UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Northwest Region
7600 Sand Point Way N.E., Bldg. 1
Seattle, WA 98115

Refer to NMFS No:
2009/01756

May 28, 2010

Joyce Casey
Chief, Environmental Resources Branch
Planning, Programs and Project Management Division
U.S. Army Corps of Engineers
P.O. Box 2946
Portland, Oregon 97208-2946

Re: Endangered Species Act Section 7 Formal Consultation and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation for the Corps Maintenance Dredging Program for the Oregon Coastal Projects.

Dear Ms. Casey:

The enclosed document contains a biological opinion (Opinion) prepared by the National Marine Fisheries Service (NMFS) pursuant to section 7(a)(2) of the Endangered Species Act (ESA) on the Annual Maintenance Dredging Program for the Oregon Coastal Projects by the U.S. Army Corps of Engineers (Corps). The Corps proposes to do work in navigable waters within the Corps' Portland District under the provisions of sections 102 and 103 of the Marine Protection Reserve and Sanctuaries Act of 1972, sections 401 and 404 of the Clean Water Act of 1977, and in accordance with Regulations 33 CFR parts 335 – 338. In this Opinion, NMFS concludes that the proposed action is not likely to jeopardize the continued existence of the Oregon Coast (OC) and Southern Oregon/Northern California Coasts (SONCC) coho salmon (*Oncorhynchus kisutch*) or Southern Distinct Population Segment (DPS) green sturgeon (*Acipenser medirostris*). Further, NMFS concludes that the proposed action will not result in the destruction or adverse modification of designated critical habitats for OC and SONCC coho salmon or critical habitat for green sturgeon.

As required by section 7 of the ESA, an incidental take statement prepared by NMFS is provided with the Opinion. The incidental take statement describes reasonable and prudent measures NMFS considers necessary or appropriate to minimize incidental take associated with the proposed action. It also sets forth nondiscretionary terms and conditions, including reporting requirements, with which the Corps must comply to carry out the reasonable and prudent measures. Incidental takings of listed species from actions by the Corps that meet these terms and conditions will be exempt from the ESA's prohibition against such takings.

This document also includes the results of our analysis of the action's likely effects on essential fish habitat (EFH) pursuant to section 305(b) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA), and includes five conservation recommendations to avoid, minimize, or otherwise offset potential adverse effects on EFH.

These conservation recommendations include an identical subset of the ESA terms and conditions as well as conservation recommendation specific to the conservation of MSA-listed species. 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, the Corps 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 consultation and how many are adopted by the action agency. Therefore, in your statutory reply to the EFH portion of this consultation, we ask that you clearly identify the number of conservation recommendations accepted.

If you have questions regarding this consultation, please contact Cathy Tortorici, Branch Chief of the Oregon Coast/Lower Columbia Habitat Branch, at 503.231.6268, or Ken Phippen, Branch Chief of the Southwest Oregon Habitat Branch, at 541.957.3385.

Sincerely,

Michael Tehan

for Barry A. Thom
Acting Regional Administrator

cc: Richard Parkin, EPA

Endangered Species Act Section 7 Consultation
Biological Opinion

and

Magnuson-Stevens Fishery Conservation and Management Act
Essential Fish Habitat Consultation

Maintenance Dredging Program for the Oregon Coastal Projects

Lead Action Agency:	U.S. Army Corps of Engineers
Consultation Conducted By:	National Marine Fisheries Service Northwest Region
Date Issued:	May 28, 2009
Issued by:	for Barry A. Thom Acting Regional Administrator
NMFS No.:	**2009/01756**

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INTRODUCTION

This document contains a biological opinion (Opinion) and incidental take statement prepared in accordance with section 7(b) of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531, *et seq*.), and implementing regulations at 50 CFR 402. With respect to designated critical habitat, the following analysis relied only on the statutory provisions of the ESA, and not on the regulatory definition of "destruction or adverse modification" at 50 CFR 402.02.

The National Marine Fisheries Service (NMFS) also completed an essential fish habitat (EFH) consultation, prepared 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.

The docket for this consultation is on file at the Oregon State Habitat Office in Portland, Oregon.

Consultation History

On April 7, 2009, the U.S. Army Corps of Engineers (Corps) submitted a biological assessment (BA) to NMFS on Oregon Coast (OC) coho salmon (*Oncorhynchus kisutch*), Southern Oregon Northern California Coasts (SONCC) coho salmon, and southern distinct population (DPS) of North American green sturgeon (*Acipenser medirostris*), evaluating the effects to these ESA-listed species and their designated and proposed critical habitat, and an EFH analysis for the Operations and Maintenance Dredging Program of the Oregon Coastal Projects; a species list was not requested from NMFS by the Cops. The Corps maintains these navigational channels as appropriate based on necessity and appropriations. This is the first comprehensive consultation that addresses all of the Corps dredging program for the Oregon Coastal Projects.

On May 22, 2009, the Corps requested that the southern resident killer whale (*Orcinus orca*) be included in the consultation for the Oregon Coastal Dredging program. The Corps determined that the proposed action was not likely to adversely affect the species, and requested concurrence from NMFS.

In that same request, the Corps requested the Rogue River Project be consulted on individually for the 2009 season to expedite the needed work for 2009. None of the proposed 2009 activities at the Rogue River were interrelated or interdependent on actions that may occur at other Oregon Coast Projects. It was therefore deemed feasible and appropriate to review the Rogue River Project in a separate analysis for a single year. That consultation was completed on June 2, 2009 (refer to NMFS No.: 2009/02720).

On July 28, 2009, the Corps requested that the Umpqua River Project be consulted on separately for just the 2009 dredging season to ensure that work could be completed within the typical dredging window. As with the Rogue River Project, none of the activities at the Umpqua River were interrelated or interdependent to actions that may occur at other Oregon Coast Projects. NMFS facilitated this request and completed consultation on the Umpqua River Project, for just the 2009 dredging season, on September 11, 2009 (refer to NMFS No.: 2009/04536).

The NMFS concurs with the Corps' determination that the proposed action is NLAA eulachon (*Thaleichthys pacificus*) due to the extremely low probability that eulachon will be present in either the dredging activity action area or the in-water disposal action area during the time that the Corps is proposing to conduct maintenance dredging activities.

The NMFS also concurs with the Corps' determination that the proposed action is NLAA Southern Resident killer whales (Appendix A). The NMFS previously consulted and concurred[1] with the Corps' determinations that the proposed action is NLAA for the following marine mammal species: Steller sea lions (*Eumotopias jubatus*), blue whales (*Balaenoptera musculus*), fin whales (*B. physalus*), humpback whales (*Megaptera novaeangliae*), sperm whales (*Physeter macrocephalus*), and sei whales (*B. borealis*), and four species of marine turtles (leatherback sea turtles [*Dermochelys coriacea*], loggerhead sea turtles [*Caretta caretta*], green sea turtles [*Chelonia mydas*], and olive ridley sea turtles [*Lepidochelys olivacea*]). The effects analysis for Southern Resident killer whales and updated information on blue, humpback, fin whales and Steller sea lions is included in Appendix A. The remaining species will not be addressed further in this consultation.

Background Oregon Coastal Project Authorizations

The Tillamook Bay Project was authorized by Congress under the Rivers and Harbor Act (RHA) of: July 25, 1912, March 2, 1919, March 3, 1925, June 30, 1948, September 5, 1954, and October 26, 1965. The authorization included construction, operation, and maintenance of the two jetty formations at the mouth of Tillamook Bay, navigation channels into and through Tillamook Bay, construction of a sand and rock filled dike between Pitcher Point and the town of Bay Ocean, as well as other pertinent navigational features.

The Depoe Bay Project was authorized by Congress under the RHA of: August 26, 1937, March 2, 1945 and a RHA section 107 Project in 1960. The authorization includes the maintenance of the entrance channel and inner harbor to the authorized depths.

The Yaquina Bay Project was authorized by Congress under the RHA of: June 14, 1880, March 2, 1919, August 26, 1937, March 2, 1945, July 24, 1946, July 3, 1958, and a RHA section 107 Project from July 14, 1960. The Yaquina River (including Depot Slough) Project was authorized by Congress under the RHA of: March 4, 1913 and a RHA section 107 Project in 1960. Authorization includes operation and maintenance of two jetty formations, and other navigation-related features, and maintenance of the navigation channels through the mouth of Yaquina Bay up the Yaquina River to approximately River Mile (RM) 14.2.

The Siuslaw River Project was authorized by Congress under the RHA of: Rivers and Harbor Act of: September 19, 1890, June 25, 1910, March 3, 1925, July 3, 1958, and a section 107 Project in 1960 and Public Law 96367; October 1, 1980.

[1] This consultation was initiated on May 17, 2004, with the NMFS issuing this letter of concurrence on July 16, 2004 (refer to NMFS No.: 2004/00584). Neither the project description nor the status of the species has changed significantly since that time and the effects are not expected to be different; the NMFS has considered whether the analysis or corresponding conclusions would differ substantively depending based on information in the current BA, and has determined that they would not.

The Umpqua River Project was authorized by Congress under the RHA of: September 22, 1922, January 21, 1927, July 3, 1930, August 30, 1935, June 20, 1938, March 2, 1945, June 30, 1948, September 3, 1954, and July 14, 1960. The authorizations include construction, operation, and maintenance of jetty formations and other aids to navigation features and navigational channels into the mouth of the Umpqua River and extending for approximately 12 miles through Winchester Bay.

The Coos Bay Project was authorized by Congress under the RHA of: June 25, 1910, March 2, 1919, September 22, 1922, January 21, 1927, July 3, 1930, August 30, 1935, July 24, 1946, June 30, 1948, July 14, 1960, and December 31, 1970, and the Energy and Water Developments Act of 13 Nov 1995 (Public Law 104-46). These authorizations include the construction, operation, and maintenance of the jetty structures at the entrance to Coos Bay and navigational channels and turning basins.

The Coquille River Project was authorized by congress under the RHA of: June 14, 1880, July 13, 1892, June 25, 1910, March 2, 1919, July 3, 1930, August 30, 1935, and March 2, 1945, and a RHA section 107 Project from July 14, 1960. These authorizations include the construction, operation, and maintenance of the jetty formations and navigation channels through the mouth of the Coquille River and into the Coquille River estuary.

The Port Orford Project was authorized by Congress under the RHA of: October 27, 1965 and December 31, 1970; with modifications from the Water Resources Development Act (WRDA) of 1992.

The Rogue River Project was authorized by Congress under the RHA of 1954 (68 Stat. 1252). The authorization included construction, operations, and maintenance of two jetty formations at the mouth of the Rogue River and a navigational access channel at the entrance.

The Chetco River Project was authorized by Congress under the RHA of: 2 March 1945, 27 October 1965, and 4 December 1981; with modification from the WRDA 1992.

The Corps ‘dredging and in-water disposal of dredged sediments to maintain the above referenced authorized navigation channels is conducted under the provisions of sections 102 and 103 of the Marine Protection Reserve and Sanctuaries Act of 1972, sections 401 and 404 of the Clean Water Act of 1977, and in accordance with Regulations 33 CFR parts 335 – 338.

Description of the Proposed Action

The Corps proposes to conduct annual maintenance dredging in authorized navigation projects at 10 locations along the Oregon coast (Coastal Projects) (Tables 1 and 2). The Corps routinely dredges these projects to maintain their federally-authorized navigation channels, typically dredging the entrance and main navigation channels on an annual basis. Scheduling of maintenance dredging for Corps’ projects on the Oregon Coast considers numerous factors, including channel conditions and appropriations. Weather and ocean conditions normally limit most dredging to the period from April 1 to October 31 though it has been possible in some

years, and in some areas, to dredge later in the year or earlier if there is an emergency and navigation safety is an issue.

