UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
West Coast Region
1201 NE Lloyd Boulevard, Suite 1100
PORTLAND, OR 97232-1274

Refer to NMFS No:
WCRO-2021-01247

November 8, 2022

Science Kilner
Regional Environmental Officer
U.S. Department of Homeland Security
FEMA Region 10
130 – 228th Street, SW
Bothell, Washington 98021-8627

Re: Endangered Species Act Section 7(a)(2) Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Response for the City of Reedsport Flood Reduction Resiliency, Lower Umpqua River (5th field HUC No.: 1710030308), Douglas County, Reedsport, Oregon

Dear Ms. Kilner:

Thank you for your letter of May 24, 2021, 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.). The consultation is for the U.S. Department of Homeland Security's Federal Emergency Management Agency funding of the levee improvements for Reedsport Flood Reduction Resiliency.

The enclosed document contains a biological opinion (opinion) prepared by NMFS pursuant to section 7(a)(2) of the ESA. In this opinion, NMFS concluded that the proposed action is not likely to jeopardize the continued existence of Oregon Coast (OC) coho salmon (*Oncorhynchus kisutch*), southern distinct population segment North American green sturgeon (green sturgeon) (*Acipenser medirostris*), southern distinct population segment Pacific eulachon (eulachon) (*Thaleichthys pacificus*), or result in the destruction or adverse modification of OC coho salmon, green sturgeon, or eulachon designated critical habitat. We also concluded that the proposed action is not likely to adversely affect Southern Resident killer whale (*Orcinus orca*) or its designated critical habitat.

NMFS also reviewed the likely effects of the proposed action on essential fish habitat (EFH), pursuant to section 305(b) of the Magnuson-Stevens Fishery Conservation and Management Act [16 U.S.C. 1855(b)], and concluded that the action would adversely affect the EFH of Pacific Coast salmon, Pacific Coast groundfish, and coastal pelagic species. Therefore, we have included the results of that review in section 3 of this document.

We have included five conservation recommendations to avoid, minimize, or otherwise offset potential adverse effects on EFH. Section 305(b) (4) (B) of the MSA requires Federal agencies to provide a detailed written response to NMFS within 30 days after receiving these recommendations. If the response is inconsistent with the EFH conservation recommendations, FEMA must explain why the recommendations will not be followed, including the scientific justification for any disagreements over the effects of the action and the recommendations.

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

Please contact Michelle McMullin in the Oregon Coast Branch of the Oregon Washington Coastal Area Office, at 541-957-3378 or michelle.mcmullin@noaa.gov, if you have any questions concerning this consultation, or if you require additional information.

Sincerely,

Kim W. Kratz. Ph.D
Assistant Regional Administrator
Oregon Washington Coastal Office

cc: Galeeb Kachra, FEMA
William Kerschke, FEMA
Deanna Schafer, City of Reedsport

Endangered Species Act (ESA) Section 7(a)(2) Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Response for the

City of Reedsport Flood Reduction Resiliency
Lower Umpqua River (5th field HUC No.: 1710030308)
Douglas County, Reedsport, Oregon

NMFS Consultation Number: WCRO-2021-01247

Action Agency: U.S. Department of Homeland Security's Federal Emergency Management Agency

Affected Species and NMFS' Determinations:

ESA-Listed Species	Status	Is Action Likely to Adversely Affect Species?	Is Action Likely To Jeopardize the Species?	Is Action Likely to Adversely Affect Critical Habitat?	Is Action Likely To Destroy or Adversely Modify Critical Habitat?
Oregon Coast coho salmon (*Oncorhynchus kisutch*	Threatened	Yes	No	Yes	No
Southern distinct population segment North American green sturgeon (*Acipenser medirostris*)	Threatened	Yes	No	No	N/A
Southern distinct population segment Pacific eulachon (*Thaleichthys Pacificus*)	Threatened	Yes	No	Yes	No
Southern Resident killer whale (*Orcinus orca*)	Endangered	No	N/A	No	N/A

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
Pacific Coast groundfish	Yes	Yes
Coastal pelagic species	Yes	Yes

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

Issued By:

Kim W. Kratz, Ph.D
Assistant Regional Administrator
Oregon Washington Coastal Office

Date: November 8, 2022

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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 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 402.

We also completed an essential fish habitat (EFH) consultation on the proposed action, in accordance with section 305(b)(2) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA) (16 U.S.C. 1801 et seq.) and implementing regulations at 50 CFR 600.

We completed pre-dissemination review of this document using standards for utility, integrity, and objectivity in compliance with applicable guidelines issued under the Data Quality Act (DQA) (section 515 of the Treasury and General Government Appropriations Act for Fiscal Year 2001, Public Law 106-554). The document will be available at the NOAA Library Institutional Repository [https://repository.library.noaa.gov/welcome]. A complete record of this consultation is on file at the Oregon Washington Coastal Office.

1.2. Consultation History

On September 17, 2018, the U.S. Department of Homeland Security's Federal Emergency Management Agency (FEMA) contacted us about a potential project to upgrade pumps associated with a U.S. Army Corps of Engineers constructed levee for the City of Reedsport (City). At that time, FEMA also mentioned that the City was seeking additional funding to upgrade the levee but there was not a proposed action. FEMA informed us that they did not believe there would be effects to listed species, critical habitat or EFH from the pump replacements because the current environmental conditions in the area would be maintained.[1]

We provided a species list letter to Anderson Perry and Associates, Inc. (consultant) on November 29, 2018. Technical assistance/pre-consultation activities began on August 31, 2020, when we received a draft biological assessment from FEMA (Anderson Perry & Associates, Inc. 2018). FEMA did note that the proposed action had changed since the biological assessment (BA) had been drafted. NMFS did provide an initial review of the draft BA and responded to FEMA on October 9, 2020, with information needed, additional consequences of the proposed action, and clarifying questions.

FEMA provided an updated BA (Anderson Perry & Associates, Inc. 2020) on January 15, 2021. NMFS completed a review of the updated BA on February 19, 2021, and provided additional clarifying questions intended to fully understand the details of the proposed action. FEMA passed the information request on to the City and their consultant. Responses to the information request were received on April 9, 2021. Pre-consultation technical assistance informed the

[1] E-mail from William Kerschke, FEMA, to Michelle McMullin, NMFS (September 18, 2018)(pre-consultation).

revising of the BA with regards to the inclusion of Southern Distinct Population Segment (DPS) green sturgeon, clearer delineation of levee sections and associated construction activities, best management practices for work area isolation and fish salvage, inclusion of pile driving calculations, and overall clarification of the proposed action. The BA also provided future activity information as information for FEMA's Environmental Impact Statement but FEMA did not request consultation for those activities.

FEMA provided a final BA (Anderson Perry & Associates, Inc. 2021) and requested formal consultation from NMFS on May 24, 2021, for funding for the City of Reedsport Flood Reduction Resiliency Project (PDMC-PJ-10-WA-2018-005) in Douglas County, Oregon through the FEMA Pre-Disaster Mitigation grant program. The primary purpose of the proposed action is to increase levee height and improve storm drainage systems to reduce risk to the City from future flooding events in response to settling of the levee that has occurred since the original construction in 1971. FEMA identified that the proposed action may affect federally listed/designated coho salmon, coho salmon critical habitat, eulachon, eulachon critical habitat, green sturgeon, green sturgeon critical habitat and essential fish habitat under the MSA. On June 7, 2021, NMFS notified FEMA that sufficient information was received. Consultation was initiated on May 24, 2021.

On September 12, 2022, FEMA provided new information regarding floodplain fill impacts. They also requested to review the draft biological opinion (opinion) and hydroacoustic calculations we performed for the proposed action. NMFS did not use the applicant's hydroacoustic calculations because the necessary information identifying the variables that went into the calculations were not identified. On September 14, 2022, NMFS provided their hydroacoustic calculations and a draft description of the proposed action to FEMA; the draft did not include the new information about the floodplain fill impacts. FEMA provided feedback on September 15, 16, and 29, 2022, and after discussion, NMFS made minor clarifications to the proposed action. NMFS updated the entire opinion based on the new floodplain fill information.

This opinion is based on information provided in FEMA's consultation request packet; additional information provided on June 15, 2021, correcting the approximate amount of levee reconstruction and best management practices for pile driving; and additional information received in September 2022.

On July 5, 2022, the U.S. District Court for the Northern District of California issued an order vacating the 2019 regulations that were revised or added to 50 FR part 402 in 2019 ("2019 Regulations," see 84 FR 44976, August 27, 2019) without making a finding on the merits. On September 21, 2022, the U.S. Court of Appeals for the Ninth Circuit granted a temporary stay of the district court's July 5 order. As a result, the 2019 regulations are once again in effect, and we are applying the 2019 regulations here. For purposes of this consultation, we considered whether the substantive analysis and conclusions articulated in the biological opinion and incidental take statement would be any different under the pre-2019 regulations. We have determined that our analysis and conclusions would not be any different.

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 (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 (50 CFR 600.910).

FEMA proposes to fund the implementation of the City of Reedsport's Flood Reduction Resiliency project to increase the Reedsport levee system resiliency to meet the 500-year flood plus 2 feet of freeboard elevation through the FEMA Pre-Disaster Mitigation grant program. Since the original construction of the levee in 1971, settlement has caused some portions of the existing 2.9-mile long levee to decrease in height by approximately 5 feet. The primary purpose of this project is to raise levee height and improve the functions of four pump stations and drainage systems to reduce risk to the City from future flooding events. The proposed project will raise portions of the levee, install a sand berm and drainage trench, stabilize and increase capacity of four pump stations, replace conveyance piping at the pump stations, and improve gravity drains. Implementation activities along the levee will include adding earthen fill, sheet pile, and concrete floodwalls to satisfy hydraulic elevation requirements; adding a sand berm and drainage trench to satisfy geotechnical factors of safety for underseepage and stability; and provide adequate protection from projected future flooding events. The proposed activities are considered to evenly affect the structure because a failure of any single portion of the flood system could result in substantial landside flooding (Anderson Perry & Associates, Inc. 2021). Repairs will account for approximately 54% of the total length of the levee system.[2]

The actions are proposed to increase the Reedsport Levee system resiliency to meet the 500-year flood plus 2 feet of freeboard elevation, which is the original 1971 construction of 200-year flood plus 3 feet of freeboard (Anderson Perry & Associates, Inc. 2021). The terms "increase in levee resiliency" and "levee raising" were used interchangeably in the BA. The proposed action is expected to extend the life of the existing structure for approximately 40 years.[3] Proposed infrastructure retrofits include rebuilding and updating the levee and associated facilities. Details will be discussed by the following project components:

1. Raising of the levee to its original height using earthen fill to provide flood reduction up to the 500-year FEMA flood elevation (sections 1-5 and 7 in Figure 1).
2. Floodwall construction on top of the existing levee to meet the height requirement where placing the levee fill is impractical due to existing infrastructure (sections 8-13 in Figure 1).
3. Levee reconstruction of an approximately 700-foot sand berm and drainage trench in the northwest corner of the City to reduce the risk of levee failure due to a deep foundation underseepage and stability issues (section 6 in Figure 1).
4. Improvements to four pump stations will include new pumps to increase output capacity, additional pilings to meet seismic requirements, upgraded conveyance piping through the levee, and improved gravity drains. The 4 pump stations are located along the north and

[2] E-mail from William Kerschke, FEMA, to Michelle McMullin, NMFS (June 15, 2021)(clarifying details of the proposed action).
[3] E-mail from William Kerschke, FEMA, to Michelle McMullin, NMFS (September 18, 2018)(providing additional information during pre-consultation).

west interior portions of the levee (Figure 1) and are used to dispose of stormwater collected from inside of the levee during high water events by pumping it through the levee to the rivers. Discharge pipes will be equipped with a backflow prevention device or will be constructed at an elevation high enough to prevent backflow.[4] Conveyance pipes at three of the pump stations will discharge below the ordinary high-water elevation (OHWE).

Sections 1-5 & 7 levee raising. The combined length of sections 1-5 is approximately 4,629 feet,[3] however, the sections are not all contiguous (Figure 1). The construction sequence for these sections consists of site preparation, excavation of the levee and removal of material from the site, construction of the levee improvements, and site restoration. The City will also improve 600 feet of drainage in an existing ditch along section 7 in addition to raising the levee. The City will increase the footprint of the levee on the river side in two locations (approximately 0.35 acre combined) where existing infrastructure prevents landward expansion.[5] Proposed fill in the floodplain for levee raising will be above the high tide line and high measured tide.

1. Floodwall construction (sections 8-13). The City will remove approximately 6 to 12 inches of the levee surface to provide a stable base for the floodwalls and then the piles and sheet piles will be driven to approximately 40 feet below the surface of the levee. Concrete will be placed as needed for the T-wall and I-wall construction.
    a. The City will use an open-ended diesel impact to install 460, 12-inch steel H piles over approximately 23 days with approximately 150-400 strikes per hour, averaging 1 pile per 30 minutes.[3] Installation distance from the river varies from 30 – 1,040 feet. Soils are mostly saturated and consist of silt to organic silt and sand.
2. Section 6 sand berm/drainage trench. The City will remove topsoil and vegetation from approximately 5.1 acres and stockpile it in a designated staging area. A 3-foot sand berm will then be constructed and the City will place the stockpiled materials on top prior to reseeding. On the northern side, the City will excavate a 14-foot deep trench approximately 0.06 acre in size, fill it with sand, and cap it with mounded crushed rock.
3. Pump stations, conveyance piping, and gravity drains.
    a. The City will use an open-ended diesel impact hammer to install 5, 16-inch steel pipe piles in each pump station pond and secure them to the existing pump station structure. All 20 piles will be installed over approximately 2 days with approximately 150-400 strikes per hour, averaging 1 pile per 30 minutes. The pond locations are approximately 214 feet from the river (separated by land, mostly saturated fine soils) and bubble curtains will be used.
    b. The City will replace conveyance pipes from the pump stations and through the levee. The City will excavate the levee, replace the piping, and then refill at each of the four locations.
    c. The City will also excavate and refill six existing gravity drains with quarry spalls, associated with sections 1, 2, 4, 8, 11, and 15 (Figure 1), to increase draining capacity and efficiency.

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[4] E-mail from William Kerschke, FEMA, to Michelle McMullin, NMFS (September 15, 2022)(providing feedback on draft description of the proposed action).
[5] E-mail from Galeeb Kachra, FEMA, to Michelle McMullin, NMFS (September 16, 2022)(providing new information about the proposed action).

d. Work will occur below the OHWE in association with the conveyance piping and gravity drains. The City will isolate the work area and remove fish from six locations for this work or approximately 0.54 acre total. Work area isolation and fish removal are described below along with proposed conservation measures. In-water work is anticipated to occur over approximately eight weeks (Anderson Perry & Associates, Inc. 2021).

Wetlands on the landward side of the existing levee would be permanently disturbed (0.17 acre) and temporarily disturbed (0.08 acre) from fill and removal activities at gravity drains, conveyance piping, and raising the levee.[6]

[6] E-mail from Galeeb Kachra, FEMA, to Michelle McMullin, NMFS (September 29, 2022)(clarifying details of the proposed action).

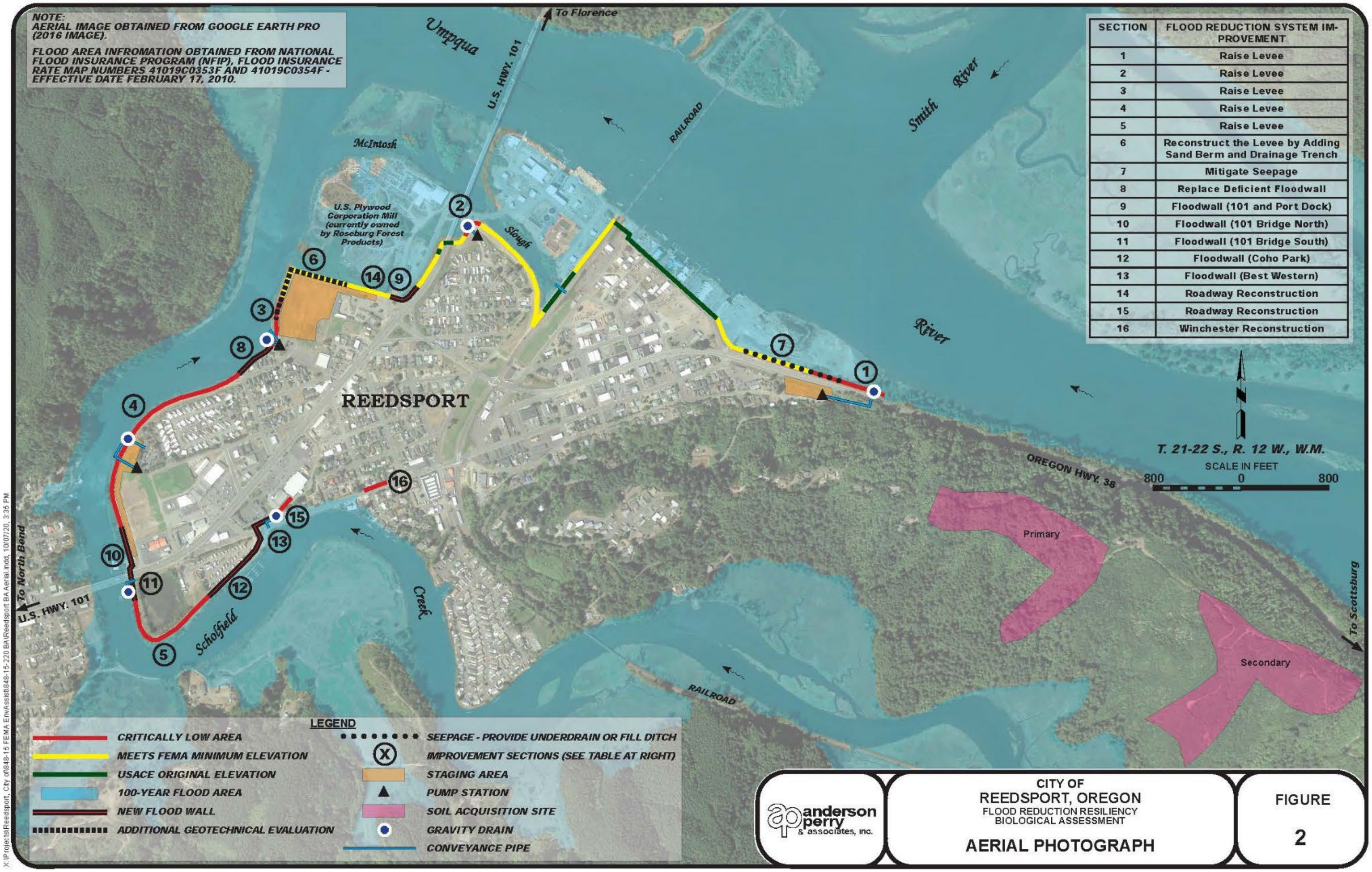

Figure 1. Overview of the Reedsport flood resiliency project (Anderson Perry & Associates, Inc. 2021). Sections 14-16 in the legend are not part of the proposed action.

The City has also proposed the following measures during construction to minimize impacts to the Umpqua River and Scholfield Creek.

