistent pollutants in Chinook salmon populations that feed in close proximity to land-based sources of contaminants. Additionally, O'Neill and West (2009) discovered elevated concentrations of polychlorinated biphenyls (PCBs) in Puget Sound Chinook salmon compared to those outside Puget Sound. Intermediate levels of polychlorinated biphenyls (PCBs) were measured in California and Oregon populations, but Chinook salmon originating from California have been measured to have higher concentrations of dichloro-diphenyl-trichloroethane (DDT) (Mongillo *et al.* 2016; O’Neill *et al.* 2017;). Overall, SRKW prey is highly contaminated, causing contamination in the whales themselves. Build-up of pollutants can lead to adverse health effects in mammals. Nutritional stress, potentially due to periods of low prey availability or in combination with other factors, could cause SRKW to metabolize blubber, which can redistribute pollutants to other tissues and may cause toxicity. Pollutants are also released during gestation and lactation which can impact calves (Noren *et al.* 2024).

Size and age structure of Chinook salmon has substantially changed across the Northeast Pacific Ocean (Ohlberger *et al.* 2018). Since the late 1970s, adult Chinook salmon (ocean ages 4 and 5) along most of the eastern North Pacific Ocean are becoming smaller, whereas the size of age 2 fish are generally increasing (Ohlberger *et al.* 2018). Additionally, most of the Chinook salmon populations from Oregon to Alaska have shown declines in the proportions of age 4- and 5-year-olds and an increase in the proportion of 2-year-olds; the mean age of Chinook salmon in the majority of the populations has declined over time. Populations along the coast from western Alaska to northern Oregon had strong declining size trends of ocean-4 fish, including wild and hatchery fish. For Puget Sound Chinook salmon (primarily hatchery origin), there were little or weak trends in size-at-age of 4-year-olds and the declining trend in the proportion of older ages in Washington stocks was also observed but slightly weaker than that in Alaska populations (Ohlberger *et al.* 2018). The authors suggest the reasons for this shift may be largely due to direct effects from size-selective removal by marine mammals and fisheries, followed by evolutionary changes toward these smaller sizes and early maturation (Ohlberger *et al.* 2018). Smaller fish have a lower total energy value than larger ones (O'Neill *et al.* 2014). Therefore, SRKWs need to consume more fish salmon in order to meet their caloric needs as a result of a decrease in average size of older Chinook salmon.

Relationship between Chinook salmon abundance and SRKW demographics

Several studies in the past have found correlations between Chinook salmon abundance indices and SRKW demographic rates (*e.g*., fecundity and mortality) (Ford *et al.* 2005; Ford *et al.* 2010; Ward *et al.* 2009; Ward *et al.* 2013). There is evidence SRKWs and other killer whale populations that consume Chinook salmon may have experienced adverse effects from low Chinook prey availability in the late 1990s, likely due to common factors affecting changes in the populations (NMFS 2008). Population viability assessments from Lacy *et al.* (2017) and Murray *et al.* (2021) attempted to quantify and compare the three primary factors affecting the whales (*e.g.,* prey availability, vessel noise and disturbance, and high levels of contaminants). The updated population viability analysis in Murray *et al*. (2021) showed that no single threat alone could replicate observed SRKW past demographic trajectories. More recently, Williams *et al.* (2024) published a new population viability analysis on SRKW extinction risk with respect to varying prey abundance, noise disturbance, contaminants, and other factors. Though it is difficult to find statistically significant relationships between prey abundance and SRKW demographics, nutritional stress as a chronic condition can lead to reduced body size and condition of individuals (*e.g*., Trites and Donnelly (2003) and whales in poor body condition have a higher likelihood of mortality, while accounting for age and sex (Stewart *et al.* 2021).

There are several challenges to quantitatively characterize the relationship between SRKWs and Chinook salmon and the impacts of reduced prey availability on SRKW behavior and health. Different Chinook salmon populations are likely more important in different years. Large aggregations of modeled Chinook salmon stocks that reflect abundance on a more coastwide scale have previously appeared to be equally or better correlated with SRKW vital rates than smaller aggregations of Chinook salmon stocks, or specific stocks, such as Chinook salmon originating from the Fraser River that have been positively identified in diet samples as key sources of prey for SRKWs during certain times of the year in specific areas (see Hilborn *et al.* 2012; Ward *et al.* 2013). For example, low coastwide Chinook salmon abundance in the late 1990s corresponded to an approximate 20% decline in the SRKW population, constraining body growth. Table 6 below shows the proportion of the ESU of CV spring-run and fall-run Chinook produced by the Yuba River annually from 2004 through 2021.

Though it is difficult to identify what level of reduced Chinook abundance that is predicted to cause adverse effects to SRKWs, there is evidence SRKWs and other killer whale populations that are also known to consume Chinook salmon may have experienced adverse effects from low Chinook prey availability in the late 1990s likely due to common factors affecting changes in the populations (NMFS 2008). Several recent studies have identified a link between Chinook salmon abundance and body condition (Stewart *et al.* 2021) and survival or reproduction (Nelson *et al.* 2024; Williams *et al.* 2024).

Due to the limitations discussed above, we are not able to translate a specific reduction in Chinook salmon to a quantified loss in SRKWs or reduced reproduction. However, all available evidence suggests there is a connection between Chinook salmon, the primary and preferred prey of SRKWs, and adequate prey abundance is critical for SRKW survival and recovery.

Table 6. Yuba River annual returns for CV spring-run Chinook and CV fall-run Chinook compared to CV wide returns (USACE 2023, raw VAKI data PSMFC 2019-2024, CDFW GrandTab).

Year	Yuba Spring-run	CV total Spring-run	% of total CV production	Yuba Fall-run	CV total Fall-run	% of total CV production
2004	1,618	14,556	11.12%	3,716	25,8573	1.44%
2005	5,274	26,593	19.83%	5,816	24,4282	2.38%
2006	1,456	12,181	11.95%	3,174	20,8071	1.53%
2007	353	9,581	3.68%	1,007	73,527	1.37%
2008	1,320	13,247	9.96%	1,182	52,191	2.26%
2009	2,616	6,073	43.08%	1,942	30,340	6.40%
2010	3,737	6,701	55.77%	2,647	111,464	2.37%
2011	2,360	8,167	28.90%	5,396	123,553	4.37%
2012	2,289	20,977	10.91%	4,368	197,493	2.21%
2013	4,046	23,562	17.17%	7,345	335,023	2,.19%
2014	2,021	9,154	22.08%	7,188	194,970	3.69%
2015	235	1,844	12.74%	4,780	99,135	4.82%
2016	N/A	N/A	N/A	N/A	85,123	N/A
2017	N/A	N/A	N/A	N/A	43,627	N/A
2018	281	3,128	8.98%	2,779	116,217	2.39%
2019	N/A	N/A	N/A	1,890	150,724	1.25%
2020	1,337	3,077	43.45%	2,531	111,593	2.27%
2021	1,669	27,264	6.12%	2,914	885,86	3.29%

2.4.4. Climate Change

Changing ocean conditions driven by climate change have been shown to influence ocean survival and distribution of Chinook salmon (Crozier *et al*., 2021; Mantua *et al*., 2021) and other Pacific salmonids, and further affecting the prey available to SRKWs. The effects of climate change described in the status of the species section are expected to occur in the action area. Extensive climate change caused by the continuing buildup of human-produced atmospheric carbon dioxide and other greenhouse gases is predicted to have major environmental impacts in the action area during the 21st century and beyond (IPCC 2023). Warming trends in water and air temperatures are ongoing and are projected to disrupt the region's annual cycles of rain and snow, alter prevailing patterns of winds and ocean currents, and result in higher sea levels (Glick *et al.* 2007; Snover *et al.* 2005). These changes, together with increased acidification of ocean waters, would likely have profound effects on marine productivity and food webs, including populations of salmon.

Currently, the Yuba River is one of the few Central Valley tributaries that has suitable water temperatures for salmonids throughout the year. LYR water temperatures generally remain below 58°F year-round at the Smartsville Gage (downstream of Englebright Dam), and below 60°F year-round at DPD (Yuba County Water Agency *et al.* 2007). At Marysville, water temperatures generally remain below 60°F from October through May, and below 65°F from June through September (Yuba RMT 2011). However, in dry years, temperatures may become warmer than the optimum range for salmonids.

As described by NMFS (2017), climate change may not have as much of an impact on salmonids in the LYR relative to other Central Valley rivers. This is because the Yuba River drains a large, high elevation watershed (Lindley *et al*. 2004), has the second highest mean annual discharge rate of all Central Valley rivers (Lindley *et al.* 2004), and New Bullards Bar Reservoir is a deep, steep-sloped reservoir with ample cold-water pool reserves. As described above, LYR water temperatures generally remain below the upper tolerable temperature values most of the time at the most biologically relevant locations, with generally infrequent exceedances of upper optimal temperature thresholds, primarily occurring during dry and critically dry years that occur with relatively low probability.

According to the Yuba County Water Agency (2010), because of specific physical and hydrologic factors, the LYR is expected to continue to provide the most suitable water temperature conditions for anadromous salmonids of all Central Valley rivers, even if there are long-term climate changes. Operations of New Bullards Bar Reservoir since 1969 have never depleted the cold-water pool. Since 1993, cold water pool availability in New Bullards Bar Reservoir has been sufficient to accommodate year-round use of the reservoir's lower level outlets to provide cold water to the LYR.

Even with future climate change, New Bullards Bar Reservoir is expected to continue to provide sustained, relatively cold water into the LYR during the late spring, summer and fall of most years (YCWA 2010). If climate changes result in a higher probability of occurrence of multi-year drought periods, such as the 2012-2016 drought, or significant changes in the timing and magnitude of runoff patterns into New Bullards Bar Reservoir, they may represent a medium stressor. Even still, NMFS (2014b) has identified that to achieve recovery, spring-run Chinook salmon require access to the upper Yuba watershed, where their life history type evolved and they persisted for thousands of years in high elevation, steep gradient habitat, reproductively isolated from fall-run Chinook salmon. Confining spring-run Chinook salmon in fall-run Chinook salmon spawning habitat in the LYR, downstream of their (spring-run) historical adult holding, spawning, incubation, and initial rearing habitat and has greatly increased the extinction risk of both run types (Cummins *et al.* 2008; Lindley *et al.* 2007).

Given the uncertainty associated with climate change predictions and NMFS' characterization of the LYR as potentially continuing to provide suitable water temperature conditions for anadromous salmonids despite long-term climate changes, overall, climate change may represent a low to medium stressor to listed salmonids in the LYR.

2.5. Effects of the Action

Under the ESA, "effects of the action" are all consequences to listed species or critical habitat that are caused by the proposed action, including the consequences of other activities that are caused by the proposed action but that are not part of the action. A consequence is caused by the proposed action if it would not occur but for the proposed action and it is reasonably certain to occur. Effects of the action may occur later in time and may include consequences occurring outside the immediate area involved in the action (see 50 CFR 402.02).

2.5.1. Effects to ESA-Listed Species

The following is an analysis of the potential effects to listed fish species that may occur as a result of implementing the proposed action in the Yuba River. For our analysis we analyzed the expected effects from proposed activities: Operation of fish passage facilities, maintenance and debris removal in the fish ladders, sediment removal upstream of DPD, redd surveys, gravel augmentation, and large woody material placement.

2.5.1.1 Effects to species: Fish Passage Facility Operations

USACE is proposing several activities that will alter and reduce fish passage through DPD (see Table 2-1 in USACE 2023) due to ladder closures and operational uncertainty (duration of activity) related to maintenance. Operation of the two existing fish ladders at DPD is the only route of passage for CV spring-run Chinook and CV steelhead to move upstream and downstream past the dam. The dam is currently a complete migratory barrier to green sturgeon, who cannot ascend the existing ladders and, therefore, spawn in the pool below the dam. Proposed O&M aspects that will alter or reduce passability include installing dam-crest flashboards, ladder control gate closures, debris blockages, gate failures, and lack of in-ladder flashboard or downstream ladder orifice use.

The PA does not include a clear operations and maintenance plan for the fish ladders to ensure passage is maximized when fish gates and orifices are present since the FLOMP does not contain specific details regarding long-term operational flow triggers to operate gates and orifices with a range that captures both low-flow and high-flow event closures. The "general rules for water surface levels within the ladders" was developed by NMFS and CDFW to prevent stranding of outmigrating juveniles as an interim solution, while more refined operational flow triggers were being evaluated. However, the CDFW (2021) report did not provide direction regarding how the upstream ladder control gates should be operated, nor did it provide guidelines regarding control gate opening relative to river flows to maximize hydraulic performance of the existing ladders for anadromous salmonid passage (USACE 2023). Any uncertainty in the day-to-day and long-term operations and maintenance risks reductions of successful passage. USACE has proposed BMPs to help reduce effects on fish passage from facility operations, such as: (1) leaving the damaged control gate in the open position, if possible, and ensuring the second ladder is open to allow some fish passage if one ladder is not operational; (2) notifying NMFS of any gate damage by 5 pm on the date of initial damage observation; (3) working with NMFS to identify and implement passage alternatives if repairs to the ladders cannot be completed in a timely manner; and (4) contracting for repair of damage as expeditiously as possible.

a. Effects to CV spring-run Chinook salmon

Exposure

While the proposed action has O&M to improve fish passage, it also includes activities that will alter and reduce fish passage through DPD at unspecified times of the year; any CV spring-run Chinook that attempt to migrate through DPD may be exposed to one or more of these activities. Adult CV spring-run Chinook salmon migrate mainly through the north ladder at DPD to utilize the 12.5 miles of habitat between DPD and Englebright Dam. Surveys have demonstrated that up to 96% of CV spring-run Chinook salmon spawn upstream of DPD (Yuba RMT 2013, USFWS 2007). For all runs of Chinook salmon, most juvenile rearing has been reported to occur above DPD (SWRI *et al*. 2000). Therefore, it is expected that the majority of the Yuba population of CV spring-run Chinook salmon would be exposed to reduced fish passage effects. Proposed monitoring and maintenance is intended to reduce exposure frequency and duration, but those actions do not fully eliminate the fish passage delays caused by the proposed action.

Response

Discerning flow values in the Yuba River is complicated by the minimal number of monitoring stations, so conditions are predicted based on releases from Englebright and measurements at the gauge in Marysville (USACE 2023). With multiple water diversions present in between those two locations, actual flows at DPD or through the ladders can be very difficult to predict, therefore causing further delays in remedying any flow scenarios that may reduce fish passage opportunities.

As prior operations have indicated, issues that may occur with the facility include gate failures, debris blockages, or other damage that may fail to allow the facility to operate as intended (USACE 2023). In these types of situations, passage delays through the ladders are expected. Delays may include adults becoming blocked/stranded below DPD and unable to pass upstream. Delays resulting in adult CV spring-run Chinook salmon passage impediments are likely to weaken fish by requiring additional use of fat stores prior to spawning, and could potentially result in reduced spawning success (*i.e.*, production) from reduced resistance to disease, increased pre-spawning mortality, and reduced egg viability (NMFS 2007). Risks to juveniles in this situation include impingement on debris/blockage if the facility is clogged with debris (Gregory *et al.* 1992). Debris buildup and blockages are a frequent occurrence in fish ladders and are monitored weekly or daily depending on flows (see proposed action, section 1.3) to ensure they can be remedied quickly. Gate failure due to damage is not expected annually, but is reasonably certain to occur several times over the life of the project.

The dam-crest flashboards operated by Cordua Irrigation District can be installed to increase the ability of Hallwood-Cordua to divert water during low flow periods, but also aid in directing the flows towards the fish ladder entrances to improve attraction flows through the ladders. This has demonstrated an increase in the passage of adult salmonids up the ladders (USACE 2023). However, the effects of dam-crest flashboard use also interact with entrainment risks at the

Hallwood-Cordua diversion. A study performed in 2021 resulted in documentation that 1 in 4 juvenile salmonids were in poor condition or dead upon exit from the Hallwood-Cordua juvenile fish return pipe (PSMFC presentation of raw data at RMT meeting 5-4-2021). The direction of additional flows toward the Hallwood-Cordua diversion may increase risk of juvenile injury or mortality from entrainment and predation at the diversion. While dam-crest flashboard use during low flows has been shown to increase the success of adult CV spring-run Chinook salmon passage, it still poses an increased risk to juveniles.

Ladder control gate closures occur frequently when high flows occur in the Yuba River. When flows are expected to reach 30,000 cfs, the gates will be closed. Previously, it was deemed that juveniles moving in the water pushed downstream through the ladders would likely be injured or killed due to the velocities in the ladder during those high flows potentially ejecting them out of the ladders, and the VAKI cameras used for monitoring were at high risk for damage (USACE 2023). When flows are high and the gates are closed, juveniles are pushed over the dam crest. Operational closures during high-flow scenarios are, therefore, intended to reduce injury and harm to juveniles, even though it may delay adult passage during that time. Gate closures due to high flows are expected to occur roughly every two years for approximately nine days during December through May (USACE 2023). This timeframe would not include adult CV spring-run Chinook salmon migration times, but would be during CCV steelhead and other non-ESA listed species adult upstream migratory periods (*i.e.* CV fall-run and late-fall run Chinook salmon) (NMFS 2014b). While upstream passage delays of up to nine days can be detrimental to adults as described below, the protection of juveniles during that time frame is expected to minimize injury and death during these scenarios. There is still expected to be a small number of juvenile CV spring-run chinook salmon injured or killed through the life of the proposed action associated with higher flows in the ladder before the gates are able to be closed.

While proposed O&M methods and frequent monitoring are expected to minimize and resolve some of these issues, adverse effects to fish are expected to occur in the time it takes for such issues to be corrected. The BA documents several occurrences over the last 10 years when one or both gates were closed for extended periods due to damage, flows, or other reasons (USACE 2023). Closing one or both gates eliminates or significantly reduces the ability for adult fish to pass upstream of DPD. CV spring-run Chinook salmon are documented to rarely use the south ladder, and show a strong preference for the north ladder (unpublished VAKI data 2013-2024). If the north ladder is closed for any reason, CV spring-run Chinook salmon passage during that time is very minimal, even when the south ladder is open. There have been occurrences where both gates were closed during peak migration time for CV spring-run Chinook salmon, which would have blocked all passage above DPD (Table 4, Yuba RMT Update 9-3-2019).

For adults delayed by malfunction of the gate, if function is not able to be restored in a timely manner (*i.e.*, hours to days), it may cause severe delays in spawning, inability to reach spawning grounds, straying, or pre-spawn mortality (Poff *et al.* 2007, Liermann *et al.* 2012). The RMT's (2013) examination of the 2009, 2010, and 2011 acoustically-tagged CV spring-run Chinook salmon data revealed a consistent pattern in fish movement. In general, acoustically tagged CV spring-run Chinook salmon have shown to hold during the summer months in areas both above and below DPD, followed by rapid movement into upstream areas (upper Timbuctoo Reach, Narrows Reach, and Englebright Reach) during September. Gate malfunctions that block passage during peak migration and spawning times could cause catastrophic pre-spawn mortality of adult CV spring-run Chinook salmon and the potential loss of an entire year class of offspring.

While the proposed action includes the submission of annual reports on O&M activities, impacts of changes in operations or instances of closures are expected to be exacerbated if not communicated in real time to agencies and groups that can minimize the species effects.

Risk

The proposed action includes long (*i.e.*, several days or more) potential gate closures expected on average every two years due to high flow occurrences, and extended closures due to gate failures occurring twice in the last ten years with no alternative passage solutions. Given the three-year life cycles of returning spawning CV spring-run Chinook and CV steelhead, closures at a frequency where multiple cohorts are impacted, or that single, extended closures (over one week), risk the viability of the Yuba population. Proposed gate operations, maintenance, and expected gate failures causing closures for weeks to months causing reduced passage are expected to cause injury and death of adult and juvenile CV spring-run Chinook salmon frequently over the life of the project.

b. Effects to CCV steelhead

Exposure

The proposed action includes many activities that will alter and reduce fish passage through DPD year-round. There is potential for exposure for any CCV steelhead that migrates through DPD. Adult CCV steelhead migrate through the two ladders at DPD to utilize the 12.5 miles of habitat between DPD and Englebright Dam. When the ladders are functioning and clear, approximately 98% of steelhead redds over a period of 3 years were located upstream of DPD (USFWS 2007). Most juvenile CCV steelhead rearing has been reported to occur above DPD, with 82% of juvenile *O. mykiss* documented in the LYR observed upstream of DPD (SWRI *et al*. 2000). Therefore, it is expected that the majority of the Yuba population of CCV steelhead would be exposed to reduced fish passage effects. Proposed monitoring and maintenance are intended to reduce exposure frequency and duration, but they do not fully eliminate the fish passage delays caused by the proposed action.

Response

Discerning flow values in the Yuba River is complicated by the minimal number of monitoring stations, so conditions are predicted based on releases from Englebright and measurements at the gauge in Marysville (USACE 2023). With multiple water diversions present in between those two locations, actual flows at DPD or through the ladders can be very difficult to predict, therefore causing further delays in remedying any flow scenarios that may reduce fish passage opportunities.

Issues that may occur with the facility include gate failures, debris blockages, or other damage that may fail to allow the facility to operate as intended. In these types of situations, passage delays through the ladders are expected. Delays may include adult CCV steelhead becoming blocked/stranded below DPD and unable to pass upstream. Delays resulting in adult CCV steelhead passage impediments are likely to weaken fish by requiring additional use of fat stores prior to spawning, and could potentially result in reduced spawning success (*i.e.*, production) from reduced resistance to disease, increased pre-spawning mortality, and reduced egg viability (NMFS 2007, Poff *et al.* 2007, Liermann *et al*. 2012)). Risks to juveniles in this situation include impingement on debris/blockage if the facility is clogged with debris (Gregory and Davis 1992). Debris buildup and blockages are a frequent occurrence in fish ladders, and are monitored daily or weekly, depending on flows, to ensure they can be remedied quickly. Gate failure due to damage is not expected annually, but is reasonably certain to occur several times over the life of the project.

The dam-crest flashboards operated by Cordua Irrigation District can be installed to increase the ability of Hallwood-Cordua to divert water during low flow periods, but also aid in directing the flows towards the fish ladder entrances to improve attraction flows through the ladders. This has demonstrated an increase in the passage of adult salmonids up the ladders (USACE 2023). However, the effects of dam-crest flashboard use also interacts with entrainment risks at the Hallwood-Cordua diversion. The direction of additional flows toward the Hallwood-Cordua diversion may increase the risk of juvenile injury or mortality from entrainment and predation at the diversion. While dam-crest flashboard use during low flows has been shown to increase the success of adult fish passage, it still poses an increased risk to juveniles.

Ladder control gate closures occur frequently when high flows occur in the Yuba River (USACE DPD BO Annual Reports 2015-2022). When flows are expected to reach 30,000 cfs, the gates will be closed. Previously, it was deemed that juveniles moving in the water pushed downstream through the ladders would likely be injured or killed due to the velocities in the ladder during those high flows potentially ejecting them out of the ladders, and the VAKI cameras used for monitoring were at high risk for damage (USACE 2023). When flows are high and the gates are closed, juveniles are pushed over the dam crest. Operational closures during high-flow scenarios are intended to reduce injury, harm, and death to juveniles, even though it may delay adult passage during that time. Gate closures due to high flows are expected to occur roughly every two years for approximately nine days during December through May. This timeframe would be during CCV steelhead upstream migratory periods (Unpublished VAKI data 2013-2024. While upstream passage delays of up to nine days can be detrimental to adults as described below, the protection of juveniles during that time frame is expected to minimize overall injury and death during these scenarios. There is still expected to be a small amount of juvenile injury or death associated with higher flows in the ladder before the gates are able to be closed.