Dredging does not typically occur over the entire footprint of the navigational channels equally. Within the entrance and navigation channels this impact will occur at those specific locations where shoals have developed since the previous dredging work. In the case of the turning areas and boat basin access channel, these areas are still variable, but may be dredged more equally due to the time between dredging events. Since shoaling patterns change continually, hydrographic surveys (bathymetry) are frequently conducted to track channel conditions throughout the dredging season. The need for dredging is determined by a combination of factors including authorized project design, hydrographic surveys, rainfall, equipment availability, and the concerns of the Coast Guard, local Ports, and other users. Some projects may need to be dredged early in the season and then follow up dredging to remedy problem areas and insure adequate depth is done in August or September, depending on the funds and amount of shoaling material. If early dredging is not done, the entrance can shoal in and make later dredging impossible. Dredging in the spring and first part of the summer on some of the Coastal Projects makes the entrances safer to cross for the Coast Guard and other users. Shoaling conditions make the entrances rougher in light sea conditions. The bulk of maintenance dredging at the coastal entrances is done with the Corps' dredge *Yaquina*, although the dredge *Essayons* typically dredges the entrance to Coos Bay.

Typically the areas of greatest shoaling are dredged first but considerations such as commercial and seasonal demand are factored into the schedule. To the extent possible, the entrance bars are dredged first (when ocean conditions permit) and areas further upriver, and not subject to ocean conditions, are dredged later in the season. Most dredging operations work 24 hours per day depending upon weather, staffing, and other factors. The Corps uses three dredging techniques at the Oregon Coastal Projects: hopper, pipeline, and clamshell dredging. These techniques are described below.

Hopper Dredging. Hopper dredges use a draghead at the end of dragarms on both sides of the dredge. The dragheads are lowered to the channel bottom and suction from the pump is used to transport material from the draghead through the dragarm and into the hold or hopper of the dredge. When the hopper is filled, the dragarms are raised and the vessel moves to the disposal site.

Material from hopper dredges is normally disposed of in the ocean or occasionally at flowlane disposal sites in deep areas in and adjacent to the channel. As the dredge is moving, a series of hopper doors are opened and the material is discharged. The rate of discharge can be varied to some extent depending on how far the hopper doors are opened. Hopper dredges provide more flexibility than other dredging operations because of their maneuverability.

During dredging operations, water is discharged through the overflow until the maximum load of the hopper is achieved. The overflow is designed to reduce sediment discharge into the water column. Water is skimmed from the top 2 inches of the hopper, which is the area that has the lowest turbidity. The amount of turbidity depends upon the type of material dredged and percentage of fines.

Pipeline Dredging. A pipeline dredge uses a 'cutterhead' on the end of an arm that is buried in the river bottom and swings in an arc in front of the dredge. Dredged material is sucked up through the cutterhead and into the pipes by an onboard pump. It is then pumped to either an upland or in-water disposal site, depending upon the project. Maintenance dredging done by pipeline is currently performed using smaller contract dredges.

Upland disposal sites normally have dikes to contain the material and water. The return water is held in settling ponds controlled by weirs to reduce suspended sediment levels and meet state water quality standards for the return water. For in-water disposal, the location of the discharge from a pipeline dredge will vary depending on the project and could be at or below the surface of the receiving water. The type of material to be dredged dictates the acceptable and feasible disposal practice that will reduce turbidity in the receiving waters.

Mechanical Dredging. Mechanical dredges remove material by grabbing it with a bucket and lifting the material to the surface, and placing on either a barge or other upland location. They include clamshell, dragline, and backhoe dredges and are well suited for removing cemented sands, gravels, or well-fractured rock outcrops. Mechanical dredges are also used for maintenance dredging in areas where other forms of dredging may not be effective. For example, mechanical dredges are often used under bridges and in other tight areas, like berthing areas. The dock face of Port Orford is an example of a tight area; dredging occurs near the dock face that requires the use of a mechanical dredge. In this proposed action, mechanical dredging will be performed from a crane that is mounted on a barge adjacent to the dock. Sediment from the bucket is usually placed on a barge for offloading and disposal in the near-shore placement area. Because mechanical dredges are not self-propelled, they are not typically used in high traffic areas; rather, they are used in tighter spaces such as around docks and piers.

Return water from mechanical dredging comes from the bucket as it is raised above the water surface and from the barge as the material is loaded. Return water from the barge can come from overflow over the sides or through a skimmer if the barge is equipped with one.

Dredging Prism. Congress authorizes federal navigation channels by specific depth and width. These authorized channel dimensions are generally based on maximizing net transportation savings considering the characteristics of the vessels using the channel and include consideration of safety, physical conditions, and vessel operating characteristics. In addition, the reliability of the channel is considered, which may result in the incorporation of advanced maintenance dredging and overdepth into the maintenance of the channel where such advanced maintenance is justified to assure channel depths. All the Coastal Projects include an advanced maintenance depth into the final dredge depth.

The dredging environment is dynamic and varies with the physical conditions (tides, currents, flow velocity, and waves); the dredged material conditions (silt, clay, sand, gravel, rock, *etc.*); the channel design (depths being dredged, side slopes, *etc.*); and the type of dredging equipment (mechanical, hydraulic, hopper, *etc.*). Due to these variables, the Corps recognizes that dredging beyond the authorized project dimensions will occur. This is necessary to assure that federal project depth and width are maintained between dredging events. When shoaling occurs in the entrance channels, sea conditions rapidly deteriorate as the shoal builds. The resulting shallower

channel depths allow smaller waves to create hazardous safety problems. Shoaled channels combined with breaking wave activity drastically impacts vessel traffic and may become a navigational safety concern.

Three phases of dredging occur at a project: project maintenance, advance maintenance, and allowable overdepth. These are discussed below.

Project Maintenance. Project maintenance is dredging that occurs down to the federally authorized project dimension and depth. These federally authorized channel dimensions and depths are described in detail for each of the Oregon Coastal Projects in the *Project-Specific Description and Activities* section below. For example, the Rogue River entrance channel is authorized to -13 feet mean lower low water (MLLW). Minus 13 feet would be the project maintenance depth.

Advance Maintenance. Advance maintenance dredging (depth and/or width) is defined as dredging beyond the federally authorized project dimensions, but included in the advance maintenance prism. Advance maintenance allows for dredging in a dynamic environment (as discussed above), and to ensure project dimensions will be maintained for channel users until the next dredging event. Because most of the Coastal Projects are dredged only once each year, advanced maintenance dredging is crucial to navigation safety.

Advanced maintenance dredging depths below the authorized navigational channel will vary for the Oregon Coastal Projects. Using the Rogue River project as an example, the entrance channel is authorized to 13 feet MLLW (project depth). Advance maintenance dredging provides for 4 additional feet. Depending on conditions, 17 feet MLLW would normally be an acceptable depth within the advance maintenance prism. This dredging depth is established to provide the project with some advance maintenance dredging. This allows the Corps' or contractor's dredge to successfully operate within the dynamic environment of the dredging process.

Allowable Overdepth. Allowable overdepth is the dredging area outside of the advance maintenance prism. Allowable overdepth for the Coastal Projects extends 3 feet below the advance maintenance prism. For example, allowable overdepth for the Rogue River Project is considered between 17 feet MLLW (limit of advance maintenance dredging) and 20 feet MLLW. Therefore, 20 feet MLLW is considered to be the maximum allowable overdepth at the Rogue River project.

To illustrate, when a cutterhead dredge is digging to the maximum advance maintenance depth, there will be a disturbance, and potential removal, of material in the allowable overdepth area. The cutterhead must reach into the allowable overdepth area in order to remove material down to the maximum advance maintenance depth. Allowable overdepth compensates for the dynamic environment in the dredging process. Providing an allowable overdepth prism allows the Corps to remove the maximum amount of advance maintenance material when needed (depending on project, cost, equipment, *etc.*).

Disposal of Dredged Material. Disposal sites vary by project and include upland, in-water, surf zone, and ocean dredged material disposal sites (ODMDS). Disposal practices are

discussed for each project in the *Project Specific* section for each Coastal Project. All of the projects may have a sponsor provided upland disposal site. Upland disposal is an option at projects where this has occurred in the past. The description of the proposed action for each project does not include a description of these upland sites because they change and are usually provided to the Corps just prior to dredging. Required environmental compliance for these sites is the responsibility of the sponsor port. The Corps will not dispose of dredged sediments at any upland location without the sponsor port demonstrating that they are adhering to all relevant environmental regulatory requirements, including compliance with Clean Water Act (CWA), Coastal Zone Management Act (CZMA), ESA, or any other regulatory requirement. In most cases, a separate CWA section 404 permit will be necessary, triggering applicable environmental regulatory compliance requirements.

The Environmental Protection Agency (EPA) designated ODMDS sites off shore of the Siuslaw River (2010), Umpqua River (2009), Coos Bay (1986 [Sites H and E] and 2006 [Site F]), Coquille River (1990), Rogue River (2009), and Chetco River (1991)under section 102(c) of the MPRSA, 33 U.S.C. §§ 1401 to 1445. There are two temporary sites that the Corps identified for use off shore of Yaquina Bay designated under section 103 of the MPRSA, 33 U.S.C. §§ 1401 to 1445; the Corps intends to pursue final (section 102) designation with EPA when funding is available. The ocean disposal sites are between one and three miles offshore in waters -45 to -205 feet deep. Annual bathymetry surveys is conducted at ocean disposal sites and compared to baseline surveys for the previous year's survey. The annual surveys verify placement of material within the sites, monitor changes and trends in bathymetry, and insure site capacity is not exceeded. An annual assessment report is prepared by the Corps and provided to the EPA; no significant changes have been identified to date. In addition to annual bathymetric surveys, characterization of chemical, physical, and biological attributes of the ocean disposal sites is conducted every 7 to 9 years and compared to baseline studies.

Dredged material is also placed at in-water sites that are in-bay/river locations adjacent to the navigation channel (Coos Bay), in the flowlane (Tillamook and Coquille), and near-shore (Port Orford breakwater and near-shore placement sites, and Chetco). Material is placed on the beach, within the surf zone at Rogue and directly on rocks at Depoe Bay. These sites do not undergo a formal "designation" process per se; the use of these sites is governed by section 404 of the Clean Water Act (CWA). The Corps does not issue itself a CWA permit to authorize Corps discharge of dredged or fill material into U.S. waters, but does apply the section 404(b)(1) guidelines and other substantive requirements of the CWA and other environmental laws. The Corps identify sites and notify the public of their use and prescribe to the practices and procedures to be followed by the Corps to ensure compliance with the statues governing Army Civil Works operations and maintenance projects involving the discharge of dredged or fill material into water of the U.S. (33 CFR part 335.1). The Corps last issued a Public Notice for the use of these sites in 2004.

Sediment Sampling and Analysis. The Corps routinely evaluates sediment from most of their Coastal Projects on a five-year cycle; at some projects (*e.g.* Tillamook Bay), sediment sampling and analysis is done on an as-needed based. The results of these studies indicate that, in general, the sediments, especially in Federal entrance channel areas, are predominately sand and gravel-sized material with minimal amounts of fine sediment or volatile solids (with some

exceptions). The sediment tends to be finer-grained, although still predominately sand, in areas outside of the main navigation channels, such as in the boat basin access channels.

The Corps follows the procedures in the Sediment Evaluation Framework (SEF) for the Pacific Northwest (Corps et al. 2009) for assessing, characterizing, and managing (disposing) sediments and determining suitability for unconfined in-water disposal. Prior to the finalizing SEF in 2009, the Corps evaluated sediment and determined suitability for unconfined in-water disposal based on the guidance of Ocean Dumping Testing Manual (1991), the Inland Testing Manual (1998), and the Dredged Material Evaluation Framework (DMEF) (1998). Because of the five-year sampling cycle, not all of the Coastal Projects have been reviewed by the SEF' Project Review Group (PRG) for compliance with the SEF's screening levels (SLs). As projects come up for sediment sampling, the sampling plan will be reviewed by the PRG and results will need to meet the SEF guidelines.

Because the Corps dredges the Coastal Projects on a routine basis and have consistently sampled and analyzed sediments, data that indicates a history of low concentrations of contaminant of concern, these projects meet the Management Area Ranking Definition of "Low" (SEF 2009). Given the history at these sites, and that there is no information suggesting new potential sources of contaminants are present within each river basin, NMFS anticipates that dredged sediments at the Corps' Coastal Projects will continue to meet the SEF requirements to be suitable for unconfined in-water placement.