- All work below the OHWE will take place during November 1-January 31 (in-water work window).
- Work area isolation and fish seining events will occur during one in-water work window. Water pump intakes will be screened according to NMFS fish screening criteria for anadromous salmonids (NMFS 2011).
- Heavy equipment will not be operated in water. Equipment for work below the OHWE will be staged on the levee and equipment extensions will reach down to the work areas.
- All pile driving will occur outside of the OHWEs of the Umpqua River and Scholfield Creek. Acoustic monitoring will be conducted during impact hammer use.
- Large woody debris is not anticipated to be required to be moved for this project. If large woody debris is required to be moved for this project, this material will be relocated to a suitable location in coordination with the Oregon Department of Fish and Wildlife (ODFW).
- No standing large trees will be removed in the riparian areas by the proposed project.
- Site restoration will include seeding disturbed upland areas with a native upland grass seed mix.
- Equipment will be inspected for noxious weeds prior to entry into the action area. Prior to entering the work area, all equipment will be inspected and cleaned in the vehicle staging areas.
- Vehicle staging areas will be inside of the levee and in upland areas. Staging areas will be separated from rivers by 150-450 feet. Vehicle fueling will occur inside of staging areas with the exception of track mounted equipment, large cranes, and other equipment with limited mobility.
- Biodegradable lubricants will be used in equipment operating within 150 feet of the Regulated Work Area.
- Spill prevention measures will be implemented along with fuel containment systems designed to completely contain potential spills when closer than 150 feet of waterbodies. Other pollution control devices and measures (such as diapering, parking on absorbent material, etc.) adequate to provide containment of hazardous material will also be used as necessary for equipment with limited mobility. Refueling operations will be completed in a way that will minimize the amount of fuel remaining in vehicles stored during non-work times. Hazardous material containment booms and spill containment booms will be maintained on site to facilitate the cleanup of hazardous material spills. Hazardous material containment booms will be installed in instances where there is a potential for release of petroleum or other toxicants.
- Construction access to all sites will be from existing roads, parking lots, and a right of way along the levee.
- An erosion and sediment control plan will be prepared and implemented prior to beginning construction. Erosion control measures may include (but are not limited to) installing straw filters on the staging area and material source site drainages to control potential erosion from material stockpiles and disturbed areas, and limiting the work area, staging, and material source site disturbance areas to the minimum necessary. Other types of erosion control measures could include silt fences or berms.

- Silt curtains will be used for in-water work and sediment fences will be placed on the exterior portion of the levee.
- Needed soils will be acquired from a location on City property (Figure 1) which is adjacent to an existing roadway.
- Levee work will occur section by section and will consist of site preparation, excavation of the levee and removal of material from the site, construction of levee improvements, and site restoration.
- Excavated materials will be transported to an upland disposal area.

Work Area Isolation and Fish Removal

Within the work areas, crews will manually install silt curtains during optimal tide periods but not to the full width of the channel allowing for fish passage outside of the isolated work areas. Crews will also conduct one seining pass through the work areas, starting along the streambank and spreading out toward the middle of the channel approximately 50 feet from the streambank. Additional seining passes will be conducted as needed to remove fish. Each of the six in-water work areas will remain isolated for approximately seven days.

The isolated work areas will be dewatered, if needed, slowly, over the course of approximately twelve hours to allow fish to voluntarily leave the work area. Any fish remaining in the isolated work area will then be removed by seining, then by dip nets, and finally by electrofishing if needed.

Electrofishing would be completed according to NMFS and ODFW electrofishing guidelines by a qualified biologist. All captured fish will be placed in aerated buckets, examined, identified, and recorded. Captured fish will be released outside the project area in similar habitat from which they were obtained, or pools located outside the project area. Observed fish injuries will result in a modification to the electrofishing settings. Fish capture will be conducted when stream temperatures are at or below 15° Celsius (59° Fahrenheit), to the extent practical. Electrofishing will be conducted early in the day to minimize stress to salmonids. Predatory fish (if any are captured) will not be put into the same bucket as prey species. To reduce impacts, the amount of time fish spend in the buckets would be minimized.

We considered, under the ESA, whether or not the proposed action would cause any other activities and determined that it would not. We evaluated three activities as possible consequences of the proposed action: pumping of water to the outside of the levee as part of normal operations, roadway reconstruction inside of the levee, and improvements to the Elm Street conveyance pipe.

The existing pump stations are used to dispose of stormwater collected from inside of the levee during high water events by pumping it through the levee to the rivers. The City could continue to pump water without upgrading each pump station with a second pump. Pumping water from inside the levee to the outside is not a consequence of the proposed action, because it would continue regardless of the proposed action; therefore, the activity is considered under the environmental baseline.

Along levee sections 14-16, the City will improve drainage by excavating 851 feet of roadway, adding fill to raise the roadway, and finish with hot mix asphalt (Anderson Perry & Associates, Inc. 2021). Future work may also include replacing the conveyance piping for the Elm Street pump station which would involve excavating a new ditch to place a new conveyance pipe. Roadway reconstruction and future Elm Street conveyance piping improvements are not funded by FEMA, are not included as part of the City's flood reduction resiliency project, and therefore are not part of the proposed action. The roads currently exist and are not connected to the levee. Drainage improvements of the existing roadway can happen at any time including before the proposed action is implemented or after; the timing of the work is in no way related to the proposed action. The roadway will also continue to exist even if the proposed action was not implemented. For these reasons, roadway reconstruction is not a consequence of the proposed action. The existing roads and any effects of the existing roads are considered under the environmental baseline. Similarly, a new conveyance pipe for the Elm Street pump station could be replaced at any time as needed. The City will continue to pump water from the Elm Street pump station using the conveyance piping upgraded as part of the proposed action; however, the upgraded piping is only to increase capacity and is not required. Therefore, the Elm Street piping can be replaced at any time as needed and will continue to exist without implementation of the proposed action; therefore, it is not a consequence of the proposed action.

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 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.

Although expanded critical habitat for Southern Resident killer whale (SRKW) was not designated when FEMA requested consultation, NMFS has provided analysis in the "Not Likely to Adversely Affect" Determinations section (section 2.13) for SRKW and designated critical habitat. NMFS has also provided analysis in section 2.13 for designated critical habitat for green sturgeon.

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 species uses 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" as described in 50 CFR 402.02. The opinion also examines the condition of critical habitat throughout the designated area, evaluates the conservation value of the various watersheds and coastal and marine environments that make up the designated area, and discusses the function of the PBFs that help to form that conservation value.

One factor affecting the rangewide status of OC coho salmon, green sturgeon, eulachon, and aquatic habitat at large, is climate change. Climate change is likely to play an increasingly important role in determining the abundance and distribution of ESA-listed species, and the conservation value of designated critical habitats, in the Pacific Northwest. These changes will not be spatially homogeneous across the Pacific Northwest. Major ecological realignments are already occurring in response to climate change (IPCC WGII 2022). Long-term trends in warming have continued at global, national, and regional scales. Global surface temperatures in the last decade (2010s) were estimated to be 1.09°Celsius (C) higher than the 1850-1900 baseline period, with larger increases over land ~1.6°C compared to oceans ~0.88 (IPCC WGI 2021). The vast majority of this warming has been attributed to anthropogenic releases of greenhouse gases (IPCC WGI 2021). Globally, 2014-2018 were the 5 warmest years on record both on land and in the ocean (2018 was the 4th warmest) (NOAA NCEI 2022). Events such as the 2013-2016 marine heatwave (Jacox *et al.* 2018) have been attributed directly to anthropogenic warming in the annual special issue of Bulletin of the American Meteorological Society on extreme events (Herring *et al.* 2018). Global warming and anthropogenic loss of biodiversity represent profound threats to ecosystem functionality (IPCC WGII 2022). These two factors are often examined in isolation, but likely have interacting effects on ecosystem function.

Updated projections of climate change are similar to or greater than previous projections (IPCC WGI 2021). The NMFS is increasingly confident in our projections of changes to freshwater and marine systems because every year brings stronger validation of previous predictions in both physical and biological realms. Retaining and restoring habitat complexity, access to climate refuges (both flow and temperature) and improving growth opportunity in both freshwater and marine environments are strongly advocated in the recent literature (Siegel and Crozier 2020). Climate change is systemic, influencing freshwater, estuarine, and marine conditions. Other systems are also being influenced by changing climatic conditions. Literature reviews on the impacts of climate change on Pacific salmon (Crozier 2015, 2016, 2017; Crozier and Siegel 2018; Siegel and Crozier 2019, 2020) have collected hundreds of papers documenting the major themes relevant for salmon. Here we describe habitat changes relevant to Pacific salmon and steelhead, prior to describing how these changes result in the varied specific mechanisms impacting these species in subsequent sections.

Forests

Climate change will impact forests of the western U.S., which dominate the landscape of many watersheds in the region. Forests are already showing evidence of increased drought severity, forest fire, and insect outbreak (Halofsky *et al.* 2020). Additionally, climate change will affect tree reproduction, growth, and phenology, which will lead to spatial shifts in vegetation. Halofsky *et al.* (2018) projected that the largest changes will occur at low- and high-elevation forests, with expansion of low-elevation dry forests and diminishing high-elevation cold forests and subalpine habitats.

Forest fires affect salmon streams by altering sediment load, channel structure, and stream temperature through the removal of canopy. Holden *et al.* (2018) examined environmental factors contributing to observed increases in the extent of forest fires throughout the western U.S. They found strong correlations between the number of dry-season rainy days and the annual extent of forest fires, as well as a significant decline in the number of dry-season rainy days over the study period (1984-2015). Consequently, predicted decreases in dry-season precipitation, combined with increases in air temperature, will likely contribute to the existing trend toward more extensive and severe forest fires and the continued expansion of fires into higher elevation and wetter forests (Alizedeh *et al.* 2021).

Agne *et al.* (2018) reviewed literature on insect outbreaks and other pathogens affecting coastal Douglas-fir forests in the Pacific Northwest and examined how future climate change may influence disturbance ecology. They suggest that Douglas-fir beetle and black stain root disease could become more prevalent with climate change, while other pathogens will be more affected by management practices. Agne *et al.* (2018) also suggested that due to complex interacting effects of disturbance and disease, climate impacts will differ by region and forest type.

Freshwater Environments

The following is excerpted from Siegel and Crozier (2019), who present a review of recent scientific literature evaluating effects of climate change, describing the projected impacts of climate change on instream flows:

Cooper *et al.* (2018) examined whether the magnitude of low river flows in the western U.S., which generally occur in September or October, are driven more by summer conditions or the prior winter's precipitation. They found that while low flows were more sensitive to summer evaporative demand than to winter precipitation, interannual variability in winter precipitation was greater. Malek *et al.* (2018) predicted that summer evapotranspiration is likely to increase in conjunction with declines in snowpack and increased variability in winter precipitation. Their results suggest that low summer flows are likely to become lower, more variable, and less predictable.

The effect of climate change on ground water availability is likely to be uneven. Sridhar *et al.* (2018) coupled a surface-flow model with a ground-flow model to improve predictions of surface water availability with climate change in the Snake River Basin. Projections using representative concentration pathways (RCP) 4.5 and 8.5 emission scenarios suggested an increase in water table heights in downstream areas of the basin and a decrease in upstream areas.

As cited in Siegel and Crozier (2019), Isaak *et al.* (2018) examined recent trends in stream temperature across the Western U.S. using a large regional dataset. Stream warming trends paralleled changes in air temperature and were pervasive during the low-water warm seasons of 1996-2015 (0.18-0.35°C/decade) and 1976-2015 (0.14-0.27°C/decade). Their results show how continued warming will likely affect the cumulative temperature exposure of migrating sockeye salmon *O. nerka* and the availability of suitable habitat for brown trout *Salmo trutta* and rainbow trout *O. mykiss*. Isaak *et al*. (2018) concluded that most stream habitats will likely remain suitable for salmonids in the near future, with some becoming too warm. However, in cases where habitat access is currently restricted by dams and other barriers salmon and steelhead will be confined to downstream reaches typically most at risk of rising temperatures unless passage is restored (FitzGerald *et al*. 2020, Myers *et al.* 2018).

Streams with intact riparian corridors and that lie in mountainous terrain are likely to be more resilient to changes in air temperature. These areas may provide refuge from climate change for a number of species, including Pacific salmon. Krosby *et al.* (2018) identified potential stream refugia throughout the Pacific Northwest based on a suite of features thought to reflect the ability of streams to serve as such refuges. Analyzed features include large temperature gradients, high canopy cover, large relative stream width, low exposure to solar radiation, and low levels of human modification. They created an index of refuge potential for all streams in the region, with mountain area streams scoring highest. Flat lowland areas, which commonly contain migration corridors, were generally scored lowest, and thus were prioritized for conservation and restoration. However, forest fires can increase stream temperatures dramatically in short time-spans by removing riparian cover (Koontz *et al.* 2018), and streams that lose their snowpack with climate change may see the largest increases in stream temperature due to the removal of temperature buffering (Yan *et al.* 2021). These processes may threaten some habitats that are currently considered refugia.

Marine and Estuarine Environments

Along with warming stream temperatures and concerns about sufficient groundwater to recharge streams, a recent study projects nearly complete loss of existing tidal wetlands along the U.S. West Coast, due to sea level rise (Thorne *et al.* 2018). California and Oregon showed the greatest threat to tidal wetlands (100%), while 68% of Washington tidal wetlands are expected to be submerged. Coastal development and steep topography prevent horizontal migration of most wetlands, causing the net contraction of this crucial habitat.

Rising ocean temperatures, stratification, ocean acidity, hypoxia, algal toxins, and other oceanographic processes will alter the composition and abundance of a vast array of oceanic species. In particular, there will be dramatic changes in both predators and prey of Pacific salmon, salmon life history traits and relative abundance. Siegel and Crozier (2019) observe that changes in marine temperature are likely to have a number of physiological consequences on fishes themselves. For example, in a study of small planktivorous fish, Gliwicz *et al.* (2018) found that higher ambient temperatures increased the distance at which fish reacted to prey. Numerous fish species (including many tuna and sharks) demonstrate regional endothermy, which in many cases augments eyesight by warming the retinas. However, Gliwicz *et al.* (2018) suggest that ambient temperatures can have a similar effect on fish that do not demonstrate this trait. Climate change is likely to reduce the availability of biologically essential omega-3 fatty acids produced by phytoplankton in marine ecosystems. Loss of these lipids may induce cascading trophic effects, with distinct impacts on different species depending on compensatory mechanisms (Gourtay *et al.* 2018). Reproduction rates of many marine fish species are also likely to be altered with temperature (Veilleux *et al.* 2018). The ecological consequences of these effects and their interactions add complexity to predictions of climate change impacts in marine ecosystems.

Perhaps the most dramatic change in physical ocean conditions will occur through ocean acidification and deoxygenation. It is unclear how sensitive salmon and steelhead might be to the direct effects of ocean acidification because of their tolerance of a wide pH range in freshwater (although see Ou *et al.* 2015 and Williams *et al.* 2019), however, impacts of ocean acidification and hypoxia on sensitive species (e.g., plankton, crabs, rockfish, groundfish) will likely affect salmon indirectly through their interactions as predators and prey. Similarly, increasing frequency and duration of harmful algal blooms may affect salmon directly, depending on the toxin (e.g., saxitoxin vs domoic acid), but will also affect their predators (seabirds and mammals). The full effects of these ecosystem dynamics are not known but will be complex. Within the historical range of climate variability, less suitable conditions for salmonids (e.g., warmer temperatures, lower streamflows) have been associated with detectable declines in many of these listed units, highlighting how sensitive they are to climate drivers (Lindley *et al.* 2009, Ward *et al.* 2015, Williams *et al.* 2016, Ford *et al.* 2022). In some cases, the combined and potentially additive effects of poorer climate conditions for fish and intense anthropogenic impacts caused the population declines that led to these population groups being listed under the ESA (Crozier *et al.* 2019).

Climate change effects on salmon and steelhead

In freshwater, year-round increases in stream temperature and changes in flow will affect physiological, behavioral, and demographic processes in salmon, and change the species with which they interact. For example, as stream temperatures increase, many native salmonids face increased competition with more warm-water tolerant invasive species. Changing freshwater temperatures are likely to affect incubation and emergence timing for eggs, and in locations where the greatest warming occurs may affect egg survival, although several factors impact intergravel temperature and oxygen (e.g., groundwater influence) as well as sensitivity of eggs to thermal stress (Crozier *et al.* 2020). Changes in temperature and flow regimes may alter the amount of habitat and food available for juvenile rearing, and this in turn could lead to a restriction in the distribution of juveniles, further decreasing productivity through density dependence. For migrating adults, predicted changes in freshwater flows and temperatures will likely increase exposure to stressful temperatures for many salmon and steelhead populations, and alter migration travel times and increase thermal stress accumulation for evolutionarily significant units (ESUs) or DPSs with early-returning (i.e. spring- and summer-run) phenotypes associated with longer freshwater holding times (Crozier *et al.* 2020, FitzGerald *et al*. 2020). Rising river temperatures increase the energetic cost of migration and the risk of *en route* or pre-spawning mortality of adults with long freshwater migrations, although populations of some ESA-listed salmon and steelhead may be able to make use of cool-water refuges and run-timing plasticity to reduce thermal exposure (Keefer *et al.* 2018, Barnett *et al.* 2020).

Marine survival of salmonids is affected by a complex array of factors including prey abundance, predator interactions, the physical condition of salmon within the marine environment, and carryover effects from the freshwater experience (Holsman *et al*. 2012, Burke *et al.* 2013). It is generally accepted that salmon marine survival is size-dependent, and thus larger and faster growing fish are more likely to survive (Gosselin *et al.* 2021). Furthermore, early arrival timing in the marine environment is generally considered advantageous for populations migrating through the Columbia River. However, the optimal day of arrival varies across years, depending on the seasonal development of productivity in the California Current, which affects prey available to salmon and the risk of predation (Chasco *et al.* 2021). Siegel and Crozier (2019) point out the concern that for some salmon populations, climate change may drive mismatches between juvenile arrival timing and prey availability in the marine environment. However, phenological diversity can contribute to metapopulation-level resilience by reducing the risk of a complete mismatch. Carr-Harris *et al.* (2018) explored phenological diversity of marine migration timing in relation to zooplankton prey for sockeye salmon *O. nerka* from the Skeena River of Canada. They found that sockeye migrated over a period of more than 50 days, and populations from higher elevation and further inland streams arrived in the estuary later, with different populations encountering distinct prey fields. Carr-Harris *et al*. (2018) recommended that managers maintain and augment such life-history diversity.

Synchrony between terrestrial and marine environmental conditions (e.g., coastal upwelling, precipitation and river discharge) has increased in spatial scale causing the highest levels of synchrony in the last 250 years (Black *et al.* 2018). A more synchronized climate combined with simplified habitats and reduced genetic diversity may be leading to more synchrony in the productivity of populations across the range of salmon (Braun *et al.* 2016). For example, salmon productivity (recruits per spawner) has also become more synchronized across Chinook populations from Oregon to the Yukon (Kilduff *et al.* 2014, Dorner *et al.* 2018). In addition, Chinook salmon have become smaller and younger at maturation across their range (Ohlberger 2018). Other Pacific salmon species (Stachura *el al*. 2014) and Atlantic salmon (Olmos *et al.* 2020) also have demonstrated synchrony in productivity across a broad latitudinal range.

At the individual scale, climate impacts on salmon in one life stage generally affect body size or timing in the next life stage and negative impacts can accumulate across multiple life stages (Healey 2011, Wainwright and Weitkamp 2013, Gosselin *et al.* 2021). Changes in winter precipitation will likely affect incubation and/or rearing stages of most populations. Changes in the intensity of cool season precipitation, snow accumulation, and runoff could influence migration cues for fall, winter, and spring adult migrants, such as coho salmon and steelhead. Egg survival rates may suffer from more intense flooding that scours or buries redds. Changes in hydrological regime, such as a shift from mostly snow to more rain, could drive changes in life history, potentially threatening diversity within an ESU (Beechie *et al.* 2006). Changes in summer temperature and flow will affect both juvenile and adult stages in some populations, especially those with yearling life histories and summer migration patterns (Crozier and Zabel 2006, Crozier *et al.* 2010, Crozier *et al.* 2019).