While proposed O&M methods and frequent monitoring are expected to minimize and resolve some of these issues, adverse effects to fish are expected to occur in the time it takes for such issues to be corrected. The BA documents several occurrences over the last 10 years when one or both gates were closed for extended periods due to damage, flows, or other reasons (USACE 2023). Because steelhead use both ladders approximately equally (Unpublished VAKI data 2013-2024), closing one gate may impact passage on a smaller level. Closing both gates eliminates the ability for adult CCV steelhead to pass upstream of DPD. There have been occurrences where at least one gate was closed for several months, which would have reduced passage above DPD (Yuba RMT Update 9-3-2019).

For adults delayed by malfunction of the gate, if function is not able to be restored in a timely manner (hours to days), it may cause severe delays in spawning, inability to reach spawning grounds, straying, or pre-spawn mortality (death).

While the proposed action includes the submission of annual reports on O&M activities, impacts of changes in operations or instances of closures are expected to be exacerbated if not communicated in real time to agencies and groups that can minimize the species effects.

Risk

The proposed action includes expected long (*i.e.*, several days or more) gate closures on average every two years due to high flow occurrences, and extended closures due to gate failures occurring twice in the last ten years with no alternative passage solutions. Proposed gate operations, maintenance, and expected gate failures causing closures for weeks to months causing reduced passage are expected to cause injury and death of adult and juvenile CCV steelhead frequently over the life of the project.

2.5.1.2 Effects to species: Redd Surveys and Manual Maintenance Activities

USACE is proposing several activities that although are intended to improve fish passage, and provide important fish monitoring information, may also cause general disturbance. These activities include redd surveys, manual debris removal with hand tools, and dam-crest flashboard installation. Activities proposed will cause a disruption in normal behavioral patterns, such as feeding, holding, and spawning of listed fish. Many of these activities may include walking or using hand tools in the water during times when fish may be present and may be observed during this work. Redd surveys in the lower Yuba River are proposed to monitor spawning near gravel augmentation sites. The surveys would include walking/boating through sections of the river to observe and assess redds through spawning seasons.

a. Effects to CV spring-run Chinook salmon

Exposure

The proposed action includes many activities that will have the effect of disrupting normal fish behaviors during summer and fall months when CV spring-run Chinook salmon adults, juveniles, and redds/eggs will be present and at risk of exposure (NMFS 2014b). This exposure is likely throughout the entire LYR, potentially putting the entire Yuba population of spring-run at risk of exposure. Proposed monitoring, maintenance methods, timing of implementation, and associated BMPs are intended to reduce exposure of fish, but these actions do not fully eliminate the fish behavioral modifications caused by the proposed action.

Response

Surveying for redds and manual maintenance activities occurring near the bank or in the water are likely to disrupt normal behavior patterns in juvenile and adult life stages. These activities require humans to be in the water working with hand tools in juvenile rearing areas and in spawning areas for redd surveys. Manual maintenance activities, such as debris removal with hand tools, may cause localized disturbances. Redd surveys will involve surveyors walking in spawning areas, locating redds, and measuring/collecting data on them once located.

Fry and juveniles frightened by the turbulence and sound from these activities are likely to seek temporary refuge in deeper water or behind or under rocks or vegetation (NMFS 2017). Due to the lack of riparian overstory in much of the LYR, juvenile spring-run Chinook salmon are likely to be physiologically stressed, and abandon typical rearing habitat putting them at higher risk for predation ((Marine and Cech 2004, Windell *et al.* 2017). In extreme cases, some individuals may leave a particular pool or habitat type and then return when observers leave the area. At times, the surveyors may observe adult fish, which are more sensitive to disturbance and could abandon their redd location, increasing the risk of delayed spawning or poor redd protection.

Risk

Although most effects of these activities are expected to be minor, harassment is the primary form of adverse effect associated with these activities and few, if any, injuries (and no deaths) are expected to occur. With implementation of the proposed minimization measures, the proposed action is expected to harass small numbers of adult and juvenile spring-run Chinook salmon annually during redd surveys and other similar proposed disturbance activities.

b. Effects to CCV steelhead

Exposure

The proposed action includes many activities that will have the effect of disrupting normal behaviors during summer and fall months when likely only yearling or juvenile steelhead would be present (NMFS 2014b). This exposure is likely throughout the entire LYR, potentially putting the entire Yuba population of steelhead at risk of exposure. Proposed monitoring, maintenance methods, timing of implementation, and associated BMPs are intended to further reduce exposure of fish, but these actions do not fully eliminate the behavioral effects caused by the proposed action.

Response

Activities occurring near the bank or in the water are likely to disrupt normal behavior patterns of juvenile life stages of CCV steelhead. Due to the lack of riparian overstory in much of the LYR, juvenile steelhead are likely to be physiologically stressed, and more susceptible to predation (Hostetter *et al*. 2012). Juveniles frightened by the turbulence and sound created by observers are likely to seek temporary refuge in deeper water or behind or under rocks or vegetation (NMFS 2017). In extreme cases, some individuals may leave a particular pool or habitat type and then return when observers leave the area. These responses increase the risk of predation.

Risk

Although most effects of these activities are expected to be minor, harassment is the primary form of adverse effect associated with these activities and few, if any, injuries (and no deaths) are expected to occur. With implementation of the proposed minimization measures, the proposed action is expected to harass small numbers of juvenile steelhead annually during redd surveys and other similar proposed disturbance activities.

c. Effects to sDPS green sturgeon

Exposure

Proposed activities causing general disturbance are mostly occurring upstream of DPD or on the banks and shallower areas around DPD itself. Since DPD limits the presence of green sturgeon to areas downstream of the dam, the likelihood of sturgeon being close enough to many of the disturbance activities that may cause behavioral changes is low. Eggs and juvenile sturgeon are not expected to be encountered by any of the activities expected to cause disturbance, such as redd surveys, debris removal, flashboard placement, etc., due to the timing of occurrences (NMFS 2018). Adults present downstream of DPD are only expected to be exposed in small numbers given the upstream location of most of these activities. Also, adult sturgeon below DPD are expected to hold toward the bottom of the pool at 15+ ft and are therefore unlikely to be exposed to any disturbance near the surface.

Response

Low numbers of green sturgeon present during activities that may cause disturbance include, adults holding below DPD. Those adults would be at such a depth (holding at the bottom of the DPD plunge pool) that any construction or monitoring activities that would occur near the surface or in shallower waters may not produce meaningful disturbance.

Risk

With the combination of green sturgeons' reduced exposure (below DPD), and their preference for holding in deep pools, sturgeon are unlikely to be affected to the point of behavioral changes by physical disturbances occurring near shore or near the surface of the water. With the combination of BMPs proposed, and the reduced likelihood of sturgeon presence in areas where many activities are occurring, adverse effects are not expected.

2.5.1.3 Effects to species: Contaminants from Spills or Leakage

During restoration activities, the potential exists for spills or leakage of toxic substances that could enter the Yuba River. Activities expected to utilize heavy machinery near the water have a higher potential for spills. These activities could include gravel augmentation, woody material placement, clearing sediment from fish ladder bays, removal of sediment upstream of DPD, and clearing of debris near the north fish ladder. Refueling, operation, and storage of construction equipment and materials could result in accidental spills of pollutants (*e.g.*, fuels, lubricants, sealants, and oil). High concentrations of contaminants can cause sub-lethal to lethal effects on fish.

a. Effects to CV spring-run Chinook salmon

Exposure

The proposed action includes the use of heavy equipment during summer and fall months when adult CV spring-run Chinook salmon, yearling or juveniles, and redds/eggs would be present and at risk of exposure to contaminants or spills. This exposure is likely throughout the entire LYR, putting the entire Yuba population of CV spring-run Chinook salmon at risk for potential exposure. Proposed monitoring, maintenance methods, and associated BMPs are intended to reduce exposure of fish to the maximum extent possible, and likely to significantly reduce risk of contaminant exposure to fish that may be in the area during proposed activities. BMPs proposed to help minimize spills or contaminants include: (1) cleaning heavy equipment of all oils, greases, soils, and organic materials prior to operation; (2) hoses and connections would be inspected prior to and periodically during operation to ensure there are no leaks; (3) heavy equipment would use vegetable based hydraulic fluids; and (4) a spill kit would be maintained on-site during heavy equipment operation (USACE 2023).

Response

Direct effects include mortality from exposure or increased susceptibility to disease that reduces the overall health and survival of the exposed fish. The severity of these effects depends on the contaminant, concentration, duration of exposure, and sensitivity of the affected life stage. A potential indirect effect of contamination is reduced prey availability since invertebrate prey survival could be reduced following exposure, decreasing food availability for fish.

Fish consuming contaminated prey may also absorb toxins directly and be exposed to biomagnification of the contaminant as it moves up the food chain. For salmonids, potential effects of reduced water quality during construction will be addressed by avoiding construction during times when salmonids are most likely to be present, using vegetable-based lubricants and hydraulic fluids in equipment operated in the wetted channel, and implementing the BMPs described in the BA (USACE 2023). These measures include provisions to avoid, and if necessary, clean up accidental releases of hazardous materials.

In general, water degradation or contamination can lead to either acute toxicity, resulting in death when concentrations are sufficiently elevated. More typically, concentrations are lower, leading to chronic or sublethal effects that reduce the physical health of the organism, and lessens its survival over an extended period of time. Exposure to contaminated food sources and bioaccumulation of contaminants from feeding on them may create delayed sublethal effects that negatively affect the growth, reproductive development, and reproductive success of listed anadromous fishes, thereby reducing their overall fitness and survival (Laetz *et al.* 2009). Mortality may become a secondary effect due to compromised physiology or behavioral changes that lessen the organism's ability to carry out its normal activities. For example, increased levels of heavy metals are detrimental to the health of an organism because they interfere with metabolic functions by inhibiting key enzyme activity in metabolic pathways, decreased neurological function, degrade cardiovascular output, and act as mutagens, teratogens, or carcinogens in exposed organisms (Salbu *et al.* 2008). For listed species, these effects may occur directly to the listed fish or to its prey base, which reduces the forage base available to the listed species.

Risk

Potential risk of effects to salmonids related to contaminant spills will be further reduced by the BMPs described in the proposed action. With implementation of these measures, potential risks from contaminants or spills will be avoided and not expected to result in injury or death to any life stage of spring-run.

b. Effects to CCV steelhead

Exposure

The proposed action includes the use of heavy equipment during summer and fall months when likely only yearling or juvenile steelhead would be present and at risk of exposure to contaminants or spills. This exposure is likely throughout the entire LYR, putting the entire Yuba population of steelhead at risk for potential exposure. Proposed monitoring, maintenance methods, and associated BMPs are intended to reduce exposure of fish to the maximum extent possible, and likely to significantly reduce risk of contaminant exposure to fish that may be in the area during proposed activities. BMPs proposed to help minimize spills or contaminants include: (1) cleaning heavy equipment of all oils, greases, soils, and organic materials prior to operation; (2) hoses and connections would be inspected prior to and periodically during operation to ensure there are no leaks; (3) heavy equipment would use vegetable based hydraulic fluids; and (4) a spill kit would be maintained on-site during heavy equipment .operation (USACE 2023).

Response

Direct effects include mortality from exposure or increased susceptibility to disease that reduces the overall health and survival of the exposed fish. The severity of these effects depends on the contaminant, concentration, duration of exposure, and sensitivity of the affected life stage. A potential indirect effect of contamination is reduced prey availability since invertebrate prey survival could be reduced following exposure, decreasing food availability for fish (Laetz *et al.* 2009).

Fish consuming contaminated prey may also absorb toxins directly and be exposed to biomagnification of the contaminant as it moves up the food chain. In general, water degradation or contamination can lead to either acute toxicity or chronic sublethal effects. More typically, concentrations are lower leading to chronic sublethal effects that reduce the physical health of the organism and lessen its survival over an extended period of time. Mortality may become a secondary effect due to compromised physiology or behavioral changes that lessen the organism's ability to carry out its normal activities (Goyer 1996).

For listed species, these effects may occur directly to the listed fish or to its prey base, which reduces the forage base available to the listed species. For salmonids, potential effects of reduced water quality during construction will be addressed by avoiding construction during times when salmonids are most likely to be present, using vegetable-based lubricants and hydraulic fluids in equipment operated in the wetted channel, and implementing the BMPs described in the BA (USACE 2023).

Risk

With implementation of the BMPs, potential risks from contaminants or spills would be avoided and, therefore, not expected to result in injury or death to any life stage of steelhead.

c. Effects to sDPS green sturgeon

Exposure

The proposed action includes the use of heavy equipment during summer and fall months when adult or juvenile green sturgeon would be present and at risk of exposure to contaminants or spills. This exposure is potentially throughout the entire LYR, potentially putting the entire Yuba population of green sturgeon at risk of exposure. Proposed monitoring, maintenance methods, and associated BMPs are intended to reduce exposure of fish to the maximum extent possible, and likely to significantly reduce risk of contaminant exposure to fish that may be in the area during proposed activities.

Response

Effects from contaminants can include injury and mortality from exposure or increased susceptibility to disease that reduces the overall health and survival of the exposed fish. The severity of these effects depends on the contaminant, concentration, duration of exposure, and sensitivity of the affected life stage.

A potential effect of contamination is reduced prey availability since invertebrate prey survival could be reduced following exposure, decreasing food availability for fish (Laetz *et al.* 2009). Fish consuming contaminated prey may also absorb toxins directly and be exposed to biomagnification of the contaminant as it moves up the food chain (Suedel *et al*. 1994).

Risk

With implementation of the BMPs, potential risks from contaminants or spills will be extremely low, and not expected to result in injury or death to any life stage of green sturgeon.

2.5.1.4 Effects to species: Noise

Noise generated by heavy equipment and personnel during in-water maintenance activities could adversely affect fish and other aquatic organisms. The potential direct effects of underwater noise on fish and other organisms depend on several biological characteristics (*e.g*., fish size, hearing sensitivity, behavior) and the physical characteristics of the sound (*e.g*., frequency, intensity, duration) to which fish and invertebrates are exposed (Mickle and Higgs 2017). Potential direct effects include behavioral effects, physiological stress, physical injury (including hearing loss), and mortality (Wysocki *et al.* 2007).

Exposure of adult and juvenile salmonids and sturgeon to noise will be minimized by conducting the majority of in-water activities during the dry season. The number of fish potentially residing in the action area during in-water work is expected to be lowest during this time of the year based on species life history, however, some adult and juvenile fish will still be present (NMFS 2014b, NMFS 2018). Activities expected to cause increases in noise include gravel augmentation, large woody material placement, clearing sediment from fish ladder bays, removal of sediment upstream of DPD, and clearing of debris near the fish ladders.

a. Effects to CV spring-run Chinook salmon

Exposure

The proposed action includes many activities that will produce in-stream noise during summer and fall months when all life stages of adult CV spring-run Chinook salmon would be present and at risk of exposure. This exposure is potentially throughout the entire LYR, putting the entire Yuba population of CV spring-run salmon at risk for potential exposure. Proposed monitoring, maintenance methods, timing of implementation, and associated BMPs are intended to further reduce exposure of fish, but these actions do not fully eliminate the risk of noise exposure caused by the proposed action.

Response

Once these activities start producing increased in-stream noise, individual fish are likely to detect the sounds and vibrations and avoid the immediate area. Smaller fish with lower mass are more susceptible to the impacts of elevated sound fields than larger fish, so they are more at risk for non-auditory tissue damage (Popper and Hastings 2009) than larger fish (yearlings and adults) of the same species. Multiple studies have also shown responses in the form of behavioral changes in fish due to human-produced noises (Wardle *et al*. 2001, Slotte *et al*. 2004, Popper and Hastings 2009).

Most of the activities proposed are not expected to produce noise levels resulting in immediate physical injury. Gravel augmentation can produce a large amount of in-water noise, and thus is the most likely to affect fish. The shallow depth of most areas within the work area combined with flowing water adding ambient sound will act to attenuate propagated sound within the water column. As gravel augmentation generally only occurs in shallow riffle areas suitable for salmonid spawning, much of the sound is expected to be attenuated quickly. Any fish disturbed by the aquatic noise generated by in-water activities are expected to move away to other suitable habitats with lower sound levels. Therefore, fish are not expected to be exposed to sound levels that may cause physical injury. They may however experience behavioral changes due to noise caused by in-water work activities, such as habitat avoidance and reduced feeding (Voellmy *et al.* 2014, NMFS 2017)

Risk

The effects of increased noise will be minor and are unlikely to result in injury or death to eggs, juvenile, or adult CV spring-run Chinook salmon that may be present. In-stream noise is expected to cause harm and harassment annually due to behavioral changes, such as reduced feeding, habitat avoidance, and increased risk of predation.

b. Effects to CCV steelhead

Exposure

The proposed action includes several activities that will produce in-stream noise during summer and fall months when yearling or juvenile CCV steelhead would be present and at risk of exposure. This exposure is potentially throughout the entire LYR, putting the entire Yuba population of CCV steelhead at risk for potential exposure. Proposed monitoring, maintenance methods, timing of implementation, and associated BMPs are intended to further reduce exposure of fish, but these actions do not fully eliminate the risk of noise exposure caused by the proposed action.

<u>Response</u>

Once these activities start producing increased in-stream noise, individual fish are likely to detect the sounds and vibrations and avoid the immediate area. Smaller fish with lower mass are more susceptible to the impacts of elevated sound fields than larger fish, so they are more at risk for non-auditory tissue damage (Popper and Hastings 2009) than larger fish (yearlings and adults) of the same species. Multiple studies have also shown responses in the form of behavioral changes in fish due to human-produced noises (Wardle *et al.* 2001, Slotte *et al*. 2004, Popper and Hastings 2009).

Most of the activities proposed are not expected to produce noise levels resulting in immediate physical injury. Gravel augmentation can produce a large amount of in-water noise, and thus is the most likely to affect fish. The shallow depth of most areas within the work area combined with flowing water adding ambient sound will act to attenuate propagated sound within the water column. As gravel augmentation generally only occurs in shallow riffle areas suitable for salmonid spawning, much of the sound is expected to be attenuated quickly. Any fish disturbed by the aquatic noise generated by in-water activities are expected to move away to other suitable habitats with lower sound levels. Therefore, fish are not expected to be exposed to sound levels that may cause physical injury. They may however experience behavioral changes due to noise caused by in-water work activities, such as habitat avoidance and reduced feeding (NMFS 2017).

<u>Risk</u>

The effects of increased noise will be minor and are unlikely to result in injury or death to eggs, juvenile, or adult CCV steelhead that may be present. In-stream noise is expected to cause behavioral changes annually, such as reduced feeding, habitat avoidance, and increased risk of predation.

c. Effects to sDPS green sturgeon

<u>Exposure</u>

The proposed action includes activities that will produce in-stream noise during summer and fall months when adult or juvenile green sturgeon would be present and at risk of exposure. Activities expected to cause increases in noise include clearing sediment from fish ladder bays, removal of sediment upstream of DPD, and clearing of debris near the fish ladders. The proposed gravel augmentation and large woody material placement are both occurring well above DPD, and are therefore not expected to have noise effects that would reach areas where green sturgeon are present (USACE 2023). This exposure is potentially throughout the entire LYR, putting the entire Yuba population of green sturgeon at risk for potential exposure. Proposed monitoring, maintenance methods, timing of implementation, and associated BMPs are intended to further reduce exposure of fish, but these actions do not fully eliminate the risk of noise exposure caused by the proposed action.

Response

As green sturgeon are only currently present below DPD, the likelihood of them being present during activities that may cause high levels of instream noise are minimal. Adult sturgeon holding below DPD are also at a depth that any disturbance or noises in shallow areas near the banks or near the surface are unlikely to reach the level of behavioral effects, injury, or mortality to any adults or juveniles holding at the bottom of the DPD plunge pool.

Risk

With implementation of the BMPs, potential disturbance to green sturgeon from noise will be minor and unlikely to result in behavioral changes, injury, or death to any life stage of green sturgeon.

2.5.1.5 Effects to species: In-stream Construction, Maintenance, and Monitoring Activities

Although activities are expected to improve fish passage and spawning success, minimal physical disturbance in aquatic habitat will occur during maintenance and other proposed activities, such as gravel augmentation, large woody material placement, clearing sediment from fish ladder bays, removal of sediment upstream of DPD, and debris removal or other maintenance activities using heavy equipment.

a. Effects to CV spring-run Chinook salmon

Exposure

The proposed action includes in-stream construction and monitoring activities during summer and fall months when all life stages of CV spring-run Chinook salmon would be present and at risk of exposure. This exposure is potentially throughout the entire LYR, putting the entire Yuba population of spring-run at risk for potential exposure. Proposed monitoring, maintenance methods, and timing of implementation are intended to further reduce exposure of fish, but these actions do not fully eliminate the risks associated with in-stream construction and monitoring activities caused by the proposed action. Additionally, the in-water work period is scheduled to occur during the dry summer period (August) when the lowest amount of salmonids are expected to be within the action area. However, due to their life history, holding adults and rearing juvenile spring-run Chinook are expected to be in the area during the work window and may be affected by project activities.

Response

In-stream construction and monitoring activities have the potential to affect the juvenile and adult life stages of salmon through displacement, disruption of normal behavior, and direct injury or death from crushing during in-water activities.

The proposed in-stream activities may also cause mortality and reduced abundance of benthic aquatic macroinvertebrates within the action area, due to the placement of gravel over the existing streambed. Increased suspended sediment from in-water work is correlated with a decline in primary productivity and reductions in the abundance and diversity of invertebrate fauna in the affected area (Lloyd 1987; Newcombe and MacDonald 1991). These effects to aquatic macroinvertebrates are expected to be frequent, but short-term, as sediment removal and disturbance activities may occur annually and alter the natural streambed (USFWS 2004). Invertebrates may be able to repopulate to a moderate level in areas where disturbance activities do not occur for several consecutive years. As sediment removal and disturbance activities occur as needed, it cannot be assumed that invertebrate populations will have the necessary time to fully repopulate between actions. The amount of food available for salmonids in the action area is, therefore, expected to be decreased due to the recurring maintenance in the areas where sediment removal and disturbance activities occur, and cause increased stress and reduced fitness.

During construction activities, juvenile and, particularly, adult fish may be able to detect areas of active disturbance and avoid those portions of the action area where equipment is actively operated or a turbidity plume occurs. Juveniles may also stay and hunker down in the activity zone. Additionally, there is the more remote possibility of physical injury or direct mortality to juveniles hiding in the substrate from being contacted by the excavator bucket or other equipment in the water. Juveniles will have opportunities to move to other portions of the channel and avoid potential injury or mortality. Adult salmonids are expected to move out of the area to adjacent suitable habitat as equipment enters the water, or before gravel or sediment is placed over them due to the disturbance caused by vibrations on land. Multiple studies have shown responses in the form of behavioral changes in fish due to human produced noise (Wardle *et al*. 2001, Slotte *et al*. 2004, Popper and Hastings 2009).

Though adults are more likely able to avoid in-water disturbances, a few adults may also be injured or killed due to the large scale and frequent occurrence of the proposed action activities. Although salmonids are expected to avoid areas being dredged, an undetermined number of juvenile salmonids may attempt to find shelter in the substrate and be injured or killed by the dredging equipment. Proposed activities will cause intermittent physical disturbance over the long-term, and many of the maintenance activities will occur annually. Disturbances from proposed gravel augmentation, woody material placement, clearing sediment from fish ladder bays, removal of sediment upstream of DPD, and clearing of debris near the fish ladders may cause injury, localized behavioral disturbances, and mortality to species.