Conservation Measures

The following overall impact minimization practices and best management practices (BMPs) will be used for all maintenance dredging of the Coastal Projects.

1. To reduce the potential for entrainment of coho salmon or green sturgeon, the dragheads and cutterheads will remain on the bottom to the greatest extent possible and only be raised 3 feet off the bottom when necessary for dredge operations.
2. If the Captain or crew operating the dredges observes any kind of sheen or other indication of contaminants, he/she will immediately stop dredging and notify the Corps' environmental staff to determine appropriate action.
3. If routine or other sediment sampling determines that dredged material is not acceptable for unconfined, in-water placement, then a suitable alternative disposal plan will be developed in cooperation with the NMFS, EPA, Oregon Department of Environmental Quality (ODEQ), and other agencies.
4. Pipeline dredging is done only on an outgoing tide when using in-bay disposal sites.

Project-Specific Description and Activities

Tillamook Bay

The authorized project includes a 5,700-foot-long jetty on the north side of the entrance to Tillamook Bay, an 8,000-foot-long jetty on the south side, an entrance channel, and an access channel to the Garibaldi boat basin. A sand- and rock-filled dike extends 1.4 miles from Pitcher Point on the mainland to the old town site of Bay Ocean on the south end of Kincheloe Point. The entrance channel is 18 feet deep and as wide as can be practically and economically maintained across the ocean bar to deep water in the bay. The authorized channel from deep water to the Garibaldi boat basin near river mile (RM) 3.2 is 12 feet deep, 100 feet wide, and approximately 1,200 feet long (approximately 2.75 acres). Only the access channel to the Garibaldi boat basin and the boat basin itself are regularly sampled and dredged for maintenance. This project has been designated as a critical harbor of refuge. Rescue vessels are maintained at the U.S. Coast Guard station. The project sponsor is the Port of Garibaldi. The access channel to the Garibaldi boat basin was last dredged in 2000, and approximately 33,000 cubic yards (cy) of material were dredged and placed upland adjacent to the project. There has been no further dredging at the project.

Historically, the Tillamook Bay entrance has not needed dredging and none is forecast at this time. For the purposes of this consultation, the Corps proposes to conduct maintenance dredging of the access channel to the Garibaldi boat basin, which supports commercial and recreational fishing vessels. Dredging will occur once every 5 to 8 years. Maximum dredge depth is -14 feet, as measured from MLLW, including 2 feet of advanced maintenance dredging. A maximum 50,000 cubic yards (cy) of material will be removed per dredging season. The proposed dredging method is clamshell or pipeline. Operations are anticipated to take place for a maximum of 17 days from July 15 to March 15.

On August 22, 2007, the Corps collected four surface grab samples and one gravity core sample from the Tillamook Bay Federally-maintained channel near the boat basin (Corps 2007). The Corps submitted these samples for physical and chemical analyses, including: metals, total organic carbon (TOC), pesticides/polychlorinated biphenyls (PCBs), phenols, phthalates, miscellaneous extractables, polynuclear aromatic hydrocarbons (PAHs) and organotin (TBT) (total) analysis. The chemical analyses indicated only very low levels of contamination in any of the samples. Laboratory detection levels were sufficiently low to evaluate material proposed for dredging. The samples collected during this sampling event are consistent with historical sampling results and meet the guidelines established in the SEF for unconfined in-water placement without further characterization (Corps 2007, Corps et al. 2010).

Dredged material disposal will occur at a flowlane site (10 to 20 feet deep) on the north side of the navigation channel at approximately RM 2.5. A sponsor-provided upland site may also be used if all environmental compliance requirements are completed by the sponsor.

Depoe Bay

Depoe Bay is a moorage for commercial, charter, and recreational fishing boats. The authorized project includes two breakwaters north of the entrance to Depoe Bay and an entrance channel that is 8 feet deep and 50 feet wide. The channel widens at its seaward end. The inner basin is 8 feet deep and 750 feet long and averages 390 feet wide. A concrete retaining wall was built along the east side of the basin. A small sediment check dam at the mouth of South Depoe Bay Creek helps to intercept sediments before they reach the bay. This 6-foot-high dam was completed in 1950. This project has been designated as a critical harbor of refuge. Rescue vessels are maintained at the U.S. Coast Guard station. The local sponsor is the City of Depoe Bay. The project was last dredged in 2005 when approximately 9,595 cy of material was removed from the boat basin and approximately 1,058 cy was removed from behind the sediment check dam.

The Depoe Bay entrance channel is totally self-scouring and no dredging is proposed at this time. Two projects are proposed for maintenance dredging: (1) Depoe Bay boat basin and (2) South Depoe Bay Creek sediment check dam. Dredging of the 750-foot by 390-foot boat basin is proposed once every 5 to 8 years. The Federally authorized depth is -8 feet, as measured from MLLW, with a maximum dredge depth of -10 feet, including 2 feet of advanced maintenance dredging. A maximum 25,000 cy of material will be removed per dredging season. The proposed dredging method is pipeline or clamshell. Operations are anticipated to take place for a maximum of 30 days from July 1 to March 15. Material disposal will occur south of the basin entrance at an intertidal placement site (surf zone site) where material is placed on intertidal rocks and washes down into the water.

South Depoe Bay Creek Sediment Check Dam

Maintenance dredging will occur behind the sediment check dam on South Depoe Bay Creek. Dredging of the sediment basin will occur once every 5 to 8 years. Maximum dredge depth will be -2 feet MLLW including advanced maintenance dredging of 1 foot. Up to 2,000 cy of material will be removed per dredging season. The proposed dredging method is dragline, clamshell, or pipeline. Operations are anticipated to take place for a maximum of seven days from July 1 to March 15. Dredged material disposal will occur at the surf zone site discussed above for the boat basin or at a sponsor-provided upland disposal site.

On February 2-3, 2005, the Corps collected nine sediment samples in the Depoe Bay boat basin and one sample from behind the dam at South Depoe Bay Creek. The Corps submitted these samples for physical and chemical analysis, including metals, TOC, pesticides, PCBs, phenols, phthalates, miscellaneous extractables, and PAHs. Three samples also were analyzed for total and pore-water TBT

The chemical analyses indicated low levels of contamination in any of the samples, with all levels below their respective Dredged Material Evaluation Framework (DMEF) screening level (SL). No pesticides, PCBs, or tributyltin were detected in any of the samples. Several PAHs and phthalates were detected, but at low levels. Detection levels were sufficiently low to evaluate material proposed for dredging. The samples collected during this sampling event are consistent

with historical sampling results and meet the DMEF guidelines for unconfined in-water placement without further characterization.

Yaquina Bay and River

The authorized project for Yaquina Bay and River includes two high tide rubble mound jetties at the entrance. The north jetty is 7,000 feet long and the south jetty is 8,600 feet long. The entrance channel is authorized at 400 feet wide and 40 feet deep and runs from deep water at approximately -1 mile to RM 0. From RM 0, the authorized channel is 30 feet deep and 300 feet wide to the turning basin at McClean Point (RM 2+20). The turning basin is authorized at 30 feet deep, 900 to 1,200 feet wide and 1,400 feet long. The channel from the turning basin (RM 2+20) to Yaquina (RM 4+20) is 18 feet deep and 200 feet wide. The project includes a small boat basin at Newport. The South Beach marina is east of the Highway 101 Bridge and is protected by two breakwaters that are 1,800 feet and 700 feet long. An access channel to the boat basin (RM 1+10) is authorized at 10 feet deep, 100 feet wide and 2,035 feet long. This project has been designated as a critical harbor of refuge. Rescue vessels are maintained at the U.S. Coast Guard station. The local sponsor is the Port of Newport.

Three projects are proposed for maintenance dredging: (1) Yaquina Bay entrance channel, (2) South Beach Marina access channel, and (3) Yaquina River navigation channel.

Yaquina Bay Entrance Channel

The entrance reach extends from RM -1 to RM 4.4. Dredging will occur annually. Maximum dredge depth will be -45 feet (RM -1 to RM 0), -32 feet (RM 0 to RM 2+20), and -20 feet (RM 2+20 to 4+20) as measured from MLLW, including advanced maintenance dredging. A maximum 370,000 cy of material will be removed per dredging season. The proposed dredging method is hopper, pipeline, or clamshell. Operations are anticipated to take a maximum of 32 days from June 15 to October 31. An additional 6 days of dredging may be necessary in April or May to clear the entrance of shoals that accumulated during winter storms. Dredged material disposal will occur at two ODMDS. Both sites are 4,000 feet by 6,500 feet, approximately 597 acres, and their depth ranges from 112 to 152 feet.

South Beach Marina Access Channel

The South Beach Marina access channel is approximately 2,035 feet long and runs from Yaquina RM 1 to the marina. Dredging will occur once every 5 to 8 years. Maximum dredge depth will be -11 feet, as measured from MLLW, including 1 foot of advanced maintenance dredging. Up to 25,000 cy of material will be removed per dredging season. The proposed dredging method is pipeline or clamshell. Operations are anticipated to take a maximum of 30 days from July 1 to October 31. Dredged material disposal will occur at one of the two ocean sites identified for the entrance channel.

On September 12, 2005, the Corps collected 10 samples from shoaling areas at seven stations within the federally maintained entrance channel and harbor and three stations within South Beach Marina channel (Corps 2005. The Corps submitted all 10 samples for physical and

chemical analysis. The chemical analyses indicated only very low levels of contamination in any of the samples, with all levels well below their respective DMEF SL. Detection levels were sufficiently below the SL to evaluate material proposed for dredging. The samples collected during this sampling event, both in the Federally-maintained navigation channel and the South Beach Marina access channel, are consistent with historical sampling results and are determined to be suitable for unconfined, in-water placement without further characterization.

Yaquina River Navigation Channel (Depot Slough)

The authorized project for the Yaquina River consists of a channel 10 feet deep running from approximately RM 4+20 (at the town of Yaquina) to RM 14.0. Generally, the channel is 150 feet wide. At Toledo, the channel widens to 200 feet and extends into Depot Slough (RM 13). A turning basin is on the south side of the river at RM 14.0 (across from Olalla Slough) and is 350 feet wide and 500 feet long. The local sponsor is the Port of Toledo.

Only Depot Slough is currently proposed for dredging. Dredging will occur once every 5 to 8 years. Maximum dredge depth will be -12 feet, as measured from MLLW, including 2 feet of advanced maintenance dredging. A maximum of 100,000 cy of material will be removed per dredging season. The proposed dredging method is hopper, pipeline, or clamshell. Operations will take place over a 30-day period from July 1 to October 31. Dredged material disposal will occur at one of the two ocean sites identified for the entrance channel.

On August 12, 2003, the Corps collected five gravity-core sediment samples along the length of the authorized channel at Depot Slough and submitted them for physical analyses and chemical analysis, including total volatile solids (Corps 2003). In addition, these samples were, also analyzed for metals, total organic carbon, pesticides and PCBs, phenols, phthalates, miscellaneous extractables, PAHs, dioxin/furan, and for both total and pore-water tributyltin.

The chemical analyses indicated only very low levels of contamination in any of the samples, with all levels well below their respective DMEF SL. No pesticides, PCBs, low molecular weight PAHs, or tributyltin were detected in any of the samples. Several high molecular weight PAHs, dioxin/furans and phthalates were detected, but at very low levels. Detection levels were sufficiently low to evaluate material proposed for dredging. The analytical results of this characterization are consistent with historical data. The results of this sampling event are consistent with historical sampling results, meet the frequency and recency guidelines established in the SEF, and are suitable for unconfined, in-water placement without further characterization (Corps 2003, Corps *et al*. 2009).

