



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

Refer to NMFS ECO #: WCR-2024-01103

August 7, 2024

Mr. Marshall Harper
Chief, Environmental Resources Branch
Department of the Army
United States Army Corps of Engineers
Sacramento District
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
2024-2028 Green Sturgeon monitoring associated with the Sacramento River Bank
Protection Project Post-Authorization Change Report Program

Dear Mr. Harper:

Thank you for your letter of February 27, 2024, 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 2024-2028 adult and juvenile green sturgeon monitoring associated with the Sacramento River Bank Protection Project Post-Authorization Change Report Program. The Program was previously analyzed in a Framework Programmatic Biological Opinion (WCRO 2019-01893).

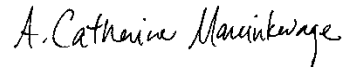
NMFS also reviewed the proposed action for potential effects on essential fish habitat (EFH) designated under the Magnuson-Stevens Fishery Conservation and Management Act (MSA) (16 U.S.C. 1855(b)). This review was pursuant to section 305(b) of the MSA, implementing regulations at 50 CFR 600.920, and agency guidance for use of the ESA consultation process to complete EFH consultation. NMFS concluded that the action would adversely affect EFH designated under the Pacific Coast Salmon Fishery Management Plan. Therefore, we have included the results of that review in this document.

The enclosed biological opinion, based on the best available scientific and commercial information, concludes that the proposed monitoring is not likely to jeopardize the continued existence of the federally-listed endangered Sacramento River winter-run Chinook salmon (*Oncorhynchus tshawytscha*) evolutionarily significant unit (ESU), the threatened Central Valley spring-run Chinook salmon (*O. tshawytscha*) ESU, the threatened California Central Valley steelhead (*O. mykiss*) distinct population segment (DPS), and the threatened southern DPS (sDPS) of the North American green sturgeon (*Acipenser medirostris*), and is not likely to destroy or adversely modify their designated critical habitats.



Please contact Camille Cube in the NMFS West Coast Region's California Central Valley Office at (707) 696-3123 or via email at Camille.Cube@noaa.gov if you have any questions concerning this consultation, or if you require additional information.

Sincerely,



Cathy Marcinkevage
Assistant Regional Administrator for
California Central Valley Office

Enclosure

cc: ARN 151422-WCR2024-SA00018

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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**

2024-2028 Green Sturgeon Monitoring associated with the Sacramento River Bank Protection
Project Post-Authorization Change Report Program

NMFS Consultation ECO Number: WCR-2024-01103

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?
Southern DPS of North American green sturgeon (<i>A. medirostris</i>)	Threatened	Yes	No	No	No
California Central Valley steelhead DPS (<i>O. mykiss</i>)	Threatened	Yes	No	No	No
Sacramento River winter-run Chinook salmon ESU (<i>O. tshawytscha</i>)	Endangered	Yes	No	No	No
Central Valley spring-run Chinook salmon ESU (<i>O. tshawytscha</i>)	Threatened	Yes	No	No	No

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	No

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

A. Catharine Marcinkevage

Issued By:

Cathy Marcinkevage
Assistant Regional Administrator for California Central Valley Office

Date: August 6, 2024



TABLE OF CONTENTS

1. Introduction.....	1
1.1. Background.....	1
1.2. Consultation History.....	2
1.3. Proposed Federal Action	2
2. Endangered Species Act: Biological Opinion And Incidental Take Statement	6
2.1. Analytical Approach.....	6
2.2. Rangewide Status of the Species and Critical Habitat	7
2.3. Action Area	8
2.4. Environmental Baseline.....	8
2.5. Effects of the Action.....	9
2.5.1. Effects on Critical Habitat and PBFs.....	9
2.5.2. Effects on Listed Fish Species.....	9
2.6. Cumulative Effects	13
2.7. Integration and Synthesis	14
2.7.1. Summary of the Status of the Species and Critical Habitat.....	14
2.7.2. Summary of the Environmental Baseline and Cumulative Effects	15
2.7.3. Summary of Effects of the Proposed Action to Listed Species.....	15
2.7.4. Summary of Effects of the Proposed Action to Critical Habitat	15
2.7.5. Risk to Listed DPS/ESU and Critical Habitat at the Designation Level	16
2.8. Conclusion.....	16
2.9. Incidental Take Statement	16
2.9.1. Amount or Extent of Take	17
2.9.2. Effect of the Take	17
2.9.3. Reasonable and Prudent Measures	18
2.9.4. Terms and Conditions.....	18
2.10. Conservation Recommendations.....	19
2.11. Reinitiation of Consultation	19
3. Magnuson–Stevens Fishery Conservation and Management Act Essential Fish Habitat Response	19
3.1. Essential Fish Habitat Affected by the Proposed Action	20
3.2. Adverse Effects on Essential Fish Habitat	20

3.3. Supplemental Consultation.....	20
4. Data Quality Act Documentation and Pre-Dissemination Review.....	20
4.1. Utility.....	20
4.2. Integrity	20
4.3. Objectivity	21
5. References	21

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 the 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.

On September 8, 2015, the U.S. Army Corps of Engineers (USACE) proposed the development of a Green Sturgeon Habitat Mitigation and Monitoring Plan (HMMP) at multiple bank repair projects in the Central Valley, including the Sacramento River Bank Protection Project Post-Authorization Change Report (SRBPP PACR) Program. USACE's goal for developing the HMMP is to ensure that adverse effects to southern Distinct Population Segment (sDPS) green sturgeon as a result of future bank repair actions are sufficiently offset, to allow for the growth, survival, and recovery of the species in the areas affected. The HMMP was published in December 2021.

On August 30, 2019, NMFS issued the SRBPP PACR Program Opinion (NMFS 2019). As described in the SRBPP PACR Program Opinion, in-river monitoring will be implemented pre-, during, and post-construction to reflect any changes to species using the repair areas. Tagging of adult sDPS green sturgeon under the SRBPP PACR Program has been occurring since 2020. The battery life on older tags from previous sDPS green sturgeon studies are running out, and there is limited tagging of juvenile sDPS green sturgeon, so there is a need to tag more adult and juvenile sDPS green sturgeon in order to continue monitoring the effects of bank repair actions under the SRBPP PACR Program. The data from this monitoring will also be used by USACE to determine effects on green sturgeon arising from the American River Common Features project, the West Sacramento project, and construction and operation of the new Sacramento Weir and fish passage facility.