Risk

While the work window avoids times where higher numbers of CV spring-run Chinook salmon would be in the area, adults and juveniles are still expected to be present in the LYR during proposed activities. Disturbances from proposed gravel augmentation, woody material placement, conducting redd surveys, clearing sediment from fish ladder bays, removal of sediment upstream of DPD, and clearing of debris near the fish ladders may cause injury, localized behavioral disturbances, and mortality to species. Small numbers of fish are expected to be injured or killed from crushing by construction equipment and in-water work activities due to the large scale of the action area, and the annual occurrence of much of the work. Therefore, even with the minimization measures described above, the proposed action is expected to result in injury or death to a small number of juvenile and adult CV spring-run Chinook salmon annually during the life of the project.

b. Effects to CCV steelhead

Exposure

The proposed action includes in-stream construction and monitoring activities during summer and fall months when juvenile CCV steelhead would be present and at risk of exposure. This exposure is likely throughout the entire LYR, putting the entire Yuba population of CCV steelhead at risk for potential exposure. Proposed monitoring, maintenance methods, timing of implementation, and associated BMPs are intended to further reduce exposure of fish, but these actions do not fully eliminate the risks associated with in-stream construction and monitoring activities caused by the proposed action.

Response

The in-water work period is scheduled to take place during the dry summer period (August) when the least amount of ESA-listed fish are expected to be within the action area. However, juvenile steelhead are expected to be in the area during the work window and may be affected by project activities. In-stream construction and monitoring activities have the potential to affect juvenile steelhead through displacement, disruption of normal behavior, and direct injury or death from crushing during in-water activities.

The proposed in-stream activities may also cause mortality and reduced abundance of benthic aquatic macroinvertebrates. These effects to aquatic macroinvertebrates are expected to be long-term, as sediment removal and disturbance activities may occur annually and alter the natural streambed (USFWS 2004). The amount of food available for salmonids in the action area is, therefore, expected to be decreased due to the recurring maintenance in the areas where sediment removal and disturbance activities occur, and cause increased stress and reduced fitness.

During construction activities, juvenile CCV steelhead may be able to detect areas of active disturbance and avoid those portions of the action area where equipment is actively operated or a turbidity plume occurs. Juveniles may also stay and hunker down in the activity zone. Additionally, there is a more remote possibility of physical injury or direct mortality to juveniles hiding in the substrate from being contacted by the excavator bucket or other equipment in the water. Juveniles will have opportunities to move to other portions of the channel where they can avoid potential injury or mortality. Multiple studies have shown responses in the form of behavioral changes in fish due to human-produced disturbances (Wardle *et al*. 2001, Slotte *et al*. 2004, Popper and Hastings 2009).

Although salmonids are expected to avoid areas being dredged, an undetermined number of juvenile steelhead may attempt to find shelter in the substrate and be injured or killed by the dredging equipment. Proposed activities will cause intermittent physical disturbance over the long term, and many of the maintenance activities will occur annually. Disturbances from proposed gravel augmentation, woody material placement, clearing sediment from fish ladder bays, removal of sediment upstream of DPD, and clearing of debris near the fish ladders may cause injury, localized behavioral disturbances, and mortality to species.

<u>Risk</u>

While the in-water work window of August avoids times when higher numbers of steelhead would be in the area, some juveniles are still expected to be present in the LYR during proposed activities. Disturbances from proposed gravel augmentation, woody material placement, clearing sediment from fish ladder bays, removal of sediment upstream of DPD, and clearing of debris near the fish ladders may cause injury, localized behavioral disturbances, and mortality to species. Proposed activities will cause intermittent physical disturbance over the long term, and many of the maintenance activities will occur annually. Small numbers of fish are expected to be injured or killed from crushing by construction equipment and in-water work activities due to the large scale of the action area, and the annual occurrence of much of the work. Therefore, even with the minimization measures described above, the proposed action is expected to result in injury or death to a small number of juvenile steelhead annually during the life of the project.

c. Effects to sDPS green sturgeon

<u>Exposure</u>

The proposed action includes instream construction and monitoring activities during summer and fall months when adult or juvenile green sturgeon would be present and at risk of exposure. This exposure is potentially throughout the entire LYR, putting the entire Yuba population of green sturgeon at risk for potential exposure. Proposed monitoring, maintenance methods, timing of implementation, and associated BMPs are intended to further reduce exposure of fish, and are likely to significantly reduce risk of contaminant exposure to sturgeon that may be in the area during proposed activities.

<u>Response</u>

As green sturgeon are only currently present below DPD, the likelihood of them being present during activities where physical contact or crushing are a risk is minimal. Adult sturgeon holding below DPD are also at a depth that any construction or monitoring activities that would occur near the surface or in shallower waters are unlikely to be noticed by adults holding at the bottom of the DPD plunge pool, and therefore the fish are not expected to be disturbed by the impact of these activities..

<u>Risk</u>

With implementation of the BMPs, potential disturbance to green sturgeon from instream construction or monitoring will be minor and unlikely to result in behavioral changes, injury, or death to any life stage of green sturgeon. However, turbidity and suspended sediment from these activities are discussed separately below.

2.5.1.6 Effects to species: Sediment and Turbidity

Construction and sediment-disturbing activities related to the proposed action will temporarily disturb soil and riverbed sediments and riparian vegetation, resulting in the potential for temporary increases in turbidity and suspended sediments. Activities expected to cause increases in turbidity include gravel augmentation (between July 15 to August 31), large woody material placement (August to December), clearing sediment from fish ladder bays (August), removal of sediment upstream of DPD (August), and clearing of debris near the north fish ladder. Increases in sedimentation and siltation above the background level could potentially affect fish species and their habitat by reducing embryo and juvenile survival, impairing gill function, interfering with feeding activities, causing breakdown of social organization, and reducing primary and secondary productivity (Cordone and Kelley 1961).

a. Effects to CV spring-run Chinook salmon

Exposure

The proposed action includes construction and sediment disturbing activities that will temporarily disturb soil and riverbed sediments in early spring, summer, and fall months when adult, juvenile, and egg/larval stage CV spring-run Chinook would be present and at risk of exposure. This exposure is likely throughout the entire LYR, putting the entire Yuba population of spring-run at risk for potential exposure. Proposed monitoring, maintenance methods, timing of implementation, and associated BMPs are intended to further reduce exposure of fish, but those actions do not fully eliminate the risks associated with increased turbidity and suspended sediment caused by the proposed action.

Impacts to CV spring-run Chinook salmon will be minimized by conducting in-water activities during the drier months (whenever possible) when the number of fish potentially residing in the action area is expected to be lowest based on species life history (NMFS 2014b, NMFS 2018).

For those fish that are present and exposed to turbidity plumes, the higher concentrations of suspended sediment can adversely affect salmonids. The severity of these effects depends on the sediment concentration, duration of exposure, and sensitivity of the affected life stage.

Response

The effects of increased sedimentation and turbidity will be minimized by the timing of activities and by implementing the project's BMPs. Proposed BMPs include monitoring turbidity in accordance with the section 401 Water Quality Certification for the project. If turbidity exceeds the thresholds identified in the certification (15 NTUs above the most recent upstream reading), work will cease until turbidity returns to background levels (USACE 2023).The majority of the increase in turbidity associated with in-stream work is likely to occur only in the vicinity of the specific worksite, attenuating downstream as suspended sediment settles out of the water column. Turbidity plumes would be expected to affect only a portion of the channel width and extend up to 300 feet downstream of the specific activity's footprint.

Juvenile salmonids have been observed to avoid streams that are chronically turbid (Lloyd 1987) or move laterally or downstream to avoid turbidity plumes (Sigler *et al*. 1984). For juveniles, this may increase their exposure to predators if they are forced to leave protective habitat (Gregory 1992). Temporary spikes in suspended sediment may result in behavioral avoidance of the site by fish; several studies have documented active avoidance of turbid areas by juvenile and adult salmonids (Bisson and Bilby 1982, Lloyd 1987, Sigler *et al*. 1984).

Sigler *et al*. (1984) found that prolonged exposure to turbidity between 25 and 50 NTUs resulted in reduced growth and increased emigration rates of juvenile Coho salmon and steelhead compared to controls. Newcombe and Jensen (1996) also found increases in turbidity could lead to reduced feeding rate and behavioral changes, such as alarm reactions, displacement or abandonment of cover, and avoidance, which can lead to increased predation and reduced feeding. These findings are generally attributed to reductions in the ability of salmon to see and capture prey in turbid water (Gregory 1991). Chronic exposure to high turbidity and suspended sediment may also affect growth and survival by impairing respiratory function, reducing tolerance to disease and contaminants, and causing physiological stress (Sigler *et al*. 1984). Berg and Northcote (1985) observed changes in social and foraging behavior and increased gill flaring (an indicator of stress) in juvenile Coho salmon at moderate turbidity (30-60 NTUs). In this study, behavior returned to normal quickly after turbidity was reduced to lower levels (0-20 NTU). Based on the types and duration of proposed in-water construction methods, short-term increases in turbidity and suspended sediment may disrupt feeding activities or result in avoidance or displacement of fish from preferred habitat. The magnitude of potential effects on fish will depend on the timing and extent of sediment loading and flow in the river before, during, and immediately following construction.

Generally, we expect that most fish will actively avoid the elevated turbidity plumes when possible during construction activity. This expectation is based on the general avoidance behaviors of salmonids and the requirement to suspend construction when turbidity exceeds Central Valley Regional Water Quality Control Board standards (USACE 2023). Some juveniles exposed to turbidity plumes may be injured or killed by predatory fish that take advantage of disrupted normal behavior. Once fish move past the turbid water, normal feeding and migration behaviors are expected to resume. Expected fish responses include displacement, increased stress, increased food competition, behavioral disruption, and temporary habitat avoidance.

<u>Risk</u>

Proposed operations and maintenance will cause intermittent small and large-scale increases in turbidity over the duration of the proposed action. A low proportion of fish exposed to the area of increased turbidity are expected to be adversely affected by behavioral modifications leading to reduced feeding, habitat avoidance, and increased predation due to displacement and the lowered visibility caused by the suspended sediment. As this proposed action is expected to have multiple annual activities causing turbidity occurrences, a small number of juvenile CV spring-run chinook salmon are expected to be injured or killed through the ongoing proposed action.

b. Effects to CCV steelhead

<u>Exposure</u>

The proposed action includes construction and sediment disturbing activities that will temporarily disturb soil and riverbed sediments during early spring, summer, and fall months when adult, juvenile, and egg/larval stage CCV steelhead would be present and at risk of exposure. This exposure is likely throughout the entire LYR, putting the entire Yuba population of steelhead at risk for potential exposure. Proposed monitoring, maintenance methods, timing of implementation, and associated BMPs are intended to further reduce exposure of fish, but these actions do not fully eliminate the risks associated with increased turbidity and suspended sediment caused by the proposed action.

Impacts to CCV steelhead will be minimized by conducting in-water activities during the drier months (whenever possible) when the number of fish potentially residing in the action area is expected to be lowest based on species life history (NMFS 2014b, NMFS 2018).

For those fish that are present and are exposed to turbidity plumes, the higher concentrations of suspended sediment can have adverse effects on salmonids. The severity of these effects depends on the sediment concentration, duration of exposure, and sensitivity of the affected life stage.

<u>Response</u>

The effects of increased sedimentation and turbidity will be minimized by the timing of activities and by implementing the proposed BMPs. Proposed BMPs include monitoring turbidity in accordance with the section 401 Water Quality Certification for the project. If turbidity exceeds the thresholds identified in the certification (15 NTUs above the most recent upstream reading), work will cease until turbidity returns to background levels. Most of the increases in turbidity associated with in-stream work are likely to occur only in the vicinity of the specific worksite, attenuating downstream as suspended sediment settles out of the water column. Turbidity plumes would be expected to affect only a portion of the channel width and extend up to 300 feet downstream of the specific activity's footprint.

Juvenile salmonids have been observed to avoid streams that are chronically turbid (Lloyd 1987) or move laterally or downstream to avoid turbidity plumes (Sigler *et al*. 1984), which result in behavioral avoidance of sites by juvenile and adult salmonids and increase their exposure to predators (Bisson and Bilby 1982, Lloyd 1987, Servizi and Martens 1992, Sigler *et al*. 1984).

Sigler *et al*. (1984) found that prolonged exposure to turbidity between 25 and 50 NTUs resulted in reduced growth and increased emigration rates of juvenile Coho salmon and steelhead compared to controls. Chronic exposure to high turbidity and suspended sediment may also affect growth and survival by impairing respiratory function, reducing tolerance to disease and contaminants, and causing physiological stress (Waters 1995). Based on the types and duration of proposed in-water construction methods, short-term increases in turbidity and suspended sediment may disrupt feeding activities or result in avoidance or displacement of fish from preferred habitat. The magnitude of potential effects on fish will depend on the timing and extent of sediment loading and flow in the river before, during, and immediately following construction.

Generally, we expect that most fish will actively avoid the elevated turbidity plumes when possible during construction activity. This expectation is based on the general avoidance behaviors of salmonids and the requirement to suspend construction when turbidity exceeds Central Valley Regional Water Quality Control Board standards (USACE 2023). Some juveniles that are exposed to turbidity plumes may be injured or killed by predatory fish that take advantage of disrupted normal behavior. Once fish move past the turbid water, normal feeding and migration behaviors are expected to resume. Expected fish responses include displacement, increased stress, behavioral disruption, and temporary habitat avoidance.

Risk

Proposed operations and maintenance will cause intermittent small and large-scale increases in turbidity over the duration of the proposed action. A low proportion of fish that are exposed to the area of increased turbidity are expected to be adversely affected by behavioral modification leading to reduced feeding, habitat avoidance, and increased predation due to displacement and the lowered visibility caused by the suspended sediment. As this project is expected to have multiple annual activities causing turbidity occurrences for the life of the dam, a small number of juvenile steelhead are expected to be injured or killed through the life of the proposed action.

c. Effects to sDPS green sturgeon

Exposure

The proposed action includes construction and sediment-disturbing activities that will temporarily disturb soil and riverbed sediments during early spring, summer, and fall months when adult or juvenile green sturgeon would be present and at risk of exposure. This exposure is likely throughout the entire LYR, putting the entire Yuba population of green sturgeon at risk for potential exposure. Impacts to sturgeon will be minimized by conducting in-water activities during the drier months (whenever possible) when the number of fish potentially residing in the action area during in-water work is expected to be lowest based on species life history (NMFS 2018). Proposed BMPs include monitoring turbidity in accordance with the section 401 Water Quality Certification for the project, which is expected to reduce exposure duration and severity. If turbidity exceeds the thresholds identified in the certification (15 NTUs above the most recent upstream reading), work will cease until turbidity returns to background levels.

Response

Green sturgeon are expected to be more vulnerable than salmonids to sediment contamination due to their benthic-oriented behavior, which put them in closer proximity to the contaminated sediment horizon, although it is unclear if juveniles exhibit this behavior to the same extent as adults (Presser and Luoma 2010, 2013). Increases in suspended sediment are likely to cause sediment deposition in deep pools where water slows and adult sturgeon hold and spawn. Excessive sedimentation over time can also reduce successful green sturgeon spawning and egg survival (Waters 1995).

Turbidity and sedimentation events are not expected to affect visual feeding success of green sturgeon, as they are not believed to utilize visual cues (Sillman *et al.* 2005). Sturgeon are benthic invertebrate feeders that forage on organisms, such as clams, that can sequester contaminants at much higher levels than the ambient water or sediment content. Of particular concern is the bioaccumulation of selenium that can occur in filter feeders (Linville *et al*. 2002).

Changes in turbidity and suspended sediment levels may negatively impact fish populations temporarily when deposition of fine sediments fills interstitial substrate spaces in food-producing riffles, reducing the abundance and availability of aquatic insects and cover for juvenile fish which are food sources for sturgeon (Bjornn and Reiser 1991). While sDPS green sturgeon are lotic fish, as bottom feeders their foraging activity may not be as impacted as other species due to turbidity and may be increased during times of higher turbidity. Wishingrad *et al.* (2015) found that lake sturgeon (*Acipenser fulvescens*) exhibited greater foraging activity in turbid water than in clear water.

Less is known about the specific detrimental physical and physiological effects of sediment and turbidity to sturgeon. It is believed that high levels of turbidity can generally result in gill fouling, reduced temperature tolerance, reduced swimming capacity, and reduced forage capacity in lotic fishes (Wood and Armitage 1997). An increase in foraging activity during turbidity plumes could put sturgeon at greater risk for gill fouling and other negative physiological effects of suspended sediments.

Risk

For those fish that are present and are exposed to turbidity plumes, the higher concentrations of suspended sediment can have adverse effects on sturgeon. The severity of these effects depends on the sediment concentration, duration of exposure, and sensitivity of the affected life stage. Proposed operations and maintenance will cause intermittent small and large-scale increases in turbidity over the lifetime of the proposed action. A low proportion of fish that are exposed to the area of increased turbidity are expected to be adversely affected by behavioral modification leading to reduced feeding and habitat avoidance caused by the suspended sediment.

2.5.1.7 Effects to species: Reduction in Prey to Southern Resident Killer Whale

a. Effects to Southern Resident Killer Whale DPS

Exposure

Healthy Chinook salmon populations along the Pacific coast are important for SRKW health, survival, and reproduction (see section 2.4.3.4 for a summary of the evidence). Given the whales' seasonal movements in the Salish Sea (primarily during summer and fall) and along the Canadian, Washington, Oregon, and northern California coasts (primarily during winter and spring), it is critical that a diverse range of Chinook salmon stocks in different times and areas are available to support the population. Effects of reductions in overall Chinook salmon abundance are likely a more significant risk to SRKWs when Chinook abundance is already relatively low. Past efforts have recognized the greater risk of reduced prey availability to SRKWs (Nelson *et al.* 2024), particularly in low Chinook salmon abundance years (PFMC 2020). Additionally, winter and spring appear to be vulnerable times for SRKW, when they expand seasonal movements along the coast (NMFS 2021b), diversify their diet (Hanson *et al.* 2021), and present in poor body condition, suggesting nutritional stress (Fearnbach *et al*. 2018; 2020).

CV Chinook salmon constitute a sizable proportion of the total abundance of Chinook salmon in SRKW diet in the winter and spring months. CV Chinook salmon become an increasingly significant portion of prey source during any southerly movements of SRKW along the coast of Oregon and California that may occur during the winter and spring (Hanson *et al.* 2021; NMFS 2021c). CV fall-run Chinook salmon can be expected to constitute at least 25 percent of local abundance in many places throughout this area at any time (Bellinger *et al.* 2015), and are expected to constitute well over 50 percent of the local abundance of Chinook salmon in some areas off California when SRKW are present there (Shelton *et al.* 2019). Hanson *et al.* (2021) used genetic analysis of prey remains and fecal samples to determine the composition of SRKW prey in their coastal habitat in the fall, winter, and spring months between 2004 and 2017. They found that although the average proportion of the diet made up by CV Chinook salmon from February through April is about 20 percent, the contribution varies in each of those months.

The dominant CV stock noted in the study from 2004 to 2017 in February and March was observed to be spring-run Chinook salmon with 18.3 ± 11 percent of the February diet and 11.7 ± 9 percent of the March diet. In April, 26.6 ± 17.1 percent of SRKW diet is composed of CV fall-run Chinook salmon, with no spring-run Chinook salmon detected in that month (Hanson *et al.* 2021). In February and March, when spring-run CV Chinook salmon dominated the stocks from the Central Valley in samples analyzed, the mean contribution of fall-run Chinook salmon was 0, however, the standard error for those months was 15 and 6 percent, respectively. Winter-run Chinook salmon were not detected in the SRKW diet (Hanson *et al.* 2021). They also observed CV fall-run Chinook salmon in about 5 percent of the prey samples collected in Puget Sound. CV fall-run Chinook salmon have been detected as far north in the SRKW range as northwest Vancouver Island (Shelton *et al.* 2020).

These diet data led to the development of the 2018 Priority Chinook Stocks Report (NMFS and WDFW 2018), which utilizes 3 different factors to weight the importance of different runs of Chinook as part of the SRKW diet. The factors include (1) the Chinook stock (*i.e.,* different runs of Chinook, such as spring-run, and fall/late fall-run) is an observed part of SRKW diet; (2) stock is consumed during times of reduced SRKW body condition (October-May); and (3) the degree of spatial and temporal overlap. The Chinook salmon populations with the highest total scores are considered the highest priority to increase abundance to benefit the whales.

The Yuba produces three runs of Chinook salmon that are identified in this report, though fall-run and late fall-run are considered one stock in the analysis: CV spring-run Chinook, CV fall-run/late fall-run Chinook. Both stocks are reported as being greater than 5% of the SRKW diet, and consumed during the months of October through May, indicating they fulfill factors 1 and 2 (1 point each). Factor 3 is scored from 0 to 3 based on the amount of the stock that overlaps with SRKW habitat in the same timeframe. CV spring-run Chinook were rated a 1.5 for Factor 3, while fall-run/late fall-run were rated 0.75. The 2018 Priority stocks report scored CV spring-run Chinook at a 3.5 overall, and CV fall and late-fall run at a 2.75 overall. This indicates that both stocks that are identified as priority prey have the ability to make up a significant portion of SRKW diet, though CV spring-run Chinook may have a larger importance than fall-run due to more spatial/temporal overlap.

Table 7 demonstrates the average percentage of returns that the Yuba population makes up from the CV spring-run Chinook and CV fall-run Chinook ESUs each year. This is important to note as CV fall-run/late fall-run overall population numbers are exponentially higher than the CV spring-run Chinook ESU. The Yuba's contribution to the overall fall-run Chinook ESU is generally low (about 2.76% on average), but the contribution to the CV spring-run Chinook population can be substantial in some years. The Yuba averages about 20% of the total CV spring-run annual adult returns based on data from 2004 through 2021. The Yuba population however can make up anywhere from 3% to over 55% of the total CV spring-run ESU returns.

Table 7. Yuba River annual percent of ESU production for CV spring-run Chinook and CV fall-run Chinook (USACE 2023, raw VAKI data PSMFC 2019-2024, CDFW GrandTab).

Year	% of total CV spring-run ESU production	% of total CV fall-run ESU production
2004	11.12%	1.44%
2005	19.83%	2.38%
2006	11.95%	1.53%
2007	3.68%	1.37%
2008	9.96%	2.26%
2009	43.08%	6.40%
2010	55.77%	2.37%
2011	28.90%	4.37%
2012	10.91%	2.21%
2013	17.17%	2.19%
2014	22.08%	3.69%
2015	12.74%	4.82%
2016	N/A	N/A
2017	N/A	N/A
2018	8.98%	2.39%
2019	N/A	1.25%
2020	43.45%	2.27%
2021	6.12%	3.29%

Reduction of SRKW prey due to the proposed action is expected primarily due to barriers to fish passage at DPD, resulting in frequent prevention of access to preferred habitat upstream of DPD. When coupled with the downstream impacts of instream construction/maintenance (resulting in harassment, increased turbidity, and predation), and water diversions (resulting in entrainment, and impingement), it reduces the abundance and productivity of CV spring-run and fall-run/late fall-run Chinook salmon in the Yuba River. Recognizing that the CV spring-run Chinook salmon ESU is currently at a moderate to high risk of extinction (SWFSC 2023), any reduction in the viability of the Yuba River population is likely to reduce the viability and further increase the extinction risk of the ESU. This risk to the ESU means high risk to SRKW, which are highly dependent on this population during a vulnerable time. The ESU for CV fall-run/late fall-run Chinook is not an ESA-listed species, and when previously evaluated was determined to be at a low risk for extinction (NMFS 1999). CV fall-run/late fall-run Chinook salmon will generally experience the same effects from the proposed action as CV spring-run Chinook salmon. For instance, fish passage effects from the proposed action will also impact CV fall-run/late fall-run Chinook salmon since all runs of Chinook salmon show preference for the north fish ladder. CV fall-run/late fall-run may be less likely to experience pre-spawn mortality since they hold in the river for a shorter amount of time, but they would likely still experience some pre-spawn mortality due to expenditure of limited energy in trying to ascend closed and reduced clearance bays due to sediment accumulation that result in documented fallback (PSMFC unpublished VAKI data), if the upstream gates are closed during their migration. Passage data at DPD indicates that, like CV spring-run Chinook salmon, CV fall-run/late fall-run Chinook salmon prefer to spawn upstream of DPD (VAKI data). Monitoring data from recent years shows that the Yuba's contribution to the overall fall-run ESU is generally low, but the contribution to the CV spring-run Chinook population can be substantial in some years (CDFW GrandTab, PSMFC unpublished VAKI data).