Siuslaw River

The Siuslaw River Project is near the City of Florence in Lane County, Oregon. The authorized project includes two high-tide jetties that are 750 feet apart at their outer ends. Both were extended in 1986, the north jetty from 7,790 to 9,690 feet and the south jetty from 4,200 to 6,000 feet. Spur jetties that are 400 feet long also were added to the jetty extensions. An entrance channel into the Siuslaw River, authorized at 18 feet deep and 300 feet wide, runs from deep water to RM 0.2. From there, the channel is 16 feet deep and 200 feet wide, to the dock at

Florence at RM 5.0. A turning basin opposite of the dock is 16 feet deep, 400 feet wide and 600 feet long. There is an unmaintained, authorized channel 12 feet deep and 150 feet wide from Florence to RM 16.5 with a turning basin at RM 15.8, which is 300 feet wide and 500 feet long. This project has been designated as a critical harbor of refuge. Rescue vessels are maintained at the Coast Guard station. The local sponsor is the Port of Siuslaw.

The Corps proposes to conduct maintenance dredging of the entrance channel at the mouth of the Siuslaw River. The maintained channel runs from RM -1 to RM 5 (6 miles). Dredging will occur annually, except at the turning basin where dredging will occur every five to eight years. Maximum dredge depth will be -23 feet (RM -1 to RM 0.2) and -18 feet (RM 0.2 to RM 5), as measured from MLLW, including advanced maintenance dredging (see Table 2). Approximately 100,000 cy of material will be removed from the navigation channel per dredging season, with an additional 100,000 cy every five to eight years when turning basin is dredged. The proposed dredging method is hopper, clamshell, or pipeline. Operations in the navigation channel are anticipated to take a maximum of 20 days; an additional 20 days of dredging will occur every five to eight years when the turning basin is dredged. All dredging will occur from June 1 to October 31. Material disposal will occur at ocean disposal sites B or C, approximately one mile offshore. Ocean disposal site B is 3,000 feet by 2,000 feet with an average depth of 90 feet, and site C is 3,000 feet by 1,000 feet with an average depth of 78 feet.

In August 2006, the Corps collected seven surface grab samples in the Siuslaw River from the entrance to RM 6, including the turning basin and submitted all samples for physical analysis, one sample was submitted for chemical analyses to include select chemicals of concern from the following: metals, TOC, pesticides and PCBs, chlorinated hydrocarbons, phenols, phthalates, miscellaneous extractables, PAHs, with two samples submitted for TBT analysis (Corps 2006). Sediments collected for analysis are considered representatives of the material to be dredged including any advanced maintenance or overdepth material. The results of this sampling event are consistent with historical sampling results, meet the frequency and recency guidelines established in the SEF, and are suitable for unconfined, in-water placement without further characterization (Corps 2006, Corps *et al*. 2009).

Umpqua River

The Umpqua Project includes two jetties at the entrance; the north jetty is 8,000 feet long and the south jetty is 4,200 feet long. The authorized channel at the entrance is 26 feet deep and 400 feet wide. The river channel, which is 22 feet deep and 200 feet wide, extends from the entrance to Reedsport at RM 11.4. A turning basin at Reedsport is 22 feet deep, 600 feet wide and 1,000 feet long. Two adjacent but unconnected boat basins are at Winchester Bay (Salmon Harbor) near RM 1.5. Access channels to these boat basins are authorized at 16 feet deep and 100 feet wide.

The southernmost 950 feet of the channel to the east boat basin is maintained at a 12-foot depth and 75-foot width. This boat basin includes a turning basin which is 16 feet deep, 175 feet wide and 300 feet long. A turning basin in the west boat basin also is 16 feet deep. Another side channel near RM 8 provides access to Gardiner and is 22 feet deep and 200 feet wide. A turning basin at Gardiner is authorized to 22 feet deep, 500 feet wide, and 800 feet long, but is not currently maintained to these dimensions. This project has been designated as a critical harbor of refuge. The local sponsor is the Port of Umpqua.

Three projects are proposed for maintenance dredging: (1) Umpqua River entrance; (2) Umpqua River navigation channel; and (3) Winchester Bay access channels.

Umpqua River Entrance and Navigation Channel

At the entrance, the maintained channel extends from RM -1 to RM 0-10 (0.8 miles). Dredging will occur annually. Maximum dredge depth will be -31 feet, as measured from MLLW, including five feet of advanced maintenance dredging. Approximately 150,000 cy of material will be removed per dredging effort (includes all payable dredged material to the allowable overdepth). The proposed dredging method is hopper or clamshell. The Umpqua River navigation channel is maintained upstream of the entrance channel from RM 0-10 to RM 11+40 (11.9 miles). Dredging will occur annually. Maximum dredge depth will be -24 feet, as measured from MLLW, including 2 feet of advanced maintenance dredging. At estimated 100,000 cy of material will be removed at most per dredging season. The proposed dredging method is hopper, clamshell, or pipeline. Operations will take place over a 20-day period from July 1 to October 3, although four days of dredging may be necessary in April or May to clear the entrance of shoals that accumulated during winter storms. Dredged material disposal will occur at two ocean disposal sites or at an in-bay site on the north side of the channel at approximately RM 1. The in-bay site is 1,000 feet long, 35 to 75 feet in depth, has a sand substrate with no vegetation, and is a naturally erosive site where sediment disperses following disposal.

Winchester Bay Boat Basin Access Channels

The west boat basin access channel runs approximately 4,300 feet from RM 1+10 (Umpqua River) to the marina. The east boat basin access channel runs approximately 4,500 feet from RM1+35 (Umpqua River) to the marina. Dredging will occur annually. Maximum dredge depth will be -14 to -18 feet, as measured from MLLW, including 2 feet of advanced maintenance dredging. Up to 25,000 cy of material will be removed per dredging effort (includes all payable dredged material to the allowable overdepth). The proposed dredging method is clamshell, pipeline, or hopper. Operations will take place over a 30-day period from July 1 to October 31. Material disposal will occur at the disposal sites identified for the entrance channel.

In 2009, two new ocean disposal sites were designated by the EPA under section 102(c) of the Marine Protection, Research and Sanctuaries Act, as amended (MPRSA), 33 U.S.C. §§ 1401 to 1445, near the mouth of the Umpqua River. These ODMDS are to the north and south of the entrance to the Umpqua River on the Oregon Coast. Each of the ODMD sites occupies approximately 533 acres (5,800 feet wide by 4,000 feet long) with depth ranging from approximately 30 to 130 feet; only one site per year will be used.

On August 29-30, 2006, the Corps collected 18 samples from the Umpqua River navigation channel, Winchester Bay and Gardiner Channel and submitted all 18 samples for physical analysis including total volatile solids; seven of the 18 samples were also analyzed for metals, total organic carbon, pesticides and PCBs, phenols, phthalates, miscellaneous extractables, PAHs, with six samples selected for both total sediment (bulk) and pore-water organotin, although only bulk analyses were conducted due to lack of pore-water volume.

The results of this sampling event are consistent with historical sampling results, meet the frequency and recency guidelines established in the SEF, and are suitable for unconfined, in-water placement without further characterization (Corps 2006, Corps *et al*. 2009).

Coos Bay

The Coos Bay project includes two rubble mound jetties that were originally constructed in 1878 to provide a stable entrance channel. The north and south jetties are approximately 10,400 feet long and 9,000 feet long, respectively. The south jetty was last repaired in 1969 and the north jetty in 1989 to repair a low section. The north jetty subsequently breached in 2001 and was repaired in an emergency action in 2002. During the winter of 2008-2009, additional repairs were made to three damaged areas between stations 45+00 and 64+00. The navigation channel in Coos Bay begins at deep water in the ocean and extends up river to RM 15 at the Port of Coos Bay. At RM 2.0, a side channel extends from the main channel to the Charleston commercial boat basin. The main navigation channel is annually dredged to provide for authorized depth and width. The channel was originally constructed in 1891, deepened to 24 feet between 1927 and 1934, and to 40 feet at the entrance and 30 feet in the inner channel in 1946. The entrance channel was further deepened to 45 feet and the inner channel to 35 feet in 1969. The latest improvements were made in 1995 when the entrance channel was deepened to 47 feet deep and 700 feet wide tapering through the jetties to a channel 37 feet deep and 300 feet wide at RM 1. The inner channel from RM 1 to 9 is 37 feet deep by 300 feet wide and from RM 9 to 15 the inner channel is 37 feet deep by 400 feet wide. This project has been designated as a critical harbor of refuge. Rescue vessels are maintained at the U.S. Coast Guard station. The local sponsor is the Port of Coos Bay.

Four areas are proposed for maintenance dredging in the Coos Bay Project: (1) Coos River entrance channel (RM -1 to 1); (2) Coos River navigation channel (RM 1 to 12); (3) Coos River navigation channel (RM 12 to 15); and (4) Charleston access channel.

Entrance Channel

Maintenance dredging of the navigation channel at the Coos River entrance channel from RM -1 to 1 (2 miles) will occur annually. Maximum dredge depth will be -52 feet, as measured from MLLW, including 5 feet of advance maintenance dredging. In this reach, advance maintenance dredging of up to 50 feet outside the channel will take place in locations where there is a historical problem with infill. A maximum 1,000,000 cy of material will be removed per dredging effort (includes all payable dredged material to the allowable overdepth). The proposed dredging method is hopper or clamshell. Dredging operations are anticipated to take a maximum of 20 days from June 15 to October 31. Up to 5 days of dredging may be necessary in April or May to clear the entrance of shoals that accumulate during winter storms. Dredged material disposal will primarily occur at ODMDS F approximately 1.5 miles offshore and its average depth is 80 feet. ODMDS E, which is approximately 55- to 60 feet deep, was last used in 1991 but is still available for disposal of sandy material. When the bar is not passable, material will be placed at in-bay disposal site G. Site G is on the south side of the channel and is about 200 feet wide by 1,000 feet long, approximately 40 to 45 feet in depth, the substrate is sand with no vegetation, and the site is dispersive.

Navigation Channel RM 1-12

Maintenance dredging of the Coos River main navigation channel from RM 1 to 12 (11 miles) will occur annually. Maximum dredge depth will be -40 feet, as measured from MLLW, including 3 feet of advanced maintenance dredging. In this reach, advance maintenance dredging of up to 50 feet outside the channel will take place in locations where there is a historical problem with infill. A maximum 300,000 cy of material will be removed per dredging effort (includes all payable dredged material to the allowable overdepth). The proposed dredging method is hopper, pipeline, or clamshell. Dredging operations will take place over a 35-day period from June 15 to October 31. Early dredging usually occurs over a 1-week period in April or May with the remainder of dredging occurring after June 15. The early dredging is done to remove shoals that have accumulated during winter.

Dredged material disposal will occur at ODMDS F (and ODMDS E, if needed), at an in-bay disposal site at RM 8.4 adjacent to the North Bend municipal airport, or at in-bay disposal site G. Site 8.4 is an in-water fill site (rehandle) on the south side of the channel and is about 300 feet wide by 2,500 feet long, 30 to 35 feet in depth, and has a sand substrate and no vegetation. Site 8.4 has material added annually; it is dredged every 5 to 10 years and the material is taken to ODMDS F. Site G is used about 20 days per year for material taken from the Charleston channel and the main channel when the bar is not passable.

Navigation Channel RM 12-15

Maintenance dredging from RM 12 to 15 (3 miles) will occur annually. Maximum dredge depth will be -40 feet, as measured from MLLW, including 3 feet of advanced maintenance dredging. Up to 600,000 cy of material will be removed per dredging effort (includes all payable dredged material to the allowable overdepth). The proposed dredging method is clamshell, hopper, or pipeline. Dredging operations will take place over an 80-day period from July 1 to October 31. Dredged material disposal will occur at ODMDS H, which has an average depth of 180 feet or occasionally at in-bay disposal site 8.4. Site 8.4 would be used about 4 days per year for material above RM 12 when it is not economically feasible to use ODMDS H.