1.2. Consultation History

- **February 27, 2024** – NMFS received a letter from the USACE requesting consultation under the 2019 SRBPP PACR Framework Programmatic opinion for the 2024-2028 sDPS green sturgeon monitoring sampling seasons.
- **March 18, 2024** – NMFS sent an email to USACE requesting additional information in regard to the methods that would be used to sample juvenile green sturgeon in the project area.
- **March 25, 2024** – NMFS met with USACE to discuss NMFS’s request for additional information. Later the same day, USACE provided NMFS an updated request letter via email. On this date, NMFS determined there was sufficient information, and consultation was initiated.
- **May 30, 2024** – NMFS and USACE communicated via email to clarify information regarding monitoring methods (specifically, net soak times).

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. [If an incidental take statement relies upon the 2024 regulations and includes one or more offsetting RPMs, then the above paragraph should be modified to acknowledge the inclusion of such measures by adding this clause to the end of the sentence: “except we note that we have included offsetting reasonable and prudent measures in the incidental take statement (an option that was not included in the section 7 regulations prior to 2024).”]

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

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).]

Future actions associated with the SRBPP PACR Program include bank repair projects that would occur within the SRBPP PACR Program area, which encompasses the levees and weirs of various basins within the Sacramento River Flood Control Project. The SRBPP PACR Program encompasses over 1,000 miles of levees and weirs. This area extends north to south along the Sacramento River, upstream from Chico at river mile (RM) 184 to the town of Collinsville at RM zero. The SRBPP PACR Program also includes Cache Creek, the lower reaches of Elder and

Deer creeks, the lower reaches of the American River (RM 0–23), Feather River (RM 0–61), Yuba River (RM 0–11), and Bear River (RM 0–17), portions of Three Mile, Steamboat, Sutter, Miner, Georgiana, and Cache sloughs, as well as a number of flood bypasses and distributaries. For the purposes of the framework programmatic consultation, there was no limit to the number of erosion sites, but a limit of 30,000 linear feet of repairs. Additional details of the SRBPP PACR Program opinion are incorporated here by reference (NMFS 2019).

The proposed monitoring includes capture and tagging of adult and juvenile sDPS green sturgeon between the years 2024-2028. This includes non-lethal capture of up to 100 adult and 500 juvenile green sturgeon. There will be up to 100 juvenile green sturgeon captured per year and up to 50 juvenile green sturgeon acoustically tagged per year. The proposed monitoring may also result in bycatch of Sacramento River (SR) winter-run Chinook salmon, Central Valley (CV) spring-run Chinook salmon, and California Central Valley (CCV) steelhead associated with juvenile sampling. Monitoring will be carried out by authorized individuals, as indicated by USACE, from the California Department of Fish and Wildlife (CDFW), the U.S. Fish and Wildlife Service (USFWS), USACE, the California Department of Water Resources (DWR), and ACE contracted consultants from FISHBIO (USACE 2024).

Adult Sampling Methods

Adult sDPS green sturgeon will be captured using angling with a baited hook-and-line. Hooks will be circular or octopus-style with a size ranging from 5/0 to 9/0. Fishing line will consist of 100-pound braided test line with a 150-pound leader with 6-10 ounces of weight. Various types of live bait will be used, depending upon availability, including species of local shrimp, lamprey, or salmon roe. Captured fish will be reeled to the boat immediately and secured in a vinyl tagging stretcher, ventral side up to induce tonic immobility. Sturgeon will be brought to shore, if possible, for tag implementation; however, tagging may also take place on the boat, if that is safer/faster for the fish. Upon capture, the fish will be scanned for existing acoustic and passive integrated transponder (PIT) tags using a Vemco VR100 receiver and PIT tag reader (respectively), measured for total length, fork length, and girth (+/- 1.0 centimeters). Fish with existing (functional) acoustic and PIT tags will be examined for signs of infection, incision closure, and healing. The tag numbers and physical data will then be entered into the OTN tracking database (oceantrackingnetwork.org) and will be sent to NMFS and the California, Oregon, and Washington Departments of Fish and Wildlife. Fish that lack tags will be tagged as described below and then released.

During acoustic tagging, ambient river water will be pumped gently over the gills of the sturgeon. The tags used in this effort will be Vemco V16-6x transmitters with a 60 – 90 second pulse interval and a battery life of ten years. The transmitters are 95 millimeters (mm) long and have a diameter of 16 mm. Tags will be surgically implanted by making an incision approximately 20 – 35 mm long with a sterilized surgical scalpel, just off-center of the ventral line, approximately 50 – 70 mm anterior to the insertion of the pelvic fin. Surgical tools will be initially sterilized within a forced air sterilization oven at 160 – 170 degrees Celsius (° C) for two to four hours and then disinfected between each surgery with 70 percent (%) or greater ethyl alcohol and a 10% iodine solution. The area where the tagging incision is to be located will be disinfected with a betadine or iodine solution prior to the surgical procedure. Tags will be

immersed in a Nolvasan solution prior to insertion and allowed to dry thoroughly. The incision will be closed using four or five interrupted sutures using 2-0 or 3-0 absorbable PDS II violet monofilament suture with a model NCT-1 or CP-2 cutting edge needle. After the surgical procedure is complete, an iodine solution will then be applied externally to the incision site prior to releasing the fish.

If the captured sturgeon lacks a PIT tag, one will be inserted at that time. A 23 mm HDX PIT tag will be placed either inside the peritoneal cavity during the acoustic tagging surgery already described, or a 12 mm HDX PIT tag will be injected intramuscularly on the left side, just posterior to the bony plates of the dermatocranium using a 12-gauge needle. These are the same tagging locations currently used for other similar research activities, ensuring consistency among the various sturgeon tagging efforts throughout the Central Valley. If an adult is caught with an existing PIT tag, but no acoustic tag is detected, one will be implanted as described above. A genetic sample (approximately 3 square millimeters) will be taken from one of the pelvic fins of all sturgeon captured and sent to a designated location, as recommended by NMFS. Total handling time is anticipated to be less than 15 minutes. USACE does not anticipate capturing any other protected fish species with this method of hook and line capture, as the method of angling specifically targets benthic feeding fish, and salmonids would not be feeding at the depths the bait will be fished. Tag information and meta-data will be shared amongst the research community for collaborative transparency. Tagging metadata will also be sent to the Interagency Telemetry Advisory Group.