At the population level, the ability of organisms to genetically adapt to climate change depends on how much genetic variation currently exists within salmon populations, as well as how selection on multiple traits interact, and whether those traits are linked genetically. While genetic diversity may help populations respond to climate change, the remaining genetic diversity of many populations is highly reduced compared to historic levels. For example, Johnson *et al.* (2018), compared genetic variation in Chinook salmon from the Columbia River Basin between contemporary and ancient samples. A total of 84 samples determined to be Chinook salmon were collected from vertebrae found in ancient middens and compared to 379 contemporary samples. Results suggest a decline in genetic diversity, as demonstrated by a loss of mitochondrial haplotypes as well as reductions in haplotype and nucleotide diversity. Genetic losses in this comparison appeared larger for Chinook from the mid-Columbia than those from the Snake River Basin. In addition to other stressors, modified habitats and flow regimes may create unnatural selection pressures that reduce the diversity of functional behaviors (Sturrock *et al.* 2020). Managing to conserve and augment existing genetic diversity may be increasingly important with more extreme environmental change (Anderson *et al.* 2015), though the low levels of remaining diversity present challenges to this effort (Freshwater *et al.* 2019). Salmon historically maintained relatively consistent returns across variation in annual weather through the portfolio effect (Schindler *et al.* 2015), in which different populations are sensitive to different climate drivers. Applying this concept to climate change, Anderson *et al.* (2015) emphasized the additional need for populations with different physiological tolerances. Loss of the portfolio increases volatility in fisheries, as well as ecological systems, as demonstrated for Fraser River and Sacramento River stock complexes (Freshwater *et al.* 2019, Munsch *et al.* 2022).

2.2.1 Status of the Critical Habitats

The proposed action takes place in the Lower Umpqua River fifth-field watershed (HUC: 1710030308), which contains approximately 81.8 stream miles from head of tide to the Pacific Ocean. The Umpqua estuary is also known as Winchester Bay. The Umpqua river estuary is the fourth largest estuary in Oregon. It is classified as a highly river dominated drowned river mouth and is approximately 9,516 acres in area. A 16% loss in total estuary area was calculated for the Umpqua estuary due to filling and diking that occurred from approximately 1870 to 1970 (Good 2000). The Umpqua estuary is on the Oregon's Clean Water Act section 303(d) list year-round for temperature and fecal coliform bacteria (ODEQ 2022).

OC coho salmon. Designation-wide, critical habitat for OC coho salmon encompasses 13 sub-basins in Oregon (73 FR 7816). The long-term decline in OC coho salmon productivity reflects deteriorating conditions in freshwater habitat as well as extensive loss of access to habitats in estuaries and tidal freshwater. Many of the habitat changes resulting from land use practices over the last 150 years that contributed to the ESA-listing of OC coho salmon continue to hinder recovery of the populations; changes in the watersheds due to land use practices have weakened natural watershed processes and functions, including loss of connectivity to historical floodplains, wetlands and side channels; reduced riparian area functions (stream temperature regulation, wood recruitment, sediment and nutrient retention); and altered flow and sediment regimes (NMFS 2016a). Several historical and ongoing land uses have reduced stream capacity and complexity in Oregon coastal streams and lakes through disturbance, road building, splash damming, stream cleaning, and other activities. Beaver removal, combined with loss of large wood in streams, has also led to degraded stream habitat conditions for OC coho salmon (Stout *et al*. 2012).

Physical and biological features for OC coho salmon are presented in Table 1. These PBFs are essential to the conservation of OC coho salmon because they support one or more of the species' life stages (e.g., sites with conditions that support spawning, rearing, migration, and foraging).

Table 1. PBFs of critical habitat designated for OC coho salmon with corresponding species life history events.

Physical or Biological Features		Species Life History Event
Site Type	**Site Attribute**	
Freshwater spawning	Substrate Water quality Water quantity	Adult spawning Embryo incubation Alevin growth and development
Freshwater rearing	Floodplain connectivity Forage Natural cover Water quality Water quantity	Fry emergence from gravel Fry/parr/smolt growth and development
Freshwater migration	Free of artificial obstruction Natural cover Water quality Water quantity	Adult sexual maturation Adult upstream migration and holding Fry/parr/smolt growth, development, and seaward migration
Estuarine areas	Forage Free of artificial obstruction Natural cover Salinity Water quality Water quantity	Adult sexual maturation and "reverse smoltification" Adult upstream migration and holding Fry/parr/smolt growth, development, and seaward migration
Nearshore marine areas	Forage Free of artificial obstruction Natural cover Water quantity Water quality	Adult growth and sexual maturation Adult spawning migration Nearshore juvenile rearing

For most salmon and steelhead, NMFS's critical habitat analytical review teams (CHARTs) ranked watersheds within designated critical habitat at the scale of the 5th field hydrologic unit code (HUC5) in terms of the conservation value they provide to each ESA-listed species that they support (NMFS 2005, 2007).[7] The rankings were high, medium, or low. To determine the conservation value of each watershed to species viability, the CHARTs evaluated the quantity and quality of habitat features, the relationship of the area compared to other areas within the species' range, and the significance to the species of the population occupying that area. Even if a location had poor habitat quality, it could be ranked with a high conservation value if it were essential due to factors such as limited availability, a unique contribution of the population it served, or is serving another important role.

The CHART rated the Lower Umpqua River watershed conservation value and the corridor conservation value[8] as high (NMFS 2007). The CHART identified forestry, grazing, and urbanization as key management activities affecting the PBFs within the Lower Umpqua River critical habitat unit. More specifically, the landscape changes are largely from: a loss of large woody debris and forested land cover (mostly associated with grazing), diking and filling of

[7] The conservation value of a site depends upon the importance of the populations associated with a site to the ESU conservation.
[8] The corridor conservation value reflects the conservation value of the spawning areas to which it connects and the fish it serves.

estuarine wetlands (related to grazing and urbanization), and sedimentation (related to landslides related to forestry and roadbuilding). Gravel mining is another management activity that has impacted habitat in the watershed. There are 35.4 miles of coho salmon spawning/rearing habitat and 49.2 miles of coho salmon rearing/migration habitat, for a total of approximately 84.6 miles of critical habitat (NMFS 2007). The critical habitat unit is also used for transition between freshwater and saltwater. The PBFs present in the critical habitat unit are substrate, water quality, water quantity, floodplain connectivity, forage, natural cover, fish passage free of obstruction, and salinity.

Southern DPS Eulachon. Critical habitat for southern DPS eulachon includes portions of 16 rivers and streams in California, Oregon, and Washington (USDC 2011). We designated all of these areas as migration and spawning habitat for this species (10/20/11; 76 FR 65324). In Oregon, 24.2 miles of the lower Umpqua River, 12.4 miles of the lower Sandy River, and 0.2 miles of Tenmile Creek have been designated. The mainstem Columbia River from the mouth to the base of Bonneville Dam, a distance of 143.2 miles is also designated as critical habitat. Table 2 lists the physical or biological features of critical habitat designated for eulachon and corresponding species life history events.

Table 2. Physical or biological features of critical habitats designated for eulachon and corresponding species life history events.

Physical or biological features		Species Life History Event
Site Type	**Site Attribute**	
Freshwater spawning and incubation	Flow Water quality Water temperature Substrate	Adult spawning Incubation
Freshwater and estuarine migration	Migration corridor Flow Water quality Water temperature Food	Adult and larval mobility Larval feeding

Dams and water diversions are moderate threats to eulachon in the Columbia and Klamath rivers where hydropower generation and flood control are major activities. Degraded water quality is common in some areas occupied by southern DPS eulachon. In the Columbia and Klamath river basins, large-scale impoundment of water has increased winter water temperatures, potentially altering the water temperature during eulachon spawning periods. Numerous chemical contaminants are also present in spawning rivers, but the exact effect these compounds have on spawning and egg development is unknown. Dredging is a low to moderate threat to eulachon in the Columbia River. Dredging during eulachon spawning would be particularly detrimental. Food for eulachon larvae, primarily phytoplankton, can be affected by shifts in hydrographs related to water management operations (NMFS 2017).

In summary, the following PBFs are likely limiting the conservation role of the Lower Umpqua River critical habitat for coho salmon (spawning, migration, rearing, and estuarine areas): (1) substrate, (2) floodplain connectivity, (3) natural cover, (4) water quality, (5) passage free of artificial obstruction. Similarly, the water quality, water temperature, and substrate PBFs are likely limiting the conservation role of critical habitat in the Umpqua River for eulachon spawning, incubation, and migration.

2.2.2 Status of the Species

Table 3, below provides a summary of listing and recovery plan information, status summaries and limiting factors for the species addressed in this opinion. More information, which informs these summaries, can be found in recovery plans and status reviews for these species. These documents are available on line at the NMFS West Coast Region website and are incorporated here by reference. Acronyms appearing in the table include DPS (Distinct Population Segment), ESU (Evolutionarily Significant Unit), and NWFSC (Northwest Fisheries Science Center). OC coho salmon have high overall vulnerability to climate change, high biological sensitivity and climate exposure, and only a moderate adaptive capacity (Crozier *et al.* 2019).

Table 3. Summarized listing, recovery plan, status review, and limiting factors for each species considered in this opinion.

Species	Listing Classification and Date	Recovery Plan Reference	Most Recent Status Review	Status Summary	Limiting Factors
Oregon Coast coho salmon	Threatened 6/20/11; reaffirmed 4/14/14	NMFS 2016a	Ford 2022	This ESU comprises 56 populations including 21 independent and 35 dependent populations. The biological status of the ESU has decreased slightly since the 2015 review (high certainty of persistence, moderate certainty of sustainability), however, current ESU scores improved relative to the 2012 assessment (moderate certainty of persistence, low-to-moderate certainty of sustainability). The climate change assessment by Wainwright and Weitkamp (2013) indicated that Oregon Coast coho salmon will likely be negatively affected by climate change at all stages of the life cycle. Overall, the Oregon Coast coho salmon ESU is therefore at "moderate-to-low" risk of extinction.	• Reduced amount and complexity of habitat including connected floodplain habitat • Degraded water quality • Blocked/impaired fish passage • Inadequate long-term habitat protection • Changes in ocean conditions
Southern DPS of green sturgeon	Threatened 4/7/06	NMFS 2018	NMFS 2021a	The Sacramento River contains the only known green sturgeon spawning population in this DPS. The current estimate of adult abundance is between 1,246-2,966 individuals. Telemetry data and genetic analyses suggest that Southern DPS green sturgeon generally occur from Graves Harbor, Alaska to Monterey Bay, California and, within this range, most frequently occur in coastal waters of Washington, Oregon, and Vancouver Island and near San Francisco and Monterey bays. Large concentrations of adults and subadults have been observed in the Columbia River estuary, Willapa Bay, Grays Harbor, and Humboldt Bay. Within the nearshore marine environment, tagging and fisheries data indicate that Northern and Southern DPS green sturgeon prefer marine waters of less than a depth of 60 fathoms. There has not been a significant change in	• Reduction of its spawning area to a single known population • Lack of water quantity • Poor water quality • Poaching

Species	Listing Classification and Date	Recovery Plan Reference	Most Recent Status Review	Status Summary	Limiting Factors
				status and the Threatened status is still applicable.	
Southern DPS of eulachon	Threatened 3/18/10	NMFS 2017	NMFS 2016b	The Southern DPS of eulachon includes all naturally-spawned populations that occur in rivers south of the Nass River in British Columbia to the Mad River in California. Sub populations for this species include the Fraser River, Columbia River, British Columbia and the Klamath River. In the early 1990s, there was an abrupt decline in the abundance of eulachon returning to the Columbia River. Despite a brief period of improved returns in 2001-2003, the returns and associated commercial landings eventually declined to the low levels observed in the mid-1990s. Although eulachon abundance in monitored rivers has generally improved, especially in the 2013-2015 return years, recent poor ocean conditions and the likelihood that these conditions will persist into the near future suggest that population declines may be widespread in the upcoming return years	• Changes in ocean conditions due to climate change, particularly in the southern portion of the species' range where ocean warming trends may be the most pronounced and may alter prey, spawning, and rearing success. • Climate-induced change to freshwater habitats • Bycatch of eulachon in commercial fisheries • Adverse effects related to dams and water diversions • Water quality, • Shoreline construction • Over harvest • Predation

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).

Reedsport is located approximately 11.6 miles upstream of the Pacific Ocean at the confluence of Scholfield Creek with the Umpqua estuary (Figure 2). The latitude and longitude are 43.698, -124.129 degrees. The action area is located in the Umpqua River estuary, which is the fourth largest estuary in Oregon. The Umpqua River estuary is classified as a highly river dominated drowned river mouth and is approximately 9,516 acres in area. The Umpqua River is one of the largest coastal rivers in Oregon, draining almost all of Douglas County.

Figure 2. The Pacific Ocean, Umpqua estuary, and City of Reedsport.

The levee is approximately 2.9 miles long and runs along portions of the Umpqua River, Scholfield Creek, and McIntosh Slough (Figures 1 and 3). Scholfield Creek is a tributary to the Umpqua River and McIntosh Slough is a tributary to Scholfield Creek. The legal description is Township 21 South, Range 12 West, Sections 34, 35, and 36; and Township 22 South, Range 12 West, Sections 01, 02, and 03. The action area for the Reedsport Flood Reduction Resiliency project is defined as the immediate project area including the levee, sand berm and drainage trench area, transport roads, pump stations, gravity drain areas, conveyance pipe areas, soil acquisition areas, and upland staging areas. The action area also includes the Umpqua River, Scholfield Creek, and McIntosh Slough along the length of the 2.9-mile levee. The river portions of the action area are tidally-influenced. Head of tide endpoints are upstream in the Umpqua River at 43.6675, -123.808889 degrees latitude and longitude and in Scholfield Creek at 43.676667, -124.093889 (74 FR 52300).

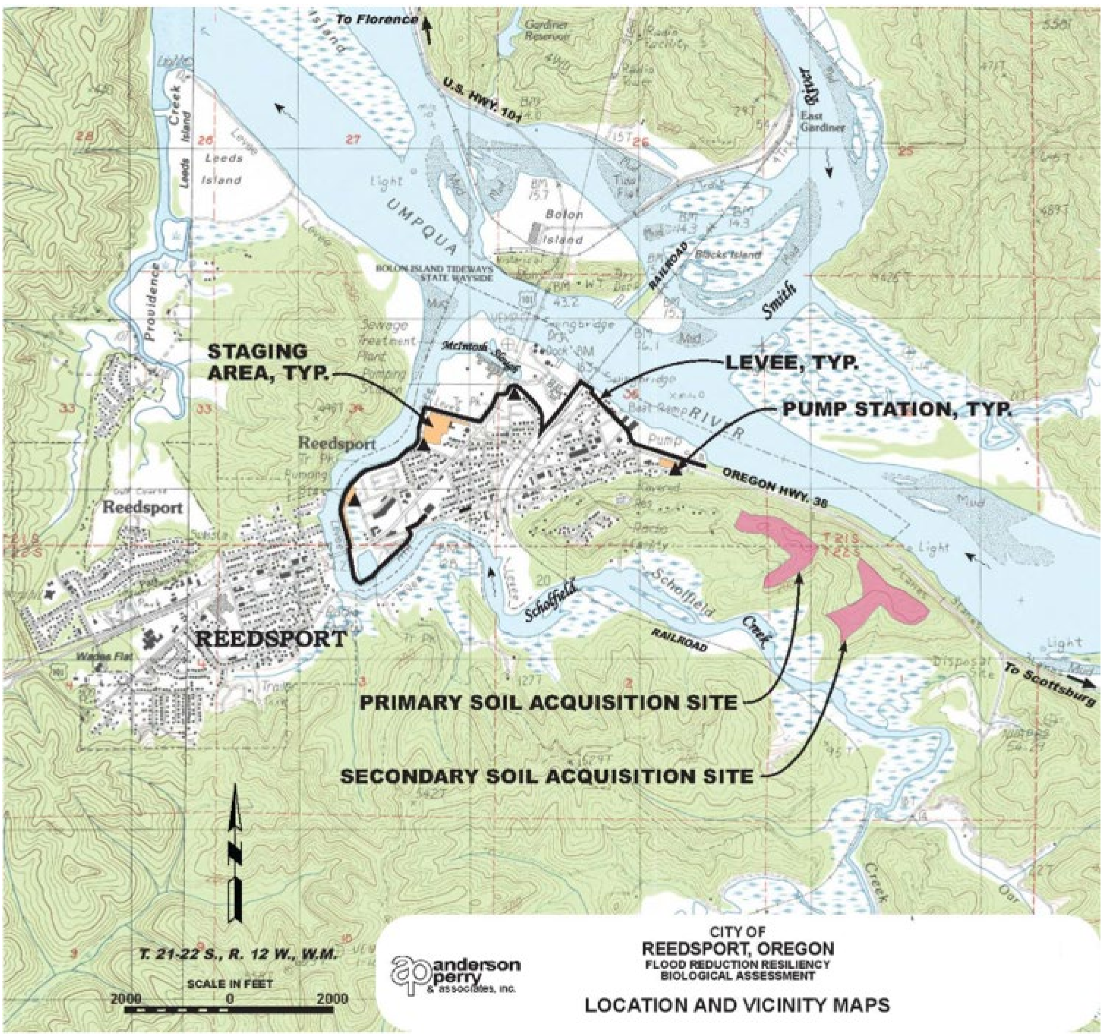

Figure 3. Location of levee, staging areas, and soil acquisition sites (Anderson Perry & Associates, Inc. 2021).

The extent of the action area was determined based on the extent of effects from pile driving (approximately 1.2 miles of Scholfield Creek) and turbidity and sediment plumes (approximately 2,400 feet of Scholfield Creek, approximately 600 feet of the Umpqua River, and approximately 600 feet of McIntosh Slough to account for effects from work on the river side of the levee including the 0.54 acre of isolated work areas); this distance is all included with the 2.9 mile length of the levee along these three waterbodies. The project area (including staging areas) totals approximately 23.4 acres, while the two soil acquisition areas total approximately 40.2 acres.

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 consequences to listed species or designated critical habitat from ongoing agency activities or existing agency facilities that are not within the agency's discretion to modify are part of the environmental baseline (50 CFR 402.02). Climate change effects on the environmental baseline in the action area are as described for the aquatic environment in section 2.2 above; resulting modified habitat conditions contribute to the fluctuating population abundances that will be described further in section 2.4.2 below.

The area in and adjacent to the City is prone to flooding due to its location and elevation approximately 10 feet above mean sea level. In 1964, an approximately 100-year flood event occurred, causing water depths up to 4 feet in the City. The Reedsport Levee was constructed in 1971 to provide flood reduction for the 200-year flood while maintaining 3 feet of freeboard above the peak water surface elevations. None of the pump stations have natural inflow from or outflow to the adjacent waterway, and fish passage to the pump stations is blocked by flap gates (Anderson Perry & Associates, Inc. 2021). The pump stations are used to dispose of stormwater collected from inside of the levee during high water events by pumping it through the levee to the rivers. Several wetlands exist around the levee, including a wetland associated with a small pond south of Highway 101 and east and north of Scholfield Creek.

Levee construction disrupts the natural processes of rivers, resulting in a multitude of habitat-related effects including isolation of the watershed's natural floodplain behind the levee from the active river channel and its fluctuating hydrology. The effects of channelization include the alteration of river hydraulics and cover along the bank as a result of changes in bank configuration and structural features. The Umpqua River action area is heavily navigated by boats, with a wide channel that feeds into low floodplain areas or abuts man-made infrastructure.