Charleston Access Channel

Maintenance dredging of the Charleston channel will occur annually. The channel runs approximately 6,500 feet from RM 2 (Coos River) to the marina. Maximum dredge depth will be -18 to -19 feet, as measured from MLLW, including 2 feet of advanced maintenance dredging. Up to 40,000 cy of material will be removed per dredging effort (includes all payable dredged material to the allowable overdepth). The proposed dredging method is hopper, pipeline, or clamshell. Dredging operations will take place over a 30-day period from July 1 to October 31. An additional 3 days of dredging may be necessary each April, May, and June to clear the entrance of sediment accumulated during winter storms. Dredged material disposal will occur at ODMDS F (and ODMDS E, if needed) or at in-bay disposal site G as discussed above for the entrance channel.

On September 16, 2009, the Corps collected 16 box core grab samples and three gravity core samples along the length of the Federal navigation channel in Coos Bay, Isthmus Slough, and Charleston Channel. All 19 sediment samples were submitted for physical analyses, with eight samples collected from finer-grained areas further subjected to chemical analyses, including metals, TOC, pesticides and PCBs, chlorinated organic compounds, phenols, phthalates, miscellaneous extractables, PAHs, and total and pore water TBT. The chemical analyses indicated only low levels of contamination in any of the samples, with all levels well below their respective SEF SL, Levels of metals were consistent with historical values and did not approach the SEF SL. All analyte concentrations were substantially below the SLs. The results of this sampling event are consistent with historical sampling results, meet the frequency and recency guidelines established in the SEF, and are suitable for unconfined, in-water placement without further characterization (Corps 2009a, Corps *et al*. 2009).

Coquille River

The authorized project at Coquille River includes a jetty that is 3,450 feet long north of the entrance and a jetty that is 2,700 feet long south of the entrance. A channel of suitable width and 13 feet deep runs from deep water to RM 1.3. Snagging operations to clear the channel are authorized to RM 24, but the Corps has not performed snag removal for the past 20 years. This project has been designated as a critical harbor of refuge. Rescue vessels are maintained at the U.S. Coast Guard station. The local sponsor is the Port of Bandon.

Two projects are proposed at Coquille River for maintenance dredging: (1) Coquille River entrance and (2) Bandon boat basin access channel.

Coquille River Entrance Channel

The maintained channel at Coquille River entrance runs from RM 0-20 to RM 1+15 (1.7 miles). Dredging will occur annually. Maximum dredge depth will be -17 feet, as measured from MLLW, including 4 feet of advanced maintenance dredging. An estimated maximum 38,000 cy of material will be removed per dredging effort (includes all payable dredged material to the allowable overdepth). The proposed dredging method is hopper or clamshell. Operations will take place over a 7-day period from June 15 to October 31. Material disposal will occur at an ocean disposal site approximately 1 mile offshore, with an average depth of approximately 60 feet.

Bandon Boat Basin Access Channel

The Bandon boat basin access channel runs approximately 700 feet from RM 1 (Coquille River) to the marina. Dredging will occur every 5 to 10 years. Maximum dredge depth will be -15 feet, as measured from MLLW, including 2 feet of advanced maintenance dredging. An estimated 6,000 cy of material will be removed per dredging effort (includes all payable dredged material to the allowable overdepth). The proposed dredging method is pipeline or clamshell. Operations will take place over a 14-day period from July 1 to October 31, after the river entrance dredging. Dredged material disposal will occur at the previously mentioned ocean disposal site or within the flowlane at RM 1. The flowlane site is in the authorized channel and is clean sand with some

gravel. The material from the boat basin to be placed here is primarily silt with sand with an organic content of 9.2% to 10.1%. The depth of the site is 15-30 feet and the site is dispersive.

On September 8, 2006, the Corps collected four surface grab samples from the entrance to RM 1.3 and two from the boat basin access channel at the Coquille River Project (Corps 2007). The Corps submitted all six samples for physical testing; the two finer-grained samples collected within the boat basin were submitted for chemical analyzes to include: metals, TOC, pesticides, PCBs, phenols, phthalates, miscellaneous extractables, PAHs and TBT analysis. Sediment analysis results indicated no contaminants of concern were present at levels that approached the SEF Sl guidelines. The results of this sampling event are consistent with historical sampling results, meet the frequency and recency guidelines established in the SEF, and are suitable for unconfined, in-water placement without further characterization (Corps 2007c, Corps *et al*. 2009).

Port Orford

The Port Orford harbor is a natural cove that is protected from the north and west by a headland that extends seaward on a southerly direction for a distance of approximately one mile. A breakwater was constructed in 1935 at the southern end of the cove and later extended to its current length of 550 feet in 1968. The turning basin was constructed to the east of an existing dock in 1971 to provide adequate depths for navigation in the harbor behind the extended breakwater.

The Federally authorized project includes a breakwater that is 550 feet long and a turning basin that is 16 feet deep, 900 feet wide, and 750 feet long. Currently, the navigation channel is dredged each summer and the area around the boat hoist is dredged in the winter. This project has been designated as a critical harbor of refuge. The local sponsor is the Port of Port Orford.

The 750-foot long, 90-foot wide and 16-foot deep navigation channel is typically dredged between the turning basin and the dock over a 50-day period each summer. The channel is dredged to the authorized depth of 16 feet plus 4 feet of advanced maintenance for a total dredging depth of 20 feet. An additional 3 feet of sediment may be disturbed during dredging activities for a total depth of 23 feet. The proposed dredging method is either pipeline or clamshell. The proposed dredging period for the summer is from May 1 and October 31. Sediment from summer dredging will typically be placed in a near-shore placement area that is approximately 200 feet off the edge of the breakwater. Sediment from summer dredging may also be discharged off the breakwater ("Breakwater Placement Area"), as close to the outer end as possible, to avoid the natural rocky intertidal habitat at the shoreward end of the breakwater. Discharge will occur no less than 300 feet south of station "LEAD". The discharge pipe will be approximately 10 feet above the water surface and will be moved as necessary to prevent mounding and to keep the discharge directed seaward. Up to 45,000 cy of material will be removed per dredging effort (includes all payable dredged material to the allowable overdepth). This is an open ocean, dispersive site and is 30 to 40 feet deep.

The area adjacent to the boat hoist is approximately 305 feet long by 30 feet wide. The authorized depth is 16 plus 4 feet of advanced maintenance for a total depth of 20 feet, but the

actual dredging depth is typically less than -17 feet. An estimated 500 to 7,000 cubic yards per year will be removed by pipeline dredging (submersible pump is lowered from the dock). Dredging will normally occur in 2 to 5 increments between May 1 and April 15. The frequency of dredging will depend on how long adequate depths remain below the hoists. Sediment from winter dredging will typically be discharged off the breakwater ("Breakwater Placement Area"), as close to the outer end as possible, to avoid the natural rocky intertidal habitat at the shoreward end of the breakwater. Discharge will occur no less than 300 feet south of station "LEAD". The discharge pipe will be approximately 10 feet above the water surface and will be moved as necessary to prevent mounding and to keep the discharge directed seaward. Sediment from winter dredging may also be placed in a near-shore placement area that is approximately 200 feet off the edge of the breakwater.

On August 6, 2007, the Corps collected three surface-grab sediment samples along the length of the Port Orford turning basin and submitted them for physical analyses and chemical analysis, including total volatile solids, metals, total organic carbon, pesticides and PCBs, phenols, phthalates, miscellaneous extractables, and PAHs (Corps 2007d). The chemical analysis indicated only very low levels of contamination in any of the samples, with all levels well below their respective SEF SL. The results of this sampling event are consistent with historical sampling results, meet the frequency and recency guidelines established in the SEF, and are suitable for unconfined, in-water placement without further characterization (Corps 2007d, Corps *et al.* 2009).

Rogue River

The authorized project includes two jetties at the north and south sides of the entrance to the Rogue River and a navigation channel through the entrance and to the Gold Beach boat basin. Construction of the south jetty was completed in 1959 and the north jetty was completed in 1960. In 1961, the navigation channel (13 feet deep, 300 feet wide, and 3,500 feet long) and turning basin (13 feet deep, 500 feet wide, and 650 feet long) along the north jetty were completed. To address continued shoaling in the river, the Port of Gold Beach constructed a breakwater on the south side of the Rogue River and tangent to the south jetty in 1972. The area between the end of the breakwater and eastern end of the south jetty formed the entrance to the Gold Beach boat basin. After construction of the breakwater, the Corps dredged an access channel (10 feet deep, 100 feet wide, and 3,000 feet long) to the boat basin and a turning basin (10 feet deep, 150 feet wide, and 600 feet long) within the basin. Dredging of the navigation channel turning basin ended with the construction of the breakwater. This project has been designated as a critical harbor of refuge. Rescue vessels are maintained at the U.S. Coast Guard station. The local sponsor is the Port of Gold Beach.

Two projects are proposed for maintenance dredging in the Rogue River: (1) Rogue River entrance channel and (2) Gold Beach boat basin access channel.

Rogue River Entrance Channel

The maintained entrance channel extends from RM -1 to RM 0+28 (1.1 mile). Dredging will occur annually. Maximum dredge depth will be -17 feet, as measured from MLLW, including 4 feet of advanced maintenance dredging. An additional 3 feet of sediment may be disturbed during dredging activities for a total depth of 20 feet. A maximum 73,000 cy of material will be removed per dredging effort (includes all payable dredged material to the allowable overdepth). The proposed dredging method is hopper or clamshell. Operations will take place over a 12-day period from June 1 to October 31. Dredged material disposal will occur at an ocean site approximately 1.75 miles offshore, with an average depth of 60 feet.

Gold Beach Boat Basin Access Channel

The Gold Beach boat basin access channel extends approximately 3,000 feet from RM 0.04 (Rogue River) to the marina. Dredging will occur once every five years. Maximum dredge depth will be -12 feet, as measured from MLLW, including 2 feet of advanced maintenance dredging. An additional 3 feet of sediment may be disturbed during dredging activities for a total depth of 15 feet. Up to 24,000 cy of material will be removed per dredging effort (includes all payable dredged material to the allowable overdepth). The proposed dredging method is pipeline or clamshell. Operations will take place over an 18-day period from July 15 to October 31. Dredged material disposal will be placed in either the previously mentioned ocean disposal site, an upland rehandling area or adjacent to the Gold Beach airport in the south beach surf zone, where material is placed directly on the beach at the surf zone. The rehandling area is a beneficial use site and the material is given away or sold by the Port.

On August 6, 2007, the Corps collected six grab samples from the Rogue River Project; three samples were from the outer channel and three from the inner channel leading to the Gold Beach boat basin. All six samples were submitted for physical analyses including total volatile solids. Select samples containing higher percent of fine-grained material were analyzed for metals (inorganic), total organic carbon, pesticides and PCBs, phenols, phthalates, miscellaneous extractables, PAHs, and organotin.

The chemical analyses indicated only very low levels of contamination in any of the samples, with all levels below their respective SEF SL, with the exception of phenol, which was detected above the 420 ug/kg SEF screening level at 1200 ug/kg in the sample closest to the boat basin. It is suspected that phenol is a possible laboratory cross-contamination, but has not been verified. Therefore, the dredge material represented by that sample will not be dredged until further characterization or re-sampling is completed. The results of this sampling event are consistent with historical sampling results, meet the frequency and recency guidelines established in the SEF, and are suitable for unconfined, in-water placement without further characterization with the exception of sediment represented by the sample collected near the boat basin (as previously described) (Corps 2008, Corps *et al*. 2009).

Chetco River

The authorized project includes two rock jetties at the entrance to the Chetco River which were constructed in 1957. An entrance channel extends from the ocean to a turning basin at RM 0. The entrance channel (6 feet deep and 120 feet wide) was completed in 1957 and later expanded to its current dimensions of 14 feet and 120 feet wide. A barge turning basin (14 feet deep, 250 feet wide, and 650 feet long) was completed between 1968 and 1970 and is at the entrance to the small boat basin. The turning basin is protected by a dike that is 18 feet high and 1,800 feet long. A small boat access channel that is 12 feet deep and 100 feet wide parallels the south side of the dike. A small boat basin was originally dredged by local interests in 1957 after the completion of the protective dike and the access channel to the boat basin was completed in 1970. In 1977, the Port of Brookings constructed the commercial boat basin that is to the south of the small boat basin. An access channel to the commercial boat basin is maintained to 14 feet deep, 100 feet wide and 200 feet long. This project has been designated as a critical harbor of refuge. Rescue vessels are maintained at the U.S. Coast Guard station. The local sponsor is the Port of Brookings Harbor.