Juvenile Sampling Methods

Juvenile sDPS green sturgeon within the lower Sacramento River will be captured using benthic trawl methods and tangle nets. Sampling will occur between September and February, and up to twice weekly during peak emigration months (October - February). Efforts will likely occur during day periods but may be adjusted to focus on crepuscular periods if capture rates are low. Trawling methods are adapted from those used in the upper Sacramento River USFWS monitoring program (see Gruber et al. 2022). A custom trawl measuring 4.9 meters (m) in length, made with a 15.9 mm mesh body, with a 3.2 mm mesh cod bag tied at the end and fitted with a pair of custom plywood otter boards will be deployed and towed by vessel. The trawl will be towed downstream at a pace slightly faster than the speed of the current (~3-5 river kilometers per hour (rkm/hr); Gruber et al. 2022). Trawl durations will be limited to one hour between sets but will likely be shorter due to physical limitations, such as, but not limited to, obstructions, reach length, and channel morphology. Tangle nets are size selective. Current CDFW monitoring programs use a 2-inch mesh in the downstream reaches of the Sacramento/San Joaquin Delta (Delta) near Rio Vista, California. Since the size of juveniles to be captured in the lower Sacramento River is expected to be smaller than juveniles encountered in the Delta, mesh sizes will range from 1-2 inches. Tangle nets will have a bottom lead line and an upper float line and will measure approximately 100 feet long by approximately 10 feet tall when stretched. Each corner of the net will be weighed down with an additional 40-pound pyramid weight so the net fishes the bottom of the river. Soak times may extend up to four hours when water temperature is up to 19° C, two hours when water temperature is between 19° C and 23° C, and one hour for water temperature between 23° C and 25° C.

The proposed location of sampling will include the 3-kilometer (km) reach of the Sacramento River downstream of the Feather River confluence. This section of the river offers a pinch point where migrating juvenile sturgeon may be more easily intercepted, along with key features such as a large sand bar, a potential foraging location, and a series of unique wing dams.

Up to 50 captured juvenile sturgeon will be implanted with an acoustic transmitter per year. Acoustic transmitters will be surgically implanted within the coelomic cavity of the fish. The length of juvenile green sturgeon in this region are anticipated to be 200-300 mm. The smallest 69 kilohertz (kHz) transmitter available, the Innovasea V7, will be used. Innovasea V7 tags are 19 mm long by 7 mm wide and have a battery life of approximately 199 days, which is sufficient to track the fish through the study reach. The Vemco/Innovasea 69 kHz system has been used with success in the study region for the purpose of tracking adult green sturgeon. Using the Innovasea V7 tags will allow for continuity in stations, reaches, and reported metrics for both adult and juvenile life stages. Due to the anticipated size of juvenile sturgeon in this reach, there will not be the additional implantation of PIT tags as described in the *Adult Sampling Methods* section above. Preparation of surgical supplies will include the soaking of tools and the transmitter in a 10% solution of Chlorohexadine (Nolvasan) and distilled water to maintain aseptic conditions, followed by a rinse of distilled water.

Juvenile surgery procedures include anesthesia of individuals, using the fish anesthetic MS222. Juvenile sturgeon will be placed in a bath consisting of 130 milligrams per liter (mg/L) of MS222 with a 130 mg/L sodium bicarbonate buffer for several minutes until fish reach stage four anesthesia, which is represented by loss of mobility, loss of equilibrium, and a slowed but steady opercular rate (Poytress et al. 2024). Fish will then be placed in a portable surgery station, consisting of a foam block with a narrow v-shaped groove, to secure the fish ventral side up during the procedure. A diluted maintenance dosage of 70 mg/L of MS222 and 35 mg/L sodium bicarbonate buffer with ambient water will be pumped across the gills during the procedure to help maintain sedation. An incision 7 mm long will be made between the third and fourth ventral scute using a 5 mm micro-scalpel. The transmitter will be placed in the peritoneal cavity of the fish following methods described in past wild juvenile green sturgeon telemetry studies using 69 kHz transmitters (Miller et al. 2014; Thomas et al. 2019, 2022). Ventral implantation is the preferred method due to the dimensions of the V7 transmitter. The ventral insertion method has little to no effect on swimming performance, growth, and, to a lesser extent, healing, when suture numbers are minimized (Miller et al. 2014). The incision site will be closed with two interrupted sutures using an absorbable size 4-0 PDSII suture. The interrupted suture method relies on multiple knots to maintain the closure, which are predicted to withstand abrasions from the environment more than a cross pattern suture, which has a single knot. Post-surgery recovery will be performed in an aerated enclosure until individuals exhibit voluntary swimming behavior. Release of individuals will occur at the lower extent of the sampling site to avoid recapture of individuals within the same day.

USACE proposes to provide annual take reports, in coordination with DWR and CDFW, to NMFS, no later than January 30th of the year following sampling.

Minimization measures to sDPS green sturgeon during capture and tagging include:

1. Reduce handling time to the maximum extent possible.

2. Sturgeon will be placed in tonic immobility during handling/tagging to minimize stress.
3. Targeted benthic fishing methods will be used to minimize bycatch.
4. USACE, CDFW, and DWR will ensure all tagging personnel will be appropriately trained.
5. Only post-spawn adults will be targeted to eliminate risk of stress to spawning fish.
6. To reduce the tag burden on fish, tags must weigh less than two percent of body weight and fish that appear too stressed (i.e. presenting unusual swimming or respiratory behavior) will not be tagged.

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 biological 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 sDPS green sturgeon, CCV steelhead, and CV spring-run Chinook salmon 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 biological 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.

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.

For the rangewide status of the species and critical habitat, we adopt here by reference the entire section 2.2 of the SRBPP PACR Program opinion (NMFS 2019).

In addition to the information being adopted by reference, more specific recent sDPS green sturgeon data is included as follows: according to Dudley et al. (2024), adult green sturgeon demonstrated an average spawning interval of 4.2 years for females and 3.8 years for all fish, meaning adults would return to spawn about every 4 years. A previous study by Mora et al.

(2018) estimated the population size to be 17,548 individuals, with 2,106 adults, 11,055 subadults, and 4,387 juveniles (NMFS 2021). A more recent study by Dudley et al. (2024) estimated the total population size in 2018 to be 10,700 individuals (with a 95% highest density interval (HDI) between 5,300 and 18,400 individuals), with 2,400 adults (2197-2624 95% HDI).

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).

For the action area, we adopt here by reference the entire section 2.3 of the SRBPP PACR Program opinion (NMFS 2019).