Areas of the levee have settled since the original construction. When compared to the existing physical topography, hydraulic data indicates the levee system is insufficient for preventing overtopping during the 1% chance annual recurrence flood (100-year flood) (Wells 2017). The 100-year flood does not overtop the Reedsport Levee, but adequate freeboard is not provided. Without improvements, the levee will continue to function but at an increasing risk to residents and businesses due to predicted increases in flood events which will ultimately overtop the levee or otherwise flood the low-lying areas of Reedsport.[9] Levee erosion is currently occurring primarily around piping penetrations; other areas of the levee have remained stable over the last 50 years.

2.4.1 Critical Habitat in the Action Area

The entire action area is designated critical habitat for OC coho salmon. The PBFs of critical habitat that support OC coho salmon in the action area include floodplain connectivity, forage, natural cover, water quality, water quantity, passage free of artificial obstruction, and salinity.

The portion of the action area within the Umpqua River is designated critical habitat for southern DPS eulachon. The physical or biological features of critical habitat that support eulachon in the action area include migration corridor, flow, water quality, water temperature, and food.

Natural processes and land and water management activities have affected critical habitat in the action area. Key management activities that occur or have occurred in and upstream of the estuarine action area have impacted aquatic habitats in the project estuaries and include forestry, grazing, and urbanization (NMFS 2007). These activities have reduced water and sediment quality, habitat complexity and functionality, high quality habitat and habitat availability, and forage abundance and quality. Specific activities related to the key management activities that have contributed to this modified habitat include dredging, construction of in-water and over-water structures, discharge of stormwater associated with impervious surfaces, discharge of industrial and municipal wastewater effluent, estuarine fill, streambank armoring and stabilization, and construction of dikes and levees.

The condition of PBFs of OC coho salmon critical habitat is described below:

1. Floodplain connectivity. The existence of the Reedsport levee has negative impacts on channel conditions and dynamics, including channelization, reduced floodplain connectivity, and creating artificial conditions to protect the City from flooding. Floodplain connectivity in the vicinity is controlled by the existing levee along most of the action area. Most of the floodplain on the exterior of the levee has been developed for industrial purposes and consists of mainly impervious surfaces and little natural vegetation. Due to the levee, the action area does not contain any oxbows, ponds, or side channels along the side of the Umpqua River. Scholfield Creek is also constrained by the levee in the action area. However, McIntosh Slough, off Scholfield Creek, features some off-channel habitat.
2. Forage. The action area is occupied by numerous species of marine invertebrates and marine fishes including mysids, amphipods, copepods, and various life stages of bottom fish and pelagic forage fish. Myers (1980) documented that coho salmon forage both in nearshore and deep subtidal habitats. Coho salmon in the estuary are known to feed on invertebrates and fish including decapod larvae, euphasiids, gammarid amphipods, and fish larvae (Simenstad 1983, Miller and Simenstad 1997, Magnusson and Hilborn 2003). Myers 1979 found that juvenile coho salmon in Yaquina Bay consumed juvenile anchovy

[9] E-mail from FEMA 4/9/2021.

(*Engraulis mordax*), surf smelt (*Hypomesus pretiosus*), and sand lance (*Ammodytes hexapterus*); crangonid shrimp; and megalopa larvae of Dungeness crab (*Cancer magister*). Many of these species' various life stages (i.e. adults, juveniles, larvae) are likely present in and use the substrate and water column in the action area for rearing and reproduction.

3. Natural cover. Urbanization that has occurred in the action area negatively affects this PBF as does the presence of the levee. The City is built along the streambanks with little to no vegetation existing between structures, parking lots, and other man-made material. Riparian areas along Scholfield Creek in the action area consist of limited patches of trees, shrubs, and herbaceous vegetation running north and south of Highway 101. Other clumps of riparian vegetation are discontinuous along the action area but are small and do not provide adequate habitat. McIntosh Slough has the greatest amount of vegetated riparian areas, with trees, shrubs, and herbaceous vegetation lining most of the bank and intersects with only a small portion of the project area. Shoreline vegetation that does exist includes grasses, sedges, shrubs, and trees, although some areas of the bank have little to no vegetation. Large wood is not abundant in the action area (Anderson Perry & Associates, Inc. 2021).
4. Water quality. The Umpqua estuary in the action area is listed on ODEQ's 2022 303(d) list of water quality limited waterbodies for fecal coliform and water temperature; Scholfield Creek watershed is also listed for dissolved oxygen and biocriteria. High levels of sediment occur within the Umpqua River basin primarily due to the natural water regime, tidal influences, and dredging activities to maintain the channel for navigation (Anderson Perry & Associates, Inc. 2021). Water quality in the action area has also been degraded by stormwater inputs associated with the urbanization of the estuary. Forestry and grazing upstream of the action area have contributed to increased suspended sediments during high flows that are greater in magnitude, intensity, and duration. Wastewater inputs have also contributed to degraded water quality as treatment for metals, polybrominated diphenyl ethers, pharmaceuticals and personal care products, and fragrances is not 100% effective.
5. Water quantity. Water withdrawals associated with agriculture and urbanization are likely impacting this PBF but given estuarine location of the action area water quantity is sufficient to support OC coho salmon.
6. Salinity. Salinity concentrations in the action area are low to moderate and fluctuate in the action area due to high freshwater flows during the rainy season. ODEQ measured salinities at the highway 101 bridge in Reedsport that averaged 3.8, 7.8, 12.0, 11.8, and 10.8 in June, July, August, September, and October with salinities dropping off from 0.1 to 8.5 in November.
7. Passage free of artificial obstruction. Although the levee has minimized floodplain connectivity, off-channel habitat formation, and off-channel habitat access, there are no fish passage barriers on the Umpqua River or Scholfield Creek in the action area or downstream of the action area.

The condition of PBFs of southern DPS eulachon critical habitat is described below:

1. Migratory corridor. See Passage Free of Artificial Obstruction as described above for OC coho salmon in the action area, which also applies to eulachon.

2. Flow. Water flow is subject to tidal influence and is sufficient to support eulachon in the action area.
3. Water quality. Same as that described for OC coho salmon in the action area.
4. Water temperature. See Water Quality as described above for OC coho salmon in the action area, which also applies to eulachon.
5. Food. During their downstream migration larvae do not feed exogenously due the presence of their yolk sac (Gustafson *et al.* 2010). Additionally, it is unlikely larval eulachon would remain in the action area long enough to need to feed on anything other than their yolk sac. Adult eulachon do not feed during their freshwater spawning run (Gustafson *et al.* 2010). Food is not a major concern for eulachon in the action area.

2.4.2 Species in the Action Area

The action area is occupied by three ESA-listed species including OC coho salmon, southern DPS green sturgeon, and southern DPS eulachon.

OC coho salmon. OC coho salmon use the action area for migration, rearing, and to transition between freshwater and marine environments. Adult OC coho salmon migrate through the action area beginning in September through December. Adult coho salmon primarily rely on energy accumulated prior to their upstream migration; they either do not feed during their upstream migration (McMahon 1983, Cooke *et al.* 2011, Hughes *et al.* 2014) or greatly reduce their food intake (Garner *et al.* 2009, 2010). OC coho salmon smolts migrate and rear in the action area from February through June. While the migration of smolts mostly ends in June, it is likely that a few will remain in the action area into the late summer to complete smoltification. Historically, researchers believed juvenile coho salmon rear in freshwater streams for a year, migrating out to sea in the spring at age 1. More recently, the flexibility of pre-smolt coho salmon life histories, including estuary rearing during all parts of the year, has been documented (Bennett *et al.* 2014). Miller and Sadro (2003) observed pre-smolt OC coho salmon entering the estuary in the South Slough of Coos Bay during spring and remaining up to eight months, when they moved back upstream to overwinter. They also found pre-smolts moving into the estuary in the fall and winter with individuals having a mean residence time of 48 to 64 days per year. This life history flexibility has not been documented in the Umpqua River, but it is reasonable to assume that a few pre-smolt OC coho salmon will use the action area during construction with more using the action area during the life of the levee

Umpqua River populations. There are four populations of OC coho salmon in the Umpqua River basin that make up the Umpqua River strata, including: (1) Lower Umpqua River; (2) Middle Umpqua River; (3) South Umpqua River; and (4) North Umpqua River populations. These are all functionally independent populations.[10] Together they form the Umpqua stratum. A stratum is a group of salmonid populations that is geographically and genetically cohesive and there are five strata in the OC coho ESU (NMFS 2016a). Each population and each stratum has a role in the ESU; for the ESU to be sustainable all five strata must be sustainable and for each stratum to

[10] A functionally-independent population is a population with a likelihood of persisting in isolation over a 100-year period and is not substantially altered by exchanges of individuals of other populations.

be sustainable, most of the independent populations within the stratum must be sustainable (NMFS 2016a).

OC coho salmon from the Lower, Middle, North, and South Umpqua Rivers populations use the action area for rearing and migration. The composition of adult and smolt life stages using the action area consists of all four populations. The pre-smolt life stage likely consists of only the Lower Umpqua population of OC coho salmon. The description of climate change effects discussed in section 2.2 is applicable to the environmental baseline of all population. We provide additional status information for each population below.

Lower Umpqua River population. The Lower Umpqua River population consists of all naturally-spawned individuals from the mouth of the Umpqua River upstream to the confluence of Elk Creek near Elkton, Oregon. The Lower Umpqua River population is quite different from the other Umpqua populations, based on its landscape position and its proximity to marine climate influence. The Lower Umpqua River population is different genetically and has its affinities with nearby lake populations (Johnson and Banks 2008). The abundance of Lower Umpqua River OC coho salmon has shown a high degree of fluctuation since 2008 (Figure 4) and earlier. Fluctuation in population abundance occurs for many reasons including changes in land use, changing climate conditions, and changes in ocean conditions. During the most recent status review, the Biological Review Team (BRT) reported the population persistence truth value for the Lower Umpqua River population was 0.85 (Ford 2022). A value of 1.0 would indicate complete confidence that this population will persist for the next 100 years, a value of negative 1.0 would indicate complete certainty of failure to persist, and a value of 0 would indicate no certainty of either persistence or extinction. The persistence score indicates a high probability that this population will persist into the future. The truth value for population sustainability was 0.87. As with the persistence score, this value indicates a high probability that this population is sustainable.

The Oregon Coast Coho Conservation Plan (ODFW 2007) identified primary and secondary limiting factors for independent populations within the OC coho salmon species. The primary and secondary limiting factors in the Lower Umpqua River population are stream complexity and water quality. Stream complexity refers to the ability of a stream to provide various types of habitat. The type of habitat most limiting to OC coho salmon is high quality over-winter rearing habitat (ODFW 2007).

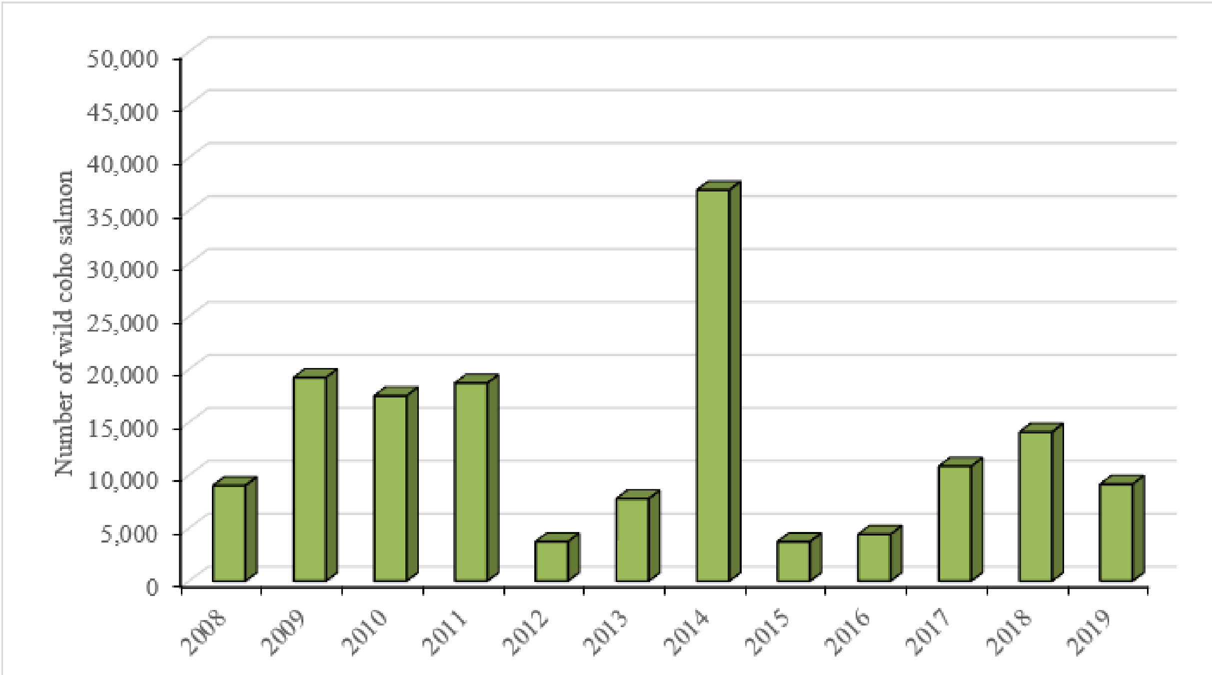

Figure 4. Estimated abundance of wild adult OC coho salmon spawners in the Lower Umpqua River population from 2008 to 2019.[11]

Middle Umpqua River population. The Middle Umpqua River population of OC coho salmon consists of all naturally-spawned individuals from the Elk Creek confluence with the Umpqua River to the confluence of the North and South Umpqua rivers near Roseburg, Oregon. The Middle Umpqua population of OC coho salmon has fluctuated since 2008 (Figure 5) and earlier from changes in land use, changing climate conditions, and changes in ocean conditions. The BRT reported the persistence truth value for this population was 0.43 and the truth value for population sustainability was 0.38 (Ford 2022). This indicates a moderate certainty that this population is viable. Only adults and smolts from this population are likely to found in the action area.

[11] ODFW data available at: https://odfw.forestry.oregonstate.edu/spawn/cohoabund.htm

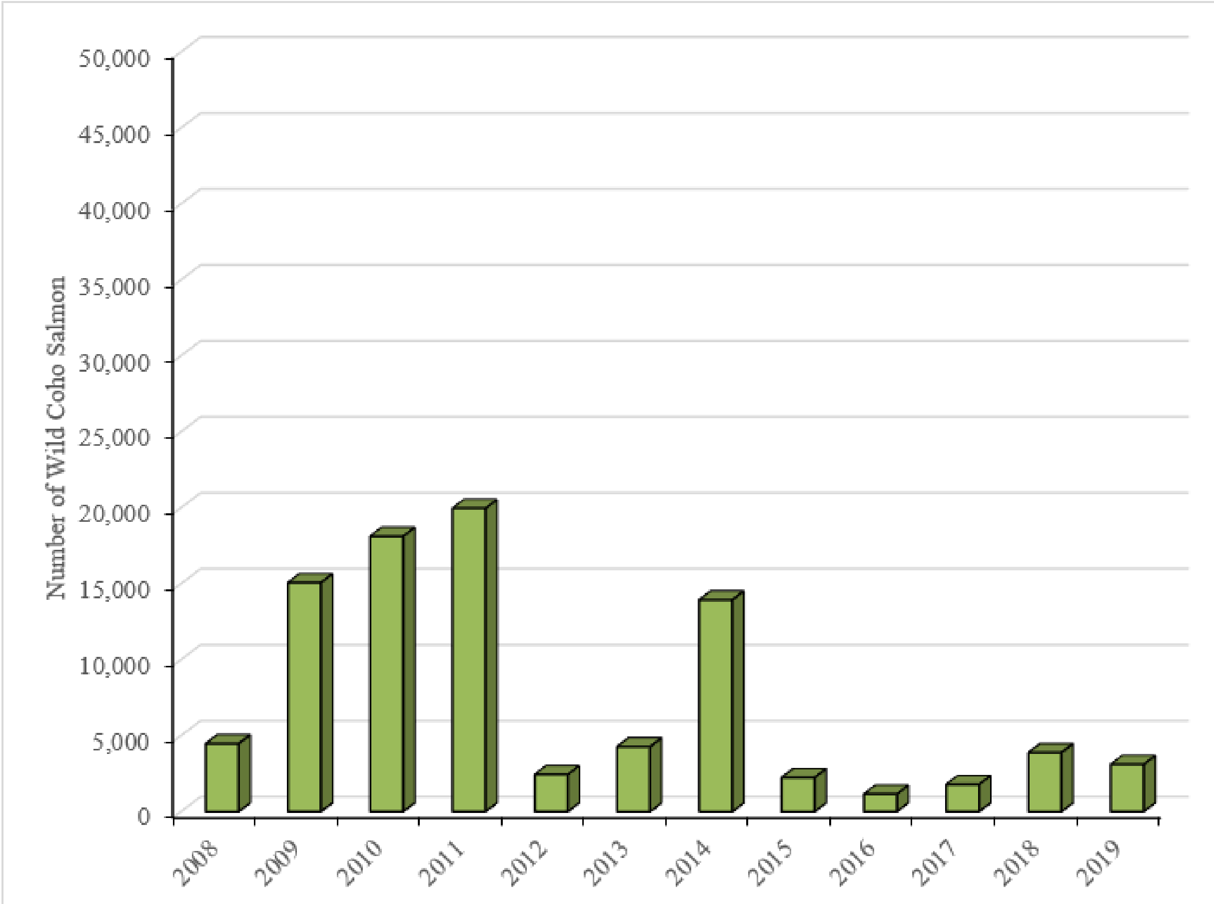

Figure 5. Estimated abundance of wild adult OC coho salmon spawners in the Middle Umpqua River population from 2008 to 2019.[11]

South Umpqua River population. The South Umpqua River population includes individuals in the South Umpqua River and its tributaries. Figure 4 shows the OC coho salmon spawner abundance estimates for the South Umpqua River from 2008 to 2019. Estimated adult spawner abundances for the South Umpqua appear to have been the lowest in the last 5 years, compared to abundances from 2008-2011 (Figure 6). The OC-Technical Recovery Team estimated potential historical abundance for adult spawners for the South Umpqua River population at 331,000 (Lawson *et al.* 2007). The BRT report the persistence truth value for this population was 0.26 and the truth value for population sustainability was 0.14 (Ford 2022). This indicates a low to moderate certainty that this population is viable. Only adults and smolts from this population are likely to found in the action area.