New analysis by Holt *et al*. (2021b) found that the probability of prey capture for SRKWs increased as prey abundance increased (both Chinook and Coho), highlighting the importance of prey availability in meeting caloric needs. Though there are general estimates of how many Chinook salmon need to be consumed to meet the biological needs of the whales, we do not have estimates of the total amount needed in their environment or what density is needed for the population to be able to successfully forage and consume this amount. Therefore, we are unable to quantify how any reduction in the number of adult Chinook salmon in the ocean by the proposed action affects foraging efficiency of the whales and are limited in our interpretation of these values. However, with the Yuba CV spring-run Chinook population weighting so heavily on the overall ESU contribution during drought years, it is clear that there are times where a significant portion of the SRKW diet would be based on Yuba CV spring-run Chinook salmon.

Proposed monitoring, maintenance methods, timing of implementation, and associated BMPs are intended to further reduce lethal effects to Chinook salmon, but do not fully eliminate the risks to SRKWs caused by the proposed action.

<u>*Response*</u>

Populations with healthy individuals may be less affected by changes to prey abundance than populations with less healthy individuals (*i.e.*, there may be a spectrum of risk based on the status of the whale population). Because SRKWs are already impacted due to the cumulative effects of multiple stressors, and the stressors can interact additively or synergistically, any additional stress, such as reduced Chinook salmon abundance, likely has a greater physiological effect than it would for a healthy population, which may have negative implications for SRKW vital rates and population viability (Lacey *et al.* 2017).

At some low Chinook salmon abundance levels, the prey available to the whales may not be sufficient to allow for successful foraging leading to adverse effects, such as reduced body condition and growth and/or poor reproductive success. This could affect SRKW survival and fecundity. For example, food scarcity could cause whales to draw on fat stores, mobilizing the relatively high levels of contaminants stored in their fat and potentially affecting reproduction and immune function (Mongillo *et al.* 2016). Increasing time spent searching for food during periods of reduced prey availability may decrease the time spent socializing, potentially reducing reproductive opportunities. Also, low abundance across multiple years may have an even greater effect, because SRKWs likely require more food consumption during certain life stages. Female body condition and energy reserves potentially affect reproduction and/or result in reproductive failure at multiple stages of reproduction (*e.g.*, failure to ovulate, failure to conceive, miscarriage, failure to successfully nurse calves, etc.), and effects of prey availability on reproduction should be combined across consecutive years. Good fitness and body condition coupled with stable group cohesion and reproductive opportunities are important for reproductive success.

The health of individual animals and the overall population dynamics of SRKW are related to the abundance of Chinook salmon available as prey throughout the range of SRKW. Reductions in the availability of SRKW's preferred prey, Chinook salmon, would be expected to influence the behavior and potentially affect the fitness of individual SRKW, and may affect the survival and reproductive success of SRKW. As members of K and L pods in particular are likely to spend at least some time in coastal waters where CV Chinook salmon can be found, they would be affected by reductions in CV Chinook salmon abundance due to the proposed action. Body condition data collected using photogrammetry suggest that these winter and spring months may be a time of low prey availability, resulting in seasonally poorer body condition, particularly among younger individuals (Fearnbach *et al.* 2019). The number of reproductive-aged females in K and L pods has declined over time, while the number of reproductive-age females in J pod has increased over that same period. These population dynamics could further exacerbate the impacts of reduced prey availability on the reproductive success of the two pods as a result of the proposed action.

<u>Risk</u>

NMFS and Washington Department of Fish and Wildlife (WDFW) developed a priority stock report identifying the Chinook salmon stocks along the West Coast that are important for the SRKW prey base (NMFS and WDFW 2018). Of the CV Chinook salmon stocks, CV spring-run Chinook salmon was determined to be the highest priority, followed by fall-run and then winter-run Chinook salmon. Due to the expected injury or death to at least a small portion of juvenile and adult CV spring-run Chinook salmon annually, with larger mortality incidents expected every few years, SRKW are expected to experience behavioral disturbances, reduced body condition, and reduced fitness as a result of the proposed action.

2.5.2. Effects to Critical Habitat

Critical habitat has been designated in the Yuba River extending up to Englebright Dam for CV spring-run Chinook salmon and CCV steelhead, and up to DPD for sDPS green sturgeon. The Yuba River below Englebright Dam has highly degraded habitat PBFs.

The Yuba River provides three of the six PBFs essential to support one or more life stages of the CV spring-run Chinook salmon and CCV steelhead. The specific PBFs relevant to the Yuba River are: (1) freshwater migration corridors; (2) freshwater spawning sites; and (3) freshwater rearing sites. The Yuba River also includes PBFs for freshwater riverine habitats for sDPS green sturgeon as follows: (1) food resources; (2) substrate type or size; (3) water flow; (4) water quality; (5) migratory corridor; and (6) depth.

2.5.2.1 Effects to Critical Habitat from Fish Passage Facility Operations and Maintenance

The operations and maintenance of DPD and its fish ladders, continue to present a partial barrier to CV spring-run Chinook salmon and CCV steelhead. Freshwater migration corridor PBFs are located both upstream and downstream of DPD so any reduction in access to those will have negative effects on the quantity of those habitats available. Migratory and spawning habitat PBFs for CV spring-run Chinook and CCV steelhead will be impaired by the proposed operations and maintenance of the DPD ladders as an intermittent migration barrier with blockage or reduction to upstream and downstream passage occurring as part of the proposed action. Operations and maintenance are also expected to reduce sDPS green sturgeon PBFs for freshwater riverine habitats through turbidity and suspended sediment as a result of some of these activities, which is discussed in a separate section below.

Successful outmigration of juveniles is impaired by the operations at DPD and its associated water diversions, which have a high risk of impingement and entrainment (PSMFC presentation of raw data at RMT meeting 5-4-2021), reducing the value of juvenile rearing and migratory corridor PBFs. Dam-crest flashboards are expected to be installed when river flows are low to aid in directing water flow to the adjacent diversions (Hallwood-Cordua diversion and the South Yuba/Brophy diversion), as well as directing more flow down the fish ladders to aid in the upstream migration of adult CV spring-run chinook salmon, and the downstream emigration of juvenile salmonids. The use of dam-crest flashboards to increase adult passage up the fish ladders simultaneously increases the risk of juvenile impingement and entrainment in the adjacent diversions and in debris caught on the flashboards themselves. Entrainment, impingement, and predation due to fish ladder operations reduce the PBFs for rearing and migratory corridors for out-migrating juvenile CV spring-run Chinook salmon and CCV steelhead.

The proposed action has some measures to improve adult migration at DPD, but successful migration of CV spring-run Chinook salmon and CCV steelhead at DPD can be impacted by delayed maintenance actions. BMPs, such as visual monitoring for blockages and testing and inspection of all gates annually, are expected to reduce the duration of time passage may be reduced in some situations. The proposed action states the USACE does not propose to use the in-ladder flashboards or downstream gated ladder orifices; however, orifices will be inspected annually (USACE 2023). Eliminating both of these operational aspects of the fish ladders removes the ability to alter flow within the ladders to improve fish passage, therefore resulting in reduced passage into spawning habitat and access to migratory corridors and spawning habitat PBFs. Modeling of the ladders has demonstrated that the use of the downstream gated orifices could significantly increase the passability of the ladders in different flow scenarios (CDFW 2021). The proposed DPD maintenance and ladder operations limit the access to spawning, rearing, and migratory corridor PBFs for CV spring-run Chinook salmon and CCV steelhead, as they may be forced to hold and spawn in unsuitable habitat downstream of DPD or have reduced reproductive fitness resulting from migration delays while attempting to pass DPD.

Sediment accumulation in the ladders reduces fish passage by lowering the flow through the ladders and the depth of the ladder pools (USACE 2023). Although the proposed action includes measures to reduce migration impediments at DPD, even with prompt sediment management and O&M actions, sediment and debris related blockages are likely and expected to occur during any high-flow event. High flows that increase risk of sediment and debris blockages also tend to encourage upstream salmonid migration. Blockage of one ladder could impact approximately half of the steelhead migration given their equal use of the two ladders, and even more for spring-run Chinook salmon, if the preferred (*i.e.*, north) ladder is blocking spring-run Chinook salmon passage. Because over 95% of CV spring-run Chinook and CCV steelhead spawning in the Yuba River occurs above DPD when the ladders are fully functional, blocking passage through DPD during adult migration and spawning could nearly eliminate the access to spawning habitat PBFs in the Yuba River, affecting the entire returning population.

The overall value and access to spawning and migratory habitat PBFs are negatively affected for both CV spring-run Chinook salmon and CCV steelhead as a result of the proposed action. This effect is expected to occur chronically throughout the life of the structure and the proposed action.

2.5.2.2 Effects to Critical Habitat from Sediment and Turbidity

Several proposed activities are expected to cause increases in suspended sediment and turbidity throughout implementation of the proposed action. These activities include gravel augmentation, large woody material placement, conducting redd surveys, clearing sediment from fish ladder bays, removal of sediment upstream of DPD, and clearing of debris near north fishway. Proposed BMPs include monitoring turbidity in accordance with the section 401 Water Quality Certification for the project. If turbidity exceeds the thresholds identified in the certification (15 NTUs above the most recent upstream reading), work will cease until turbidity returns to background levels (USACE 2023).

All work occurring in or near the water can cause temporary increases in turbidity and suspended sediment levels within the project area and downstream areas. The redeposition of suspended sediments is expected to temporarily reduce food availability and feeding efficiency due to the natural substrate being coated with a new layer of sediment. Short-term increases in turbidity and suspended sediment levels associated with maintenance may negatively impact rearing habitat and feeding PBFs temporarily through reduced availability of food and reduced feeding efficiency, resulting in avoidance or displacement from preferred habitat (Bjornn and Reiser 1991). Increased turbidity can scour and fill in pools and riffles, reduce primary productivity and photosynthesis activity (Cordone and Kelley 1961), and affect intergravel permeability and dissolved oxygen levels (Lisle and Eads 1991, Zimmermann and Lapointe 2005). However, these adverse effects are expected to be temporary, lasting only as long as project construction actions are taking place or until the first fall storm flushes out the work site, removing any residual fine-grained sediments.

The potential pathways to affect spawning habitat PBFs include temporary increases in fine sediment resulting from proposed activities. The timing of proposed activities that may cause increased turbidity is in the summer months when salmonids and sturgeon are not spawning. Spawning habitat is located where water velocities are higher and where mobilized fine sediments are less likely to settle. The project also includes gravel augmentation that is expected to replenish salmonid spawning habitat that has washed out from below Englebright Dam .

Incorporation of the BMPs described in the BA are expected to reduce some of the adverse effects from turbidity and suspended sediment to critical habitat PBFs through use of water quality monitoring. Proposed operations and maintenance will cause intermittent increases in turbidity over the lifetime of the proposed action resulting in short-term, localized disturbances to critical habitat for CV spring-run Chinook salmon, CCV steelhead, and sDPS green sturgeon.

2.5.2.3 Effects to Critical Habitat from Increased Noise, Vibrations, and Motion

Explicit in-water work windows are designed to avoid impacts to salmonid and sturgeon habitat during periods of high species presence, their spawning seasons, and egg incubation. These timeframes are associated with many of the PBFs of critical habitat as well. Impacts to freshwater rearing habitat, migratory corridor, and freshwater spawning site PBFs for salmonids are expected to occur due to proposed instream activities. These activities are also expected to negatively impact the PBFs of food resources, water quality, and depth for green sturgeon.

Project activities are expected to cause increases in instream noise, motion, and vibrations throughout implementation of the proposed action including gravel augmentation, large woody material placement, clearing sediment from fish ladder bays, removal of sediment upstream of DPD, installing dam-crest flashboards, and clearing of debris near the fish ladders. As a result, some localized reduction in the quality of salmonid and sturgeon habitat PBFs is expected within the action area during proposed activities. Similarly, O&M activities utilizing heavy machinery in close proximity to the river channel have the potential to transfer kinetic energy through the adjoining substrates, disturb the water column in the river (Kemp *et al*. 2011), and affect the ability of rearing and migratory PBFs to support fish.

Any excessive noise, motion, or vibrations may temporarily reduce use of the habitat within the action area. Suitable habitat within the worksite will likely be used less if machinery noise is present. Critical habitat effects from noise, motion, and vibration are expected to be temporary and limited to the direct vicinity of activities over the lifetime of the proposed action. While small increases in noise may cause some localized habitat avoidance, the actions are not expected to cause any effects beyond what is described above.

Potential temporary effects related to short term reduction in PBFs of salmonid and sturgeon critical habitat will be minimized by implementation of BMPs included in the proposed action. However, effects of in-stream O&M activities are still expected to cause a temporary reduction in suitable PBFs for critical habitat of salmonids and green sturgeon. Any temporary reduction in habitat is only expected to last for days to weeks on an annual basis when small numbers of each species are present. The proposed action is not expected to reduce the overall value and access to PBFs of critical habitat for CV spring-run Chinook salmon, CCV steelhead, and sDPS green sturgeon.

2.5.2.4 Effects to Critical Habitat from Contaminants from Spills or Leakage

Operation of power equipment, such as an excavator, in or near aquatic environments increases the potential for toxic substances to enter the aquatic environment and has negative effects on ESA-listed anadromous fish species and designated critical habitat (Feist *et al.* 2011). Spills of toxic substances could negatively affect the freshwater migratory corridor, freshwater spawning, and freshwater rearing habitat PBFs for salmonids, and the water quality PBFs for green sturgeon.

Equipment refueling, fluid leakage, and maintenance activities within and near the stream channel pose some risk of contamination and potential impacts to listed fish species. The proposed action includes the development of a hazardous materials spill prevention plan. The proposed action includes daily inspections of all heavy equipment for leaks, and use of environmentally safe lubricants. With inclusion of these measures, potential negative effects from hazardous materials entering the aquatic environment and adversely affecting designated critical habitat are not expected to occur.

2.5.2.5 Effects to Southern Resident Killer Whale Critical Habitat

The PBF for SRKW critical habitat that may be negatively impacted by the proposed action is: Prey species of sufficient quantity, quality, and availability to support individual growth, reproduction, and development, as well as overall population growth. The proposed action is expected to chronically reduce the production of Chinook salmon from the Yuba River, thereby reducing available priority prey to SRKW from the CV spring-run and fall/late fall-run ESUs. All areas of SRKW critical habitat have the potential to be adversely affected by the proposed action, given the broad distribution of CV Chinook salmon throughout the coast (Shelton *et al.* 2019; 2020). However, critical habitat within Oregon and California waters may be most affected given the higher abundance of CV Chinook salmon ESUs in these regions, particularly during the winter and spring months when SRKWs are expected to occupy these regions.

As discussed in section 2.5.1.7, the CV spring-run ESU of Chinook salmon make up nearly 20% of the SRKW diet during the late winter and early spring months, meaning that significant impacts to this ESU has the potential to negatively impact SRKW critical habitat through impacts to the prey PBF. CV fall-run/late fall-run Chinook salmon are also a part of the SRKW diet (Hanson *et al*. 2021) and are expected to be similarly affected by the proposed action. Adequate prey available in critical habitat is especially important during these seasons, as the whales are presumed to be prey limited due to reduced body condition (Fearnbach *et al*. 2018; 2020), a diversified diet (Hanson *et al*. 2021), and expanded movements along the coast (NMFS 2021d). For more details, please see the analysis of effects to the SRKW DPS in section 2.5.1.7.

Reduced prey availability may impact survival and reproduction (Nelson *et al*. 2024; PFMC 2020). Though there are general estimates of how many Chinook salmon need to be consumed to meet the biological needs of the whales, we do not have estimates of the total amount needed in their environment or what density is needed for the population to be able to successfully forage and consume this amount. Therefore, we are unable to quantify how any reduction in the number of adult Chinook salmon in the ocean by the proposed action affects foraging efficiency of the whales and are limited in our interpretation of these values. However, given the strong connection between SRKWs and Chinook salmon, and CV Chinook salmon in particular, the impacts to salmon expected to occur under the proposed action are therefore expected to reduce available prey fish within SRKW critical habitat.

2.5.2.6 Beneficial Effects of Proposed Conservation Measures

The gravel augmentation plan that will be implemented as a conservation measure under the proposed action is likely to temporarily replace spawning habitat for CV spring-run Chinook salmon and CCV steelhead that is lost during high flows below Englebright Dam. The gravel augmentation is likely to support approximately 23 to 37 redds between Englebright and DPD (USACE 2023), but the increase will not be permanent, and the benefit to the conservation of CV spring-run Chinook salmon and CCV steelhead will decrease as the augmentation gravels are moved out of the system during high flow events. The augmentation is proposed to happen annually, assuming spawning areas are determined to need additional gravel depending on flow and substrate transport conditions the previous year. While the gravel augmentation is funding dependent, USACE has been able to secure funding every year since the injections began in 2014, and it is assumed to be reasonably certain to occur in the future (USACE 2023). Therefore, the proposed action is more likely to increase CV spring-run Chinook salmon and CCV steelhead spawning habitat PBFs value and availability during years when the gravel augmentation occurs. Gravel augmentation is not expected to benefit green sturgeon as it occurs above DPD, where sturgeon are not present, and sturgeon prefer sandy substrates rather than gravel for spawning and feeding (NMFS 2018).

The proposed action also includes implementation of a LWM management plan to increase the amount of LWM in the LYR. LWM is a valuable feature of salmonid stream habitat. Large wood can break up water velocities and create hydraulics that increase channel complexity, providing holding habitat for salmonids (Spence *et al*. 1996). Large wood can provide cover from predators, and locations from which to forage. While the LWM placement is funding dependent, USACE has been able to secure annual funding since the program began, and it is assumed to be reasonably certain to occur in the future. Therefore, the proposed action is expected to increase CV spring-run Chinook salmon and CCV steelhead migratory and rearing habitat PBFs value and availability during years when the LWM is inundated and accessible to the species. The actions of the LWMMP and GAIP are not expected to benefit green sturgeon because sturgeon are not present above DPD.

2.6. Cumulative Effects

"Cumulative effects" are those 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 consultation pursuant to section 7 of the ESA.

Some continuing non-federal activities are reasonably certain to contribute to climate effects within the action area. However, it is difficult if not impossible to distinguish between the action area's future environmental conditions caused by global climate change that are properly part of the environmental baseline *vs.* cumulative effects. Therefore, all relevant future climate-related environmental conditions in the action area are described earlier in the discussion of environmental baseline (Section 2.4).

2.6.1. Water Diversions and Agricultural Practices

Water diversions for irrigated agriculture, municipal and industrial use, and managed wetlands are found along the action area. Depending on the size, location, and season of operation, these insufficiently screened diversions entrain and kill many life stages of aquatic species, including juvenile listed anadromous species. For example, as of 1997, 98.5% of the 3,356 diversions included in a CV database were either unscreened or screened insufficiently to prevent fish entrainment (Herren and Kawasaki 2001).

Agricultural practices in the action area may adversely affect riparian and wetland habitats through upland modifications of the watershed that lead to increased siltation or reductions in water flow. 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 associated watersheds. Stormwater and irrigation discharges related to both agricultural and urban activities contain numerous pesticides and herbicides that may adversely affect listed salmonid and green sturgeon reproductive success and survival rates (Dubrovsky *et al.* 1998).

2.6.2. Rock Revetment and Levee Repair Projects

Cumulative effects include non-federal riprap projects for streambank and levee repair, many of which occur annually (Hallwood Irrigation District, Teichert Construction Company, and other landowners do this as common practice). Depending on the scope of the action, some non-federal riprap projects carried out by state or local agencies do not require federal permits. These types of actions and illegal placement of riprap occur within the Sacramento and Yuba River watersheds. The effects of such actions result in continued fragmentation of existing high-quality habitat, and conversion of complex nearshore aquatic habitat to simplified habitats that negatively affect salmonids and sturgeon.

2.6.3. Aquaculture and Fish Hatcheries

More than 32 million fall-run Chinook salmon, 2 million spring-run Chinook salmon, 1 million late fall-run Chinook salmon, 0.25 million winter-run Chinook salmon, and 2 million steelhead are released annually from six hatcheries producing anadromous salmonids in the CV. All of these facilities are currently operated to mitigate for natural habitats that have already been permanently lost as a result of dam construction. The loss of this available habitat resulted in dramatic reductions in natural population abundance, which is mitigated for through the operation of hatcheries. Salmonid hatcheries can, however, have additional negative effects on ESA-listed salmonid populations.

Within the action area, hatchery CV spring-run Chinook salmon, CCV steelhead, or CV fall-run Chinook from the Feather River Fish Hatchery (FRFH) may compete with wild fish for food and other resources. Hybridization of spring- and fall-run Chinook salmon and straying of adults from the FRFH have posed a significant threat to the genetic integrity of natural spawning fall- and spring-run Chinook salmon in other watersheds, such as the upper Sacramento River and associated tributaries (NMFS 2014b; NMFS 2019). Research suggests that the practice of trucking hatchery fish downstream to the Delta and Bay increases adult straying (Huber and Carlson 2015). With current in-river release practices implemented since 2014, straying into watersheds outside of the Feather River has likely been reduced (California HSRG 2012; Huber and Carlson 2015; Palmer-Zwahlen *et al*. 2019; Sturrock *et al.* 2019).The high level of hatchery production in the CV can result in high harvest-to-escapements ratios for natural stocks. California salmon fishing regulations are set according to the combined abundance of hatchery and natural stocks, which can lead to overexploitation and reduction in the abundance of wild populations that are indistinguishable and exist in the same system as hatchery populations. Releasing large numbers of hatchery fish can also pose a threat to wild Chinook salmon and steelhead stocks through the spread of disease, genetic impacts, competition for food and other resources between hatchery and wild fishes, predation of hatchery fishes on wild fishes, and increased fishing pressure on wild stocks as a result of hatchery production.

Impacts of hatchery fishes can occur in both freshwater and the marine ecosystems. Limited marine carrying capacity has implications for naturally produced fish experiencing competition with hatchery production. Increased salmonid abundance in the marine environment may also decrease growth and size at maturity, and reduce fecundity, egg size, age at maturity, and survival (Bigler *et al*. 1996). Ocean events cannot be predicted with a high degree of certainty at this time. Until good predictive models are developed, there will be years when hatchery production may be in excess of the marine carrying capacity, placing depressed natural fish at a disadvantage by directly inhibiting their opportunity to recover (NPCC 2003).

2.6.4. Recreational Fishing

The Yuba River is home to a robust resident *O. mykiss* fishery upstream of Daguerre Point Dam; this fishery is a statewide destination for anglers across California and beyond, including those from the California Sportfishing Alliance, Fly Fishers International, and Gold Country Fly Fishers. Local outfitters provide guided fishing tours year round, and restrictions are in place for return of any caught listed species (*i.e*., natural spawned steelhead or Chinook salmon). It is, therefore, expected that the impacts of incidental take of recreational fishing in the lower Yuba River will continue.

While hatchery CCV steelhead and Chinook salmon are targeted, incidental catch of non-hatchery, listed salmonids does occur. Since 1998, all hatchery CCV steelhead have been marked with an adipose fin clip, allowing anglers to tell the difference between hatchery and wild CCV steelhead. Current regulations restrict anglers from keeping unmarked CCV steelhead in Central Valley streams.

Current sport fishing regulations do not prevent wild CCV steelhead from being repeatedly caught and released while on the spawning grounds, where they are more vulnerable to fishing pressure. Studies on hooking mortality based on spring-run Chinook salmon have found a 12 percent mortality rate for the Oregon in-river sport fishery (Lindsay *et al.* 2004). Applying a 30 percent contact rate for Central Valley rivers (*i.e*., the average of estimated Central Valley harvest rates), approximately 3.6 percent of adult steelhead die before spawning from being caught and released in the recreational fishery. Studies have consistently demonstrated that hooking mortality increases with water temperatures. Mortality rates for steelhead may be lower than those for Chinook salmon, due to lower water temperatures in the places where they are caught.