Two projects are proposed for maintenance dredging in the Chetco River: (1) Chetco River entrance channel and (2) the Brookings-Harbor commercial boat basin access channel. The conservation measures to be used for maintenance dredging were discussed previously (also see Table 1).

Chetco River Entrance Channel

The maintained channel at the entrance runs from RM 0-20 to RM 0+30 (0.9 mile). Dredging will occur annually. Maximum dredge depth will be -18 feet, as measured from MLLW, including 4 feet of advanced maintenance dredging. An additional 3 feet of sediment may be disturbed during dredging activities for a total depth of 22 feet. An estimated 35,000 cy of material will be removed per dredging effort (includes all payable dredged material to the allowable overdepth). The proposed dredging method is hopper or clamshell. Operations will take place over a 12-day period from June 1 to October 31. Dredged material disposal typically occurs at the nearshore placement site in the Pacific Ocean and only very rarely will occur at the ODMDS approximately 1.5 miles offshore. The near-shore site has an average depth of 24 feet and is an open ocean, marine sand site that is near shore to feed the beaches and keep the material in the littoral zone.

Brookings-Harbor Commercial Boat Basin Access Channel

The Brookings-Harbor commercial boat basin access channel runs approximately 600 feet from RM 0+15 (Chetco River) to the south boat basin. Dredging will occur once every five years. Maximum dredge depth will be -16 feet, as measured from MLLW, including 2 feet of advanced maintenance dredging. An additional 3 feet of sediment may be disturbed during dredging activities for a total depth of 21 feet. An estimated 5,000 cy of material will be removed per dredging effort (includes all payable dredged material to the allowable overdepth). The proposed dredging method is hopper or clamshell. Operations will take place over a 14-day period from

July 15 to October 31. Dredged material disposal will occur at the disposal sites described for the entrance channel.

On August 6, 2007, the Corps collected six sediment samples from the Chetco River Federal channel and boat basin entrance channel. All samples were submitted for physical analyses including Total Volatile Solids. Four sediment samples were analyzed for metals (inorganic), TOC, pesticides and PCBs, organotin, phenols, phthalates, miscellaneous extractables, and PAHs. Laboratory analyses was generally good, however, the laboratory detection limits for chlordane, 2,4-dimethylphenol, benzoic acid and benzyl alcohol were higher than SEF SLs. These compounds were not detected in any previous sediment analysis; however, the elevated detection levels do not allow them to be characterized under the SEF SL. The project was reviewed d by the PRG as part of the SEF review process; the PRG concurred[2] with the determination that the project is consistent with the SEF guidelines. With no new sources for these compounds likely to be present within the watershed, the historical values are being used to characterize the compounds in question. The laboratory provided component chlordane (alpha and gamma), with sufficiently low detection limits individually, to evaluate chlordane as not present at levels of concern. The results of this sampling event are thus considered consistent with historical sampling results, meet the frequency and recency guidelines established in the SEF, and are suitable for unconfined, in-water placement without further characterization (Corps 2008, Corps *et al*. 2009).

[2] Memorandum for Portland District Regulatory, Subject: Project Review Group Decision Document for Chetco Federal Project, the PRG reviewed the sediment characteristic report and found the material at Chetco meets the SEF guidance. Date: September 8, 2008

Table 1. Summary of Maintenance Dredging at the Corps' Oregon Coast Projects within the OC Coho Salmon Recovery Domain.

Project	Location	Dredging Frequency (years)	Authorized Depth (ft) and Advanced Maintenance	Dredge Period	Maximum Dredge Days	Maximum Dredge Volume (cy)	Last Dredged	Disposal Location
Tillamook Bay	Garibaldi Boat Basin Access Channel	5 - 8	12 +2 + od	15 July - 15 Mar	45	50,000	2009	Upland / in-bay
Depoe Bay	Boat Basin	5 - 8	8 + 2 + od	1 July - 15 Mar	30	25,000	2009	Surf zone
	Check Dam Catch Basin	5 - 8	0 + 1 + od	1 July - 15 Mar	7	2,000	2009	Upland
Yaquina Bay and River	Yaquina Bay Entrance Channel	1	40 + 5 + od (RM -1 to 0) 30+ 2 + od (RM 0 to 2+20) 18 + 2 + od (RM 2 + 20 to 4 + 20)	15 June - 31 Oct (6 days in Apr or May)	32	370,000	2009	Ocean
	South Beach Marina Access Channel	5 - 8	10 + 2 + od	1 July - 31 Oct	30	25,000	2007	Ocean
	Yaquina River (Depot Slough)	5 - 8	10 + 2 + od	1 July - 31 Oct	30	100,000	2009	Ocean
Siuslaw River	Entrance and Navigation Channel	1	18 + 5 + od (RM -1 to 0.2) 16 + 2 + od (RM 0.2 to 5)	1 Jun - 31 Oct	20	100,000	2009	Ocean
	Florence Turning Basin	5 - 8	18 + 5 + od	1 Jun - 31 Oct	20	100,000	Unknown	Ocean
Umpqua River	Entrance and Navigation Channel	1	26 + 5 + od RM -1 to 0-10 22 + 2 + od RM 0-10 to 11+40	1 July - 31 Oct (4 days Apr or May)	20	250,000	2009	Ocean / In-bay
	Winchester Bay Boat Basin Access Channel	1	12/16 + 2 + od	1 July - 31 Oct	30	25,000	2008	Ocean / In-bay

Project	Location	Dredging Frequency (years)	Authorized Depth (ft) and Advanced Maintenance	Dredge Period	Maximum Dredge Days	Maximum Dredge Volume (cy)	Last Dredged	Disposal Location
Coos Bay	Entrance Channel	1	47 + 5 + od	15 June - 31 Oct (5 days in Apr or May)	20	1,000,000	2009	Ocean / In-bay
	Navigation Channel (RM 1 – 12)	1	37 + 3 + od	15 June - 31 Oct (6 days in Apr and May)	35	300,000	2009	Ocean / In-bay
	Navigation Channel (RM 12 – 15)	1	37 + 3 + od	1 July - 31 Oct	100	1,000,000	2009	Ocean
	Charleston Access Channel	1	17/16 + 2 + od	1 July - 31 Oct (3 days in Apr, May, and June)	30	40,000	2009	Ocean / In-bay
Coquille River	Entrance Channel	1	13 + 4 + od	15 June - 31 Oct	7	38,000	2009	Ocean
	Bandon Boat Basin Access Channel	5 - 10	13 + 2 + od	1 July - 31 Oct	14	6,000	1997	Ocean / Flow lane

Table 2. Summary of Maintenance Dredging at the Corps, Oregon Coast Projects within the SONCC Coho Salmon Recovery Domain.

Project	Location	Dredging Frequency (years)	Authorized Depth (ft) and Advanced Maintenance	Dredge Period	Max. Dredge Days	Max. Dredge Volume (cy)	Last Dredged	Disposal Location
Port Orford	Navigation Channel	1	16 + 4 + od	1 May - 31 Oct	50	45,000	2009	Breakwater / Nearshore
	Boat Hoist Area	1	16 + 4 + od	1 May - 15 Apr	30	7,000	2007	Breakwater / Nearshore
Rogue River	Entrance Channel	1	13 + 4 + od	1 June - 31 Oct	12	73,000	2009	Ocean
	Gold Beach Boat Basin Access Channel	5	10 + 2 + od	15 July - 31 Oct	18	24,000	Unknown	Ocean / Surf zone
Chetco **River**	Entrance Channel	1	14 + 4 + od	1 June - 31 Oct	12	70,000	2009	Ocean / Nearshore
	Brookings Boat Basin Access Channel	5	14 + 2 + od	15 July - 31 Oct	14	5,000	Unknown	Ocean / Nearshore

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). The proposed action will affect the river/bay/estuary bottom and result in the suspension and dispersal of some fine sediments. In-water disposal of dredged material will affect the bottom topography and result in the suspension and dispersal of sediments (gravel, sand, and some fine sediment) in the water column from the water surface to the bottom.

The action area consists of the immediate project sites within each of the Federally-authorized coastal projects (Tables 1 and 2), and a 100-foot area (200-foot area for finer-grained when finer-grained sediments are present) on each side of and downstream (or down current) of the dredging and in-river/bay/estuary disposal activity sites to account for turbidity drift. The Corps described a 200-foot turbidity plume associated with ocean disposal, however, the NMFS reasonably expects the turbidity plume to drift and/or extend as much as 500 feet outside of individual ocean disposal locations. The duration of the turbidity plume and the dispersion of this plume are dependent on variables such as ocean currents, size composition of the disposal materials, wave action, dredge ship speed, dredge ship route in relation to ODMDS boundaries, and disposal rate but is predicted to drift approximately 500 feet outside of each of the ODMDS.

Each action area is within the range of the ESA-listed species considered in this Opinion and includes designated critical habitat for both OC and SONCC coho salmon and designated critical habitat for southern green sturgeon (Table 3). The action area is used as rearing habitat by juvenile OC and SONCC coho salmon and as a migration corridor habitat for juvenile and adult OC and SONCC coho salmon. Adult and subadult southern green sturgeon use the action area as habitat for growth, feeding and development to adulthood, and as a migration corridor.

Table 3.
Federal Register notices for final rules that list threatened and endangered species, designate critical habitats, or apply protective regulations to listed species considered in this consultation. Listing status: 'T' means listed as threatened under the ESA; "P" means proposed for listing or designation.

Species	Listing Status	Critical Habitat	Protective Regulations
Marine and Anadromous Fish			
Coho salmon (*O. kisutch*)			
Southern Oregon/Northern California Coasts	T 6/28/05; 70 FR 37160	5/5/99; 64 FR 24049	6/28/05; 70 FR 37160
Oregon Coast	T 2/11/08; 73 FR 7816	2/11/08; 73 FR 7816	2/11/08; 73 FR 7816
Green sturgeon (*Acipenser medirosris*)			
Southern	T 4/07/06; 71 FR 17757	10/09/09; 74 FR 52300	P 5/21/09; 74 FR 23822

OC coho from the Tillamook, Depoe, Big (Yaquina), Yaquina, Big (Siuslaw), Siuslaw, Umpqua, Coos, and Coquille River populations likely present at one or more the Oregon Coastal Project action areas. It is also likely that adult and juvenile coho salmon from adjacent basins use the nearshore ocean portion of the action areas as a migration corridor and newly ocean entered smolts (yearlings) use it as the transition habitat for their initial adaptation to ocean living. The NMFS designated critical habitat for OC coho salmon at Tillamook Bay, Depoe Bay, Yaquina Bay, Siuslaw River, Umpqua River (Winchester Bay), Coos Bay, and Coquille River, although the nearshore ocean off the Oregon coast was not designated critical habitat (Table 4).

SONCC coho salmon from the Rogue and Chetco River Basins are expected to use the action area. It is also likely that nearby southern Oregon populations use the nearshore ocean portion of the action area. Adult and juvenile coho salmon from these populations use the action area as a migration corridor and newly ocean-entered smolts use it as the transition habitat for their initial adaptation to ocean living. NMFS designated critical habitat for SONCC salmon at the Rogue River and Chetco River, although the nearshore ocean was not designated (Table 5).

The southern green sturgeon use the action area as habitat for adult and subadult migration and feeding, as well as growth and development to adulthood by subadults. The NMFS has designated critical habitat for southern DPS green sturgeon in Yaquina Bay, Winchester Bay (Umpqua River), and Coos Bay, as well as coastal marine areas (within 60 fathoms) off the Oregon Coast in the action area (Table 6); Tillamook Bay and the Rogue River estuary were excluded from the proposed critical habitat.

The action area also includes habitat which has been designated as EFH for various life stages of 20 species of groundfish (PFMC 2006), five species of coastal pelagics (PFMC 1998), and two species of Pacific salmon (PFMC 1999). The NMFS also identified the following marine mammal species: the Eastern DPS of Steller sea lions, blue whales, fin whales, humpback whales, and Southern Resident killer whales (see Appendix A) may occur within the action area.