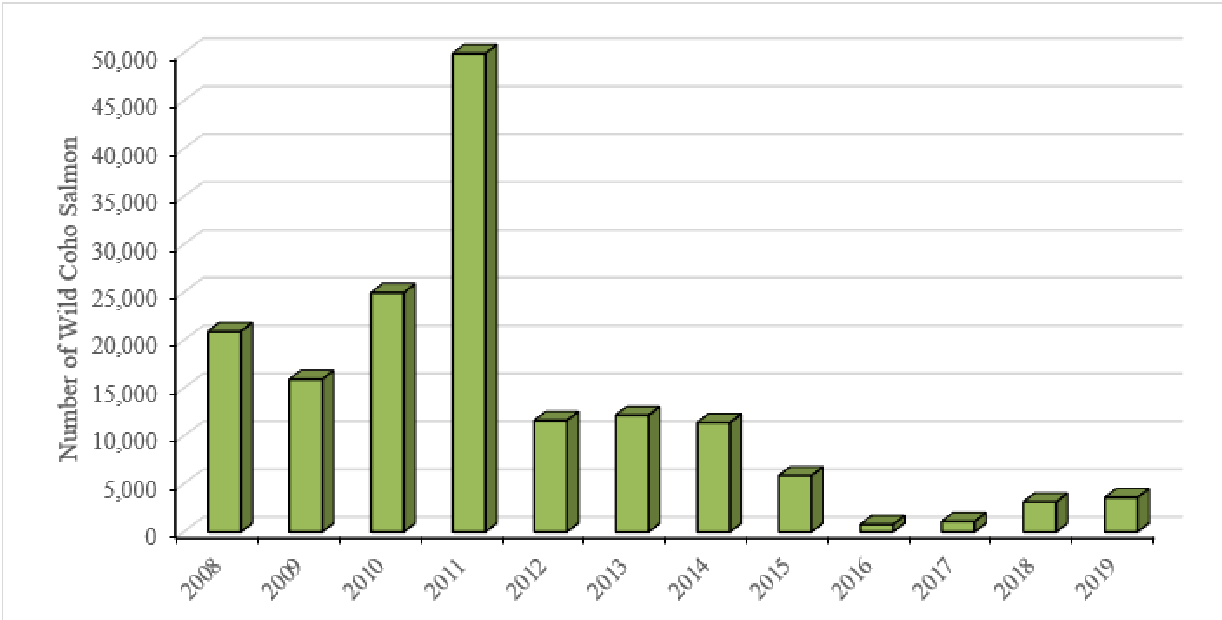

Figure 6. Estimated abundance of wild adult OC coho salmon spawners in the South Umpqua River population from 2018 to 2019.[11]

North Umpqua River population. The North Umpqua River population includes individuals in the North Umpqua River and its tributaries. Until recently, the upstream range of OC coho salmon in the North Umpqua River drainage stopped at Soda Springs Dam. However, fish ladder construction was completed in November 2012 and OC coho salmon have been confirmed upstream of the dam. Another barrier exists at Slide Creek at approximately River Mile 73.[12] The North Umpqua population of OC coho salmon has been consistently low since 2008 (Figure 7) and earlier. The BRT reported the persistence truth value for this population was 0.52 and the truth value for population sustainability was also negative 0.41 (Ford 2022). This indicates a high degree of certainty that this population is not viable. Only adults and smolts from this population are likely to found in the action area.

[12] Email from Rob Burns, U.S. Fish and Wildlife Service, to Michelle McMullin, NMFS (May 6, 2013)(updating status of passage at Soda Springs Dam).

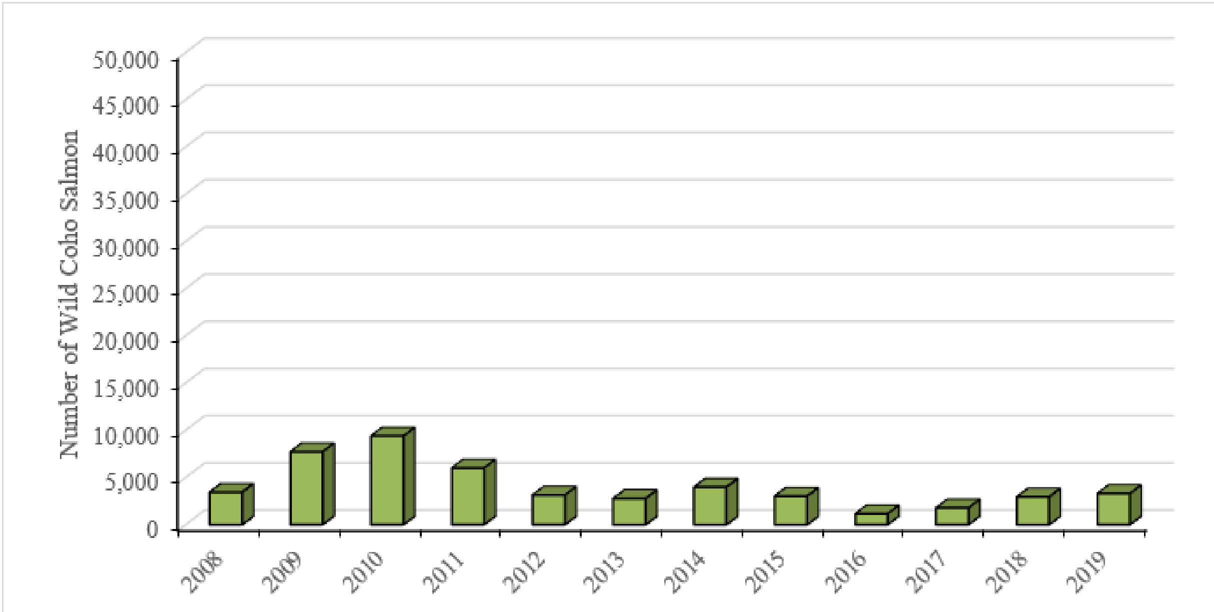

Figure 7. Estimated abundance of wild adult OC coho salmon spawners in the North Umpqua River population from 2008 to 2019.[11]

<u>Southern DPS green sturgeon</u>. Southern DPS green sturgeon use the Umpqua River estuary for subadult and adult growth, development, and migration. Green sturgeon congregate in coastal waters and estuaries, including non-natal estuaries. Beamis and Kynard (1997) suggested that green sturgeon move into estuaries of non-natal rivers to feed. Data from Washington studies indicate that Southern DPS green sturgeon will only be present in Oregon estuaries from June until October (Moser and Lindley 2007). Recent fieldwork indicates that green sturgeon generally inhabit specific areas of coastal estuaries near or within deep channels or holes, moving into the upper reaches of the estuary, but rarely into freshwater (WDFW and ODFW 2012). Green sturgeon in these estuaries may move into tidal flats areas, particularly at night, to feed (Dumbauld *et al.* 2008). Green sturgeon adults and sub-adults will be feeding and migrating in the action area from June to October and will be exposed to the long-term effects of the levee.

<u>Southern DPS Eulachon</u>. Monaco *et al.* (1990) describe eulachon occurrence in the Umpqua River as common citing Mullen (1977), Ratti (1979), and Johnson *et al*. (1986) as supporting references (as cited in Gustafson *et al.* 2010). Williams (2009) provided additional information on eulachon observations and captures during inventories occurring in December 1954 and January 1955 and from 1995 to 2003, during which ODFW captured eulachon in seining efforts in 4 years out of the 14 year period. Furthermore, the Umpqua River is known to have once supported an extensive recreational fishery for eulachon from 1969 to 1982 (Gustafson *et al.* 2010). The number of eulachon returning to the Umpqua River seems to have declined in the 1980s, and does not appear to have rebounded to previous levels.

First appearance of eulachon spawners in the Umpqua River has not been studied, but based on the available information for eulachon run-timing, small numbers of spawners, and frequency of occurrence, adult eulachon will likely migrate through the action area from mid-January through May with exposure to construction effects during January and long-term effects of the levee.

Eggs hatch in 20 to 40 days and larval eulachon, which are feeble swimmers, are carried downstream within hours or days. Thus, larval eulachon could be present in the action area from February through mid-July. Some studies found larval eulachon may be retained for weeks or months in inlets or fjords of estuaries on the British Columbia mainland coast (McCarter and Hay 2003), but no such habitat features exist in the action area. Therefore, individual larval eulachon will likely only be present in the action area as they are carried out to sea and are unlikely to be exposed to construction effects. These individuals are unlikely to be feeding while in the action area as larval nutrition is provided by the yolk sac prior to first feeding (WDFW and ODFW 2001).

2.4.3 Summary

Land and water management activities previously mentioned, including changing climate conditions, have reduced the quality and function of aquatic habitat important for successful production of OC coho salmon and eulachon in the action area. Overall, the following PBFs are likely limiting critical habitat in the action area for OC coho salmon migration, rearing, and estuarine areas: (1) floodplain connectivity, (2) natural cover, and (3) water quality. The water quality and water temperature PBFs are likely limiting critical habitat in the action area for eulachon migration. Climate change effects in the action area are as described for the aquatic environment in section 2.2 above. While the habitat in the action area is modified, it provides support for OC coho salmon and eulachon production.

Specific limiting factors for the species that apply to the action area include reduced amount and complexity of habitat including connected floodplain habitat for coho salmon, poor water quality for both species, and shoreline construction for eulachon. As a result, OC coho salmon and eulachon occurring in the action area have been negatively affected by the modified baseline conditions. The response of these species is not immediately apparent, but can be observed in individuals' reduced growth, survival, and fitness, and overall abundance over the long-term in the action area. The baseline condition of an individual fish in the action area is likely to be slightly stressed, but with the ability to compensate. Individuals are likely to be slightly less efficient metabolically and physiologically compared to individuals in areas without water quality and floodplain connectivity stressors but are still expected to be healthy because the habitat does provide functional support for estuarine life history activities.

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, (50 CFR 402.02). 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 (50 CFR 402.17). In our analysis, which describes the effects of the proposed action we considered the factors set forth in 50 CFR 402.17(a) and (b).

2.5.1 Effects on Critical Habitat

Construction associated with the proposed action will occur in and adjacent to the Umpqua River estuary and Scholfield Creek/McIntosh Slough (Figure 3). The levee is also located here. The proposed action will affect the Lower Umpqua River fifth-field watershed (HUC: 1710030308), which is designated critical habitat for OC coho salmon. In this analysis we refer to the 5th field watersheds as critical habitat units for OC coho salmon because critical habitat units were designated at the 5th field watershed level for that species.

Boundaries for critical habitat designations for eulachon were not based on 5th field watersheds. Effects of the proposed action will also affect eulachon critical habitat in the Umpqua River; only the mainstem of the Umpqua River is designated as critical habitat for eulachon.

The PBFs of critical habitat for OC coho salmon present in the action area include floodplain connectivity, forage, natural cover, water quality, water quantity, salinity, and passage free of obstruction. Migratory corridor, flow, water quality, water temperature, and food are also present in the action area as PBFs for southern DPS eulachon. The conservation role of critical habitat in the action area for OC coho salmon is to provide habitat that supports successful juvenile and adult growth, development, and migration. The conservation role of critical habitat in the action area for southern DPS eulachon is to provide habitat that supports successful migration.

Potential effects on designated critical habitat in the action area from funding the proposed action are reasonably certain to include: (1) temporary and localized reductions in passage/migratory corridors, water quality, and forage/food from construction activities and (2) long-term effects on floodplain connectivity from extending the life of the existing levee. These effects are described in greater detail below. The proposed action will not change the quality and function of sediment quality, natural cover, water quantity, salinity, water flow, water depth or water temperature.

Passage Free of Obstruction/Migratory Corridors

Passage and migratory corridors PBFs will be temporarily affected during November 1 through January 31 by isolated work areas and elevated underwater sound pressure waves from pile driving. Scholfield Creek contains designated critical habitat for OC coho salmon and green sturgeon; only effects in the Umpqua River will affect the migratory corridor PBF for eulachon.

Isolated work areas for construction activities for conveyance piping and gravity drain improvements are a conservation measure included in the proposed action and are intended to minimize effects on fish and will extend midway into the stream channels. They will not fully block the passage and migratory corridor PBFs of critical habitat as fish passage opportunities will remain in the non-isolated portions of the channels. Additionally, each of the six in-water work areas (approximately 0.09 acre in size each; five in Scholfield Creek/McIntosh Slough and one in the Umpqua River; Figure 1) will only be isolated for approximately seven days. These effects on the passage and migratory corridor PBFs will only occur from November 1 through January 31 and will cease once construction is complete. Adverse effects from work area isolation on these PBFs for OC coho salmon will be temporary and localized on approximately 0.54 acre distributed across the Umpqua River, Scholfield Creek, and McIntosh Slough. Adverse effects from work area isolation in the Umpqua River (one location; 0.09 acre) on the migratory corridor PBF for eulachon and OC coho salmon will also be temporary and localized.

Pile driving activities will occur in association with pump station stabilization and with floodwall construction. For floodwall construction, the City will use an impact hammer to drive 460 piles above the OHWE but adjacent to Scholfield Creek in saturated, fine sediments. Pile driving associated with floodwall construction is proposed for six locations along the levee on Scholfield Creek at distances ranging from approximately 30 to 1,040 feet from rivers containing critical habitat. Because piles driven in saturated soils adjacent to a waterway (i.e., within approximately 200 feet of the edge of water) produce in-water sound levels that are about the same as piles driven directly in-water, this activity is considered as in-water pile driving (CalTrans 2020).

Five of the six locations (i.e., sections 8 and 10-13, see Figure 1) are within 200 feet of waterways containing critical habitat and in saturated, fine soils. However, we do not know the number of piles to be driven at each location so we will assume the total duration of pile driving associated with floodwall construction will occur as in-water pile driving. NMFS' estimates of pile driving effects on fish passage for the consultation are potentially overestimated because our calculation tool assumes that all fish, including juveniles and adults are stationary (CalTrans 2020). However, it is the best tool available for our use.

The dual threshold interim criterion for behavior modification (150 decibels (dB)) from impact pile driving is based on adverse effects directly related to migration and rearing behaviors. Using this threshold, we can relate elevated underwater sound disturbance to the fish passage PBF for OC coho salmon. Root mean square (RMS) sound levels above 150 dB would negatively affect passage in the action area. Using the practical spreading model for transmission loss and sound attenuation, we determined that during vibratory pile driving RMS sound levels greater than 150 dB would extend to a distance of 328 feet laterally in all directions from the pile. Therefore, effects on the passage PBF are expected to occur within a distance of approximately 328 feet from a pile driven during floodwall construction for the time that RMS sound levels are likely to exceed 150 dB. An area extending approximately 328 feet laterally in all directions from a driven pile and extending outward below the mean high higher water elevation would be negatively affected by RMS sound levels greater than 150 dB which would affect Scholfield Creek along levee sections 8 and 10-13 for approximately 1.2 miles. At two locations (i.e., sections 10 and 11) elevated RMS sound levels are likely to occur for the full width of Scholfield Creek while pile driving occurs due to its narrower width at these locations. At the widest location (i.e., section 8), approximately 63 percent of the width of Scholfield Creek is likely to have elevated RMS sound levels greater than 150 dB leaving approximately 37 percent open to passage in this area. The entire area will not be impacted at one time as pile driving progresses around the levee at various locations over a period of 23 days. These negative effects on critical habitat for OC coho salmon will be temporary, only occurring when pile driving occurs (Scholfield Creek only).

Pile driving in association with pump stations will occur farther than 200 feet from the edge of the rivers containing critical habitat so we will not consider these locations as in-water pile driving due to their distance from waterways. Because pile driving in pump station ponds will occur with bubble curtains and are separated from waterways containing critical habitat by more than 200 feet of soil, effects on the passage/migratory corridor PBFs are unlikely from this component of the proposed action.

Water Quality

Water quality will be temporarily diminished by the proposed action at times only during November 1 through January 31. Although heavy equipment will operate from the levee and not in the water, small operational leaks or spills (a few ounces) of fuel, oil, or hydraulic fluids from equipment operation are likely to occur. The most likely scenario for fuel or oil contact with water in the action area is smaller leaks composed of diesel fuel or lubricating oils. The City proposed conservation measures as described in section 1.3 of this opinion to minimize the likelihood of fuel, oil, or lubricants contacting any waterbody in the action area. Thus, leaks or spills will be small in both volume and area, but will be measurable, and will disperse within minutes.

Construction activities for conveyance piping and gravity drain improvements will temporarily disturb the streambed and stream banks at six locations resulting in short-term and localized turbidity and sediment plumes. The City proposed conservation measures as described in section 1.3 of this opinion to minimize the erosion and sediment transport into waterbodies. However, it is reasonably certain that turbidity and sediment associated with dewatering the isolated work areas will occur and that other minor events due to operations on the river side of the levee will also occur as work will occur during the winter months. Therefore, approximately 2,400 feet of Scholfield Creek, approximately 600 feet of the Umpqua River, and approximately 600 feet of McIntosh Slough will be temporarily affected by increased sediment and turbidity from work on the river side of the levee including the 0.54 acre of isolated work areas. However, the affected areas will remain along the streambanks and are unlikely to be detectable across the entire width of Scholfield Creek or the Umpqua River. Additionally, the estuarine area is a naturally dynamic and turbid area especially during winter; turbidity and sediment levels will return to background levels after a few hours.

Overall, negative effects on the water quality PBF for OC coho salmon (Scholfield Creek, McIntosh Slough, and Umpqua River) and eulachon (Umpqua River only) from contaminants and sediments resulting from construction activities will be temporary, localized, and minor.

Forage/Food

Adult eulachon do not feed during their freshwater spawning run (Gustafson *et al.* 2010) and larval eulachon will not be present until February. Additionally, larval eulachon typically feed from their yolk sac rather than rely on external resources while being transported to the ocean (Gustafson *et al.* 2010). Therefore, because effects on the food PBF will not occur when eulachon would be using it, these effects on eulachon critical habitat will be insignificant.

The City will temporarily dewater approximately 0.54 acre of substrate/macroinvertebrate habitat for work area isolation. Reductions in foraging opportunities for OC coho salmon will likely be short-term while each area is isolated (i.e., 7 days at each site) as new prey items will be brought in with the tide once the areas are no longer isolated. Volitional migration into the areas will also occur by highly mobile prey items accustomed to a dynamic environment. The isolated areas represent a small proportion of the overall habitat available. Negative effects on the forage PBF for OC coho salmon critical habitat will be temporary and localized on approximately 0.54

acre distributed across the Umpqua River, Scholfield Creek, and McIntosh Slough at six locations.

Floodplain Connectivity

The wetlands affected by the proposed action are on the landward side of the levee and therefore are extremely unlikely to have any additional effects on floodplain connectivity. The levee negatively affects the floodplain connectivity PBF. The proposed action will also result in an additional 0.35 acre permanent impact where the footprint of the levee will be expanded on the river side. Floodplain connectivity is not a PBF for eulachon. Long-term effects on critical habitat for OC coho salmon will continue to occur as a result of extending the life of the levee and maintaining the existing disconnected floodplain. Limiting floodplain connectivity also constrains and prevents oxbows, ponds, or side channels or other channel features associated with overall habitat quality and complexity. These effects will continue to occur for approximately 40 years following the proposed action which is the anticipated duration before additional repair work will be needed. The length of the levee is 2.9 miles along Scholfield Creek, McIntosh Slough, and the Umpqua River.

Summary of Effects on Critical Habitat – OC coho salmon

In section 2.2.1, we determined that the condition of the floodplain connectivity, natural cover, water quality, substrate, and passage free of obstruction PBFs were limiting the conservation role of all the critical habitat unit. The proposed action will result in temporary and localized reductions on the water quality PBF as well as the fish passage free of artificial obstruction and forage PBFs from construction and repair activities including pile driving and work area isolation. These effects will occur over approximately 1.2 miles of Scholfield Creek, approximately 600 feet of McIntosh Slough, and for approximately 600 feet of the lower Umpqua River along the levee.

Additionally, the proposed action will continue to meaningfully decrease the function and value of the floodplain connectivity PBF for approximately 40 years along 2.9 miles of three waterbodies: McIntosh Slough, Scholfield Creek, and the Umpqua River.

Overall, long-term and temporary effects will occur on approximately 3.4 percent of the Lower Umpqua River designated critical habitat unit. Because of the small component of critical habitat negatively affected within the overall critical habitat unit, these effects are unlikely to adversely affect the OC coho salmon critical habitat at the 5th field watershed level or its conservation role. Although the current condition of critical habitat is not fully functional for the conservation of the species, the proposed action will not preclude or significantly delay the natural trajectory of PBF development for critical habitat in the Lower Umpqua River unit. The critical habitat unit will continue to provide functional support for successful OC coho salmon juvenile and adult growth, development, and migration.