On a more specific level, the action area includes the locations capture and tagging is anticipated to occur. Adult sDPS green sturgeon capture and tagging activities will occur between river miles 205 to 209 of the Sacramento River, within the Feather and Lower Yuba rivers within Butte, Sutter, Yuba, and Nevada Counties, and in the San Francisco Bay-Delta region (including Suisun and San Pablo Bays). Juvenile sDPS green sturgeon capture and tagging activities will occur between river miles 46 to 79 of the Sacramento River.

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).

For the Environmental Baseline, we adopt here by reference the entire section 2.4 of the NMFS 2019, SRBPP PACR opinion. For the purposes of the sDPS sturgeon tagging activities proposed, it is also important to highlight existing monitoring activities currently occurring used for this action. Within the action area, there are extensive existing acoustic arrays intended to track tagged fish throughout the Sacramento River watershed and its tributaries (which entirely encompass the action area and extend well beyond it). These existing acoustic arrays were placed by a variety of other state, federal, and private organizations and are used to monitor multiple species of fish with the same tag types.

There is an existing recreational fishery within the action area for other sport fish that share habitat and feeding styles with sDPS green sturgeon. The action area is frequented by boaters, recreational fishing, and other scientific collection methods. Any fish within the action area are likely to already encounter noise from boat traffic, and exposure to fishing gear on a regular basis.

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 on Critical Habitat and PBFs

The action area includes waters that have been designated as critical habitat for CCV steelhead, CV spring-run Chinook salmon, SR winter-run Chinook salmon, and sDPS green sturgeon. The PBFs essential for the conservation of CCV steelhead, CV spring-run Chinook salmon, and SR winter-run Chinook salmon in the action area include: (1) freshwater rearing sites, (2) freshwater spawning sites, (3) freshwater migration corridors, and (4) estuarine areas. The PBFs essential for the conservation of sDPS green sturgeon in the action area include: (1) food resources, (2) water flow, (3) water quality, (4) migratory corridor, (5) depth, (6) sediment quality, and (7) substrate type and size.

The PBFs essential for the conservation of green sturgeon that would be affected by the proposed action include migratory corridors, food resources, and sediment quality. The PBFs essential for the conservation of salmonids that would be affected by the proposed action include freshwater rearing sites, freshwater spawning sites, and freshwater migration corridors. Full descriptions of effects of the proposed research activities are described in the following sections. In general, the activities would be capturing fish with angling equipment, benthic trawls, and tangle nets and surgically tagging fish. All of these techniques are minimally intrusive in terms of their effect on habitat because they would involve very little, if any, disturbance of streambeds or adjacent riparian zones. Juvenile sDPS green sturgeon collection activities involve bottom trawls which would temporarily disturb substrate, displace benthic invertebrate prey, and increase turbidity. However, such trawl actions affect small spatial areas and are brief in duration, so these effects are expected to be ephemeral and attenuate rapidly. Therefore, the effects of activities analyzed in this opinion on PBFs of designated critical habitat are minor.

2.5.2. Effects on Listed Fish Species

NMFS expects that adult and juvenile SR winter-run Chinook salmon, CV spring-run Chinook salmon, CCV steelhead, and sDPS green sturgeon may be present in the action area during sampling activities for both adult and juvenile green sturgeon. Juvenile sDPS green sturgeon sampling will occur in the Sacramento River near the confluence with the Feather River between September and February, which overlaps with peak salmonid and green sturgeon juvenile emigration. Listed species do not spawn in the area where juvenile sampling will take place, however, they do use that area as a migratory corridor. Areas where adult sampling will occur overlap with known spawning locations for CV spring-run Chinook salmon and CCV steelhead in the Feather and Lower Yuba rivers and green sturgeon spawning locations in the Sacramento, Feather, and Lower Yuba rivers. However, adult green sturgeon sampling will occur after the

green sturgeon spawning season has passed, will avoid known green sturgeon spawning locations, and is not anticipated to capture listed salmonids due to an angling method targeted towards adult green sturgeon.

The primary effect of the proposed research will be on sDPS green sturgeon in the form of capturing, handling, and tagging fish. Harassment caused by capturing, handling, surgical tagging, and releasing fish generally leads to stress and other sub-lethal effects, although a small number of fish captured may die during the process. The proposed monitoring is only intended to capture sDPS green sturgeon, however small numbers of listed salmonids are expected to be encountered as an unintentional result of sampling.

Effects of Angling

Fish that are caught and released alive may still die as a result of injuries or stress they experience during capture and handling. The likelihood of killing a fish varies widely, based on a number of factors including the gear type used, the species caught, the water conditions, and the care with which the fish is released. Struthers et al. (2018) evaluated the response in shortnose sturgeon (*Acipenser brevirostrum*) after being captured through hook and line angling. Observations indicated hooking injuries did not influence the sturgeons' ability to respond to a stimulus; however, the odds of impairment did increase with longer intervals of air exposure. Boat-side holding time by anglers led to an increase in stress levels. Assuming that sDPS green sturgeon would have a similar response, information in Struthers et al. (2018) indicates that one of the most important factors to reducing angling effects is to reduce holding times to the maximum extent possible. Effects from angling are expected to mostly be limited to stress and potential hook injury. Common hook injuries seen on sturgeon from the study were generally small and would not be expected to cause reduced feeding ability, but if a severe injury were to occur, reduced feeding and fitness would follow.

As sDPS green sturgeon have been documented to hold in deep pools together (Heublein et al. 2009), it is possible that other sDPS green sturgeon in the area may be disturbed by the process of bringing a hooked fish into the boat. The methods being proposed would mimic the existing recreational fishery methods in the action area. This disturbance would cause temporary disruption to normal holding and feeding behavior, but any disturbed fish would be expected to return to normal behaviors almost immediately.

The angling methods proposed are not anticipated to affect or capture listed salmonids, as the method of angling specifically targets benthic feeding fish, and salmonids would not be feeding at the depths the bait will be fished.

Effects of Bottom Trawling and Use of Tangle Nets

Bottom trawls and tangle nets will be used for juvenile sDPS green sturgeon sampling in the Sacramento River. These nets can catch non-target fish, including listed salmonids, as bycatch, potentially exposing them to injury and stress due to capture, handling, and relocation.