Table 4. Primary constituent elements (PCEs) of critical habitats designated for OC coho salmon and corresponding species life history events.

Primary Constituent Elements		Species Life History Event
Site Type	**Site Attribute**	
Freshwater spawning	Substrate Water quality Water quantity	Adult spawning Embryo incubation Alevin development
Freshwater rearing	Floodplain connectivity Forage Natural cover Water quality Water quantity	Fry emergence Fry/parr growth and development
Freshwater migration	Free of artificial obstructions Natural cover Water quality Water quantity	Adult sexual maturation Adult upstream migration, holding Kelt (steelhead) seaward migration Fry/parr seaward migration
Estuarine areas	Forage Free of obstruction Natural cover Salinity Water quality Water quantity	Adult sexual maturation Adult "reverse smoltification" Adult upstream migration, holding Kelt (steelhead) seaward migration Fry/parr seaward migration Fry/parr smoltification Smolt growth and development Smolt seaward migration
Nearshore marine areas*	Forage Free of obstruction Natural cover Water quantity Water quality	Adult sexual maturation Smolt/adult transition

*Nearshore marine areas were identified only in/around Puget Sound, Washington.

Table 5. PCEs of critical habitats designated for SONCC coho salmon and corresponding species life history events.

PCEs		Species Life History Event
Site	**Site Attribute**	
Spawning and juvenile rearing areas	Access (sockeye) Cover/shelter Food (juvenile rearing) Riparian vegetation Space (Chinook and coho) Spawning gravel Water quality Water temp (sockeye) Water quantity	Adult spawning Embryo incubation Alevin development Fry emergence Fry/parr growth and development Fry/parr smoltification Smolt growth and development
Juvenile migration corridors	Cover/shelter Food Riparian vegetation Safe passage Space Substrate Water quality Water quantity Water temperature Water velocity	Fry/parr seaward migration Smolt growth and development Smolt seaward migration
Areas for growth and development to adulthood	Ocean areas – not identified	Adult growth and development Adult sexual maturation Fry/parr smoltification Smolt/adult transition
Adult migration corridors	Cover/shelter Riparian vegetation Safe passage Space Substrate Water quality Water quantity Water temperature Water velocity	Adult sexual maturation Adult “reverse smoltification” Adult upstream migration Kelt (steelhead) seaward migration

Table 6. PCEs of critical habitat for SDPS green sturgeon and corresponding species life history events.

PCEs			Species Life History Event
Site Type	**Site Attribute**		
Freshwater riverine system	Food resources Substrate type or size Water flow Water quality	Migratory corridor Water Depth Sediment quality	Adult spawning Embryo incubation Alevin development Juvenile growth/development Juvenile/subadult seaward migration Adult upstream migration Adult post-spawning seaward migration
Estuarine areas	Food resources Water flow Water quality	Migratory corridor Water depth Sediment quality	Juvenile/subadult growth/development Juvenile/subadult seaward migration Adult growth/development Adult upstream migration Adult post-spawning seaward migration
Coastal marine areas	Migratory corridor Water quality Food resources		Subadult migration between marine/estuarine areas Subadult/adult migration within marine areas Subadult/adult growth and development Adult sexual maturation

The direct effects occur at the individual project sites, and indirect effects may extend throughout each coastal bay/estuary and in the open ocean based on the potential for changes in bottom topography, increase in total suspended solids, redistribution of contaminated sediments, displacement of coho salmon and southern green sturgeon, injury to or killing of coho salmon and southern green sturgeon, and discharge of pollutants into the environment.

Project-Specific Description of the Action Area

For each Coastal Project, the effects of the maintenance activities are described for an *action area*, which is larger than the specific project area dimensions. The action area encompasses the area where the dredging and disposal effects could be expected to occur from a proposed action. It represents the best estimate of the largest area of effect. An evaluation of the action area specific to each Coastal Project is provided below.

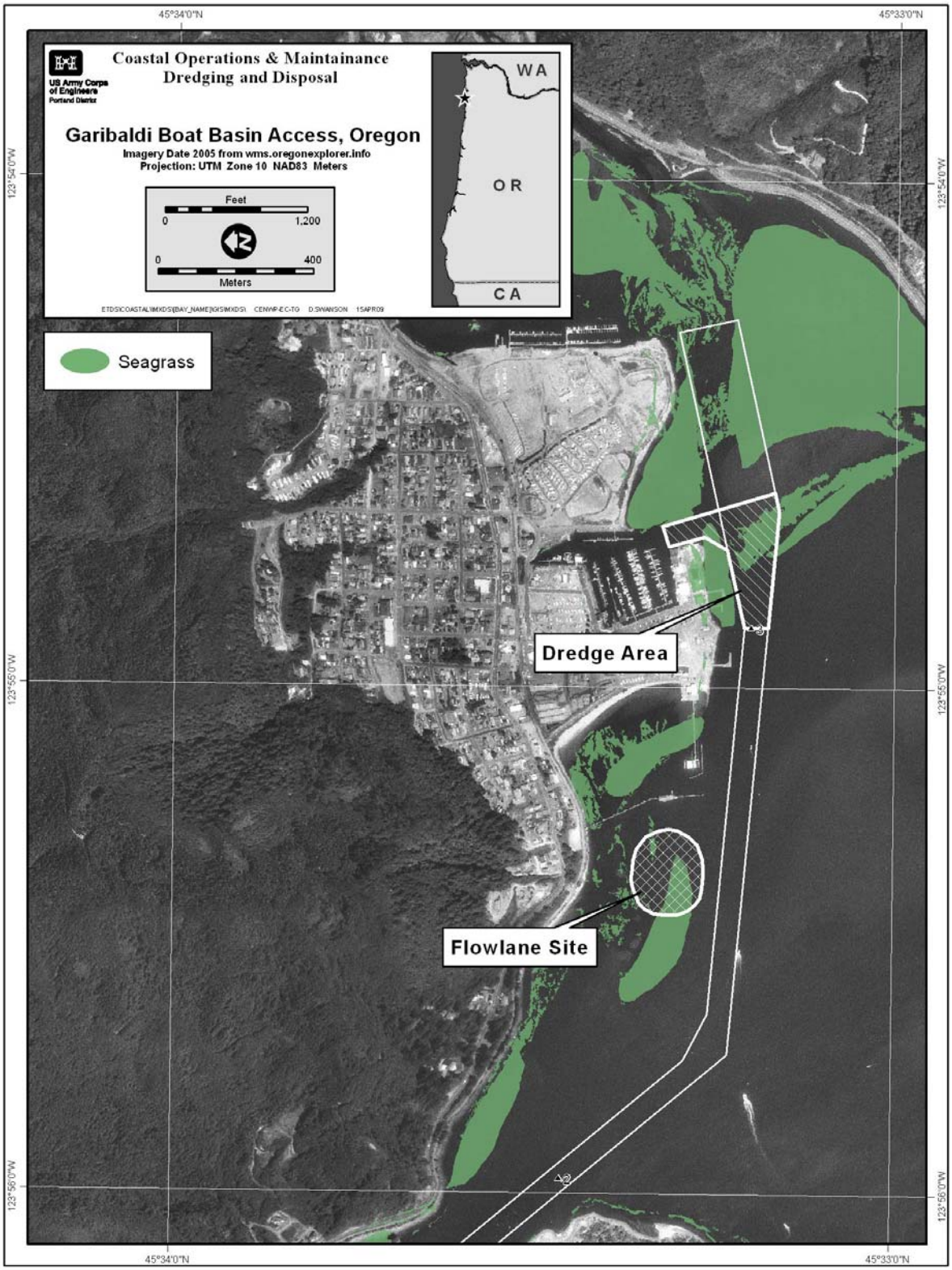
Tillamook Bay

The action area for dredging includes the boat basin access channel plus a 200-foot area (due to presence of fine-grained sediment) on each side of and downstream (or down current) of the dredging activity to account for potential turbidity, as well as the entire turning basin. The boat basin access channel is 1,500 feet long by 100 feet wide, with a footprint of approximately 3.4 acres.

This disposal area is at RM 2.5 and is within the flow-lane on the north of the navigation channel, and ranges in depth from approximately 10 to 20 feet. No specific boundaries were provided in the BA, but based on the figures provided by the Corps (Figure 1), the area appears

to be approximately 800 feet long by 600 feet wide, with a footprint of approximately 11 acres. The action area includes the geographic area of the flow-lane disposal area plus an area outside of the area meant to describe the extent of turbidity drift, as well as the water column from the water surface to the estuary floor. The NMFS is reasonably certain the drift will exceed the Corps' predicted 200 feet and is more likely to extend as much as 500 feet outside the flow-lane disposal area boundary based on river flows and tidal action. The disposal action area then is combined with the 500-foot area on each side of the placement activity for a total maximum of approximately 32.8 acres (1300 feet long by 1100 feet wide).

Figure 1. Garibaldi Boat Basin Access Channel at Tillamook Bay, Oregon.

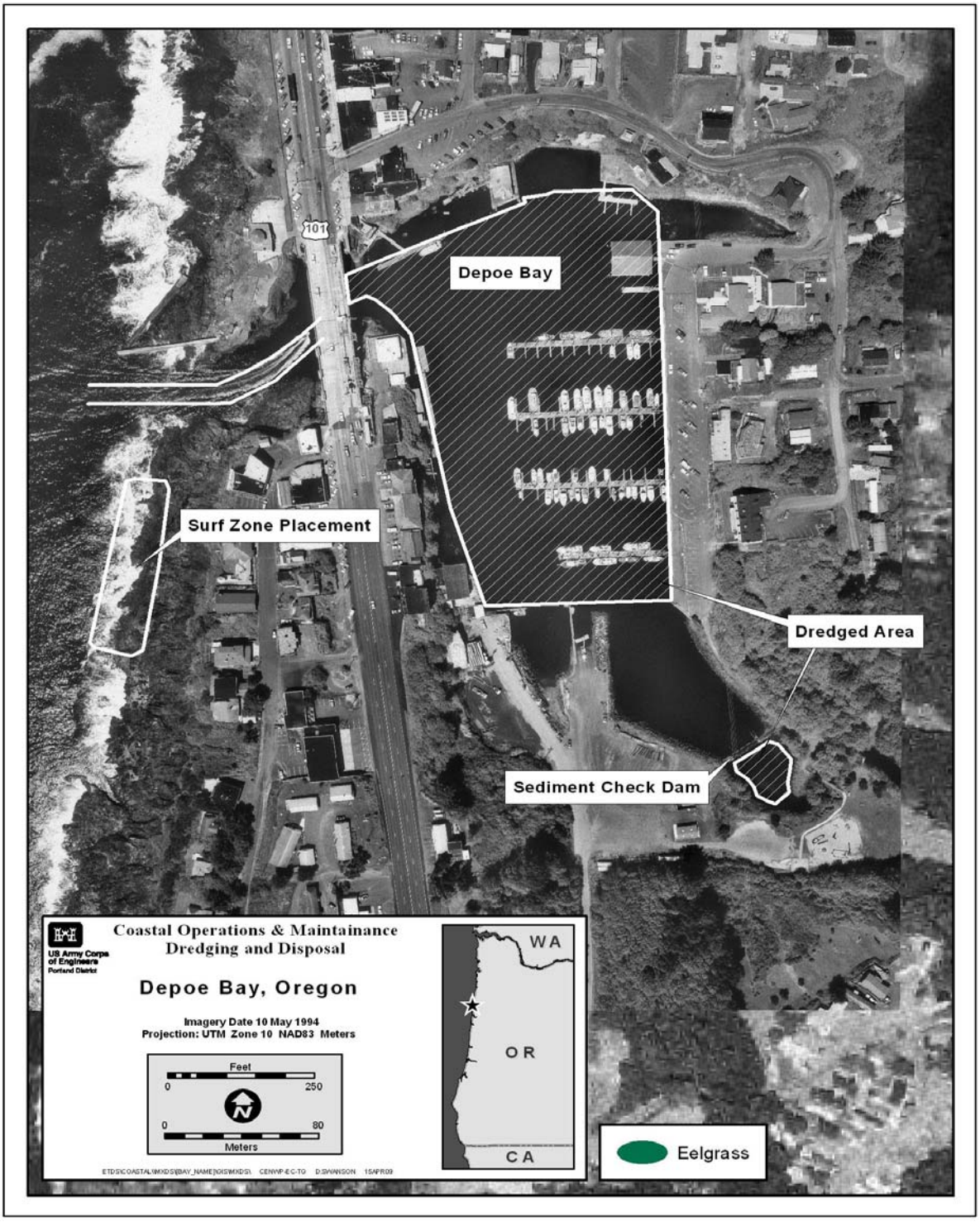


Depoe Bay

The action area for Depoe Bay occupies nearly the entirety of the bay plus a 200-foot margin into the entrance channel where suspended sediments could be carried with currents and tidal action. The boat basin is approximately 750 feet long by 390 feet wide with a maximum project footprint of approximately 6.7 acres. The dredging area on South Depoe Bay Creek (100-foot by 100-foot – approximately 0.24 acres) is within the catch basin behind the dam and is approximately 100 feet long by 100 feet wide, with a footprint of approximately 0.24 acres.