Summary of Effects on Critical Habitat – Southern DPS Eulachon

In section 2.2.1, we determined that the condition of the water quality, water temperature, and substrate PBFs were likely limiting the conservation role of critical habitat in the Umpqua River. The proposed action will result in temporary and localized reductions (i.e., approximately 600 feet for no more than a few hours) on the water quality PBF as well as the migratory corridor PBF from construction and repair activities including pile driving and work area isolation; floodplain connectivity is not a PBF for eulachon critical habitat. These effects will occur on approximately 0.5 percent of critical habitat designated in the lower Umpqua River. Insignificant effects will occur on the food PBF because effects on the food PBF will not occur when eulachon would be using critical habitat. Although the current condition of critical habitat is not fully functional for the conservation of the species, the proposed action will not preclude or significantly delay the natural trajectory of PBF development for critical habitat in the Umpqua River. Critical habitat for eulachon in the Umpqua River will continue to provide functional support for successful eulachon migration.

2.5.2 Effects on Species

The City proposes to complete all in-water work during one work window from November 1-January 31. Southern DPS green sturgeon will not be present in the action area during this time. Adult southern DPS eulachon and adult and pre-smolt OC coho salmon are anticipated to be present in the action area during in-water construction activities. Although not all species or life history stages will be present during the in-water work window, all species and life history stages will be exposed to the long-term effects of the proposed action. The action area is important as a migration route for OC coho salmon; therefore, migrating smolts and migrating adults exposed could be from any of the four Umpqua populations; affected rearing juveniles likely belong to the Lower Umpqua River population.

Short-term Effects - Work Area Isolation & Fish Salvage

The City will manually install silt curtains at each in-water work site for isolation up to 50 feet from the streambank. Crews will conduct at least one seining pass to remove fish. Dewatering will occur over 12 hours to assist fish in leaving voluntarily. Any fish remaining in the sites after dewatering will be removed by seining, dip nets, and electrofishing. Adults have greater mobility than juveniles and are far more likely to leave the sites and not remain during or after dewatering. Adult southern DPS eulachon and adult and pre-smolt OC coho salmon will be displaced from the in-water work sites for approximately seven days at each site. These fish are mobile and capable of evading some construction disturbance, but these fish will be forced to move into other suitable habitats already occupied by other fish as natural cover is scarce in the action area. Thus, due to displacement, we anticipate an increased risk of predation on the adult eulachon and pre-smolt coho salmon while they move and hold in areas surrounding the work sites. The forced movement may also cause these individuals to expend additional energy while swimming in the current. Increased energetic costs, combined with physiological stress caused by response to the construction disturbance, are likely to reduce fitness and survival of adult eulachon and pre-smolt coho salmon and growth of pre-smolt coho. Given their larger size and mobility, adult coho salmon are unlikely to expend a meaningful greater amount of energy if displaced from along the shoreline in the work area isolation sites or experience a meaningful greater amount of increased predation risk.

Those individuals remaining in the sites after dewatering will also experience the added effects of capture during salvage. Although fish salvage is a conservation measure intended to reduce adverse effects from the project, fish will experience stress and injury during capture and transfer, although overall effects of the procedure are generally short-term if appropriate precautions are exercised. The crews will capture and remove fish from six locations or approximately 0.54 acre total and proposed conservation measures (section 1.3) will minimize injury and death of salvaged fish. We cannot predict the number of pre-smolt coho salmon or adult eulachon exposed, injured or harmed through displacement or salvaged from the isolated work sites precisely because the distribution and abundance of fish within the action area, at the time of the action, are not a simple function of the quantity, quality, or availability of predictable habitat resources within that area. Rather, the distribution and abundance of fish also show wide, random variations due to biological and environmental processes operating at much larger demographic and regional scales. Therefore, we will use the 0.54 acre as an extent of injury, death, increased risk of predation and reduced fitness and survival of pre-smolt coho salmon and adult eulachon associated with work area isolation rather than a number. Although, for adult eulachon, because five of the six sites are located in Scholfield Creek and the work areas only extend 50 feet from shore, the overall proportion of affected individuals will be relatively small because the majority of migrating fish will remain in the Umpqua River.

Short-term Effects - Underwater Sound Pressure

Elevated underwater sound pressure will occur during pile driving associated with floodwall construction. Pile driving activities were described above in section 2.4.1. The dual threshold interim criteria for impact pile driving are cumulative sound exposure level (SEL) of 187 dB (1 μPa^2 sec^{-1}) for fish greater than 2 grams and 183 dB (1 μPa^2 sec^{-1}) for fish less than 2 grams, and peak pressure of 206 dB (1 μPa^2 sec^{-1}), respectively, for adverse effects (*i.e.* injury or harm). The threshold for behavior modification is 150 dB RMS (re: 1μPa). In our assessment of pile driving for this proposed action (i.e., 12-inch steel H piles and approximately 4,000 strikes per day in saturated soils), we determined that the use of an impact hammer for pile driving will result in peak, cumulative SEL, and RMS values exceeding the dual threshold interim criteria within a distance of 0 feet (peak), 59 feet for fish over 2 grams and 69 feet for fish under 2 grams (cumulative SEL; injury or harm), and 328 feet (RMS; behavioral). All life stages of OC coho salmon and eulachon, except for larval eulachon, are considered to weigh more than 2 grams. The NMFS uses the practical spreading model to calculate transmission loss and a sound pressure exposure calculator to estimate effects.

Sound pressure increases from pile driving can cause behavior modification in fishes, which may result in injury depending on exposure duration and magnitude. Exposure to elevated sound pressure may affect foraging (Purser and Radford 2011), anti-predator behavior (Voellmy *et al.* 2014, Simpson *et al.* 2015), and migration (Popper *et al.* 2019) in fishes. Behavioral responses can vary broadly, from insignificant to a range of short- and long-term responses limiting to survival, growth, and fitness depending on the duration and intensity of elevated sound pressure.

Behavioral effects. Adult southern DPS eulachon and adult and pre-smolt OC coho salmon in Scholfield Creek and within 328 feet of the driven pile will be exposed to elevated sound pressure waves greater than 150 dB RMS daily along levee sections 8 and 10-13 for approximately 1.2 miles. These individuals will experience altered antipredator behavior (i.e., slower avoidance response) resulting in increased predation risk. They will also experience avoidance responses that will temporarily affect or delay migration. Only pre-smolt OC coho salmon are likely to experience reduced foraging efficiency, because adult coho salmon and eulachon typically do not feed during their upstream migrations. At two locations (i.e., sections 10 and 11) elevated RMS sound pressure levels are likely to occur for the full width of Scholfield Creek while pile driving occurs due to its narrower width at these locations. At the widest location (i.e., section 8), approximately 63 percent of the width of Scholfield Creek is likely to have elevated RMS sound pressure levels greater than 150 dB leaving approximately 37 percent available to fish. The entire area will not be impacted at one time as pile driving will progress along the levee at various locations over a period of 23 days. It is also expected that all species will move out of the affected areas to avoid the elevated sound pressure waves which will minimize predation and reductions in foraging efficiency. However, displacement will have adverse effects on adult eulachon and pre-smolt coho salmon individuals (see Work Area Isolation & Fish Salvage above). Migration delays for adult eulachon and OC coho salmon are expected to be temporary and only for the daily duration of pile driving and therefore are unlikely to be meaningfully affected overall. Adult southern DPS eulachon will only be present for approximately one month during the in-water work window (i.e. January); adult OC coho salmon will be present in the for approximately two months during the in-water work window (i.e., November-December).

Injury or Death. Physical injury to adult and pre-smolt OC coho salmon and adult eulachon from elevated underwater sound pressure will occur as sound levels will exceed thresholds for injury. The degree to which an individual fish exposed to underwater sound will be affected is dependent on the number of variables such as species of fish, size of the fish, presence of a swim bladder, sound pressure intensity and frequency, shape of the sound wave (rise time), depth of the water around the pile and the bottom substrate composition and texture. High levels of underwater sound pressure have been shown to have negative physiological and neurological effects on a wide variety of vertebrate species (Yelverton *et al*. 1973, Yelverton and Richmond 1981, Cudahy and Ellison 2002, Hastings and Popper 2005). Risk of injury from elevated underwater sound pressure appears related to the effect of rapid pressure changes, termed barotraumas, especially on gas-filled spaces in the bodies of exposed organisms (Turnpenny *et al*. 1994). The elevated sound pressure from impact pile driving can injure and/or kill fishes, as well as temporarily stun them or alter their behavior (Turnpenny *et al*. 1994, Turnpenny and Newell 1994, Popper 2003, Hastings and Popper 2005).

Fish with swim bladders appear to be more susceptible to barotraumas from impulsive sound pressure (sounds of very short duration with a rapid rise in pressure) because the sounds cause their swim bladders to resonate. When a sound pressure wave strikes a gas-filled space such as the swim bladder, it causes that space to expand and contract. When the amplitude of this vibration is sufficiently high, the pulsing swim bladder can press against, and strain, adjacent organs, such as the liver and kidney. This pneumatic compression causes injury including ruptured capillaries, internal bleeding, and laceration of highly vascular organs (Popper *et al.* 2019). Sound pressure waves can cause different types of tissue to vibrate at different frequencies, and this differential vibration can tear mesenteries and other sensitive collective tissues (Hastings and Popper 2005). Exposure to high sound levels can also lead to injury through “rectified diffusion,” the formation and growth of bubbles in tissues. These bubbles can cause inflammation and cellular damage and block or rupture capillaries, arteries, and veins (Crum and Mao 1996, Vlahakis and Hubmayr 2000, Stroetz *et al*. 2001). Death from barotrauma and rectified diffusion injuries can be instantaneous or delayed for minutes, hours, or even days after exposure. Even if fish are not killed, elevated sound levels can cause sublethal injuries that affect the fishes' survival and fitness (Slabbekoom *et al*. 2010). Fish suffering damage to hearing organs may suffer equilibrium problems, and have a reduced ability to detect predators and prey (Turnpenny *et al*. 1994, Hastings 1996). Exposure to elevated sound levels can cause a temporary shift in hearing sensitivity (referred to as a temporary threshold shift, or TTS), decreasing sensory capability for periods lasting from hours to days (Turnpenny *et al*. 1994, Hastings 1996). Other types of sub-lethal injuries can place the fish at increased risk of predation and disease. One significant difference between the effects of elevated sound pressure on coho salmon and eulachon is the lack of a swim bladder in eulachon. Nonetheless, fish without swim bladders are also sensitive to sharp increases in sound pressure and may experience auditory damage, burst skin capillaries, neurotrauma, eye hemorrhage, and death.

Regardless of species, smaller fish such as juveniles and larvae appear to be more sensitive than larger fish to non-auditory tissue injury (Yelverton *et al*. 1975). For example, NMFS biologists observed that approximately 100 surf perch from three different species (*Cymatogaster aggregate, Brachyistius frenatus,* and *Embiotoca lateralis*) were killed during impact pile driving of 30-inch diameter steel pilings at Bremerton, Washington (NMFS 2009) and dissections revealed complete swim bladder destruction across all species in the smallest fish (80 millimeters fork length (mm FL)), while swim bladders in the largest fish (170 mm FL) were nearly intact. Comparable size specific results have been demonstrated in other species. Due to their large size, adult salmon appear to tolerate higher sound levels and are generally less sensitive to injury of non-auditory tissues than juveniles (Hubbs and Rechnitzer 1952). However, no information is available to determine whether the risk of auditory tissue damage decreases with increasing size of the fish.

Egg-carrying female salmon may face elevated injury risk relative to immature adults and sub-adults of comparable size. Eggs and supporting mesenteries are highly vascular tissues located in close proximity to the swim bladder, suggesting elevated sensitivity to barotrauma. These risks could include direct injury to individual eggs, tearing of the mesenteries that hold the eggs in place (resulting in the eggs being extruded prematurely), and loss of blood flow leading to developmental abnormalities or death. While this form of barotrauma has not been the subject of directed study, some inferences can be drawn from studies of other species. For example, Banner and Hyatt (1973) demonstrated increased mortality of sheepshead minnow eggs and embryos when exposed to continuous broadband noise (100 to 1000 Hertz) approximately 15 dB above ambient. Hatched sheepshead minnow fry were unaffected by the same exposure, as were the eggs and fry of the longnose killifish (*Fundulus similis*). However, it must be noted that the sounds produced by impact driving of steel piles are very different in character than the sounds in this study, and the eggs were free floating and not contained within the ovaries of the mother. As such, extrapolations from this study to eggs in a gravid female salmon are tenuous, nonetheless, it is prudent to avoid potential injury to gravid female salmon because individual level effects can significant impact population productivity.

Adult southern DPS eulachon, adult and pre-smolt OC coho salmon, and eggs in females of both species in Scholfield Creek within 69 feet of a driven pile will experience injury or death because of elevated sound pressure levels resulting from pile driving. However, as described in section 2.4.1, pile driving for levee sections 8 and 10-13 are within 200 feet of Scholfied Creek but not actually in Scholfield Creek. Pile driving at section 10 will occur at approximately 98 feet from Scholfield Creek so injury or death is not expected at this location because elevated sound pressure levels are not expected to occur in water. Pile driving at levee sections 8, and 11-13 are expected to occur approximately 29 feet, 39 feet, 49 feet, and 52 feet from Scholfield Creek so elevated sound pressures are expected to reach water where species are present, although for gradually decreasing extents. For example, pile driving at closest of these locations (section 8) is expected to affect Scholfield Creek for approximately 40 feet from the shoreline and pile driving at the farthest of these locations (i.e., section 13) is expected to only affect Scholfield Creek for approximately 17 feet from the shoreline. The total extent of Scholfield Creek where species are likely to experience physical injury or death from cumulative SEL levels greater than 183 dB is approximately 3.4 acres, estimated by multiplying the lengths of the levee sections by the distance from shoreline. However, this is an overestimate as there was only one length provided for sections 10 through 12 (Anderson Perry & Associates, Inc. 2021) and as noted above, section 10 will not affect Scholfield Creek. The elevated sound levels will occur over approximately 23 days of pile driving.

Quantifying the number of OC coho salmon and eulachon individuals in the area of injury resulting from pile driving is impractical because the relationship between habitat conditions and the distribution and abundance of individuals in the action area is inexact and shows wide, random variations due to biological and environmental processes operating at much larger demographic and regional scales. There is insufficient information available to provide a reliable and accurate estimate of the number of individual fish present in this area at any one time because of variability of environmental conditions and migration patterns. However, the extent of the affected area of injury in Scholfield Creek will not extend across the full width of Scholfield Creek in any location. Adult southern DPS eulachon and adult and pre-smolt OC coho salmon will be killed or injured. Eggs in female coho salmon and female eulachon migrating to upstream spawning areas are also likely to be killed or injured, negatively affecting reproduction. Therefore, we will use 3.4 acres as an extent of injury and death of adult and pre-smolt coho salmon, adult eulachon, and eggs associated with increased underwater sound pressure rather than a number. Not all migrating fishes will be exposed because only portions of their run timing overlaps with the in-water work window: adult southern DPS eulachon will only be present for approximately one month during the in-water work window (i.e. January) and adult OC coho salmon will be present in the for approximately two months during the in-water work window (i.e., November-December). Although surveys for either eulachon or spawning coho have either not occurred or occurred infrequently in Scholfield Creek, the overall proportion of affected adults and eggs will be relatively small because the majority of migrating fish will remain in the Umpqua River.

Short-term Effects - Decreased Food

Work area isolation will result in temporary and localized decreases in prey availability for pre-smolt coho salmon. As noted in section 2.5.1, this will be a short-term effect that only disturbs approximately 0.54 acre distributed across the Umpqua River, Scholfield Creek, and McIntosh Slough at six locations. Therefore, it is unlikely that the proposed action will reduce prey in sufficient amounts to meaningfully decrease normal behavior of feeding for juveniles. It is extremely unlikely that migrating adult coho salmon or eulachon will experience reduced feeding as a result of the proposed action because migrating adults typically do not feed during their upstream migrations.

Short-term Effects - Water Quality

Increased risk of unintentional chemical contamination. Operation of backhoes, excavators, and other construction equipment near sensitive habitats, such as streams and wetlands, creates the potential for introduction of toxic materials (i.e., fuel, lubricants) into the stream or into the adjacent riparian zone from accidental spills, improper storage of petrochemicals, or mechanical failure, which can injure or kill aquatic organisms. Based on experience with construction activities, the probability of a fuel spill, equipment malfunction, or accident is more than negligible. However, proposed conservation measures using vehicle staging areas for general construction practices; locating vehicle staging areas inside of the levee and in upland areas separated from rivers by 150-450 feet; using biodegradable lubricants in equipment operating within 150 feet of work areas; not operating heavy equipment in water; staging equipment for work above the OHWE on the levee and using equipment extensions to reach down to the work areas; implementing spill prevention measures along with fuel containment systems designed to completely contain spills when closer than 150 feet of waterbodies will minimize the probability and extent of unintentional chemical contamination, such that an accidental spill is extremely unlikely to occur. However, in spite of proposed conservation measures, it is reasonable to expect that a few drops (up to an ounce, approximately) of contaminants may drip from equipment into the adjacent riparian area. The resulting effects on OC coho salmon and eulachon from these small drips will be so mild that no individual will be meaningfully disturbed or affected and their essential behavioral patterns of breeding, rearing, feeding, sheltering, and migrating will be not be meaningfully impaired.

Increased Suspended Sediment. Increased suspended sediment will occur during approximately six events, associated with construction activities for conveyance piping and gravity drain improvements, and other work occurring on the river side of the levee, resulting in short-term and localized turbidity and sediment plumes. The areas expected to be affected are described in section 2.5.1. Increases in suspended fine sediments can affect OC coho salmon through physical impairments, behavioral responses, availability of preferred forage, and changes in habitat quality. These sediments entering the stream can contribute to total suspended sediment concentrations, as well as the bedload. The effect of sediment particles on free swimming individuals decreases with particle size and increases with particle concentration and exposure duration (Newcombe and Jensen 1996). The fine suspended sediments generated as part of the proposed action may affect salmon and cause direct physical damage (Newcombe and Jensen 1996, Newcombe 2003). Salmon regularly experience physiological stress when exposed to suspended sediment particles, a response often paralleled by increased hematocrit values (Redding and Schreck 1980, Servizi and Martens 1987). Gill abrasion and particle uptake in gills and spleen have also been reported (Servizi and Martens 1987). Behavioral responses include avoidance of sediment plumes and alarm reactions (Bisson and Bilby 1982, Berg and Northcote 1985).

Response of OC coho salmon to project-generated suspended sediment is related to concentration levels and exposure duration. Researchers investigating relationships between suspended sediment concentrations and exposure duration provide general predictors for salmon response. Of key importance in considering the potentially detrimental effects of suspended sediment on juvenile coho salmon are the concentration and duration of the exposure, as well as the frequency or persistence of elevated levels. Sub-lethal effects of short-term exposure (i.e., hours to weeks) of juvenile coho salmon to suspended sediment occur at 20 nephelometric turbidity units (NTU) laboratory settings, although such effects were also reported to be generally temporary in nature and did not persist once turbidities returned to more normal background levels (Robertson *et al*. 2006). Suspended sediment may be estimated by turbidity measurements (in NTU), which is a measure of light scattered by particles suspended in liquid. Increases in suspended sediment concentrations as low as 30 NTU can result in reduced prey capture success or gill flaring for juvenile coho salmon exposed to turbidity pulses for periods as short as four hours (Berg and Northcote 1985). Other negative behavioral responses can include changes in territorial behavior, alarm reactions with downstream displacement and increased predation and competition, avoidance behavior, decreased feeding, and reduced growth (Noggle 1978, Berg 1983, Lloyd 1987, Newcombe and Jensen 1996, Bash *et al.* 2001, Robertson *et al.* 2006). High levels of suspended sediment can be lethal to salmonids; lower levels can cause chronic sub-lethal effects including loss or reduction of foraging capability, reduced growth, reduced resistance to disease, reduced respiratory ability, increased stress, and interference with cues necessary for homing and migration (Bash *et al.* 2001). Sub-lethal effects are those that are not directly or immediately lethal, but are detrimental and have some probability of leading to eventual death via behavioral or physiological disruption. Some juveniles use suspended sediment plumes for cover to reduce risk of predation where other cover is lacking (Bisson and Bilby 1982).