Trawls are cone-shaped, mesh nets that are towed, often along benthic habitat (Hayes 1983; Hayes et al. 1996). Rectangular doors, attached to the towing cables, keep the mouth of the trawl open. Most trawls are towed behind a boat, but small trawls can be operated by hand. As fish enter the trawl, they tire and fall to the narrow cod-end of the trawl. Mortality and injury rates associated with trawls can be high, particularly for small or fragile fish. Fish can be crushed by debris or other fish caught in the net. Depending on mesh size, some small fish are able to escape the trawl through the netting. However, not all fish that escape the trawl are uninjured, as fish may be damaged while passing through the netting. Short duration trawl hauls (5 to 10 minutes maximum) may reduce injuries (Hayes 1983, Stickney 1983, Hayes et al. 1996).

A study by Gruber et al. (2017) analyzed methods to capture juvenile green sturgeon and found that benthic trawls, when towed for short durations, are feasible for simple capture and low impacts to green sturgeon in the upper Sacramento River. However, in this study, benthic trawling resulted in incidental catch and mortalities of non-target ESA listed fish. Out of 413 benthic trawls conducted during the two years of the study, 41 green sturgeon were caught, two of which were mortalities; five CCV steelhead were caught (no mortalities); and eight SR winter-run Chinook salmon were caught, one of which was a mortality (Gruber et al. 2017).

Tangle nets are similar to gillnets, having a top net with floats and a bottom net with weights, but tangle nets have smaller mesh sizes than gill nets. Tangle nets are designed to capture fish by the snout or jaw, rather than the gills. Researchers must select the mesh size carefully depending on their target species, since a tangle net may act as a gill net for fish that are smaller than the target size. Fish may be injured or die if they become physiologically exhausted in the net or if they sustain injuries such as abrasion or fin damage.

Entanglement in nets can damage the protective slime layer, making fish more susceptible to infections. These injuries can result in immediate or delayed mortality. Vander Haegen et al. (2004) reported that spring Chinook salmon had improved survival when captured in tangle nets (92% survival) versus gill nets (50% survival), relative to a control group. Vander Haegen et al. (2004) emphasized that, to minimize both immediate and delayed mortality, researchers must employ best practices including using short nets with short soak times, and removing fish from the net carefully and promptly after capture. According to Kahn and Mohead (2010), safe net soak times are influenced by water temperature, DO, and, to a lesser extent, salinity. Shorter soak times are safer for fish than longer soak times. As with other types of capture, fish stress increases rapidly if the water temperature exceeds 18° C or dissolved oxygen is below saturation.

Bottom trawls include dragging a net and its associated weights along the floor of a body of water, which can disturb sediments and displace benthic invertebrate prey. However, the proposed trawls will affect small spatial areas and are brief in duration, so these effects are expected to be ephemeral and attenuate rapidly and are not likely to measurably affect any of the listed species. Similarly, tangle nets will be weighted so that they contact the bottom of the river. Tangle nets will be stationary, so they are not expected to appreciably increase turbidity or damage the benthos in a way that would affect listed species.

Effects of Handling, Surgical Tagging, and Tissue Sampling

Once the fish is captured, the tagging procedural steps begin (described in section 1.3 *Proposed Federal Action*). Temporary stress may occur. For adult sampling, temporary stress may be caused from placing the animal into the stretcher and getting them into a tonic immobility position (no anesthetics will be used for adult surgery). As sturgeon can reach fairly large sizes, it is possible that some injury to the fish may occur during movement of the animal from the water into the stretcher, but those potential effects are expected to be minimized with the proposed safe handling procedures. The use of tonic immobility has been demonstrated to be nearly as effective as anesthetics, but have a much quicker recovery period and require minimal handling time before being released. Juvenile surgery procedures do include the use of anesthetic, however post-surgery juvenile green sturgeon will be placed in an aerated enclosure until individuals exhibit voluntary swimming behavior. Once they exhibit such behavior, they will be released at the lower extent of the sampling site to avoid recapture of individuals within the same day. Increased levels of stress from handling are expected to be temporary, with only small changes in behavior immediately following release back to the water (Henningsson 1994).

The use of surgical tagging and tissue sampling for monitoring purposes has increased over the last 30 years. Many studies have evaluated the risks and effects posed from the surgical and tissue sampling process to sturgeon (Henningsson 1994; Collins et al. 2002; Frisk 2019). Numerous studies were performed on juveniles to determine effects to growth and swimming abilities, as juvenile sized fish would be more vulnerable to predators if their swimming capabilities were impacted. Miller et al. (2014) evaluated juvenile green sturgeon for growth, swimming performance, and incision healing after being surgically tagged. While 96.8% of fish in the study were seen to have inflammation around their incision, no effect was seen in swimming ability or growth after tagging or tissue sampling. More severe risks with surgical tagging include internal organ injury, surgical site infection, and potentially death.

Studies have documented fewer instances of internal injury to adult sturgeon during tagging procedures, which may be due to their large size (Collins et al. 2002). Effects to adults would be expected to be similar to those of juveniles, though at a lessened degree due to their larger size and lack of predators in freshwater systems. A similar study on adult lake sturgeon (*Acipenser fulvescens*; Hondorp et al. 2015) found no difference in the movement and behavior of fish newly tagged (within 15 days), versus fish tagged years prior. Therefore, it can be assumed that while the proposed action may cause some temporary incision inflammation on tagged fish, it would not be expected to reduce overall animal fitness or significantly change behavior. There is a chance of internal injury or death occurring due to the surgical tagging procedures, though it is not anticipated. The likelihood of this occurrence is reduced furthermore with the proposed safe handling, tagging, and release methods.

Beneficial Effects

There is a need for additional information about sDPS green sturgeon, especially related to more precise abundance estimates, an improved understanding of their biology, and further information on their movements, distribution patterns, and micro- and macro-habitat ecology. By tagging up to 100 adult and 250 juvenile green sturgeon over five years, a portion of each year's returning spawners will be able to be monitored in the future with tags that should last an estimated 10 years. The benefits of tagging fish will provide important information on movement

and behavior. The tags implanted will provide additional data on the species for another 10 years, which is invaluable. The tags proposed to be used are compatible with the acoustic arrays already within the area, and will allow immediate monitoring of any fish tagged through the proposed action.

The information gained from this study can be used to inform future management decisions. This study will be used by USACE to better determine construction and post-construction effects on the green sturgeon population arising from the SRBPP PACR Program and other projects in the surrounding area. The data will also be provided to other federal and state agencies so that they may use the data in their future management efforts or scientific research.