In addition, survival of CCV steelhead eggs is reduced by anglers walking on redds in spawning areas while targeting hatchery CCV steelhead or salmon. Roberts and White (1992) identified up to 43 percent mortality from a single wading over developing trout eggs, and up to 96 percent mortality from twice daily wading over developing trout eggs. Salmon and trout eggs are sensitive to mechanical shock at all times during development (Jensen and Alderice, 1989). Typically, CCV steelhead and salmon eggs are larger than trout eggs and are likely more sensitive to disturbance than trout eggs. While state angling regulations have moved towards restrictions on selected sport fishing to protect listed fish species, hook and release mortality of steelhead and trampling of redds by wading anglers may continue to cause a threat.

2.6.5. Increased Urbanization

Increases in urbanization and housing developments can impact habitat by altering watershed characteristics and changing both water use and stormwater runoff patterns. Increased growth will place additional burdens on resource allocations, including natural gas, electricity, and water, as well as on infrastructure, such as wastewater sanitation plants, roads and highways, and public utilities. Some of these actions, particularly those which are situated away from water bodies, will not require federal permits, and thus will not undergo review through the ESA section 7 consultation process with NMFS.

Increased urbanization also is expected to result in increased recreational activities in the region. Among the activities expected to increase in volume and frequency is recreational boating. Boating activities typically result in increased wave action and propeller wash in waterways. This potentially will degrade riparian and wetland habitat by eroding channel banks and mid-channel islands, thereby causing an increase in siltation and turbidity. Wakes and propeller wash also churn up benthic sediments thereby potentially re-suspending contaminated sediments and degrading areas of submerged vegetation. This in turn will reduce habitat quality for the invertebrate forage base required for the survival of juvenile salmonids and green sturgeon moving through the system. Increased recreational boat operation is anticipated to result in more contamination from the operation of gasoline and diesel-powered engines on watercraft entering the associated water bodies.

2.6.6. Global Climate Change

The world is about 1.3°F warmer today than a century ago, the latest computer models predict that, without drastic cutbacks in emissions of carbon dioxide, and other gases released by the burning of fossil fuels, the average global surface temperature may rise by two or more degrees in the 21st century (IPCC 2023). Much of that increase likely will occur in the oceans, and evidence suggests that the most dramatic changes in ocean temperature are now occurring in the Pacific (Noakes 1998). Using objectively analyzed data Huang and Liu (2000) estimated a warming of about 0.9°F per century in the northern Pacific Ocean.

Sea levels are expected to rise by 0.5 to 1.0 meters in the northeastern Pacific coasts in the next century, mainly due to warmer ocean temperatures, which lead to thermal expansion much the same way that hot air expands. This will cause increased sedimentation, erosion, coastal flooding, and permanent inundation of low-lying natural ecosystems (*e.g.*, salt marsh, riverine, mud flats) affecting listed salmonid and green sturgeon PBFs. Increased winter precipitation, decreased snowpack, permafrost degradation, and glacier retreat due to warmer temperatures will cause landslides in unstable mountainous regions, and destroy fish and wildlife habitat, including salmon-spawning streams. Glacier reduction could affect the flow and temperature of rivers and streams that depend on glacier water, with negative impacts on fish populations and the habitat that supports them.

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

In light of the predicted impacts of global warming, the CV has been modeled to have an increase of water temperatures between 2 to 7 ºC by 2100 (Dettinger *et al.* 2004, Hayhoe *et al.* 2004), with a drier hydrology predominated by rainfall rather than snowfall. This will alter river runoff patterns and transform the tributaries that feed the CV from a spring and summer snowmelt-dominated system to a winter rain-dominated system. It can be hypothesized that summer temperatures and flow levels will become unsuitable for salmonid survival. The cold snowmelt that furnishes the late spring and early summer runoff will be replaced by warmer precipitation runoff. This will truncate the period of time that suitable cold-water conditions exist downstream of existing reservoirs and dams due to the warmer inflow temperatures to the reservoir from rain runoff. Without the necessary cold-water pool developed from melting snow pack filling reservoirs in the spring and early summer, late summer and fall temperatures downstream of reservoirs could potentially rise above thermal tolerances for juvenile and adult salmonids (*i.e.,* CV spring-run Chinook salmon and CCV steelhead) that must hold and/or rear downstream of the dam over the summer and fall periods.

2.7. Integration and Synthesis

The Integration and Synthesis section is the final step in assessing the risk that the proposed action poses to species and critical habitat. In this section, we add the effects of the action (Section 2.5) to the environmental baseline (Section 2.4) and the cumulative effects (Section 2.6), taking into account the status of the species and critical habitat (Section 2.2), to formulate the agency's biological opinion as to whether the proposed action is likely to: (1) reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing its numbers, reproduction, or distribution; or (2) appreciably diminish the value of designated or proposed critical habitat as a whole for the conservation of the species.

Populations of CV spring-run Chinook salmon and CCV steelhead in California have declined drastically over the last century. The current status of listed anadromous fish species has not significantly improved since the species' most recent status reviews (NMFS 2016b, NMFS 2022, SWFSC 2023). The CV spring-run Chinook salmon ESU and CCV steelhead DPS are constrained by small population sizes and altered habitat that are susceptible to climate change. If measures are not taken to reverse these trends, the recovery and survival potential of CV spring-run Chinook salmon and CCV steelhead will continue to worsen. The viability of sDPS green sturgeon is constrained by factors, such as a small population size, lack of multiple populations, and concentration of spawning sites into just a few locations. Although threats due to habitat alteration are thought to be high and indirect evidence suggests a decline in abundance, there is much uncertainty regarding the scope of threats and the viability of population abundance indices (NMFS 2018). The critical habitat for all listed fish species in the action area are degraded from their historical conditions, but are still considered critically important to the recovery and conservation of the species for which they were designated.

The action area encompasses a large stretch of the Yuba River. DPD sits around RM 11.5 and Englebright Dam is at the upper extent of the action area at RM 24. The action area is considered an important habitat area for rearing, migration, and spawning for CV spring-run Chinook salmon, CCV steelhead, and sDPS green sturgeon. Upstream migrating adult sDPS green sturgeon cannot pass above DPD, while CV spring-run Chinook salmon and CCV steelhead use the ladders to reach their preferred spawning habitat below Englebright Dam.

DPD is an intermittent barrier to CV spring-run Chinook salmon and CCV steelhead. If passage is blocked during key migratory windows, fish are susceptible to stress, reduced fecundity, straying, and pre-spawn mortality.

Continuing activities described in the environmental baseline and cumulative effects sections include agricultural practices, water diversions, bank stabilization projects, and recreational boating and fishing, which are expected to continue to negatively affect federally listed anadromous fish species in the action area. The impacts described in the cumulative effects section are also expected to further diminish the functional value of critical habitat for the conservation of the species within the action area.

For instance, increased demands for water, whether for agricultural purposes or domestic consumption, are expected to continue in the action area. These demands will result in diminished flows in the river and contribute to higher water temperatures, increased competition for prey and/or cover, and more frequent interactions with predators, contributing to reduced growth and survival. Runoff from agricultural activities may contain contaminants, such as pesticides, sediments, and nutrients, that may affect listed species through lethal and sublethal impacts. Levee construction and bank protection has reduced floodplain connectivity, changed substrate size, and decreased riparian habitat and shaded riverine aquatic cover. Regional urban development is also expected to continue, although the rate of development may slow due to economic pressures in the area. Therefore, the demand for domestic and municipal water supplies diverted from the Yuba River and Sacramento River basin are expected to increase to meet these demands in future years. As urban development increases in the area, the ability to modify or enhance riparian habitat conditions will be diminished in response to flood management needs for urbanized areas. This circumstance will perpetuate the already degraded status of the critical habitat in the action area and reduce the potential for future environmental restoration actions, such as setback levees or flood benches along the river channels.

2.7.1. Summary of the Proposed Action Effects to Listed Species

The proposed action is expected to adversely affect adults and juveniles of CV spring-run Chinook salmon, CCV steelhead, sDPS green sturgeon, and SRKW. As proposed action effects can differ for each of the species, they will be discussed separately in the following sections.

2.7.1.1 Proposed Action Effects on Central Valley Spring-Run Chinook Salmon

The primary concern with the proposed action is the frequent prevention of access to preferred habitat upstream of DPD. Decreased access to preferred habitat upstream of DPD, when coupled with the downstream impacts of the proposed action including instream construction/maintenance (resulting in harassment, increased turbidity, and predation), and water diversions (resulting in entrainment, and impingement), reduces the abundance and productivity of CV spring-run Chinook salmon in the Yuba River as a whole. Proposed action effects are expected to contribute to the pattern of low abundance, variable/declining growth rate, and insufficient access to spawning habitat..

Risk to Northern Sierra Nevada Diversity Group

The Yuba River falls within the Northern Sierra Nevada Diversity Group of the CV Spring-run Chinook salmon ESU. The recovery criteria identified in NMFS' Recovery Plan (2014) requires four populations at low risk of extinction within this diversity group. As of the previous published status review (NMFS 2016) only the Butte Creek population was at low risk for extinction. Recent viability assessments indicate that the extinction risk of populations within the Northern Sierra Nevada Diversity Group have not improved (SWFSC 2023). The Yuba River population has previously been deemed at a high risk for extinction (NMFS 2014b).

Hatchery influence from the FRFH significantly increases the extinction risk of populations within the Northern Sierra Nevada Diversity Group (Lindley *et al.* 2007). Reducing passage above DPD further constrains available spawning habitat, leading to a higher risk of genetic hybridization between the Yuba and FRFH spring-run strays, even with the reduced number of FRFH strays from more recent hatchery release strategy changes. Delayed spawning also increases the risk for genetic introgression between CV spring-run and fall-run Chinook populations.

The Yuba River may be one of the only currently accessible Sacramento tributaries that will be able to withstand increased temperatures associated with climate change in the future (Lindley *et al.* 2007). As water temperatures slowly rise, the LYR will be one of the few refuges for CV spring-run Chinook salmon (Lindley *et al.* 2007). A reduction in successful passage of adults into the cold spawning habitat below Englebright reduces the Yuba population's chances at increasing their overall productivity and viability. The effects of the proposed action are expected to prevent the Yuba River population from becoming a population that meets the criteria for being a low risk to recovery, thereby delaying the recovery of the Northern Sierra Nevada Diversity Group.

The moderate to poor condition of the Yuba River population, in combination with proposed action effects that perpetuate the population to be at a high risk of extinction, reduces the likelihood that the Northern Sierra Nevada Diversity Group can reach recovery. The proposed action, environmental baseline, and cumulative effects perpetuate conditions that prevent the Yuba River population from contributing to the recovery of the Northern Sierra Nevada Diversity Group. Climate changes, increased water consumption, and hatchery effects increase the risk that the Northern Sierra Diversity group will become extinct.

Risk to ESU

The combined impacts of the proposed action and environmental baseline increase the risk of extinction of the Yuba River population and of the Northern Sierra Nevada Diversity Group. With increased risk of extinction to this diversity group – which has the highest number of historical spring-run Chinook salmon populations and the highest number of viable populations needed to meet the recovery criteria – the viability and recovery of the ESU is diminished as a whole. NMFS' salmonid recovery plan has identified establishment of additional populations in the Northern Sierra Nevada Diversity Group as being essential to this species' future viability (NMFS 2014b). While some recovery actions in the Yuba River have recently been completed (*e.g.*, Hallwood Side Channel Restoration Project, Long Bar Restoration Project, see section 2.4.1.3) to alleviate stressors associated with rearing habitat, the stressors associated with passage, migratory habitat, and spawning habitat access continue. With predicted Climate Change water temperature increases throughout the ESU, the Yuba River is one of the only watersheds with volitionally accessible habitat that is expected to still provide suitable temperature conditions for CV spring-run Chinook salmon (Lindley *et al.* 2004). Because of this, future CV conditions are likely to increase the value of the Yuba population and habitat for the entire ESU. Without further restoration actions to stabilize the Yuba River population and allow it to contribute to the recovery of the species, both the survival and recovery of the species are diminished by the proposed action.

Summary of Effects on the Survival and Recovery of the Species

The proposed action is expected to produce or exacerbate stressors that adversely affect the environment of CV spring-run Chinook salmon. These stressors include long-term delays or blockages of upstream migration to preferred spawning habitat, entrainment into water diversion facilities, predation of juveniles at project-related facilities, and continued degradation of adult holding, spawning, and juvenile rearing habitats. Individuals that are exposed to one or more of these environmental stressors will experience adverse effects from habitat degradation that kills or injures individuals through significant impairment to their breeding, feeding, sheltering, migration, or spawning. These environmental consequences also reduce the survival of individuals and ultimately impair the long-term survival and viability of the local population by continuing to drive low population abundance rates, variable and declining production rates, and impaired spatial and genetic diversity.

Recognizing that the CV spring-run Chinook salmon ESU is currently at a moderate to high risk of extinction (SWFSC 2022), any reduction in the viability of the Yuba River population is likely to reduce the viability and further increase the extinction risk of the ESU. Therefore, the proposed action is expected 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 CV spring-run Chinook salmon.

2.7.1.2 Proposed Action Effects on Central Valley Steelhead

The frequent prevention of access to preferred habitat upstream of DPD coupled with the downstream impacts of instream construction/maintenance (resulting in harassment, increased turbidity, and predation), predation, and water diversions (resulting in entrainment, and impingement), reduces the abundance and productivity of CCV steelhead in the Yuba River. Proposed action effects are expected to contribute to the pattern of low abundance, variable/declining growth rate, and insufficient access to spawning habitat.

Risk to Northern Sierra Nevada Diversity Group

The Yuba River falls within the Northern Sierra Nevada Diversity Group of the CCV steelhead DPS. The recovery criteria identified in NMFS recovery plan (2014) requires four populations at low risk of extinction within the Diversity Group. As of the most recent published status review (NMFS 2016a) all of the steelhead populations were still determined to have either a high risk of extinction or an uncertain extinction risk due to lack of data. Recent viability assessments indicate that the extinction risk of populations within the Northern Sierra Nevada Diversity Group are all within moderate or high risk of extinction (SWFSC 2023).

Hatchery influence can significantly increase the extinction risk of populations within the Northern Sierra Nevada Diversity Group. Reducing passage above DPD further constrains available spawning habitat, leading to a higher risk of interbreeding with FRFH strays.

A reduction in successful passage of adults into the cold spawning habitat below Englebright reduces the Yuba population's chances at increasing their overall productivity and viability. The Yuba River is likely to be one of the only populations within the diversity group that can maintain juvenile rearing during summer months with predicted Climate Change water temperature increases. The effects of the proposed action are expected to prevent the Yuba River population from meeting the criteria for low risk of extinction, thereby delaying the recovery of the Northern Sierra Nevada Diversity Group.

The moderate to poor condition of the Yuba River population, in combination with proposed action effects that perpetuate the population to be at a high risk of extinction, reduces the likelihood that the Northern Sierra Nevada Diversity Group can reach recovery. The proposed action, baseline, and cumulative effects perpetuate conditions that prevent the Yuba River population from contributing to the recovery of the Northern Sierra Nevada Diversity Group. Climate changes and increased water consumption, and hatchery effects increase the risk that the Northern Sierra Diversity group will become extinct.

Risk to DPS

The combined impacts of the proposed action and environmental baseline increase the risk of extinction of the Yuba population and Northern Sierra Nevada Diversity Group. With increased risk of extinction to this diversity group – which has the highest number of historical CCV steelhead populations and the highest number of viable populations needed to meet the recovery criteria – the viability and recovery of the DPS is diminished as a whole. While some recovery actions have recently been completed in the Yuba River to alleviate stressors associated with rearing habitat, the stressors associated with passage, migratory habitat, and spawning habitat access continue. With predicted climate change water temperature increases throughout the DPS, the Yuba River is one of the only watersheds with volitionally accessible habitat that is expected to still provide suitable temperature conditions for steelhead (Lindley *et al.* 2007). Because of this, future CV conditions are likely to further increase the value of the Yuba population and habitat for the entire DPS. Without further restoration actions to stabilize the Yuba River population and allow it to contribute to the recovery of the species, both the survival and recovery of the species are measurably diminished by the proposed action.

Summary of Effects on the Survival and Recovery of the Species

The proposed action is expected to produce or exacerbate stressors that adversely affect the environment of CCV steelhead. These stressors include delays or blockages of upstream migration to historic spawning habitat, superimposition of redds due to lack of spawning habitat availability, entrainment and predation of juveniles at project-related facilities, and continued degradation of adult holding, spawning, and juvenile rearing habitats. Individuals that are exposed to one or more of these environmental stressors will experience adverse effects from habitat degradation that kills or injures individuals through significant impairment to their breeding, feeding, sheltering, migration, or spawning. These environmental consequences also reduce the survival of individuals and ultimately impair the long-term survival and viability of the local population by continuing to drive low population abundance rates, variable and declining production rates, and impaired spatial and genetic diversity.

Recognizing that the CCV steelhead DPS is currently at a moderate to high risk of extinction, any reduction in the viability to the Yuba River population is likely to reduce the viability and increase the extinction risk of the DPS. Therefore, the proposed action is expected 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 CCV steelhead.

2.7.1.3 Proposed Action Effects on Green Sturgeon

The principal threat to sDPS green sturgeon is the insufficient amount of suitable spawning habitat. Proposed action effects include harassment, increased turbidity, and behavioral disturbances. The proposed action will increase potential stressors in a known sturgeon spawning area just below DPD. While increased stressors may cause some behavioral changes, they are not expected to cause injury or death of sturgeon.

Risk to DPS

The DPS has only one viable population, the Sacramento River population, upon which the Yuba River green sturgeon population is dependent to provide sources of individuals. The DPS requires at least one additional annual spawning location (other than the Sacramento mainstem) persisting for 20 years to reach their demographic recovery criteria. The Yuba River has the potential to become a second independent population in the DPS, demonstrating successful spawning several times recently as well as having documented adult holding in most recent years (NMFS 2018, Beccio 2019, Pers. Comm. Kassie Hickey, Environmental Scientist, DWR, July 10, 2023)). The combined impacts of the proposed action and environmental baseline are not expected to change the risk of extinction of the DPS. The proposed action does not preclude recovery actions for the species from occurring. The survival and recovery of the DPS are not measurably diminished by the proposed action.

Summary of Effects on the Survival and Recovery of the Species

The proposed action of operations and maintenance of DPD is likely to produce mild stressors that adversely affect green sturgeon. Because there are minimal effects of the proposed action that extend downstream of the dam that might affect green sturgeon, the incremental effects of the proposed action on green sturgeon are not expected to increase the extinction risk of the species.

2.7.1.4 Proposed Action Effects on Southern Resident Killer Whales

The principal threats to SRKW are (1) quantity and quality of prey, (2) toxic chemicals that accumulate in top predators, and (3) impacts from sound and vessels (NMFS 2008). Proposed action effects to SRKW are due to the long-term reduction in available prey from lowered numbers of CV spring-run and fall and late-fall run Chinook salmon. The proposed action will increase one of the highest stressors on a sensitive population. Increased stressors from reduced prey availability may cause behavioral disturbances, injury, or reduced fitness of SRKW.

Risk to Population

The spatiotemporal overlap between SRKW and CV spring-run Chinook salmon lead to CV Chinook salmon being an important prey source for SRKW (NOAA Fisheries and WDFW 2018; NMFS 2021c). While SRKW are known to consume CV spring-run salmon along the coast and in Puget Sound (Hanson *et al*. 2021), they are most reliant on these fish during the winter and spring when whale seasonal movements along the coast increase, and the whales are known be in California coastal waters (NMFS 2021c). In the late winter/early spring months, CV spring-run Chinook salmon make up nearly 20% of the SRKW diet (Hanson *et al*. 2021). This is a time of presumed prey limitation, when whales are in a reduced nutritional state and present in poor body condition (Fearnbach *et al*. 2018; 2020). Stewart *et al*. (2021) found that whales in poor body condition had mortality probabilities two to three times higher than whales in more robust condition. As such, a diversity of Chinook salmon runs across space and time is critically important for SRKW health and survival. Reduction in CV Chinook salmon prey could cause animals to forage for longer periods, travel to alternate locations, or abandon foraging efforts altogether, ultimately impacting SRKW survival and ability to reproduce. The SRKW population at the time of listing in 2005 included 88 whales. The official summer census in 2023 included 75 whales (CWR 2023), with the population now totaling 74 individuals. Population growth has varied since listing, but is currently in a downward trend (NMFS 2021c).Any additional stressors that lead to reduced reproductive success, survival, or injury of any SRKW will have exponential effects to the population as a whole due to their very small population size.

Summary of Effects on the Survival and Recovery of the Species

The proposed action is likely to produce stressors that adversely affect SRKW due to impacts to CV spring- and fall and late-fall run Chinook salmon related to the operations and maintenance of DPD. The proposed action is expected to harm SRKW because of a reduction of priority prey availability. Because the proposed action is expected to exacerbate existing stressors on SRKW via reduction of their primary prey, CV Chinook salmon, the proposed action is expected to reduce appreciably the likelihood of both the survival and recovery of SRKW.

2.7.2. Summary of Proposed Action Effects to Critical Habitat

The proposed action is expected to affect critical habitat for CV spring-run Chinook salmon, CCV steelhead, sDPS green sturgeon, and SRKW. As proposed action effects can differ for the species' critical habitats present in the action area, they will be discussed separately in the following section.

2.7.2.1 Critical Habitat Effects for Central Valley Spring-Run Chinook Salmon

The geographic range of designated critical habitat for CV spring-run Chinook salmon includes the entire Yuba River below Englebright Dam. The physical or biological features for CV spring-run Chinook salmon critical habitat include: (1) freshwater spawning sites, (2) freshwater migratory corridors, (3) freshwater rearing sites, and (4) estuarine habitat. The entirety of the proposed action area is within the designated critical habitat for CV spring-run Chinook salmon. Individuals from the Yuba population of the Northern Sierra Nevada CV spring-run diversity group rear, migrate, and spawn within the action area. This area includes the PBFs of freshwater spawning sites, freshwater migratory corridors, and freshwater rearing sites.

The proposed action is expected to produce stressors that adversely affect the critical habitat PBFs of CV spring-run Chinook salmon by: (1) creating long-term delays or blockages through upstream freshwater migration corridors; (2) delaying or blocking access to preferred spawning habitat; and (3) degrading freshwater migration corridors and contributing to entrainment and predation of juveniles at project-related facilities.

Several restoration projects have occurred in the Yuba River recently that improve habitat quality for juvenile rearing areas, but passage impediments caused by operations and maintenance associated with DPD remain. Regular operations cause delays in upstream passage to adults, increased risk of juvenile entrainment in adjacent diversions, and regular exposure to increased turbidity, noise, and crush injuries due to instream maintenance.

These stressors reduce the quality and quantity of critical habitat and reduce the value of the PBFs of critical habitat that are essential for the survival and recovery of the entire Yuba River population. The proposed action will alter the critical habitat in the Yuba River watershed that will appreciably diminish the value of the designated critical habitat for the conservation of CV spring-run Chinook salmon.

2.7.2.2 Critical Habitat Effects for Central Valley Steelhead

The geographic range of designated critical habitat for CCV steelhead includes the entire Yuba River below Englebright Dam. The physical or biological features for critical habitat include: (1) freshwater spawning sites, (2) freshwater migratory corridors, (3) freshwater rearing sites, and (4) estuarine habitat. The entirety of the proposed action area is within the designated critical habitat for CCV steelhead. Individuals from the Yuba population of the Northern Sierra Nevada diversity group rear, migrate, and spawn within the action area. This area includes the PBFs of freshwater spawning sites, freshwater migratory corridors, and freshwater rearing sites.