The exposure of juvenile coho salmon to increased suspended sediment generated by the proposed action is reasonably certain to provoke some temporary adverse effects such as gill flaring and irritation, or they will attempt to move to locations with lower concentrations of fine sediment (see displacement effects discussed in the Work Area Isolation & Fish Salvage above). We rely on the extent of affected area as described in section 2.5.1 (i.e., 6 locations, limited to 2,400 feet of Scholfield Creek, 600 feet of Umpqua, and 600 feet of McIntosh Slough; 0.54 acre overall) rather than providing an estimate of the number of juveniles harmed for the reasons provided above.

Because the plumes will be temporary and unlikely to be detectable across the entire width of Scholfield Creek or the Umpqua River based on the size and location of the isolated work area, it is unlikely that juvenile coho salmon will undergo injury or death, however sub-lethal effects as described above are reasonably certain to affect individuals. Because the estuarine area is a naturally dynamic and turbid area especially during winter; turbidity and sediment levels will return to background levels after a few hours. Due to their larger size and greater swimming ability, migrating adults will not be inhibited from moving away from any elevated suspended sediment and will experience only slight effects that are unlikely to meaningfully delay migration or result in injury. Affected rearing coho salmon juveniles belong to the Lower Umpqua River population. While adequate information exists to analyze the effect of suspended sediment on coho salmon, little exists for eulachon. In the absence of information, we assume the thresholds for effects on adult eulachon are similar to those described for coho salmon juveniles.

Long-term Effects

The proposed Reedsport levee system resiliency will continue to confine the riverine system along one bank of the Umpqua River and one bank of Scholfield Creek for approximately 2.9 miles (Figure 3). It will also maintain fragmentation of existing habitat and maintain conversion of nearshore aquatic habitat in a simplified condition. The levee repairs include stabilization by floodwalls and earthern fill that will continue to prevent the river from migrating. There will be an additional 0.35 acre of fill in the floodplain from the raising of the levee. The long-term effects of stabilization extend beyond the river's edge and are not limited to the wetted stream channel. Connectivity longitudinally (up- and down-stream), laterally (floodplain and uplands) and vertically (groundwater and hyporheic) are major ecological features of natural stream corridors (Stanford and Ward 1992). Levees affect the hydrology, biology, morphology, and water quality of rivers (Bolton and Shellberg 2001). Typically, changes due to human activities such as levees in the channel migration zone result in a reduction in habitat diversity, which affects the numbers and kinds of animals that can be sustained. Because levees prevent lateral river movement, the opportunity for the river to experience habitat forming processes is muted, resulting in a modified river system that is simplified and limited its ability to support optimal growth, abundance, reproduction, and survival of listed species. Therefore, effects on all three listed species in the action area will continue to include decreased growth and survival along 2.9 miles of the existing levee for approximately 40 years, although the magnitude of effects will differ by species. Green sturgeon are likely to be less affected given their use of deeper water. Greater effects will occur for coho salmon because habitat complexity and diversity are limiting factors for the species and because floodplain habitats are typically the most productive habitats for rearing juvenile coho salmon. The changing climate will likely amplify the long-term effects of the proposed action.

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 and 402.17(a)]. 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. We were unable to identify any specific future non-Federal activities in the action area and no specific actions were identified in the biological assessment reasonably certain to occur in the action area (Anderson Perry & Associates, Inc. 2021). Similarly, we were unable to identify any specific future non-Federal activities that would have effects on the action area.

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 in the environmental baseline (section 2.4).

Non-project related land and waterway management activities including agriculture, forestry, grazing, road building and maintenance, and urbanization will continue to degrade aquatic habitat for OC coho salmon, green sturgeon, and eulachon in the Umpqua River estuary action area. These activities in and around the action area will contribute to modified water quality and habitat complexity in the action area that has adversely affected the action area. These activities will continue to impact water quality by increasing water temperatures, adding chemicals to the water (stormwater contaminants associated with urbanization), increasing sedimentation, increasing predation on OC coho salmon, green sturgeon, and eulachon; and reducing large wood for creation of complex habitats. Impacts associated with these activities are ongoing and likely to continue to have a depressive effect on critical habitat quality and function resulting in additional stress on OC coho salmon, green sturgeon, and eulachon in the action area. Therefore, we expect cumulative effects to cause a slight to moderate negative effect on population abundance and productivity. Likewise, we expect the quality and function of OC coho salmon and eulachon critical habitat PBFs in the action area will continue to be negatively impacted as a result of cumulative effects.

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 Critical Habitat

Overall, the value of designated critical habitat for OC coho salmon and eulachon will not be appreciably diminished and will retain its current ability to play the intended conservation role for these species. As described in section 2.6, the quality and function of critical habitat PBFs in the action area will continue to be negatively affected as a result of cumulative effects. Additional details are provided below.

OC coho salmon. The Lower Umpqua River 5th field watershed has a high conservation value. Thus, this critical habitat unit is essential to support the Lower Umpqua River population of OC coho salmon. Additionally, it serves as a migratory corridor for all four Umpqua River populations and it has a high corridor conservation value. The baseline condition of critical habitat function and value in the watershed (section 2.2.1) and in the action area (section 2.3) has been modified, primarily due by forestry, grazing, and urbanization. More specifically, the landscape changes are largely from: a loss of large woody debris and forested land cover (mostly associated with grazing), diking and filling of estuarine wetlands (related to grazing and urbanization), and sedimentation (related to landslides related to forestry and roadbuilding). Therefore, the substrate, water quality, floodplain connectivity, natural cover, and fish passage free of obstruction PBFs likely to be limiting the conservation role of the critical habitat unit (section 2.2). Although the quality and function of critical habitat has been reduced, it does provide support for OC coho salmon. Climate change is likely to amplify these habitat conditions in the future, particularly increased water temperatures and sea level rise.

In the action area, the forage, water quantity, salinity, and fish passage free of obstruction PBFs appear to be functional, but PBFs of reduced quality include floodplain connectivity, natural cover, and water quality (section 2.4). Adverse effects on the floodplain connectivity PBF for approximately 40 years; there will only be temporary and localized adverse effects on water quality, forage, and passage PBFs (section 2.5). The proposed action will not affect the quality and function of natural cover, water quantity, and salinity. Because of the small component of the adversely affected area within the critical habitat unit (approximately 3.4 percent), the effects of the proposed action are unlikely to have an adverse effect on the function of these OC coho salmon critical habitat PBFs at the 5th field watershed level or the conservation value of the critical habitat unit. The affected critical habitat unit will retain its ability to serve its intended conservation role for OC coho salmon.

Southern DPS eulachon. Baseline conditions in the Lower Umpqua River estuary are as described for OC coho salmon critical habitat above as are expected cumulative effects. The action area serves as a migratory corridor for eulachon, however critical habitat is only designated in the Umpqua River. The water quality, water temperature, and substrate PBFs are likely limiting the conservation role of critical habitat in the Umpqua River for eulachon spawning, incubation, and migration (section 2.2). The water quality and water temperature PBFs are likely limiting critical habitat in the action area for eulachon migration (section 2.4). Climate change is likely to amplify the habitat conditions in the future, particularly increased water temperatures. The proposed action will only have temporary and localized adverse effects on water quality and passage PBFs; floodplain connectivity is not a PBF for eulachon critical habitat (section 2.5). These effects will occur on approximately 0.5 percent of critical habitat designated in the lower Umpqua River. Effects on the food PBF will not occur when eulachon would be using critical habitat because it is unlikely that eulachon adults or larvae feed while they are in the action area. The proposed action will not affect the quality and function of flow or water temperature. Because of the small component of the PBFs adversely affected within the critical habitat unit (approximately 0.5 percent), the effects of the proposed action are unlikely to have an adverse effect on the conservation value of the critical habitat unit. The affected critical habitat unit will retain its ability to serve its intended conservation role for eulachon.

2.7.2 ESA Listed Species

Overall, the likelihood of both the survival and recovery of the three species will not be appreciably reduced. As described in section 2.6, population abundance and productivity will continue to be negatively affected as a result of cumulative effects. Additional details are provided below.

OC coho salmon. The OC coho salmon ESU is at a moderate-to-low risk of extinction (section 2.2). The proposed action will affect individuals of four functionally independent populations, out of a total of 21 functionally independent populations. Annual population abundance varies from year to year. Specific limiting factors for coho salmon that apply to the action area include poor water quality and reduced amount and complexity of habitat including connected floodplain habitat. Individuals in the action area are likely to be slightly less efficient metabolically and physiologically compared to individuals in areas without water quality and floodplain connectivity stressors but are still expected to be healthy because the habitat does provide functional support for estuarine life history activities. Climate change is likely to amplify these stressors in the future, particularly increased water temperatures and sea level rise. The North and South Umpqua populations have low confidence of meeting viability criteria, while the Middle and Lower Umpqua populations have a moderate and high probability of being sustainable and viable (section 2.4). The composition of adult and smolt life stages using the action area consists of all four populations. The pre-smolt life stage likely consists of only the Lower Umpqua population of OC coho salmon. The effects on each population would be the integrated responses of individuals to the predicted environmental changes. Instantaneous measures of population characteristics, such as population size, growth rate, spatial structure, and diversity, are the sums of individual characteristics within a particular area, while measures of population change, such as a population growth rate, are measured as the productivity of individuals over the entire life cycle (McElhany *et al*. 2000). A persistent change in the environmental conditions affecting a population, for better or worse, can lead to changes in each of these population characteristics.

Due to the timing of construction activities, smolts will not be affected by the temporary and localized effects occurring in the Umpqua River estuary. Pre-smolts and adults from the Lower Umpqua population and adults from all populations are anticipated to be present in the action area during in-water construction activities and exposed to temporary and localized effects from construction activities in addition to long-term effects. Smolts from all populations will also experience long-term effects associated with the levee. The following adverse effects are reasonably certain to occur from the proposed action (section 2.5).

Short-term effects

- exposure to work area isolation activities, increased suspended sediment, or fish salvage (0.54 acre) in Scholfield Creek, McIntosh Slough, and Umpqua River combined for a few hours or one day per each event (approximately six)
  - pre-smolts
    - increased risk of predation, reduced foraging efficiencies, and increased energetic costs causing reduced growth, fitness, and survival
    - stress and injury
- daily exposure to elevated underwater sound pressure in Scholfield Creek only, approximately 23 days
  - behavioral effects (1.2 miles)
    - pre-smolts
      - increased risk of predation, reduced foraging efficiencies, and increased energetic costs
  - injury or death (3.4 acres) in Scholfield Creek only
    - including but not limited to diffusion, hearing organ damage, barotrauma
      - pre-smolts
      - adults
    - including but not limited to mesentery tearing, premature release, developmental abnormalities
      - eggs within adult females

Continued long-term effects (approximately 40 years)

- on-going exposure to continued modified habitat conditions (2.9 miles of levee) Scholfield Creek and Umpqua River combined
    - reduced growth, abundance, reproduction and survival
        - all life histories

The majority of effects occurring from the proposed action are short-term ranging from six to twenty-three days at differing locations along the levee which is located in both Scholfield Creek and the Umpqua River. The duration of each event and exposure will last for no more than one day. Adverse effects of the proposed action will only occur within a small area of one 5th field watershed. Almost all of the short-term effects will occur in Scholfield Creek; only in one 0.09-acre area on the Umpqua River, the main migratory corridor for all populations, will individuals be exposed to work area isolation activities, increased suspended sediment, and fish salvage and individuals in the Umpqua River will not be exposed to elevated underwater sound pressures. Long- and short- term habitat-related effects from the proposed action are related to the primary limiting factors of the Lower Umpqua population: water quality and stream complexity. Effects on water quality from increased suspended sediments will only be temporary. Habitat modification has long-term effects but these effects will only occur along a limited portion of streams used by coho salmon and effects will not be continuous throughout the 9,516-acre estuary. There are also no new long-term effects as they currently exist within the environmental baseline, but the proposed action will allow those effects to continue to occur for another 40 years. While this is a continued and persistent modification it is unlikely to meaningfully change the limiting factors of the populations and meaningful changes to population abundance, productivity, and distribution will not occur.

For recovery of OC coho salmon, most of the functionally independent populations within the Umpqua stratum must be sustainable. Because the proposed action will not meaningfully affect viability of any of the Umpqua populations, it will also not change the extinction risk of the populations or prevent the populations from attaining their required levels of extinction risk. Therefore, the populations will not be impeded in playing their roles in the recovery of the OC coho ESU.

Given the above, the proposed action will not be likely to meaningfully change the limiting factors, will have no discernible effect on population viability, and will not impede recovery of the OC coho salmon ESU.

Southern DPS green sturgeon. Southern DPS green sturgeon in the action area spawn south of the Eel River in California. When not spawning, southern DPS green sturgeon are broadly distributed in nearshore marine areas from Mexico to the Bering Sea, including Coos Bay. The principal factor for the decline of southern DPS green sturgeon is the reduction of its spawning area to a single known population limited to a small portion of the highly degraded Sacramento River. This limiting factor does not apply in the action area. The action area supports adult and sub-adult growth, development, and migration. A specific limiting factor for southern DPS green sturgeon in the action area is poor water quality. Similar to coho salmon above, individuals in the action area are likely to be slightly less efficient metabolically and physiologically compared to individuals in areas without water quality stressors but are still expected to be healthy. Climate change is likely to amplify these stressors in the future.

Southern DPS green sturgeon will not be present in the action area when construction activities occur. Adult and sub-adult green sturgeon will have on-going exposure to continued modified habitat conditions (2.9 miles of levee) in Scholfield Creek and the Umpqua River with reduced growth, abundance, reproduction and survival. As described above this habitat modification has long-term effects but these effects will only occur along a limited portion of streams used by green sturgeon and effects will not be continuous throughout the 9,516-acre estuary. There are also no new long-term effects as they currently exist within the environmental baseline, but the proposed action will allow those effects to continue to occur for another 40 years. While this is a continued and persistent modification it is unlikely to meaningfully change the limiting factors of the population and meaningful changes to population abundance, productivity, and distribution will not occur. The DPS of green sturgeon contains one population and its recovery will not be impeded by the proposed action.

When we consider the effects of the proposed action on the population, the environmental baseline, cumulative effects, and climate change, we find the proposed action will not appreciably reduce the likelihood of the survival or recovery of the southern DPS of green sturgeon.

Southern DPS eulachon. Southern DPS eulachon use the action area for migration. They migrate through the action area on their way to or from spawning grounds in the lower reaches of rivers upstream. The Umpqua River supported an extensive recreational fishery from 1969 to 1982, but few eulachon have been observed in the Umpqua River since. The major species-wide threats to eulachon are impacts of climate change on oceanic and freshwater habitats, and fishery by-catch. Specific limiting factors for southern DPS eulachon that apply to the action area include poor water quality and shoreline construction. Individuals in the action area are likely to be slightly less efficient metabolically and physiologically compared to individuals in areas without water quality and floodplain connectivity stressors but are still expected to be healthy. Climate change is likely to amplify these stressors in the future, particularly increased water temperatures and sea level rise.

Larvae will not be affected by the temporary and localized effects occurring in the Umpqua River estuary due to the timing of construction activities. Adults are anticipated to be present in the action area during in-water construction activities and exposed to temporary and localized effects from construction activities in addition to long-term effects. Larvae will also experience long-term effects associated with the levee. The adverse effects that are reasonably certain to occur from the proposed action are the same as those described for coho salmon pre-smolts above, with the exception of those related to feeding and growth.

There is no independent Umpqua population of southern DPS eulachon, rather they contribute to the four main identified populations. The proposed action does not include any of the major threats to eulachon: dams, water diversions, water impoundments, long-term water quality degradation or chemical contamination, or dredging. Therefore, eulachon recovery will not be impeded by the proposed action.

When we consider the effects of the proposed action on the population, the environmental baseline, cumulative effects, and climate change, we find the proposed action will not appreciably reduce the likelihood of the survival or recovery of the southern DPS of eulachon.

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 cumulative effects, it is NMFS' biological opinion that the proposed action is not likely to jeopardize the continued existence of OC coho salmon, southern DPS of green sturgeon, southern DPS of eulachon or destroy or adversely modify designated critical habitat for OC coho salmon or southern DPS of eulachon.

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 interim 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.

The NMFS has not yet promulgated an ESA section 4(d) rule prohibiting take of threatened eulachon. Anticipating that such a rule may be issued in the future, we have included a prospective incidental take exemption for eulachon. The elements of this ITS for eulachon would become effective on the date on which any future 4(d) rule prohibiting take of eulachon becomes effective. Nevertheless, the amount and extent of eulachon incidental take, as specified in this statement, will serve as one of the criteria for reinitiation of consultation pursuant to 50 C.F.R. § 402.16(a), if exceeded.

2.9.1 Amount or Extent of Take

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

- Pre-smolt coho salmon and adult eulachon will be injured, killed, or experience significant impairment to essential behaviors of feeding and sheltering during work area isolation or fish capture.
- Pre-smolt coho salmon and adult eulachon will be harmed due to temporary increases in suspended sediment associated with construction activities for conveyance piping and gravity drain improvements, work area isolation, and other work occurring on the river side of the levee.

- Pre-smolt coho salmon and adult eulachon will experience significant disruption to normal behaviors of feeding, sheltering, breeding or migration due to elevated underwater sound pressure.
- Adult coho salmon, adult eulachon, pre-smolt coho salmon, and eggs within adult female coho salmon will be injured or killed due to elevated underwater sound pressure.
- All life histories of coho salmon, all life histories of eulachon, and adult and sub-adult green sturgeon will experience significant disruption to normal behaviors of breeding, feeding, and sheltering due to on-going exposure to continued modified habitat conditions associated with the levee.

Accurately quantifying the number of fish harmed by these pathways is not possible because injury and death of individuals in the action area is a function of habitat quality, competition, predation, and the interaction of processes that influence genetic, population, and environmental characteristics. These biotic and environmental processes are highly variable and interact in ways that may be random or directional, and may operate across broad temporal and spatial scales. The precise distribution and abundance of fish within the action area, at the time of the action are not a simple function of the quantity, quality, or availability of predictable habitat resources within that area. Rather, the distribution and abundance of fish also show wide, random variations due to biological and environmental processes operating at much larger demographic and regional scales. Thus, the distribution and abundance of fish within the action area cannot be attributed entirely to habitat conditions, nor can we precisely predict the number of fish that are reasonably certain to be injured or killed either directly or if their habitat is modified or degraded by actions that will be completed under the proposed action. Furthermore, there are no methods available to monitor this death and injury because the action area is too deep and velocities too great to allow observation of injured or killed individuals, because monitoring would cause additional risk of injury or harassment, and in some cases take will occur throughout the year and after the proposed action has been completed. Therefore, it is not practical or realistic to attempt to identify and monitor the number of fish taken by the pathways described.

In cases such as this, where quantifying a number of fish is not possible, we use take surrogates or take indicators that rationally reflect the incidental take caused by the proposed action. We identified four rational surrogates to serve as the best available indicators for the extent of take caused by the proposed action: (1) the number and footprint of isolated work areas, (2) the distance of visible suspended sediment plumes and (3) the number of daily impact hammer strikes for piles driven within 200 feet of the edge of water for a maximum of 23 days, and (4) the length of the levee.