Effects of Combined Methods

The proposed action incorporates a variety of stressors on 600 individual green sturgeon (500 juveniles, 250 of which will be tagged, and 100 adults), including being captured, handled, anesthetized (for juveniles), surgical tagged, sampled, and released. While each of the proposed methods on their own all have effects that are generally temporary, some carry a small risk of injury or death. When used in combination, those effects have the potential to accumulate and cause increased stress, increased risk of injury, and death. The combined effects of angling, handling, surgical tagging, and tissue sampling, in a sequential manner, all add stress and risk.

Because sDPS green sturgeon can spawn multiple times throughout their lives, the death of a mature adult can have a high adverse impact to the population. Green sturgeon are long-lived fish (up to 70 years) that can spawn every two to six years, spawning over a dozen times in a lifetime. To minimize effects to productivity, during adult sampling, only post-spawn adult sturgeon will be targeted in an effort to reduce the likelihood of interrupted spawning migrations and aborted spawning.

Sturgeon are a hardy fish and have been documented to have minimal mortality associated with the types of handling and tagging activities proposed (Frisk 2019). With the proposed minimization measures, the death of an adult green sturgeon is unlikely. However, mortality is still a possible outcome of tagging 100 adult green sturgeon over the 5-year period. We expect one adult green sturgeon will die each year over the course of the study.

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).

For the cumulative effects, we adopt here by reference the entire section 2.6 of the SRBPP PACR Program opinion (NMFS 2019).

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.

2.7.1. Summary of the Status of the Species and Critical Habitat

SR winter-run Chinook salmon, CV spring-run Chinook salmon, CCV steelhead, and sDPS green sturgeon have experienced significant declines in abundance and available habitat in the California Central Valley over the last century relative to historical conditions. The status of the species (Section 2.2) details the current range-wide status of these ESUs and DPSs and their critical habitat. Factors that led to the current listing of these listed fish species under the ESA include past and present human activities, drought, hatchery influence, dam construction, and habitat limitation and degradation that have been identified as influential to the survival and recovery of the listed species. Beyond the continuation of the human activities affecting the species, we also expect that ocean condition cycles and climatic shifts will continue to have both positive and negative effects on the species' ability to survive and recover.

The current status of listed anadromous fish species has not significantly improved since the species' previous status reviews (NMFS 2016a, 2016b, 2021, 2024; SWFSC 2022) and, in some cases, has declined further. The SR winter-run Chinook salmon ESU is constrained to a single population and a concentrated spawning area, which are both susceptible to drought and fluctuating temperatures. The CV spring-run Chinook salmon ESU and CCV steelhead DPS are constrained by small population sizes and altered habitat that is susceptible to climate change. If measures are not taken to reverse these trends, the recovery and survival potential of SR winter-run Chinook salmon, 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 is degraded from their historical conditions, but are still considered critically important to the recovery and conservation of the species for which they were designated.

2.7.2. Summary of the Environmental Baseline and Cumulative Effects

The environmental baseline (Section 2.4) describes the current baseline conditions found in the Sacramento, Feather, and Lower Yuba rivers and in the San Francisco Bay-Delta region (including Suisun and San Pablo Bays), where the proposed action is to occur. Factors affecting the listed species in the action area include barriers limiting habitat, predation, water quality and temperature management, and urbanization. The environmental baseline discusses the vulnerability of listed species and critical habitat to climate change projections in the California Central Valley, with reduced summer flows and increased water temperatures likely to occur within many, if not most, watersheds in the Central Valley. The cumulative effects from continuing activities described in Section 2.6 are expected to continually negatively affect the federally listed anadromous fish species and further diminish the functional value of critical habitat for the conservation of the species within the action area through various pathways including, but not limited to, decreased water flow and quality, increases in water temperatures, levee construction and bank protection, increased stormwater and agricultural runoff, increased river traffic, riparian habitat degradation, and fragmentation.

2.7.3. Summary of Effects of the Proposed Action to Listed Species

Adult and juvenile SR winter-run Chinook salmon, CV spring-run Chinook salmon, CCV steelhead, and sDPS green sturgeon are expected to be present in the action area during sampling activities for both adult and juvenile sDPS green sturgeon (September 1-November 30 for adult sampling, September 1-February 28 for juvenile sampling). Juvenile sDPS green sturgeon sampling overlaps with peak salmonid and green sturgeon juvenile emigration in the Sacramento River.

The proposed action is expected to affect juvenile SR winter-run Chinook salmon, CV spring-run Chinook salmon, and CCV steelhead and juvenile and adult sDPS green sturgeon. The sampling and tagging activities are likely to result in the harm, harassment, injury, or death of individuals. Adult sDPS green sturgeon sampling will use hook-and-line angling methods meant to target adult sDPS green sturgeon only, and bycatch of other listed fish is not expected to occur. Juvenile sDPS green sturgeon sampling will use benthic trawls and tangle nets, which are expected to catch juvenile listed salmonids as bycatch. As a result, the proposed research activities may cause low rates of take and mortality for salmon and steelhead. The USACE did not request to intentionally take any salmonids, and any take would be incidental. The majority of fish that researchers for the USACE capture and release are expected to recover quickly with no long-term physiological, behavioral, or reproductive effects.

2.7.4. Summary of Effects of the Proposed Action to Critical Habitat

Critical habitat has been designated in the action area for all four listed species, and PBFs affected for each species are described in section 2.5.1.

As previously discussed in section 2.5.1, we do not expect the individual actions to have any appreciable effect on any listed species' critical habitat. This remains true for all the proposed actions in combination as well: the actions' short durations and minimal intrusion signify that even when taken together they would have an insignificant impact on critical habitat.

2.7.5. Risk to Listed DPS/ESU and Critical Habitat at the Designation Level

The action area includes spawning habitat for listed species in the Sacramento, Feather, and Lower Yuba rivers. The Sacramento River contains spawning populations of SR winter-run and CV spring-run Chinook salmon, CCV steelhead, and sDPS green sturgeon, making it an important river in terms of range-wide recovery for these species. Furthermore, the Sacramento River is the primary spawning location for SR winter-run Chinook salmon and one of the few known spawning locations for sDPS green sturgeon. According to the most recent status reviews, CCV steelhead, CV spring-run Chinook salmon, SR winter-run Chinook salmon, and sDPS green sturgeon are at some level of threat or risk of extinction due to past and present activities within the greater California Central Valley that have caused significant habitat loss, degradation, and fragmentation. Cumulative effects like water diversions, increased urbanization, ongoing agricultural practices, and continuing RSP (i.e., riprap) projects will all continue to happen in and adjacent to the action area without necessarily requiring Federal permitting.