The proposed action is expected to produce stressors that adversely affect the critical habitat PBFs of steelhead by: (1) creating long-term delays or blockages through upstream freshwater migration corridors; (2) delaying or blocking access to preferred spawning habitat; and (3) degrading freshwater migration corridors and contributing to entrainment and predation of juveniles at project-related facilities.

Several restoration projects have occurred in the Yuba River recently that improve habitat quality for juvenile rearing areas, but passage impediments caused by operations and maintenance associated with DPD remain. Regular operations cause delays in upstream passage to adults, increased risk of juvenile entrainment in adjacent diversions, and regular exposure to increased turbidity, noise, and crush injuries due to instream maintenance.

These stressors reduce the quality and quantity of critical habitat and reduce the value of the PBFs of critical habitat that are essential for the survival of individual fish and the survival and recovery of the entire Yuba River population. The proposed action is expected to alter the critical habitat in the Yuba River watershed to appreciably diminish the value of the designated critical habitat for the conservation of CCV steelhead.

2.7.2.3 Critical Habitat Effects for Green Sturgeon

The designated critical habitat PBFs for freshwater riverine habitat for sDPS green sturgeon in the Yuba River include: (1) food resources, (2) substrate type or size, (3) water flow, (4) water quality, (5) migratory corridor, and (6) depth.

The proposed action is expected to produce stressors that adversely affect the critical habitat PBFs of sDPS green sturgeon by creating temporary reductions in the PBFs of food resources, water quality, and depth. These will occur through short episodes of increased turbidity, some amount of sedimentation in the holding pool below DPD, temporary reduction in food availability due to sedimentation, and noise or in-water construction causing habitat avoidance.

The duration of the increased turbidity is expected to be brief (less than ten days a year), and will not occur every year. In-stream construction equipment and noise is expected to be short in duration and fish should quickly return to the habitat once work has been completed. The suspended sediment is expected to settle out of the water column quickly and extend downstream for approximately 200 feet. Proposed action effects are not expected to further impair downstream conditions. Therefore, impacts related to the proposed action are not expected to appreciably reduce the value of designated critical habitat for the conservation of sDPS green sturgeon, or adversely modify or destroy critical habitat.

2.7.2.4 Critical Habitat Effects for Southern Resident Killer Whale

The proposed action is expected to adversely affect the prey PBF for SRKW critical habitat through reduction in prey species of sufficient quantity, quality, and availability to support individual growth, reproduction, and development, as well as overall population growth. The proposed action is expected to reduce the production of Chinook salmon from the Yuba River by at least a small amount annually, with larger reductions in Chinook occurring every few years, thereby reducing available prey fish to SRKW. The impacts to salmon that are expected to occur under the proposed action are likely to result in some level of harm constituting take to SRKW by reducing prey availability, which may cause animals to forage for longer periods, travel to alternate locations, or abandon foraging efforts. The larger levels of harm through severe Chinook reduction are not expected to occur annually, as large reductions of Yuba Chinook populations are only expected to occur during long gate closures predicted every 10 or so years. However, the small to moderate reductions in Chinook expected to occur more frequently, coupled with the frequency that Yuba spring-run Chinook are a larger proportion of the total ESU, make it more likely that a small to moderate reduction in Yuba Chinook production will measurably reduce SRKW prey.

Considering together the small and moderate annual prey reductions, plus severe prey reductions over the long term, the quantity of SRKW prey within critical habitat is expected to be appreciably reduced. Therefore, we expect proposed action-related impacts to appreciably reduce the value of designated critical habitat for the conservation of SRKW.

2.8. 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, the effects of other activities caused by the proposed action, and the cumulative effects, it is NMFS' biological opinion that the proposed action is likely to jeopardize the continued existence of CV spring-run Chinook salmon, CCV steelhead, and SRKW, and destroy or adversely modify their designated critical habitat.

It is NMFS' biological opinion that the proposed action is not likely to jeopardize the continued existence of sDPS green sturgeon or destroy or adversely modify their designated critical habitat.

2.9. Reasonable and Prudent Alternative

"Reasonable and prudent alternatives" refer to alternative actions identified during formal consultation that can be implemented in a manner consistent with the intended purpose of the action, that can be implemented consistent with the scope of the federal agency's legal authority and jurisdiction, that are economically and technologically feasible, and that would avoid the likelihood of jeopardizing the continued existence of listed species or resulting in the destruction or adverse modification of critical habitat (50 CFR 402.02).

As described above in this opinion, the proposed action is expected to jeopardize the continued existence of the federally threatened CV spring-run Chinook salmon, CCV steelhead, and endangered SRKW, and is likely to destroy or adversely modify the designated critical habitat for these species. As described below, the following RPA will avoid the likelihood of jeopardizing the continued existence of these species or resulting in the destruction or adverse modification of their designated critical habitat. The RPA will also benefit CV fall-run/late fall-run Chinook salmon which will help minimize the impacts to SRKW.

On March 7, 2024, NMFS and USACE met to discuss the consultation and preliminary effects determinations. Meetings were held on March 19, 20, and 22, 2024, to discuss potential RPA actions that are described in this opinion.

Regulations also require that NMFS discuss its findings and any RPA components with the action agency and utilize the action agency's expertise in formulating the RPA, if requested (50 CFR 402.14(g)(5)). NMFS met with USACE to discuss our findings and worked with USACE to develop this RPA. This RPA was developed through a thoughtful and reasoned analysis of the key causes of the jeopardy and adverse modification findings, and a consideration of alternative actions within the legal authority of the USACE to alleviate those stressors. These actions are intended to be implemented in addition to the proposed action as described in this opinion.

1. USACE shall manage the fish ladders to maximize safe, timely (*i.e.*, minimal to no delays), and effective fish passage at DPD through development of a robust fish ladder

operations plan targeting [NMFS' 2022 Fish Passage Guidelines]() as applicable to the existing structure.

a. Utilize existing guidelines and information to maximize functionality of upstream ladder control gates, gated ladder orifice operations, in-ladder flashboard use, and other ways to maximize fish passage.

    i. USACE will coordinate with NMFS to identify further relevant criteria to ensure maximum fish passage. Maintaining relevant criteria and guidelines for fish ladders operations could include (where applicable): (NMFS 2022, section 5.5.3):

        1. Drop between pools of 1 foot or less.

        2. Minimum of 1 foot of water depth over pool weir crests (can be marked with staff gauges or indicators on the wall).

        3. Maximum energy dissipation factor of 4: This is related to how well each pool diffuses the volume of the water coming into it.

        4. At least 3 feet of freeboard in ladder pools at high flow design (to attempt to prevent lower ladder pools from overtopping to the side).

        5. Minimum attraction flow of 5% of total river flow ladders are designed to operate at. (*e.g.*, high design flow of 10,000 cfs results in attraction flow at base of ladder of approximately 500 cfs). Determine ways to increase flow through the ladders at different river flow scenarios to achieve this. This can include use of dam crest flashboards, downstream orifices, and in-ladder flashboards to alter flow scenarios.

        6. Unless being fully closed, gates should not be closed to anything less than 12 inches.

        7. Fishway entrance depth of at least 6 feet.

        8. Minimum pool dimensions of 8 feet long, 6 feet wide, and 5 feet deep.

        9. Minimum orifice size of 18 inches high by 15 inches wide.

b. Use existing guidance, data, and studies available to create a Ladder Operations Plan, with NMFS' review and approval:

    i. Operate fish ladders to maximize fish passage at different river conditions and flows (*i.e.,* when X conditions, Y/Z actions are taken).

1. Additional data regarding conditions or operations (*e.g., usage of downstream orifices at certain flows, addition of in-ladder flashboards, etc.)* may need to be collected to augment prior studies or fill data gaps. This may be done by USACE's personnel or its designee, such as a consultant.

2. If criteria identified in and as a result of RPA Action 1.a.i cannot be met, determine and document in writing how close operations can get to each criteria, and work with NMFS to address shortcomings. NMFS may identify additional criteria based on adaptive management that will be discussed with USACE and adapted appropriately.

3. Existing guidance that should be utilized includes the CDFW report (Daguerre Point Dam Fish Ladder Evaluation, Mark Gard, 2021) and the USACE evaluation of the DPD fish ladders from 2001.

ii. Coordinate development of the Ladder Operations Plan with NMFS' technical staff.

iii. USACE will obtain detailed descriptions of actions based on flow and other river conditions. (*e.g.*, *When flow conditions are between 4,000 and 6,000 cfs at Marysville Gauge, set the upstream ladder control gates to be open 75%, keep all the downstream gated ladder orifices closed except for the middle one, and put in-ladder flashboards on the third through fifth ladder bays.*)

iv. Submit completed Ladder Operations Plan to NMFS within one year of final opinion issuance.

c. Implement in-ladder sediment removal/management starting in August 2024.

i. Annually assess in-ladder sediment accumulation, and implement removal during the August work window as outlined in the proposed action.

ii. USACE shall maintain and operate ladders as proposed (including sediment removal from ladders annually as needed, frequent monitoring and debris removal in ladders, and documenting ladder control gate position each time ladders are inspected).

d. While the Ladder Operations Plan is being developed, USACE shall coordinate with NMFS (engineers and technical staff) and include recommendations or guidance from other fish agencies as applicable to assist in adaptive management and interim operations to reduce adverse impacts to species as much as possible (see RPA Action 2), including the memo "Recommendations for Improving Fish Passage at Daguerre Point Dam with Existing Facilities" (CDFW, May 20, 2024).

2. USACE shall implement interim and temporary actions to maximize passage and reduce delay/blockage during the 2024-2025 migration season:

    a. Remove existing sediment from within both ladders, especially the south fish ladder in August 2024 utilizing a suction dredge or other methods in coordination with NMFS, if ladders have enough deposition that may impede fish passage.

    b. Engage USACE engineers, biologists, and/or contractors, NMFS engineers and biologists, and other fish agency representatives to participate in technical discussions on operation of the existing fish ladders for the 2024-2025 migration season to maximize passage opportunities.

        i. Designate the initial technical team by 30 days post-final opinion issuance to ensure interim actions can be implemented by August 2024.

        ii. Work with NMFS, USACE engineers, and other fish agencies as applicable, to identify and implement attraction and ladder flows that maximize probability of successful passage within the fish ladders (this could include a combination of sediment/debris management in the ladders and upstream of the dam, use of dam-crest flashboards, etc.).

3. USACE shall minimize impacts to migration delay during ladder gate malfunction.

    a. Create a gate closure action plan to be implemented for extended closures (any closure longer than 48 hours) and submit to NMFS for approval within 90 days of issuance of final opinion issuance.

        i. In coordination with NMFS, prioritize funds and equipment as needed within USACE's funds appropriated for DPD, so unexpected ladder closures can be resolved in a timely manner (within 48 hours of initial closure).

        ii. Examples could include, but are not limited to, a rapid repair plan, manual opening of gates, a temporary fish rescue/transport plan, or other methods developed in coordination with NMFS. Type of plan is subject to the nature of the fish passage issue, but establishing contact with NMFS within the required 24 hours will trigger next steps.

            1. The gate closure action plan will specify a flow level threshold above which USACE cannot safely make repairs, and the flow level threshold under which USACE can safely make repairs.

    b. USACE shall communicate to NMFS within 24 hours of initial gate closure. USACE shall communicate the extent of the problem and a timeline for when repairs will be made. If USACE cannot determine the extent of the problem and a timeline for repair within 24 hours, USACE shall coordinate with NMFS to develop a reasonable timeline for addressing repairs that minimizes impacts to fish passage. USACE shall also communicate to NMFS when the gate is open again.

c. USACE will work with NMFS to develop a short-term plan at the initial (within 24 hours) communication.

d. At a minimum, USACE will maintain weekly contact with NMFS, via meeting or email as determined by NMFS, during the duration of fish ladder closure.

e. Depending on timing/length of gate closure, NMFS may require a longer-term plan and/or alternative fish passage (a temporary trap-and-haul effort) during the gate closure.

4. USACE shall advance efforts that provide support of proposed conservation measures, such as Gravel Augmentation and the LWM Management Plan.

5. Implement the USACE process to include DPD in the U.S. National Dam Inventory in Civil Works. Daguerre Point Dam qualifies for listing based on the environmental damage criterion.

    a. Send email request to: nid@usace.army.mil

6. USACE shall implement effective communications on routine actions, operations, emergencies, and any other relevant activities.

    a. Create a communication plan within 60 days of final opinion issuance. This plan should address:

        i. Expected timelines and points of contact (POC) for emergency actions/closures from all relevant agencies.

            1. Including backup POCs for after-hours and/or staff absences.

            2. Including backup communication methods if unable to confirm communication was received.

        ii. Timing and POCs for routine communications.

        iii. POCs for any outgrants.

        iv. A schedule for monthly meetings between USACE, NMFS, and any of their designees to discuss O&M activities at DPD.

        v. USACE shall coordinate with NMFS regarding any additional in-water maintenance activities that may need to occur that are not fully described in this opinion prior to implementation (*e.g.*, maintenance or repair to water diversion equipment attached to DPD). USACE must receive approval from NMFS prior to starting any work that may have effects on ESA-listed fish species.

7. USACE shall participate in broader efforts that improve fish passage at DPD.

   a. Cooperate on and participate in projects that help improve fish passage at DPD and in the rest of the Yuba River to the maximum extent possible within USACE's authorities.

   b. Cooperate on and participate in technical discussions for future projects that could improve fish passage, as they can alleviate the fish passage delays and existing issues at DPD.

Because this biological opinion has found jeopardy and destruction or adverse modification of CV spring-run Chinook, CCV steelhead, and their critical habitats, USACE is required to notify NMFS of its final decision on the implementation of the RPA [50 CFR 402.15(b)].

Consistency of the Reasonable and Prudent Alternative with Regulations Implementing Section 7 of the ESA

Regulations (50 CFR §402.02) implementing section 7 of the ESA define a RPA as alternative actions, identified during formal consultation, that: (1) can be implemented in a manner consistent with the intended purpose of the action; (2) can be implemented consistent with the scope of the action agency's legal authority and jurisdiction; (3) are economically and technically feasible; and (4) would avoid the likelihood of jeopardizing the continued existence of a listed species or resulting in the destruction or adverse modification of critical habitat. In the sections that follow, NMFS provides a summary evaluation regarding the consistency of the RPA with the implementing regulations.

Consistency with the Intended Purpose of the Action

The elements of the RPA can be implemented in a manner consistent with the intended purpose of the proposed action, which is to provide operations and maintenance to DPD consistent with all federal legal obligations, including compliance with the ESA. The RPA is intended to provide USACE with more defined operations and maintenance to reduce stressors associated with the proposed action that result in reduced or delayed passage at the fish ladders. Lastly, the RPA does not preclude USACE from safely operating and maintaining the project.

Consistent with the Scope of the Action Agency's Legal Authority and Jurisdiction

The RPA is consistent with the scope of the action agency's legal authority and jurisdiction. NMFS believes there are several authorities under which USACE could implement the actions in the RPA.

Appendix A of USACE's BA (USACE 2023) describes several of USACE's authorities including:

1. Authority to Construct In-Scope Modifications

2. Authority to Implement Mitigation Measures

3. Authority to Study Structural Modification for Further Recommendations to Congress for New Project Construction Authority

USACE's BA points to the Rivers and Harbors Act of June 3, 1896 for their authorities related to dam inspections and hydropower facilities on Federal lands.

In addition, USACE's Regulation No. 1165-2-119, "Water Resources Policies and Authorities – Modifications to Completed Projects" dated September 20, 1982, provides that USACE has authority to correct a design or construction deficiency in a project under existing authority without further authorization.

Authority to Construct In-Scope Modifications

The Chief of Engineers has authority to modify projects without further authorization from Congress within strictly defined limits (*i.e.,* as long as the scope of the project, including the function and purpose of the project, and the area served by the project, is not materially changed). This understanding, set forth in detail in a 1951 report by the Chief of Engineers, was approved in the report of a special subcommittee to the House Public Works Committee in 1952, Report on the Civil Functions Program of the U.S. Army Corps of Engineers, United States Army to the House Committee on Public Works, 82d Congress, 2d Session 1 (1952).

Consistent with the authority to make minor modifications, USACE may rely on its operations and maintenance authority under the Daguerre Point Dam to study in-scope construction modifications for the purpose of extending the life of a project feature or enhancing its operational efficiency, provided such modifications are economically justified, and to recommend to Congress the funding of such construction. For example, this authority may be utilized for studying the Daguerre Point Dam fish ladders to improve the function of the fish ladders in their current configuration or to improve access to habitat once fish have navigated the fish ladders. Under its operation and maintenance authority for Daguerre Point Dam, USACE could also acquire any necessary real estate interests to the extent such acquisition would be necessary to maintain the fish preservation purpose of the fish ladders that are a feature of this project. USACE used its operation and maintenance authority to add grates to the top of the fish ladders to reduce the likelihood of fish jumping out of the ladder bays or poachers fishing for protected species as ordered by the District Court in 2011. This is another example of the type of minor modification USACE can make consistent with its operation and maintenance authority.

Authority to Implement Mitigation Measures

USACE also has authority under section 906(b) of the Water Resources and Development Act of 1986, as amended (WRDA 1986) (33 U.S.C. §2283(b)) to implement mitigation measures at completed water resources projects to address damages caused to fish and wildlife by the project. This authority is limited to measures that cost no more than $7,500,000 or 10 percent of the cost of the project whichever is greater. The construction cost of the Daguerre Point Dam was $978,000. Thus, the upper limit of any mitigation work at Daguerre Point Dam under this authority would be the $7,500,000 limit contained in the statute. In addition, section 906(c), as amended, requires the mitigation features be cost shared in proportion to other project features.

Daguerre Point Dam, for example, was built at 50 percent non-Federal expense (see House Document Numbered 431, 56th Congress, February 14, 1900, page 6). Use of section 906 authority would therefore require USACE to obtain a cost share partner for the appropriate non-Federal share. Section 906(b) also permits acquisition of real estate interests at completed projects as necessary for the implementation of the mitigation measures, except that USACE is prohibited from acquiring such interests by condemnation. Section 906(b) does not authorize mitigation which does not address damages caused by a USACE project itself, nor does it authorize mitigation measures requiring USACE to acquire significant real estate outside a project's footprint or mitigation measures to be performed far afield of a USACE project, regardless of whether they might be environmentally beneficial.

Authority to Study Structural Modification for Further Recommendations to Congress for New Project Construction Authority

USACE has authority under the Flood Control Act of 1970, section 216 (33 U.S.C. §549a) to review completed navigation, flood control and water supply projects for the purpose of determining whether, due to significantly changed physical or economic conditions, project modifications are advisable to improve the quality of the environment. Daguerre Point Dam is a navigation project; therefore, this authority would allow USACE to prepare a report to Congress regarding the need to modify the structures due to changed physical or economic conditions. Section 216 states:

> The Secretary of the Army, acting through the Chief of Engineers, is authorized to review the operation of projects the construction of which has been completed and which were constructed by USACE in the interest of navigation, flood control, water supply, and related purposes, when found advisable due [sic] the significantly changed physical or economic conditions, and to report thereon to Congress with recommendations on the advisability of modifying the structures or their operation, and for improving the quality of the environment in the overall public interest.

USACE has already taken the first steps in the process of conducting the review contemplated by section 216. In 2005, USACE completed an Initial Appraisal Report regarding the Federal interest in improving fish passage facilities at Daguerre Point Dam. Subsequently, USACE completed a reconnaissance report titled Yuba River Section 905(b) Analysis (905(b) Analysis) in October 2014 as authorized by the Rivers and Harbors Act of 1962 and the Energy and Water Development Appropriations Act, 2014 (Division D of Public Law 113-76, the Consolidated Appropriations Act, 2014). The purpose of the 905(b) Analysis was to determine whether there was a Federal interest in participating in a cost-shared feasibility study to investigate ecosystem restoration in the Yuba River watershed. The 905(b) Analysis concluded there would be a Federal interest in proceeding to the feasibility phase to analyze and evaluate ecosystem restoration in the Yuba River watershed. USACE completed the Yuba River Ecosystem Restoration Feasibility Study in January 2019. The Feasibility Study recommended a plan to include restoration of aquatic habitat including side channels, backwater areas, bank scallops, placement of boulders and large woody material and channel stabilization.

The Rivers and Harbors Act of June 3, 1896

In the River and Harbors Act of June 3, 1896 (RHA 1896) (29 Stat. 202) Congress appropriated funds for "the construction, repair and preservation of certain public works on rivers and harbors, and for other purposes." The RHA 1896 also authorized funds provided by the State of California to be used for purposes set forth in the RHA 1896. The RHA 1896 stated in relevant part:

> "For the construction of restraining barriers for the protection of the Sacramento and Feather rivers in California, two hundred and fifty thousand dollars; such restraining barriers to be constructed under the direction of the Secretary of War in accordance with the recommendation of the California Debris Commission, pursuant to the provisions of and for the purposes set forth in, section twenty five of the Act of the Congress of the United States, entitled, "an Act to create the California Debris Commission and regulate hydraulic mining in the State of California," approved March first, eighteen hundred and ninety-three:
>
> *Provided*, That the Treasurer of the United States be, and he is hereby, authorized to receive from the State of California through the Debris Commission of said State, or other officer thereunto duly authorized, any and all sums of money that have been, or may hereafter be, appropriated by said State for the purposes herein set forth. And said sums when so received are hereby appropriated for the purposes above named, to be expended in the manner above provided.

Several years later, on February 13, 1900, the House of Representatives issued Document 431 which described construction of four barriers to retain debris in the bed of the Yuba River, one of which was to be constructed at Daguerre Point.6 Thereafter on June 13, 1902, Congress passed the Rivers and Harbors Act of 1902, Public Law No. 154, 57th Congress ("RHA 1902") authorizing and appropriating funds for the construction of a structure to retain debris as previously described in House of Representatives Document Number 431. The RHA 1902 stated:

> "*Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled*, That the following sums of money be, and are hereby, appropriated, to be paid out of any money in the Treasury not otherwise appropriated, to be immediately available, and to be expended under the direction of the Secretary of War and the supervision of the Chief of Engineers, for the construction, completion, repair, and preservation of the public works hereinafter named:
>
>> "... For carrying out the provisions of the Act of Congress providing, for the restraining or impounding- of mining debris in California, in accordance with the report submitted in House Document Numbered Four hundred and thirty-one, Fifty-sixth Congress, first session, one hundred and fifty thousand dollars in addition to the amount heretofore appropriated. And the Secretary of War, within the limit of the appropriations heretofore and now made by Congress and by the State of California, is authorized to make a contract or contracts for such work and materials as may be necessary to carry out and complete the project, and may, out of said appropriations, purchase a site or sites in accordance with said project: *Provided*, That before entering on said work or making said contracts, the

> Secretary of War shall be satisfied that the State of California has appropriated for the prosecution of said project the sum of four hundred thousand dollars: *Provided further*, That contracts for the purchase of sites or for work and materials shall provide specifically that only one-half the compensation agreed to be paid shall be paid by the United States, and that the contractor or contractors shall look to the State of California for the remainder of the agreed compensation: *And provided further*, That if the work be done by the United States without contract, one-half the cost thereof shall be paid by the State of California, as the work progresses, upon estimates to be submitted from time to time by the Chief of Engineers…"

As authorized by RHA 1902, a 26-foot debris dam was constructed at Daguerre Point to retain hydraulic mining debris and prevent it from flowing into navigable waters and adversely impacting the navigable capacity of downstream waterbodies. DDP was operationally completed in 1910. Although there have been reports of fish ladders at barriers on the lower Yuba River in the late 1920s, the ladders at DPD may not have been constructed until 1937, by the State of California at the southerly end of the dam. In August 1951, two new fish ladders were completed on the DPD by the State of California, Division of Fish and Game. In 1964, USACE met with the USFWS and the California Department of Fish and Game (CDFG, now the California Department of Fish and Wildlife (CDFW)) to discuss and develop criteria for the reconstruction and modification of the existing fishways, including the dimensions and depth of the fishway bays. In October 1965, the fishways were also extended at the request of CDFG using Federal and state contributed funds. The changes that were completed by the California Debris Commission were made at the request of CDFG. Because the DPD fish ladders were not designed or constructed for upstream passage of green sturgeon, the fish ladder entrances and bays are too small to accommodate green sturgeon, and there is no other means for green sturgeon to pass over or around the structure, it [the dam] is and always has been [since construction] a complete barrier for green sturgeon (see BA chapter 5 and Appendix A). The fish ladders appear to have been designed and constructed solely for the purpose of facilitating upstream passage for salmon and trout, based on the dimensions and configurations of the bays and design flows. Furthermore, at least in 1961, trout and salmon were primary concerns of the State of California which was a cost share partner with the California Debris Commission in constructing DPD. In 1961, the State legislature enacted legislation to reduce the loss of salmon and trout habitat. One of the areas the legislation targeted for management and protection was the Yuba River between Englebright Dam and a point approximately four miles east of Marysville.