1. The number and footprint of isolated work areas are associated with take due to injury, death, or harm from work area isolation and fish capture. The number and footprint of isolated and salvaged areas are directly related to the amount of take because the greater the area isolated leads to greater amounts of fish exposed and harmed. Based on information provided in the biological assessment, there are likely to be approximately six areas isolated located along the levee for 0.09 acre each. If the combined acreage of isolated work areas exceeds a combined total of 0.54 acre, the extent of take will be exceeded and the reinitiation provisions of this opinion will be triggered.
2. The distance suspended sediment plumes are visible is associated with take due to temporary water quality effects by construction activities. This distance best integrates

the likely take pathway associated with this action, is proportional to the anticipated amount of take, and is the most practical and feasible indicator to measure. The distance of visible sediment plume is directly related to the number of fish exposed to harm and will function as an effective reinitiation trigger because of the total number of estimated events. Based on information provide din the biological assessment, there are likely to be approximately six construction events located around the levee and the locations are in a tidal estuary. Based on the location of anticipated events, if the visible distance of the six continuous suspended sediment plumes exceed 600 feet, for a combined total of approximately 2,400 feet of Scholfield Creek, approximately 600 feet of the Umpqua River, and approximately 600 feet of McIntosh Slough, the extent of take will be exceeded and the reinitiation provisions of this opinion will be triggered.

3. Installation of piles for floodwalls within 200 feet of the edge of water will cause sufficient elevated underwater pressure levels sufficient to disrupt normal behaviors of feeding, sheltering, breeding or migration for pre-smolt coho salmon and adult eulachon and injure or kill adult coho salmon, adult eulachon, pre-smolt coho salmon, and eggs within adult female coho salmon. The number of daily impact strikes used in our assessment (4,000) is a valid indicator because it is proportional to the amount of take as is the maximum number of days piles are expected to be driven within 200 feet of water's edge. The extent of risk and exposure will increase as more strikes occur and more piles are driven. Therefore, if impact pile driving within 200 feet of water's edge of Schofield Creek or McIntosh Slough occurs for more than 23 days or for more than 4,000 strikes per day, the extent of take will be exceeded and the reinitiation provisions of this opinion will be triggered.
4. Levees confine rivers and estuaries, fragment existing habitat, and reduce the overall complexity of habitat available for fishes. The proposed action is expected to extend the life of the existing structure for approximately 40 years. Therefore, the length of the levee is proportional to significant disruption to normal behaviors of breeding, feeding, and sheltering due to on-going exposure to continued modified habitat conditions. If the overall length of the levee exceeds more than 2.9 miles, the extent of take will be exceeded and the reinitiation provisions of this opinion will be triggered.

In summary and as described above, the extent of take surrogates used as reinitation triggers are:

1. Six areas of 0.09 acre each dewatered and fish salvaged for a total of 0.54 acre.
2. Six continuous suspended sediment plumes no more than 600 feet each, for a combined total of approximately 2,400 feet of Scholfield Creek, approximately 600 feet of the Umpqua River, and approximately 600 feet of McIntosh Slough.
3. Twenty-three days of impact pile driving within 200 feet of Scholfield Creek or McIntosh Slough at 4,000 strikes per day.
4. Levee length of 2.9 miles.

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" are measures that are necessary or appropriate to minimize the impact of the amount or extent of incidental take (50 CFR 402.02). The FEMA and the City shall implement the following reasonable and prudent measures that are necessary or appropriate to minimize the impact of incidental take of listed species from the proposed action:

1. Minimize incidental take from exposure to elevated suspended sediment.
2. Minimize incidental take from exposure to elevated sound pressure from impact pile driving within 200 feet of Scholfield Creek or McIntosh Slough.
3. Complete monitoring and reporting to confirm that the take exemption for the proposed action is not exceeded, and that the terms and conditions in this incidental take statement are effective in minimizing incidental take.

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. FEMA must ensure the City monitors 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).

1. The following terms and conditions implement reasonable and prudent measure 1 (elevated suspended sediment).
   a. Monitor distance of visible suspended sediment plumes throughout the in-water work of the project. If the project exceeds a visible continuous sediment plume of 600 feet, all work resulting in elevated suspended sediment must stop until the plume dissipates to match baseline conditions.
2. The following terms and conditions implement reasonable and prudent measure 2 (elevated sound pressure).
   a. Conduct pile driving with an impact hammer within 200 feet of Scholfield Creek or McIntosh Slough only during daylight hours with the sun above the horizon. This is to ensure that pile driving does not occur at dawn or dusk, which can be peak movement time for OC coho salmon.
   b. Allow a minimum rest period of 12 hours between daily pile driving activities within 200 feet of Scholfield Creek or McIntosh Slough during which no impact pile driving occurs.

3. The following terms and conditions implement reasonable and prudent measure 3 (monitoring and reporting).
   a. Monitor underwater sound according to the Federal Hydroacoustics Working Group underwater noise monitoring plan template.

b. Prepare a project completion report including the following items and provide it to FEMA and NMFS within 60 days of completing construction. The following items must be included:
   i. Project name (include the NMFS tracking number WCRO-2021-01247)
   ii. Starting and ending dates of each element of work:
      1. Provide information for each isolated work area, including dewatering and fish capture, along with the acreage and location
      2. Provide information for impact hammer pile driving within 200 feet of Scholfield Creek or McIntosh Slough
         a. Daily start and end times
         b. Total number of days
         c. Total number of daily strikes
   iii. Details of the underwater noise monitoring results
   iv. Monitoring results of the suspended sediment plumes

c. Submit a fish salvage report within 60 days of completing fish capture and release events with the following information.
   i. Date(s) of fish salvage operation and time(s) of day.
   ii. Water temperature.
   iii. Air temperature.
   iv. Means of fish capture.
   v. Number of fish captured by species, and by life history stage for coho salmon and eulachon.
   vi. Release site and condition of all fish released.
   vii. Any incidence of observed injury or mortality of coho salmon or eulachon by life history stage.
   viii. Evidence of compliance with NMFS fish screen criteria for any pump used.

d. Submit reports to:

   projectreports.wcr@noaa.gov
   ATTN: WCRO-2021-01247

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). The following conservation recommendations are discretionary measures that we believe are consistent with this obligation and therefore should be carried out by the Federal action agency:

1. FEMA should encourage applicants to use soft start procedures when implementing impact pile driving near waterbodies when ESA-listed fish or marine mammals are present. The use of a soft-start procedure for impact pile driving can provide additional protection by providing warning and providing fish/mammals an opportunity to leave the area prior to the impact hammer operating at full capacity. This is typically applied by providing an initial set of strikes from the impact hammer at reduced energy followed by

awaiting period and then repeated. An example of a soft-start protocol is an initial set of three strikes from the hammer at about 40 percent energy, followed by a 30-second waiting period, then two subsequent three-strike sets with associated 30-second waiting periods at the reduced energy. It is recommended that soft-starts be used at the start of each day's impact pile driving and at any time following cessation of impact pile driving for a period of thirty minutes or longer. This conservation recommendation could reduce the number of individuals exposed to elevated sound pressure.

2. FEMA should encourage applicants to provide mitigation measures to offset project impacts and anticipate likely changes in environmental conditions due to climate change. Recommended actions from the Recovery Plan for OC coho salmon (NMFS 2016a) for the Umpqua stratum applicable to estuaries include restoring and increasing access for fish to sloughs, side channels, and floodplains. This conservation recommendation would help increase the overall value of critical habitat for threatened and endangered species and contribute toward their recovery because these habitats improve high-flow refugia and productivity of the estuary for outmigrating coho salmon smolts from upstream and provide for life-history diversity in the estuary. FEMA may refer to all recovery plans cited in the biological opinion for additional recommended types of actions.

Please notify us if the Federal action agency carries out these recommendations so that we will be kept informed of actions that minimize or avoid adverse effects and those that benefit the listed species or their designated critical habitats.

2.11 Reinitiation of Consultation

This concludes formal consultation for funding the City of Reedsport Flood Reduction Resilience. Under 50 CFR 402.16(a): “Reinitiation of consultation is required and shall be requested by the Federal agency or by the Service where discretionary Federal agency 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.”

2.12 “Not Likely to Adversely Affect” Determinations

When evaluating whether the proposed action is not likely to adversely affect listed species or critical habitat, NMFS considers whether the effects are expected to be completely beneficial, insignificant, or discountable. Completely beneficial effects are contemporaneous positive effects without any adverse effects to the species or critical habitat. Insignificant effects relate to the size of the impact and should never reach the scale where take occurs. Effects are considered discountable if they are extremely unlikely to occur. When effects are beneficial, insignificant and/or discountable, these species are not likely to be adversely affected by the proposed action and we present our justification for that determination separately from the biological opinion since no take, jeopardy, or adverse modification of critical habitat would reasonably be expected to occur.

The proposed action and the action area for this consultation are described in sections 1.3 and 2.3 of this document. The effects analysis in this section relies heavily on the descriptions of the proposed action and project site conditions discussed in sections 1.3 and 2.4, and on the effects analyses presented in section 2.5.

2.12.1 Designated Critical Habitat for Southern DPS Green Sturgeon

The entire action area is also designated critical habitat for southern DPS green sturgeon (10/09/09; 74 FR 52300). Critical habitat in bays and estuaries includes tidally influenced areas as defined by the elevation of mean higher high water. The PBFs of critical habitat that support green sturgeon in the action area include food resources, migratory corridor, sediment quality, water flow, water depth, and water quality. Table 4 lists the physical and biological features of critical habitat designated for southern green sturgeon and corresponding species life history events. Baseline conditions in the Lower Umpqua River estuary are as described in the opinion for OC coho salmon critical habitat; floodplain connectivity is not a PBF for green sturgeon critical habitat. The conservation role of the critical habitat in the Umpqua River estuary for green sturgeon estuarine areas is likely limited by the water quality, sediment quality, and food resources PBFs.

Table 4. Physical or biological features of critical habitat designated for green sturgeon and corresponding species life history events.

Physical or Biological Features		Species Life History Event
Site Type	**Site Attribute**	
Freshwater riverine system	Food resources Migratory corridor Sediment quality Substrate type or size Water depth Water flow Water quality	Adult spawning Embryo incubation, growth and development Larval emergence, growth and development Juvenile metamorphosis, growth and development
Estuarine areas	Food resources Migratory corridor Sediment quality Water flow Water depth Water quality	Juvenile growth, development, seaward migration Subadult growth, development, seasonal holding, and movement between estuarine and marine areas Adult growth, development, seasonal holding, movements between estuarine and marine areas, upstream spawning movement, and seaward post-spawning movement
Coastal marine areas	Food resources Migratory corridor Water quality	Subadult growth and development, movement between estuarine and marine areas, and migration between marine areas Adult sexual maturation, growth and development, movements between estuarine and marine areas, migration between marine areas, and spawning migration

The PBFs of designated critical habitat for southern DPS green sturgeon likely to be affected by the proposed action are migratory corridor, water quality, and food resources. These effects (i.e., elevated sound pressure in migratory corridors, reduced water quality, reduction in foraging opportunities) are associated with proposed impact pile driving and work area isolation. These effects on PBFs for green sturgeon will not occur when green sturgeon are present. Because effects on the PBFs will not occur when green sturgeon are present and because there are no lingering effects once the activities are completed, water quality effects will disperse by the time green sturgeon are present, and foraging opportunities will recover by the time green sturgeon are present and using habitat in the action area, these effects on green sturgeon critical habitat will be insignificant.

2.11.2 Southern Resident Killer Whale and their Designated Critical Habitat

SRKW was listed as endangered on November 18, 2005 (70 FR69903) and critical habitat was designated on November 29, 2006 (71 FR 69054) and expanded on August 2, 2021 (86 FR 41668). Five-year reviews under the ESA completed in 2016 and 2021 concluded that SRKW should remain listed as endangered and includes recent information on the population, threats, and new research results and publications (NMFS 2016c, NMFS 2021b). Detailed information about the biology, habitat, and conservation status and trends of SRKW can be found in the listing regulations and critical habitat designations published in the Federal Register, as well as in the recovery plans and other sources at: https://www.fisheries.noaa.gov/species-directory/threatened-endangered, and are incorporated here by reference.

SRKW spend considerable time in the Georgia Basin from late spring to early autumn, with concentrated activity in the inland waters of Washington State around the San Juan Islands, and typically move south into Puget Sound in early autumn (NMFS 2008). Pods make frequent trips to the outer coast during this season. In the winter and early spring, SRKW move into the coastal waters along the outer coast from the Queen Charlotte Islands south to central California, including coastal Oregon and off the Columbia River (NMFS 2008). The major environmental threats to SRKW include prey availability, pollution/contamination, vessel effects, oil spills, and acoustic effects (NMFS 2008). Physical and biological features of critical habitat for SRKW are water quality to support growth and development; prey species of sufficient quantity, quality, and availability to support individual growth, reproduction, and development, as well as overall population growth; and passage conditions to allow for migration, resting, and foraging. Of those environmental threats and PBFs, only prey, pollution/contamination or water quality, and acoustic effects will be affected by the proposed action. SRKW have not been documented to occur in Oregon coastal bays or in any predictable pattern of occurrence along the Oregon outer coast (NMFS 2008), so it is extremely unlikely and therefore discountable that any SRKW will ever be in direct proximity to effects caused by the proposed action or that the passage PBF will be affected. Because the presence of SRKW in the action area is extremely unlikely, adverse effects due to increased suspended sediment and elevated sound pressures are not likely to adversely affect SRKW or the water quality PBF.

The project may, however, indirectly affect SRKW through the trophic web by affecting the quantity of prey available to SRKW. Adult Chinook salmon have been identified as the preferred prey of SRKW (Hilborn *et al.* 2012, PFMC 2020, Hanson *et al.* 2021) and thus a decrease in the abundance of PS Chinook salmon could reduce available prey for SRKW or negatively affect the prey PBF. Although not analyzed directly, Chinook salmon use the action area in ways similar to coho salmon with some discrepancies in timing and use of habitat. However, adult Chinook salmon are expected to be using the action area just like coho salmon, and all life histories of Chinook salmon will be exposed to long-term effects associated with the levee. In this case, coho salmon are an appropriate surrogate for considering effects on Chinook salmon. While we were not able to quantify the number of coho salmon adversely affected by the proposed action, the proposed action is only likely to cause a minor reduction in the quantity of SRKW preferred prey. As described in section 2.7, these adverse effects will not meaningfully influence the VSP parameters or cause detectable effects to coho salmon populations; therefore, we expect the same to be true for Chinook salmon. Any salmonid take, including Chinook salmon, up to the aforementioned extent of take would result in an insignificant reduction in prey resources for any SRKW that may intercept these species within their range. Similarly, we do not anticipate a reduction in abundance, quality, quality of Chinook salmon as a prey item to occur at levels or frequency to cause any discernible effect to the forage PBF of SRKW critical habitat.

Because all potential effects on PBFs of SRKW critical habitat are expected to be insignificant or discountable, the proposed action is not likely to adversely affect critical habitat for SRKW. With no significant indirect habitat effects to SRKW, nor measurable direct effects to SRKW, any potential effects to SRKW are expected to be insignificant. The proposed action is not likely to adversely affect SRKW or its designated critical habitat.

2.11.3 Conclusion

Based on this analysis, the proposed action is not likely to adversely affect designated critical habitat for southern DPS green sturgeon or SRKW or its designated critical habit.

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 physical, biological, and chemical 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 on EFH may result from actions occurring within EFH or outside of it and may include site-specific or EFH-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 [CFR 600.905(b)]

This analysis is based, in part, on the EFH assessment provided by FEMA and descriptions of EFH for Pacific Coast salmon (PFMC 2014), Pacific Coast groundfish (PFMC 2019), and coastal pelagic species (PFMC 1998) contained in the fishery management plans developed by the Pacific Fishery Management Council (PFMC) and approved by the Secretary of Commerce.

3.1 Essential Fish Habitat Affected by the Project

The proposed action and the action area for this consultation are described above in sections 1.3 and 2.3. The action area is designated by the PFMC as EFH for Pacific salmon, Pacific Coast groundfish and coastal pelagic species, and is in an estuary. However, Scholfield Creek does not contain EFH for coastal pelagic species. Estuaries are identified by the PFMC as a habitat area of particular concern (HAPC) for Pacific Coast salmon and Pacific Coast groundfish.

The action area is also in an area where environmental effects of the proposed project would likely adversely affect EFH and HAPC for Pacific salmon and Pacific Coast groundfish and EFH for coastal pelagic species. While the HAPC designation does not add any specific regulatory process, it does highlight certain habitat types that are of high ecological importance (PFMC 2014).

3.2 Adverse Effects on Essential Fish Habitat

The effects of the action, as proposed, on EFH are similar to those described above in the ESA portion of this document (section 2.5). The habitat requirements (i.e., EFH) for the MSA-managed species in the action area are similar to those of the ESA-listed species with the exception of coastal pelagic species. The Umpqua estuary is only considered EFH for coastal pelagic species typically during summer when the sea surface temperature is above 10ºC but less than 26ºC, but the action area may meet those criteria during the warmest winters.

Estuarine EFH (and HAPC for salmon and groundfish) quantity and quality will be reduced by (1) small and temporary increases in suspended sediment concentrations and decreases in water quality [applicable to Pacific Coast salmon, Pacific Cost Ground fish, and coastal pelagic species], (2) daily exposure to elevated underwater sound pressure in Scholfield Creek only, for approximately 23 days [applicable to Pacific Coast salmon and Pacific Cost Ground fish], (3) localized and temporary decrease of space and forage due to work area isolation activities, and (4) continued long-term exposure (approximately 40 years) to continued modified habitat conditions (i.e., restriction of floodplain and benthic habitat) along 2.9 miles of levee[applicable to Pacific Coast salmon, Pacific Cost groundfish, and coastal pelagic species].

3.3 Essential Fish Habitat Conservation Recommendations

The NMFS determined that the following conservation recommendations are necessary to avoid, minimize, mitigate, or otherwise offset the impact of the proposed action on EFH and the estuary HAPC. We believe that the following EFH conservation recommendations would address the adverse effects described above. We recommend these measures, including some which are a subset of the ESA terms and conditions described in section 2.9 of the accompanying opinion, as actions that can be taken by the action agency to conserve EFH.

1. Monitor distance of visible suspended sediment plumes throughout the in-water work of the project to minimize adverse effects on water quality, include the estuary HAPC. FEMA should require the project proponent to ensure that their contractors adjust work practices such that visible suspended sediment plumes do not exceed 600 feet and to halt work should the visible suspended sediment plume begin to approach that distance. Work may continue when the plume dissipates to match baseline conditions.

2. While minimizing water quality effects on EFH, also minimize effects on space from work area isolation by reducing the area of isolation to the smallest area necessary and reducing the duration of isolation to the least amount of time necessary.
3. Conduct pile driving with an impact hammer within 200 feet of Scholfield Creek or McIntosh Slough during low tides to increase the distance between pile driving and water, only during daylight hours with the sun above the horizon, and allow a minimum rest period of 12 hours between daily pile driving during which no impact pile driving occurs.
4. Monitor underwater sound according to the Federal Hydroacoustics Working Group underwater noise monitoring plan template.
5. Although NMFS identified adverse effects on EFH from the continuing long, term presence of the levee restricting floodplain and benthic habitat, we are unable to identify any practical measure the action agency can implement within the bounds of their jurisdiction to further minimize those effects. Therefore, NMFS has no EFH conservation measures at this time to address those adverse effects.

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, Pacific Coast groundfish, coastal pelagic species, and the estuary HAPC.

3.4 Statutory Response Requirement

As required by section 305(b)(4)(B) of the MSA, FEMA 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)).

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

3.5 Supplemental Consultation

The FEMA 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 FEMA and the City of Reedsport. Individual copies of this opinion were provided to FEMA. The document will be available at the NOAA Library Institutional Repository [https://repository.library.noaa.gov/welcome]. The format and naming adheres 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 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, if applicable 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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