During the proposed project, fish are expected to be harassed, harmed, injured, or killed through capture and surgical tagging activities. Effects to critical habitat are minor in nature, and the data collected by tagging sDPS green sturgeon will benefit the species by developing a more thorough understanding of this species' life history and movements within their range. Overall, the number of fish adversely affected by the proposed action is not expected to represent a substantial proportion of the CCV steelhead DPS, SR winter-run Chinook salmon ESU, CV spring-run Chinook salmon ESU, and green sturgeon DPS populations or their designated critical habitats.

Therefore, combining the adverse, minor, and beneficial effects associated with the proposed action, including the environmental baseline, cumulative effects, status of the species, and critical habitat, the proposed action is not expected to reduce appreciably the likelihood of both the survival and recovery of the CCV steelhead DPS, SR winter-run Chinook salmon ESU, CV spring-run Chinook salmon ESU, and green sturgeon DPS by reducing their numbers, reproduction, or distribution; nor appreciably diminish the value of designated critical habitat for the conservation of the species.

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 not likely to jeopardize the continued existence of the SR winter-run Chinook salmon ESU, the CV spring-run Chinook salmon ESU, the CCV steelhead DPS, and the Southern DPS of North American green sturgeon, or destroy or adversely modify their designated critical habitat.

2.9. 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.

2.9.1. Amount or Extent of Take

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

1. Adult sDPS green sturgeon monitoring activities: Take in the form of capture and injury to 100 adult sDPS green sturgeon due to angling, handling, surgical tagging, and relocation during adult green sturgeon monitoring activities. Additionally, we anticipate take in the form of death to one adult sDPS green sturgeon per year during the 2024-2028 study as a result of such activities.
2. Juvenile sDPS green sturgeon monitoring activities: Take in the form of capture, harm, injury, and harassment of 100 juvenile sDPS green sturgeon per study year for a total of 500 juvenile green sturgeon included in take during the entire 2024-2028 study, due to benthic trawling, tangle nets, handling, surgical tagging, aestheticization, and relocation during juvenile green sturgeon monitoring activities. We also anticipate incidental take in the form of death to five juvenile sDPS green sturgeon per study year. Additionally, there is take in the form of capture, harm, injury, harassment and/or death for five juvenile winter-run Chinook salmon, five juvenile spring-run Chinook salmon, and five juvenile CCV steelhead as a result of being caught as bycatch during juvenile green sturgeon monitoring activities.

The USACE and other authorized individuals (see USACE 2024) will be carrying out the monitoring study, and the USACE will be tracking numbers caught, including any mortalities. If the numbers captured or the number killed exceeds the amounts above, incidental take will have been exceeded, triggering reinitiation.

2.9.2. 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.

2.9.3. 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 to minimize handling time of sDPS green sturgeon by implementing handling and tagging training.
2. Measures shall be taken to monitor and reduce incidental take of listed salmonids and green sturgeon.

2.9.4. 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 USACE 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) All persons handling sDPS sturgeon associated with this proposed action shall be properly trained and use well maintained state-of-the-art equipment. All captured and/or handled fish must be documented.
 - (b) USACE shall annually provide the qualifications of persons performing surgeries for NMFS’ review and approval.
 - (c) Any persons who have not had sDPS tagging experience within the last 18 months shall be required to have supervision by a biologist who has until they are deemed able to tag on their own, and approved by NMFS.
2. The following terms and conditions implement reasonable and prudent measure 2:
 - (a) No sampling shall occur if water temperatures exceed 70° Fahrenheit (21° C).
 - (b) If any ESA-listed fish are killed during monitoring, sampling shall cease and the incident shall be reported to NMFS immediately (within 24 hours).
 - (c) USACE shall include in their annual take reports provided to NMFS an updated list of individuals who have performed tagging activities within the past year.
 - (d) All reports for NMFS shall be sent (preferably by email) to:

Cathy Marcinkevage
Assistant Regional Administrator
California Central Valley Office
National Marine Fisheries Service
650 Capitol Mall, Suite 5-100
Sacramento California 95814
ccvo.consultationrequests@noaa.gov
Phone: (916) 930-3600

2.10. 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. Individuals involved in monitoring and/or tagging of sDPS green sturgeon should carry and provide educational handouts on sturgeon to interested members of the public while performing proposed activities. Educational information should be targeted at reducing misidentification of sturgeon in the area to reduce the accidental take of sDPS green sturgeon in the white sturgeon recreation fishery. NMFS is able to provide handouts on request.

2.11. Reinitiation of Consultation

This concludes formal consultation for the 2024-2028 Green Sturgeon monitoring under the Sacramento River Bank Protection Project Post-Authorization Change Report Program.

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.”

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 Fishery Management Plan.

3.2. Adverse Effects on Essential Fish Habitat

NMFS determined the proposed action would adversely affect EFH as follows:

Juvenile green sturgeon monitoring activities, which include the use of benthic trawls and weighted tangle nets, would adversely affect EFH designated under the Pacific Coast Salmon Fishery Management Plan. However, as the Biological Opinion above describes in section 2.5.1, the adverse effects upon habitat would be temporary and minimal in nature. Therefore, NMFS has no additional EFH conservation recommendations to provide at this time. This concludes the EFH consultation.

3.3. Supplemental Consultation

The USACE 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 USACE. Other interested users could include CDFW and DWR. Individual copies of this opinion were provided to the USACE. 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.

5. REFERENCES

- Collins, M. R., D. W. Cooke, T. I. J. Smith, W. C. Post, D. C. Rust, and D. C Walling. 2002. Evaluation of four methods of transmitter attachment on shortnose sturgeon, *Acipenser brevirostrum*. *Journal of Applied Ichthyology*, 18(4-6), 491-494.
- Dudley, P.N., E.A. Mora, N.A. Friedenber, and P. Doukakis. 2024. An integrated population model and sensitivity assessment for a data poor population of green sturgeon. *Canadian Journal of Fisheries and Aquatic Sciences*. Just-IN <https://doi.org/10.1139/cjfas-2023-0147>
- Frisk, M. G., E. C. Ingram, and K. Dunton 2019. Monitoring Endangered Atlantic Sturgeon and Commercial Finfish Habitat Use in the New York Lease Area. Stoney Brook (NY): US Department of the Interior, Bureau of Ocean Energy Management. OCS Study BOEM, 74, 88.
- Gruber, J.J., W.R. Poytress, C.E. Praetorius and D.J. Ryan. 2017. 2014 and 2015 Juvenile Green Sturgeon Capture Feasibility Study. Red Bluff Fish and Wildlife Office, Anadromous Fish Restoration Program, U.S. Fish and Wildlife Service, Red Bluff, California.
- Gruber, J.J., L.C. Polansky, and W.R. Poytress. 2022. 2016-2019 Upper Sacramento River Juvenile Green Sturgeon Out-migration Investigation. Red Bluff Fish and Wildlife Office, Anadromous Fish Restoration Program, U.S. Fish and Wildlife Service, Red Bluff, California.