Under the DPD project authority, USACE is responsible for various discretionary and non-discretionary functions. The discretionary functions include monitoring and clearing debris from the fish ladders and managing sediment buildup across the upstream face of the dam. Non-discretionary functions include the inspection and maintenance of the dam structure and fish ladders to ensure they remain in good repair (Appendix A in USACE 2023).

<u>*Endangered Species Act*</u>

Section 2(b) Purposes: The purposes of this chapter are to provide a means whereby ecosystems upon which endangered species and threatened species depend may be conserved, to provide a program for the conservation of such endangered species and threatened species, and to take such steps as may be appropriate to achieve the purposes of the treaties and conventions set forth in subsection (a) of this section.

Section 2(c) Policy: It is further declared to be the policy of Congress that all federal departments and agencies shall seek to conserve endangered species and threatened species and shall utilize their authorities in furtherance of the purposes of this chapter.

Section 7(a)(1): The Secretary shall review other programs administered by them and utilize such programs in furtherance of the purposes of this chapter. All other federal agencies shall, in consultation with and with the assistance of the Secretary, utilize their authorities in furtherance of the purposes of this chapter by carrying out programs for the conservation of endangered species and threatened species listed pursuant to section 1533 of this title.

Section 7(a)(2): Each federal agency shall, in consultation with and with the assistance of the Secretary, insure that any action authorized, funded, or carried out by such agency (hereinafter in this section referred to as an "agency action") is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of habitat of such species which is determined by the Secretary, after consultation as appropriate with affected States, to be critical, unless such agency has been granted an exemption for such action by the Committee pursuant to subsection (h) of this section. In fulfilling the requirements of this paragraph each agency shall use the best scientific and commercial data available.

Water Resources Development Act (WRDA)

Section 906, of the WRDA 1986, as amended (Title 33 – Navigation and Navigable Waters; Chapter 36 – Water Resources Development Subchapter V– General Provisions) authorized mitigation for damages to fish and wildlife. Section 2283 of Title 33 includes a section for fish and wildlife mitigation including:

> "(b) Acquisition of lands or interest in lands for mitigation" and "(b)(1) After consultation with appropriate federal and non-federal agencies, the Secretary is authorized to mitigate damages to fish and wildlife resulting from any water resources project under his jurisdiction, whether completed, under construction, or to be constructed. Such mitigation may include the acquisition of lands or interests therein…"

Section (e) of Title 33 addresses enhancements cost as federal costs:

> "in those cases when the Secretary, as part of any report to Congress, recommends activities to enhance fish and wildlife resources, the first costs of such enhancement shall be a federal cost when –
>
> (1) Such enhancement provides benefits that are determined to be national, including benefits to species that are identified by the National Marine Fisheries Service as of national economic importance, species that are subject to treaties or international convention to which the United States is a party, and anadromous fish;

> (2) Such enhancement is designed to benefit species that have been listed as threatened or endangered by the Secretary of the Interior under the terms of the Endangered Species Act, as amended (16 U.S.C. 1531 *et seq*.)…"

Section 2316 of the WRDA of 1990 (Title 33 – Navigation and Navigable Waters, Chapter 36 – Water Resources Development; Subchapter V – General Provisions, Environmental Protection Mission) states that one of the primary missions of the U.S. Army Corps of Engineers is environmental protection. It states:

> "(a) General rule, The Secretary shall include environmental protection as one of the primary mission of the U.S. Army Corps of Engineers in planning, designing, constructing, operating, and maintaining water resources projects."

Section 1135, of the WRDA of 1986, as amended, (Title 33 – Navigation and Navigable Waters, Chapter 36 – Water Resources Development, Subchapter V – General Provisions, §2309a. Project Modifications for Improvement of Environment) authorizes project modifications for the improvement of the environment. That section states:

> "(a) Determination of need: The Secretary is authorized to review water resources projects constructed by the Secretary to determine the need for modifications in the structures and operations of such projects for the purpose of improving the quality of the environment in the public interest and to determine if the operation of such projects has contributed to the degradation of the quality of the environment. (b) Authority to make modifications: The Secretary is authorized to carry out a program for the purpose of making such modifications in the structures and operations of water resources projects constructed by the Secretary which the Secretary determines (1) are feasible and consistent with the authorized project purposes, and (2) will improve the quality of the environment in the public interest. (c) Restoration of environmental quality: (1) IN GENERAL – if the Secretary determines that construction of a water resources project by the Secretary or operation of a water resources project constructed by the Secretary has contributed to the degradation of the quality of the environment, the Secretary may undertake measures for restoration of environmental quality and measures for enhancement of environmental quality that are associated with the restoration, through modifications either at the project site or at other locations that have been affected by the construction of operation of the project, if such measures do not conflict with the authorized project purposes."

Feasibility of Implementing the Reasonable and Prudent Alternative

In this section, we consider whether the RPA is technically and financially feasible, in accordance with the implementing regulations for section 7 of the ESA. Each of these are described as follows, beginning with the consideration of technical implementation.

The sub-element of the RPA involving the assessment and development of Ladder Operation Plans for the existing ladders is common enough to be classified as routine, based on NMFS' experience collaborating with project proponents. The RPA is financially feasible to implement, because the actions that are described either do not add additional financial requirements to USACE, or work within the existing budget provided for the maintenance of the structure.

The Likelihood of Jeopardizing the Continued Existence of a Listed Species or Resulting in the Destruction or Adverse Modification of Critical Habitat

The following paragraphs explain why the RPA would avoid the likelihood of jeopardizing the continued existence of listed species or resulting in the destruction or adverse modification of critical habitat, consistent with regulations (50 CFR §402.02) implementing section 7 of the ESA.

The RPA addresses the reduced likelihood of survival and recovery of CV spring-run Chinook salmon and CCV steelhead due to impacts of the proposed action that will affect the reproduction, numbers, or distribution of the species and limit access to preferred critical habitat for these species to also provide increased prey availability for Southern Resident Killer Whales (SRKW). Specifically, the RPA addresses aspects of the proposed action that prevent or delay safe, timely, and effective passage and migration through the action area. The RPA includes operations plans that are expected to minimize or eliminate passage delays given the physical configurations of the existing structures. The RPA includes the establishment of consistent communications plans to allow for operational flexibility due to mechanical failures, abnormal flow scenarios, or other unexpected situations.

The ladders are expected to be operated according to interim measures, as developed by USACE and NMFS using the best scientific and commercial information available, for one year after issuance of this opinion; during that time, a Ladder Operation Plan is expected to be developed. Any deferred fish ladder maintenance is expected to be completed during the proposed work window in 2024, as identified in the proposed action. Although the level of adverse effects cannot be precisely quantified, NMFS expects implementation of the interim measures for one year to minimize the level of take by increasing the likelihood of safe, timely, and effective passage of CV spring-run Chinook salmon and CCV steelhead through the ladders thus providing greater priority prey availability for SRKW. NMFS does not expect continued population-level adverse effects to CV spring-run Chinook salmon, CCV steelhead, or SRKW due to extended passage delays after development and effective implementation of the fish ladder operations plan. NMFS concludes the RPA would avoid the likelihood of jeopardizing the continued existence of CV spring-run Chinook salmon, CCV steelhead, SRKW or resulting in the destruction or adverse modification of critical habitat for these species.

2.10. 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). “Harass” is further defined by guidance as to “create the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering." "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 ITS.

This ITS expires 5 years from the date of its issuance, after which time the incidental take associated with the proposed action below will no longer be exempt.

2.10.1. Amount or Extent of Take

In the biological opinion, NMFS determined that incidental take is reasonably certain to occur as follows:

Incidental take of CV spring-run Chinook salmon, CCV steelhead, and sDPS green sturgeon individuals is expected from specific project components that are proposed by USACE, as well as from the RPA. Components that are expected to result in incidental take of CV spring-run Chinook salmon, CCV steelhead, and sDPS green sturgeon are as follows:

- Operation of fish passage facilities
- Maintenance and debris removal in the fish ladders
- Sediment removal upstream of DPD
- Redd surveys
- Gravel augmentation
- Woody material placement

It is not practical to quantify the amount or number of individual listed fish that are expected to be incidentally taken per species as a result of the project, due to the variability associated with the response of listed species to the effects of the project, the varying population size of each species, annual variations in the timing of migration, and uncertainties regarding individual habitat use within the action area and difficulty in observing injured or dead fish.

However, it is possible to estimate the extent of incidental take by designating ecological surrogates, and it is practical to quantify and monitor surrogates to determine the extent of incidental take that is occurring.

The most appropriate thresholds for the extent of incidental take that is expected to occur during proposed activities are the following ecological surrogates:

Operation of Fish Passage Facilities

1. Take in the form of harm, injury, or death of CV spring-run Chinook salmon and CCV steelhead adults and juveniles from fish passage facility operations and resulting passage delays/blockage.

Activities will affect small numbers of juvenile and adult CV spring-run Chinook salmon and CCV steelhead annually through increased stress, injury, or death. Harm is expected to moderate numbers of juvenile CV spring-run Chinook salmon and CCV steelhead through displacement, passage delay, increased predation, and behavioral modification, resulting in decreased fitness, growth, and survival. Harm, injury, and death is also expected to small numbers of adult CV spring-run Chinook salmon and CCV steelhead through passage delay, stress, delayed spawning, inability to reach spawning grounds, straying, or pre-spawn mortality. Take will be exceeded if operations vary outside of the described RPA or vary outside of NMFS-approved operational changes, or if passage is blocked for longer than 24 hours without coordination with NMFS

Sediment Removal Upstream of DPD

1. Take in the form of harm to juvenile and adult CV spring-run Chinook salmon, CCV steelhead, and sDPS green sturgeon is expected to occur due to temporary behavioral modifications related to sediment removal.

2. Take in the form of injury or death to juvenile CV spring-run Chinook salmon and CCV steelhead are expected to occur due to crushing from heavy equipment in the river to remove sediment upstream of DPD.

Harm resulting from sediment removal on the upstream side of DPD, as frequently as once a year, is expected to cause temporary behavioral modifications that result in the injury or death of individuals. Injury or death would occur to adults when they are forced to relocate downstream of DPD and are exposed to hazards within the fish ladder or expend additional energy migrating back upstream. Sediment management work would temporarily interfere with the egress of adult CV spring-run Chinook and CCV steelhead from the fish ladder and would modify the behavior of juveniles in the vicinity of the fish ladders during sediment management activities.

Harm of juvenile and adult CV spring-run Chinook salmon, CCV steelhead, and sDPS green sturgeon is expected for fish that are in close proximity to/downstream of DPD during sediment removal activities. Activities are expected to cause temporary disturbance, increased suspended sediment, and inaccessible areas to listed fish. Fish response includes displacement, increased stress, passage delay, increased predation, and behavioral modification resulting in decreased fitness, growth, and survival.

The sediment removal area is expected to be at least 45 feet wide for direct work, extending laterally along the dam for approximately 600 feet, for a total disturbance area of approximately 27,000 square feet. Turbidity effects are expected to occur up to 300 feet upstream and downstream of the direct work area. The removal is not expected to need to occur every year based on historical frequency of need, but could occur up to once yearly depending on river conditions. The temporary loss of up to 27,000 square feet of rearing and migratory habitat within the action area is, therefore, expected through sediment removal activities, resulting in harm to small numbers of each species.

Incidental take will be exceeded if annual sediment removal or increased turbidity from the removal exceeds 15 NTUs above the most recent non-project reading more than 345 feet upstream or downstream of DPD dam.

Maintenance and Debris Removal in the Fish Ladders

1. Take in the form of harm, injury, or death of juvenile and adult CV spring-run Chinook salmon and CCV steelhead during fish ladder maintenance and debris removal within the fish ladders.

Debris accumulation is expected when flows exceed 4,200 cfs and is expected to be removed daily. Injury or death of adult and juvenile CV spring-run Chinook salmon and CCV steelhead would result when fish are within the bays of the fish ladders or near the ladders during debris maintenance and removal activities. Juvenile fish are expected to be injured or killed due to impingement on debris blockages within the ladders. If flows present unsafe conditions for workers, debris will be removed within 24 hours after flows have returned to levels at which staff can safely begin work. Activities will affect juveniles and adults through increased stress, injury, or death. Harm is also expected through displacement, passage delay, increased predation, and reduced feeding, resulting in decreased fitness, growth, and survival. A small number of adult and juvenile CV spring-run Chinook salmon and CCV steelhead are expected to be harmed, injured, or killed during maintenance and debris removal activities. Take will be exceeded if debris blockages are not removed within 24 hours of safe conditions, or if debris blockages are present for longer than 24 hours without notifying NMFS.

Gravel Augmentation

1. Take in the form of harm, harassment, injury, or death of juvenile CV spring-run Chinook salmon and CCV steelhead resulting from the physical placement of up to 5,000 tons of spawning gravel into the Yuba River from July 15 to August 31 of each year.

Harm, injury, harassment or death of low numbers of juvenile CV spring-run Chinook salmon and/or CCV steelhead during gravel augmentation are expected to cause temporary behavioral modifications that result in the injury or death of individuals. Despite the benefits of the projects activities, they are expected to cause temporary disturbance, increased suspended sediment, or inaccessible areas to listed fish. Fish response includes displacement, leading to reduced survival due to predation, and reduced feeding, leading to reduced growth and reduced fitness. Injury or death are expected to result if gravel lands on fish, or if fine sediment from turbidity plumes enters the gills of fish and causes respiratory distress or failure.

Gravel augmentation via sluice method covers an area of approximately 1.2 acres, and turbidity increases extend up to 300 feet upstream and downstream of the area. Take will be exceeded if gravel augmentation exceeds 1.2 acres in placement annually, or turbidity parameters are exceeded 300 feet upstream or downstream of the work area.

Large Woody Material Management

1. Take in the form of harm, injury or death of CV spring-run Chinook salmon and CCV steelhead juveniles from annual large wood placement and associated in-water minimization measures, such as block nets and herding fish out of the area.

Harm, injury, or death of low numbers of juvenile CCV steelhead and/or CV Chinook spring-run Chinook salmon related to large woody material placement is expected to occur annually. Fish response includes displacement, leading to reduced survival due to predation, and reduced feeding, leading to reduced growth, and reduced fitness. Injury or death are expected to result if fish are crushed by wood or machinery, or if fine sediment from turbidity plumes enters the gills of fish and causes respiratory distress or failure.

Wood placement occurs at specific small areas near the shore. The expected effects of suspended sediment and risk for fish injury are expected up to 300 feet in any direction from the location of the small work area. Take will be exceeded if turbidity parameters downstream of the work area exceed 15 NTUs above the reference site 300 feet upstream of the work.

Redd Surveys and Manual Maintenance Activities

1. Take in the form of harassment of juvenile and adult CV spring-run Chinook salmon and CCV steelhead during redd surveys and manual maintenance activities.

Harassment of juvenile or adult CV spring-run Chinook salmon and CCV steelhead is expected for fish that are in the area during redd surveys or manual maintenance activities (activities using hand tools only). These activities are expected to cause temporary disturbance and increased suspended sediment. Fish response includes displacement, increased stress, and delayed spawning. Responses are not expected to cause injury or death of any fish. Take will be exceeded if any redds are physically disturbed or any fish (at any life stage) are injured or killed as a result of redd surveys or manual maintenance activities.

Reduction in Prey to Southern Resident Killer Whales

1. Take in the form of harm to Southern Resident Killer Whales resulting from the reduction in prey.

The injury and mortality of CV Chinook salmon that may occur under the proposed action is likely to result in some level of harm constituting take to SRKW by reducing availability of priority prey, which may cause animals to forage for longer periods, travel to alternate locations, or abandon foraging efforts. All individuals of the SRKW DPS have the potential to be adversely affected in the action area, particularly K and L pods which are known to spend time in California waters during the winter and spring months. There is no data available to help NMFS quantify impacts to foraging behavior or any changes to health of individual killer whales in the population from a specific amount of removal of potential prey resulting from the proposed action, as quantitative regression analyses have limitations (see section 2.4.3.4). Therefore, NMFS is using the level of Chinook salmon take, which we can quantify, as a surrogate for incidental take of SRKW. Chinook salmon take in the Yuba River relates directly to the extent of effects on prey availability from the proposed action, as we would expect Chinook salmon injury and mortality to be proportional to the reduction in prey in a given year.

Therefore, the extent of take for killer whales will be exceeded if the take for CV spring-run Chinook salmon is exceeded.

2.10.2. Effect of the Take

In the biological opinion, NMFS determined that the amount or extent of anticipated take, coupled with other effects of the proposed action, is not likely to result in jeopardy to the species or destruction or adverse modification of critical habitat when the RPA is implemented.

2.10.3. Reasonable and Prudent Measures

"Reasonable and prudent measures" refer to those actions the Director considers necessary or appropriate to minimize the impact of the incidental take on the species (50 CFR 402.02).

1. Measures shall be taken by USACE to better inform effective operations and maintenance of the fish passage facilities at DPD.

2. Measures shall be taken by USACE to minimize the effects of maintenance (*i.e.*, dredging upstream of DPD and removal of sediment within fish ladders) activities at DPD.

3. Measures shall be taken by USACE to monitor and report on operations of the fish passage facilities, implementation of conservation measures, and incidental take of listed fish during actions or operations discussed in this opinion.

2.10.4. Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the ESA, the federal action agency must comply (or must ensure that any applicant complies) with the following terms and conditions. The U.S. Army Corps of Engineers 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 ITS (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 would likely lapse.

1. The following terms and conditions implement reasonable and prudent measure 1:

    a. To the maximum extent practicable and within all available authorities, USACE shall participate with interested parties who are pursuing effective fish passage at Daguerre Point Dam, to include attending meetings, providing technical support, and other actions related to fish passage improvement.

    b. In coordination with NMFS, USACE shall install a staff gauge and/or conduct regular *in situ* monitoring upstream and downstream of DPD to record flow stage levels to better understand flow condition boundaries (headwater to tailrace of both fish ladders) to create better rating curves to inform gate and orifice opening/closing needs. This information shall be included in the annual report to NMFS and be used to assist in optimizing ladder operations.

2. The following terms and conditions implement reasonable and prudent measure 2:

a. USACE shall provide a copy of this opinion, associated BA, and other relevant documentation to any contractor on all aspects of the proposed action, making any contractor responsible for implementing all applicable requirements and obligations included in these documents and to educate and inform all other contractors involved in the project as to the requirements of this opinion. A notification that contractors have been supplied with this information prior to any in-water work activities begin will be provided to the reporting address below.

b. A NMFS-approved worker environmental awareness training program for construction and maintenance personnel, regardless of affiliation, shall be conducted by the NMFS-approved biologist (process for approval described below in 3b) for all construction and maintenance workers prior to the commencement of construction or maintenance activities. The program shall provide workers with information on their responsibilities with regard to listed fish species, their critical habitat, an overview of the life history of all the species, information on take prohibitions, protections afforded these animals under the ESA, and an explanation of the relevant terms and conditions of this opinion, associated BA, and other relevant documentation. Written documentation of personnel who have completed the training must be submitted to NMFS a minimum of one week prior to personnel beginning work and within 30 days of the completion of training. USACE shall provide the training materials to NMFS 60 days prior to the first training session for approval.

c. As the action agency responsible for dam operations, USACE shall require Hallwood and/or Cordua Irrigation Districts to repair the gate to the Hallwood-Cordua diversion (so it is no longer leaking) within the terms of the outgrant, easement, or license agreement to reduce juvenile entrainment within the diversion canal.

3. The following terms and conditions implement reasonable and prudent measure 3:

    a. USACE shall, by January 31 of each year, report to NMFS an update on the previous year's implementation of all aspects described in this opinion. Minimally, the annual report shall include:

        i. The timing (dates), cause, and solution of any fish passage impediments that lasted greater than 24 hours, including summaries of communications with NMFS regarding such impediments.

        ii. The size, quantity, and timing of the previous year's gravel augmentation, including any updates on funding requests.

        iii. The size, quantity, timing, and location of the previous year's LWM program, including any updates on funding requests.

    b. Prior to any redd surveys or fisheries monitoring occurring, USACE or their contractor shall submit qualifications for all staff biologist(s) (Designated Biologist) that are intending to perform fisheries monitoring or fish handling to demonstrate their experience. USACE will submit in writing to NMFS the name, qualifications, business address, and contact information of a biologist(s) at least 30 days before starting survey or monitoring activities. USACE will ensure that the Designated Biologist is knowledgeable and experienced in the biology and natural history of the covered species. USACE will obtain NMFS approval of Designated Biologist in writing before starting survey or monitoring activities, and will also obtain approval in advance in writing if the Designated Biologist must be changed. NMFS will email approval or denial of staff identified within 30 days of receipt of the qualifications.

c. USACE shall share redd monitoring data with NMFS and the Yuba River Management Team. USACE shall make redd monitoring data for all but the current spawning year publicly available on a USACE-hosted website (updating annually by February 1 of each year) and upon request from Yuba coordination teams.

d. USACE shall report to NMFS within 48 hours of dam-crest flashboards getting installed and shall provide the flows as reported at the Marysville Gage downstream of DPD at the time of placement.

e. USACE shall include photos of all maintenance activities in associated reports discussed in this opinion.

f. Any CV spring-run Chinook salmon, CCV steelhead, or sDPS green sturgeon found dead or injured within the action area during or within one week after construction or maintenance activities shall be reported within 48 hours to NMFS and CDFW via email or by phone. Any dead specimen(s) should be placed in a cooler with ice and held for pick up by an individual designated to do so.

g. USACE shall provide NMFS with the 1) maximum daily flow information and 2) daily temperature data collected near DPD. This data shall be included in the annual report to NMFS for evaluating impacts of ladder operations and conditions for listed fish. This data can be collected via the gauge installed on DPD and/or regular *in situ* monitoring as required by term and condition 1(b). Prior to installation, USACE can acquire this data from other sources not to exceed one year after issuance of this BO.

h. All reports for NMFS shall be sent only by email to:

> Assistant Regional Administrator
> National Marine Fisheries Service
> California Central Valley Office
> 650 Capitol Mall, Suite 5-100
> Sacramento California 95814-4607
> Email: ccvo.consultationrequests@noaa.gov

2.11. Conservation Recommendations

Section 7(a)(1) of the ESA directs federal agencies to use their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of the threatened and endangered species. Specifically, "conservation recommendations" are suggestions regarding discretionary measures to minimize or avoid adverse effects of a proposed action on listed species or critical habitat or regarding the development of information (50 CFR 402.02).

1. USACE should, within their existing authorities, pursue long-term annual funding for implementation of the LWMMP.
2. USACE should, within their existing authorities, pursue annual and long-term funding for implementation of the GAIP.
3. After installation of the gauge and initial flow monitoring, USACE should work annually with NMFS and water partners to modify ladder operations to support spawning and recruitment of green sturgeon.
4. USACE should coordinate on restoration activities and other activities that improve habitat quality and quantity in the lower Yuba River with NMFS and other Yuba watershed partners regarding DPD and the Yuba River. Some examples include: sharing VAKI and other monitoring data and participating in watershed teams.
5. USACE 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 and green sturgeon habitat restoration projects within the Feather River Basin, and the Lower Sacramento River system.
6. Within USACE's authorities, USACE should fund and support restoration actions consistent with NMFS' salmonid and green sturgeon recovery plans (NMFS 2014b, NMFS 2018). Recommended actions on the Yuba that have yet to be implemented include:
    a. Spring-run reintroduction above Englebright Dam (YUR-1.1).
    b. Modify DPD to provide unobstructed volitional upstream passage of salmonids (YUR-1.4, Recovery Action 1c).
    c. Monitoring annual abundance of sDPS green sturgeon (Monitoring Priority 1)

2.12. Reinitiation of Consultation

This concludes formal consultation for the Operations and Maintenance of Existing Fish Passage Facilities at Daguerre Point Dam on the Lower Yuba River.

Under 50 CFR 402.16(a): "Reinitiation of consultation is required and shall be requested by the federal agency, where discretionary federal involvement or control over the action has been retained or is authorized by law and: (1) If the amount or extent of taking specified in the incidental take statement is exceeded; (2) If new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not previously considered; (3) If the identified action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in the biological opinion or written concurrence; or (4) If a new species is listed or critical habitat designated that may be affected by the identified action."

Due to the application of ecological surrogates in the amount and extent of take section of this opinion, NMFS has identified the following reinitiation triggers based on their application. Essentially, these triggers identify thresholds that, if exceeded, would represent modifications to the action that could cause an effect to the listed species or critical habitat that was not considered in the opinion.

These triggers include the following:

1. Sediment Removal: If the sediment removal program is not implemented as described in the USACE BA or as otherwise conditioned by reasonable and prudent measures and terms and conditions described above.

2. Flashboard Management: If the flashboard management program is not implemented as described in the USACE BA or as otherwise conditioned by the RPA, or the reasonable and prudent measures and terms and conditions described above.

3. Debris Maintenance and Removal: If the debris maintenance program is not implemented as described in the USACE BA or as otherwise conditioned by reasonable and prudent measures and terms and conditions described above.

4. Gravel Management: If USACE does not request annual funding for the GAIP or as otherwise conditioned by reasonable and prudent measures and terms and conditions described above.

5. LWM Placement: If USACE does not request annual funding for the LWM installation program or as otherwise conditioned by reasonable and prudent measures and terms and conditions described above.

The following are further examples of when a further ESA consultation is warranted.

1. South Brophy Fish Screen: Yuba Water Agency is proposing to redesign and rebuild the screen at the South Brophy diversion, which would require permitting through USACE. Although the details of the specific fish screen type and operations plan have not been developed and, thus, the specific effects of fish screen construction and operation have therefore not been described or analyzed in this biological opinion, the construction of a new screen at the Brophy Diversion will require reinitiation of this opinion.

2. When RPA performance goals (including scheduling, reporting, coordination, physical, and/or biological) described are not met and the species are affected in a manner that was not analyzed in this biological opinion and for which there is take that has not been exempted.

3. MAGNUSON–STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT ESSENTIAL FISH HABITAT RESPONSE

Section 305(b) of the MSA directs federal agencies to consult with NMFS on all actions or proposed actions that may adversely affect EFH. Under the MSA, this consultation is intended to promote the conservation of EFH as necessary to support sustainable fisheries and the managed species' contribution to a healthy ecosystem. For the purposes of the MSA, EFH means "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity", and includes the associated physical, chemical, and biological properties that are used by fish (50 CFR 600.10). Adverse effect means any impact that reduces quality or quantity of EFH, and may include direct or indirect physical, chemical, or biological alteration of the waters or substrate and loss of (or injury to) benthic organisms, prey species and their habitat, and other ecosystem components, if such modifications reduce the quality or quantity of EFH. Adverse effects may result from actions occurring within EFH or outside of it and may include direct, indirect, site-specific or habitat-wide impacts, including individual, cumulative, or synergistic consequences of actions (50 CFR 600.810). Section 305(b) of the MSA also requires NMFS to recommend measures that can be taken by the action agency to conserve EFH. Such recommendations may include measures to avoid, minimize, mitigate, or otherwise offset the adverse effects of the action on EFH (50 CFR 600.905(b))].

3.1. Essential Fish Habitat Affected by the Proposed Action

The proposed project occurs within EFH for various federally managed fish species within the Pacific Coast Salmon Fisheries Management Plan (FMP). In addition, the project occurs within, or in the vicinity of several Habitat Areas of Particular Concern (HAPCs), which is designated for various federally managed fish species within the Pacific Coast Salmon Fisheries Management Plan (FMP). HAPC are described in the regulations as subsets of EFH which are rare, particularly susceptible to human-induced degradation, especially ecologically important, or located in an environmentally stressed area. Designated HAPC are not afforded any additional regulatory protection under the MSA; however, federal projects with potential adverse impacts on HAPC will be more carefully scrutinized during the consultation process. Habitat Areas of Particular Concern (HAPCs) that are expected to be either directly or indirectly adversely affected include (1) complex channels and floodplain habitats, (2) thermal refugia and (3) spawning habitat.

Additional species that utilize EFH designated under this FMP within the Action Area include fall-run/late fall-run Chinook salmon.

3.2. Adverse Effects on Essential Fish Habitat

Effects to the Pacific Coast Salmon FMP HAPCs are discussed in context of effects to critical habitat PBFs as designated under the ESA in section 2.5.2. Effects to ESA-listed critical habitat and EFH HAPCs are appreciably similar, therefore no additional discussion is included. The adverse effects to EFH HAPCs are listed below with the affected HAPC in parentheses, as follows: (1) complex channels and floodplain habitats, (2) thermal refugia, and (3) spawning habitat.

1. <u>Sedimentation and turbidity</u>
    a. Reduced habitat complexity (1)
    b. Reduced quality and availability of spawning substrate (3)
    c. Reduced delivery of oxygenated water to incubating eggs (3)
    d. Reduced size and connectivity of spawning patches (1, 3)
    e. Increased scouring (1, 3)
    f. Reduced riffle habitat (1, 3)
2. <u>Removal of riparian vegetation</u>
    a. Degraded water quality (1, 3)
    b. Reduced shading (2)
    c. Reduction in large woody material recruitment (1)
    d. Reduced shelter from predators (1)
    e. Reduction in aquatic macroinvertebrate production (1)

3.3. Essential Fish Habitat Conservation Recommendations

NMFS determined that the following conservation recommendations are necessary to avoid, minimize, mitigate, or otherwise offset the impact of the proposed action on EFH.

1. USACE shall 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 in the Yuba River. Implementation of future restoration projects is consistent with agency requirements set forth in section 7(a)(1). This will address adverse effects 1.a-f and 2.a-e and will benefit HAPCs 1-3.

2. Ladder operations should be evaluated to also maximize passage of fall-run and late fall-run Chinook salmon, as well as ESA-listed species described in the opinion. This will address adverse effects 1.a, 1.b, and 1.d and will benefit HAPCs 1 and 3.

3. O&M timing should also consider work windows and methods that are protective of potential fall-run and late fall-run Chinook salmon presence. This will address adverse effects 1.a-f and will benefit HAPCs 1 and 3.

Fully implementing these EFH conservation recommendations would protect, by avoiding or minimizing the adverse effects described in section 3.2, above, for Pacific Coast salmon.

3.4. Statutory Response Requirement

As required by section 305(b)(4)(B) of the MSA, the U.S. Army Corps of Engineers 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 the measures proposed by the agency for avoiding, minimizing, mitigating, or otherwise 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, mitigate, or offset such effects (50 CFR 600.920(k)(1)).

3.5. Supplemental Consultation

The U.S. Army Corps of Engineers 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. Data Quality Act Documentation and 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 opinion addresses these DQA components, documents compliance with the DQA, and certifies that this opinion has undergone pre-dissemination review.

4.1. 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 opinion are U.S. Army Corps of Engineers. A copy of this opinion were provided to the U.S. Army Corps of Engineers. The document will be available within 2 weeks at the NOAA Library Institutional Repository [https://repository.library.noaa.gov/welcome]. The format and naming adhere to conventional standards for style.

4.2. 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.

4.3. 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 part 600.

Best Available Information: This consultation and supporting documents use the best available information, as referenced in the References section. The analyses in this opinion and EFH 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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6. APPENDICES

6.1. Appendix A: Extended Consultation History and Background

6.1.1. Consultation Overview

The United State Army Corps of Engineers (USACE) and National Marine Fisheries Service (NMFS) have previously engaged in and completed four separate ESA section 7 consultations regarding USACE's operation at Daguerre Point Dam (DPD) in 2002, 2007, and then incorporated maintenance (O&M) activities at DPD in 2012, and 2014. The proposed action is located on the Yuba River in Yuba and Nevada counties, California. All consultations included threatened Central Valley (CV) spring-run Chinook salmon (*Oncorhynchus tshawytscha*) evolutionarily significant unit (ESU), threatened California Central Valley (CCV) steelhead (*O. mykiss*) distinct population segment (DPS). The threatened southern DPS (sDPS) of North American green sturgeon (*Acipenser medirostris*) was not included until the 2007 consultation.

The consultation history, as referenced in the Background has involved a series of litigation actions directing NMFS and USACE to reevaluate and reinitiate ESA section 7 consultation regarding USACE's O&M activities at DPD. Until 2014, Englebright Dam, DPD, and DPD's associated water diversions were jointly consulted on. In the 2014 consultations, USACE evaluated the Englebright Dam and DPD projects separately in two biological assessments (BAs), because "each dam has a separate authorization and appropriation, and because the actions at Englebright and Daguerre are wholly separate and are not dependent upon each other to operate (USACE 2013)." DPD's associated water diversions were incorporated into the effects analysis, but determined by USACE to be outside of the scope of USACE's discretion.

6.1.2. Litigation and Technical Assistance Leading to Current Consultation

In response to litigation brought in 2016 by Friends of the River (Case No. 2:16-00818-JAM-EFB) on the 2014 ESA letter of concurrence for Englebright and the 2014 biological opinion for DPD Operations and Maintenance, the U.S. District Court for the Eastern District of California (District Court) directed NMFS to either: (1) explain why NMFS revised its approach to USACE's "agency action" after completion of the 2012 NMFS opinion that concluded the O&M of DPD as proposed by USACE would likely jeopardize the continued existence of ESA-listed species; or (2) reinitiate consultation to adequately address potential effects to ESA-listed species (NMFS 2022).

The California Department of Fish and Wildlife (CDFW), USACE, and NMFS representatives met on site at DPD on March 2, 2020, to coordinate better communication pathways for implementation of the 2014 opinion. This site visit was to discuss, while present at the dam, the operations of the fish ladder gates, inspection and maintenance of the ladders, maintenance and operation of the VAKI fish counting devices, and any other topics related to implementation of the 2014 opinion Reasonable and Prudent Measures (RPM) and USACE's maintenance plans for allowing timely, safe, and effective fish passage at the dam.

On December 2, 2020, NMFS and USACE representatives discussed options for fulfilling the district court's remand of the DPD opinion and Englebright Dam concurrence letter. During this discussion, NMFS expressed concern that the DPD fish ladders are neither passing fish at the rate analyzed, nor passing them in an efficient and effective way. NMFS learned of the discrepancy in Chinook salmon passage at the two ladders via presentations at Yuba RMT meetings that presented VAKI data from the ladders. NMFS learned of closure of ladders due to equipment issues from stakeholders at the Yuba RMT meeting in August of 2019. When the fish ladders are not operating as expected and, therefore, as proposed and analyzed in the previous consultations, this results in harm to individuals due to delay or inability to migrate past DPD to critical habitat for all listed species and multiple life stages. The effects analysis in NMFS' 2014 opinion expected (based on the proposed action) that there would be two working ladders passing fish at the same rate. To address these concerns, both agencies agreed to have further technical staff discussions to establish immediate interim remedies regarding the following topics:

- Fish ladder operations
- Fish ladder maintenance and debris removal
- Dam-crest flashboard management
- VAKI issues
- Unauthorized boat ramp construction by a third-party in 2020

NMFS provided a letter on January 6, 2021, to USACE to memorialize the shared understanding that specifically identified the following concerns for ladder operations at DPD that often severely limit anadromy:

1. Extended closure of the north ladder due to damage between February 16 and September 10, 2019, and the north ladder operations failing to provide the fish passage opportunity as analyzed in the 2014 opinion.
2. Debris maintenance and removal program that deviates from that described in the BA or the 2014 opinion, resulting in further reduction of fish passage (*e.g.*, debris in the south ladder in fall 2019), and lack of sufficient details on debris removal activities (*e.g.*, 2020 annual report lacking specific data requirements specified in the 2014 opinion).
3. Partial gate closure during times of anadromy (*e.g.*, the south ladder's flow control gate in November 2020) and blocking of gates by debris (*e.g.*, beaver dam material) without notifying NMFS.
4. The south ladder is not preferred by spring-run Chinook for reasons unknown, effectively reducing fish passage.

USACE provided a response to NMFS' January 6, 2021, letter on January 25, 2021, that in order to provide a substantive response that would address NMFS' technical concerns and information requests, USACE required additional study and engaged HDR Engineering, Inc. (HDR). HDR was contracted to compile, organize, and analyze new data available since May 2014. USACE identified the need to resolve land ownership questions to identify the scope and extent of USACE's discretionary authority over the boat ramp construction. Additionally, USACE included their effort to work with CDFW to clarify the terms of their outgrant and identify persons/organizations that have been authorized by CDFW to perform duties under the outgrant issued by USACE on June 20, 2003.

USACE and NMFS then convened 16 technical meetings on the following dates to address issues identified and to jointly work toward meeting the District Court's remand order:

- December 18, 2020
- January 8, 2021
- January 29, 2021
- February 21, 2021
- March 16, 2021
- April 5, 2021
- April 21, 2021
- May 17, 2021
- June 2, 2021
- June 7, 2021
- July 26, 2021
- August 9, 2021
- August 26, 2021
- August 31, 2021
- September 21, 2021
- November 19, 2021

On April 21, 2021, NMFS provided USACE a letter regarding USACE's 2020 DPD annual report to provide suggestions to better address the terms and conditions of the 2014 opinion. NMFS considered both completeness in reporting, as well as "fisheries intent" (*i.e.*, is the action providing the intended ecological benefit for species).

On June 4, 2021, NMFS provided USACE a memorandum (NMFS 2021c) outlining current understanding of new information regarding sDPS green sturgeon presence and spawning in the lower Yuba River and potential effects of dam management on sDPS green sturgeon, which will inform our ongoing coordination with USACE.

On August 16, 2021, and November 4, 2021, NMFS requested numerous documents from USACE to facilitate discussions regarding making a decision to explain or reinitiate ESA consultations for DPD.

USACE provided NMFS with a draft technical memorandum (TM) in September 2021 presenting the results of HDR's analysis of post-2014 data related to USACE's discretionary activities at DPD. NMFS provided expedited review of the draft DPD TM and considered elements of it as part of the reinitiation decision-making process. Following a suite of technical team (see dates above) and management team meetings between USACE and NMFS, review of information presented in the draft DPD TM and subsequent review of additional requested documents, USACE determined that sufficient new information had become available since 2014 to warrant reinitiation of consultation for USACE's ongoing O&M activities at DPD.

On February 14, 2022, USACE sent a letter notifying NMFS that USACE decided to reinitiate ESA section 7 formal consultation concerning USACE's ongoing O&M activities at DPD.

On February 15, 2022, Department of Justice (DOJ) filed on behalf of NMFS and USACE a "Notice of Decision Regarding Daguerre Point Dam" that informed the court that the Federal defendants (NMFS and USACE) decided to reinitiate ESA section 7 consultation regarding DPD and attached relevant supporting documentation. The defendants explained that this reinitiated consultation would involve the submission of a legally sufficient BA from USACE to NMFS and the preparation of a new opinion by NMFS.

On March 15, 2022, the District Court issued a minute order "stay[ing] this litigation until the reinitiated [ESA section 7] consultation on the Daguerre Point Dam is complete and a new opinion is issued." The District Court also held, "Defendant shall provide the Court and parties with an estimated completion date for the consultation and biological opinion in the next Joint Status Report which shall be filed no later than June 15, 2022."

On April 4, 2022, NMFS provided a written response to USACE's reinitiation request. NMFS agreed to the timeline for reinitiation that USACE suggested to the District Court, which would result in the transmittal of USACE's BA to NMFS during April 2023. To continue the coordination efforts under the remand, USACE and NMFS continued technical assistance in support of BA development.

May 27, 2022, NMFS, USACE, and CDFW conducted a DPD site visit to discuss potential remedies for sediment issues at the south ladder and considerations to support DPD BA development.

June 15th 2022, NMFS and USACE filed a joint status report to the court, in which NMFS explained that a new opinion would replace the 2014 opinion regarding DPD. USACE anticipated "it will transmit a final BA for DPD to NMFS no later than April 2023," and NMFS estimated "that it could require up to nine months after receipt of a legally sufficient Biological Assessment from USCAE to complete consultation on DPD."

On August 9, 2022, USACE and NMFS held a meeting to initiate coordination efforts and technical assistance activities related to the BA. USACE declined to participate in further technical meetings between NMFS and USACE. NMFS encouraged technical discussions as an opportunity to proactively address concerns resulting in take during the development of the proposed action. Subsequently on August 10, 2022, USACE provided via electronic mail a deliverable schedule for NMFS to review and comment on the BA.

6.1.3. NMFS Technical Assistance for Development of the 2023 Biological Assessment:

Between August 25, 2022, and March 17, 2023, NMFS received the draft BA from USACE and HDR as individual chapters over an eight-month period. NMFS provided comments and in-line edits (often within 5 days) on all of the draft BA chapters and appendices, along with feedback provided at additional meetings. The following is a summary of NMFS, USACE, and HDR engagement.

On August 25, 2022, USACE provided chapter 1 (introduction and background) of the draft Daguerre Point Dam Biological Assessment to NMFS for comment and review. On September 21, 2022, NMFS, USACE, and HDR met to discuss comments on chapter 1 of the draft BA. On September 26, 2022, USACE provided responses to the comments.

On October 12, 2022, USACE provided NMFS with chapter 3 (action area) of the draft BA and NMFS provided comments on Chapter 3 to USACE on October 19, 2022. NMFS explained to the USACE that NMFS was unable to determine if the action area presented was accurate without having received the project description/proposed action (chapter 2). NMFS noted that licenses and outgrants associated with DPD, which were pending submission as appendices to the BA might affect the extent of the action area.

On October 21, 2022, USACE provided NMFS with chapter 4 (range-wide status of the listed species and critical habitat). On October 28, 2022, NMFS responded to USACE that NMFS would be relying on our own status of the species for the opinion.

NMFS received chapter 5 (environmental baseline) on November 2, 2022. On November 9, 2022, NMFS explained that a review of all 200+ pages in the five days provided would not be possible, and explained that it is standard practice for NMFS to write our own environmental baseline for the opinion and provided minimal comments on the draft BA chapter 5.

On November 17, 2022, USACE provided NMFS with chapter 6 (effects assessment methodology) and noted that the "deconstructed" activities comprising the proposed action (*i.e.*, discretionary actions that may have the potential to affect listed species or critical habitat) had been updated based on USACE and NMFS comments on chapter 1. NMFS met with USACE and HDR on November 28, 2022, to discuss the assessment methodology. NMFS provided comments on chapter 6 to USACE on December 2, 2022, making a correction to note that, as required by law, NMFS evaluates the BA following the *Assessment Framework for Conducting Jeopardy Analyses Under Section 7 of the Endangered Species Act* (NMFS 2004).

On December 2, 2022, USACE provided chapter 2 (description of the proposed action) of the draft BA.

On December 9, 2022, NMFS provided comments on chapter 2 of the BA (proposed action) to clarify the proposed action in more detail.

On December 16, 2022, NMFS provided comments on the six appendices referred to in the draft proposed action. NMFS' overarching comment was that the details provided in the appendices did not yet provide sufficient information for NMFS to understand the proposed action and its effects on fish. NMFS made recommendations to include additional information, such as duration, magnitude, frequency, timing, on how USACE will carry out its proposed action. NMFS noted additional management plans are needed for the proposed action DPD Fish Ladder Operation and Debris Monitoring and Management Plan (FLOMP, Large Woody Material Management Plan [LWMMP], etc.).

On January 18, 2023, USACE provided NMFS with chapter 7 (effects assessment) and chapter 8 (conclusion and determinations) for review. On January 24, 2023, NMFS received a revised chapter 2 (proposed action). USACE provided a new table showing each of the proposed action components and updates. NMFS met with USACE and HDR on January 25, 2023, to discuss the updated chapter 2.

On February 2, 2023, NMFS provided USACE with comments on the chapter 2 proposed action rewrite that the chapter was not yet sufficient to evaluate the effects to the species. NMFS and USACE met on February 9, 2023, to discuss these additional comments. USACE agreed to provide another update on the proposed action. On February 17, 2023, NMFS notified USACE that NMFS' staff had not yet seen the revised proposed action following the February 9, 2023, meeting. NMFS instead reviewed the effects and conclusions chapters of the BA with the recognition that effects and conclusions can only be read in the context of the complete proposed action.

NMFS and USACE staff met on March 7, 2023, to discuss outstanding draft BA issues. On February 21, 2023, USACE requested final draft BA comments by March 17, 2023, to adhere to the court-directed April deadline.

On March 8, 2023, NMFS communicated to USACE via electronic mail overarching comments related to the USACE draft BA that there were still many references to actions being taken "as directed by CDFW." NMFS asked USACE to "confirm with CDFW that they are still willing to accept that responsibility now that they are stepping away from the VAKI permit." NMFS informed USACE that we cannot assume CDFW's responsibility without CDFW's express permission, and that USACE as the federal action agency is ultimately responsible for activities at DPD. NMFS did not receive a response to this request and, therefore, cannot assume CDFW's responsibilities for actions associated with USACE's proposed action.

On March 17, 2023, NMFS provided USACE with NMFS' technical staff comments for the updated proposed action and effects chapters to identify where NMFS still had concerns regarding insufficient information.

On April 27, 2023, USACE provided NMFS with a consultation package and a request for the reinitiation of formal consultation under section 7 of the ESA for USACE's Authorized Operations and Maintenance of Existing Fish Passage Facilities at Daguerre Point Dam on the Lower Yuba River.

On May 12, 2023, NMFS sent a letter requesting additional information on sediment removal, gravel augmentation, as well as consultation under the Magnuson-Stevens Fishery and Conservation Management Act, in order to initiate formal consultation.

On June 23, 2023, USACE provided a response to the insufficiency letter and an addendum to USACE's April 2023 BA.

On July 21, 2023, NMFS and USACE engaged in a conversation regarding Essential Fish Habitat (EFH), to which USACE responded and provided a subsequent letter on July 21, 2023, requesting to reinitiate consultation on EFH under section 305(b)(2) of the Magnuson-Stevens Fishery Conservation Act (MSA) concurrently with ongoing ESA consultation. Upon receipt of the July 21, 2023, letter NMFS considered USACE's consultation package to be complete and re-initiated formal consultation. Pursuant to the March 28, 2024, court order from the U.S. District Court for the Eastern District of California, NMFS continued completion of the consultation with a delivery date of no later than July 31, 2024.

Updates to the regulations governing interagency consultation (50 CFR part 402) were effective on May 6, 2024 (89 Fed. Reg. 24268). We are applying the updated regulations to this consultation. The 2024 regulatory changes, like those from 2019, were intended to improve and clarify the consultation process, and, with one exception from 2024 (offsetting reasonable and prudent measures), were not intended to result in changes to the Services' existing practice in implementing section 7(a)(2) of the Act (89 Fed. Reg. at 24268; 84 Fed. Reg. at 45015). We have considered the prior rules and affirm that the substantive analysis and conclusions articulated in this biological opinion and incidental take statement would not have been any different under the 2019 regulations or pre-2019 regulations.