- Hayes, M.L. 1983. Active capture techniques. Pages 123-146 in L.A. Nielsen and D.L. Johnson, editors. Fisheries Techniques. American Fisheries Society. Bethesda, MD.
- Hayes, D.B., C.P. Ferreri, and W.W. Taylor. 1996. Active fish capture methods. Pages 193-220 in B.R. Murphy and D.W. Willis, editors. Fisheries Techniques, 2nd edition. American Fisheries Society. Bethesda, MD.
- Henningsen, A. D. 1994. Tonic immobility in 12 elasmobranchs: use as an aid in captive husbandry. Zoo Biology, 13(4), 325-332.
- Heublein, J. C., J. T. Kelly, C. E. Crocker, A. P. Klimley, and S. T. Lindley. 2009. Migration of green sturgeon, *Acipenser medirostris*, in the Sacramento River. Environmental Biology of Fishes, 84(3), 245-258.
- Hondorp, D. W., Holbrook, C. M., & Krueger, C. C. 2015. Effects of acoustic tag implantation on lake sturgeon *Acipenser fulvescens*: lack of evidence for changes in behavior. Animal Biotelemetry, 3(1), 44.
- Khan, J. and M. Mohead. 2010. A Protocol for Use of Shortnose, Atlantic, Gulf, and Green Sturgeons. U.S. Dep. Commerce, NOAA Tech. Memo. NMFS-OPR-45, 62 pp.
- Miller, E.A., H.E. Froehlich, D.E. Cocherell, M.J. Thomas, J.J. Cech, A.P. Klimley, and N.A. Fangue. 2014. Effects of acoustic tagging on juvenile green sturgeon incision healing, swimming performance, and growth. Environmental Biology of Fishes, 97(6), 647-658.
- Mora, E.A., R.D. Battleson, S.T. Lindley, M.J. Thomas, R. Bellmer, L.J. Zarri, and A.P. Klimley. 2018. Estimating the annual spawning run size and population size of the southern distinct population segment of green sturgeon. Transactions of the American Fisheries Society, 147(1), 195-203.
- NMFS (National Marine Fisheries Service). 2016a. 5-Year Review: Summary and Evaluation of the California Central Valley Steelhead Distinct Population Segment. U.S. Department of Commerce, pp. 43.
- NMFS (National Marine Fisheries Service). 2016b. 5-year review: Summary and evaluation of Central Valley spring-run Chinook salmon Evolutionarily Significant Unit. National Marine Fisheries Service. West Coast Region. Central Valley Office, Sacramento, CA.
- NMFS (National Marine Fisheries Service). 2018. Recovery Plan for the Southern Distinct Population Segment of North American Green Sturgeon (*Acipenser medirostris*). National Marine Fisheries Service, Sacramento, CA.
- NMFS (National Marine Fisheries Service). 2019. Biological Opinion on the Sacramento River Bank Protection Project Post Authorization Change Report. U.S. Department of Commerce.

- NMFS (National Marine Fisheries Service). 2021. 5-Year Review: Summary and Evaluation: Southern Distinct Population Segment of North American Green Sturgeon (*Acipenser medirostris*). U.S. Department of Commerce, pp. 63.
- NMFS (National Marine Fisheries Service). 2024. 5-year Review: Summary and evaluation of Sacramento River winter-run Chinook salmon Evolutionarily Significant Unit. National Marine Fisheries Service. West Coast Region.
- Poytress, W.R., L.C. Polansky, and J.J. Gruber. 2024. Transitional Strategies of Juvenile Green Sturgeon from a Riverine to a Brackish Water Environment. *Journal of Applied Ichthyology*, vol. 2024, Article ID 6637511, 20 pp. <https://doi.org/10.1155/2024/6637511>
- SWFSC (Southwest Fisheries Science Center). 2022. Viability assessment for Pacific salmon and steelhead listed under the Endangered Species Act: Southwest. 11 July 2022 Report to National Marine Fisheries Service – West Coast Region from Southwest Fisheries Science Center, Fisheries Ecology Division 110 McAllister Way, Santa Cruz, California 95060.
- Stickney, R.R. 1983. Care and handling of live fish. Pages 85-94 in L.A. Nielsen and D.L. Johnson, editors. *Fisheries Techniques*. American Fisheries Society. Bethesda, Maryland, 468 pp.
- Struthers, D.P., S.D. Bower, R.J. Lennox, C.E. Gilroy, E.C. MacDonald, S.J. Cooke, and M.K. Litvak., 2018. Short-Term Physiological Disruption and Reflex Impairment in Shortnose Sturgeon Exposed to Catch-and-Release Angling. *North American Journal of Fisheries Management*, 38(5), pp. 1075-1084.
- Thomas, M.J., M.L. Peterson, E.D. Chapman, N.A. Fangue, and A.P. Klimley. 2019. Individual habitat use and behavior of acoustically-tagged juvenile green sturgeon in the Sacramento-San Joaquin Delta. *Environ Biol Fish* 102, 1025-1037. <https://doi.org/10.1007/s10641-019-00888-1>
- Thomas, M.J., A.L. Rypel, G.P. Singer, A.P. Klimley, M.D. Pagel, E.D. Chapman, and N.A. Fangue. 2022. Movement patterns of juvenile green sturgeon (*Acipenser medirostris*) in the San Francisco Bay Estuary. *Environ Biol Fish* 105, 1749-1763. <https://doi.org/10.1007/s10641-022-01245-5>
- USACE (U.S. Army Corps of Engineers). 2024. Take Permit Request Supporting Information for Green Sturgeon monitoring associated with the Sacramento River Bank Protection Project Post-Authorization Change Report Program.
- Vander Haegen, G.E., C.E. Ashbrook, K.W. Yi, and J.F. Dixon. 2004. Survival of spring chinook salmon captured and released in a selective commercial fishery using gill nets and tangle nets. *Fisheries Bulletin* 68:123–133.