The surf zone disposal site is approximately 300 feet long and 100 feet wide. The action area includes the intertidal rocky area and could extend up to 200 feet offshore to account for turbidity drift, depending on currents and tides, accounting for approximately 0.7 acres of intertidal rocky habitat, with an additional 3.2 acres in the nearshore (surf zone) ocean.

Figure 2. Boat Basin, Sediment Check Dam, and Surf Zone Disposal Location at Depoe Bay, Oregon



Yaquina Bay and River

The action area for dredging the entrance and navigation channel is the channel itself plus a 100-foot area on each side of and downstream (or down current) of the dredging activity (Figure 3). The action area for the boat basin access channel and the channel accessing Depot Slough is the width of the slough plus 100 to 200 feet upstream/downstream (due to finer grain sediments) depending on the flow/tide currents (Figures 4 and 5). The entrance channel is authorized at 400 feet wide and 40 feet deep and runs from deep water at RM -1 to RM 0 (1 mile). From RM 0, the authorized channel is 30 feet deep and 300 feet wide to the turning basin at McClean Point (RM 2+20) (2.4 miles). From the turning basin (RM 2+20) to RM 4+20 the navigation channel is maintained to –18 feet MLLW and is 200 feet wide. The total footprint of the navigation entrance to RM 4+20, including the turning basin, is 217.5 acre; the South Beach Marina access channel covers approximately an additional 4.6 acres. The channel into Depot Slough is approximately 1,800 feet long and 200 feet wide (approximately 8.3 acres).

The two ODMDS are each approximately 597 acres (4,000 feet wide by 6,500 feet long), with a depth ranging from 112 to 152 feet. The action area includes the geographic area of the ocean disposal areas (Figure 3) plus an area outside of the area meant to describe the extent of turbidity drift, as well as the water column from the water surface to the ocean floor. The NMFS is reasonably certain the drift will exceed the Corps' predicted 200 feet and is more likely to extend as much as 500 feet outside the disposal area boundary. The disposal action area then is combined with the 500-foot area on each side of the placement activity for a total of approximately 861 acres (5,000 feet wide by 7,500 feet long).

Figure 3. Entrance Channel and ODMDSs at Yaquina Bay, Oregon.

Figure 4. Yaquina River Navigation Channel and Depot Slough, Oregon

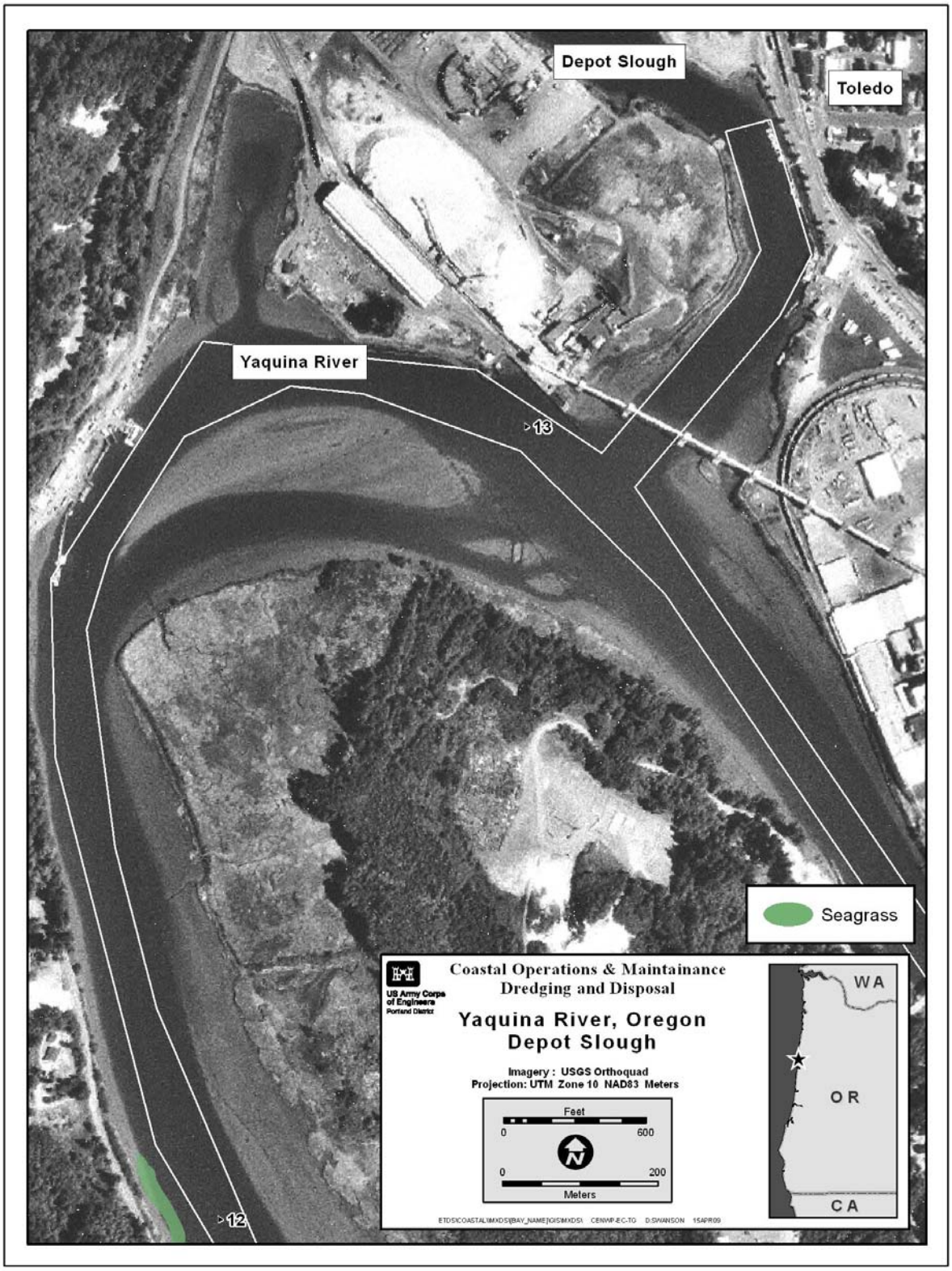
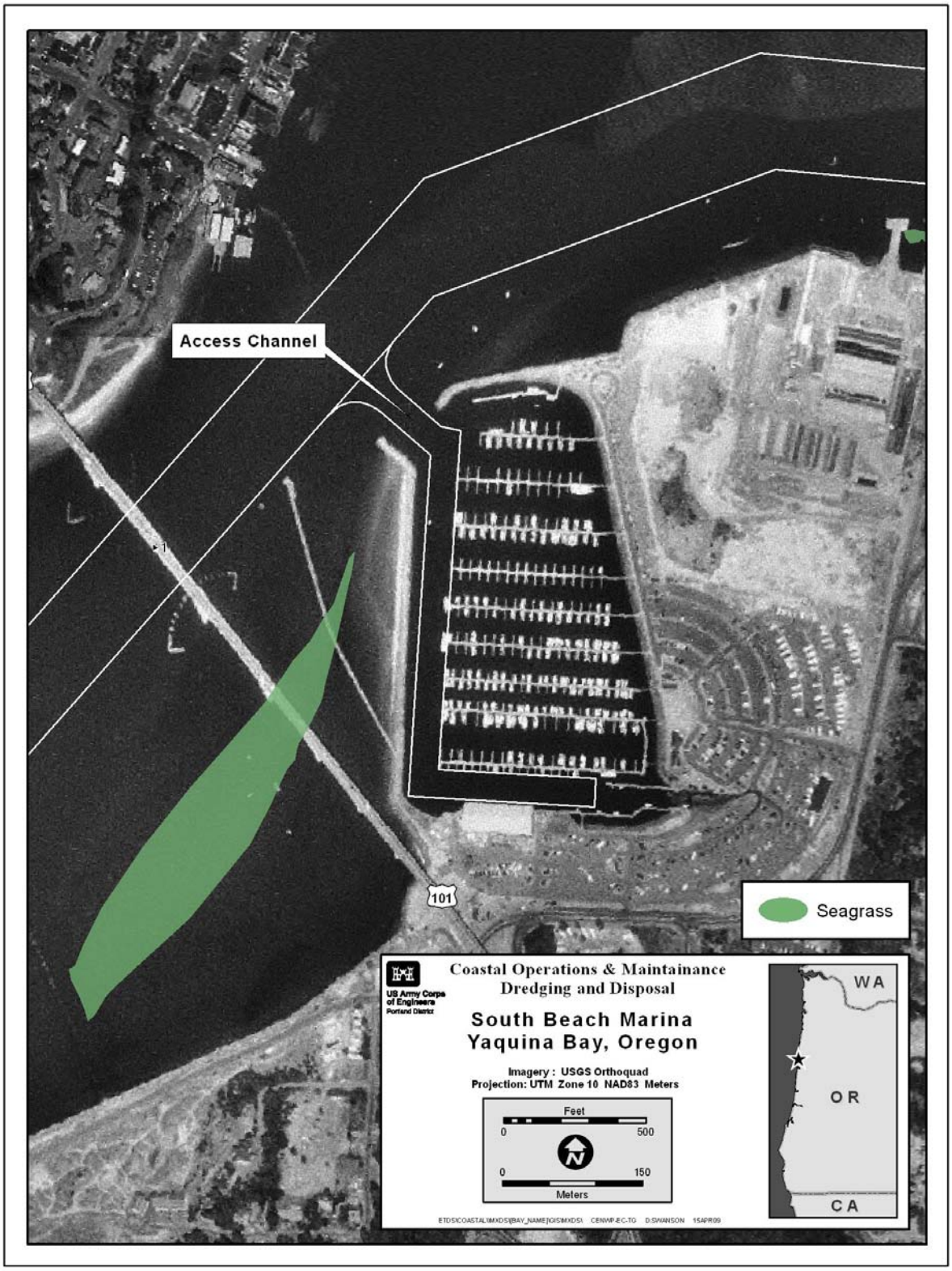


Figure 5. South Beach Marina Access Channel at Yaquina Bay, Oregon.



Siuslaw River

The action area includes the entrance and navigation channels within the channel itself plus a 100-foot area on each side of and downstream (or down current) of the dredging activity (Figure 6). The entrance channel is authorized at 300 feet wide and 18 feet deep and runs from RM -1 to RM 0.2. From RM 0.2 to RM 5.0, the authorized channel is 16 feet deep and 200 feet wide to the turning basin at the dock at Florence. The total footprint of the navigation channel from the entrance to RM 5 is 160 acres.

The ODMDS B is approximately 138 acres (3,000 feet long by 2,000 feet wide) and ODMDS C is approximately 69 acres (3,000 feet long by. 1,000 feet wide). The NMFS is reasonably certain the drift will exceed the Corps' predicted 200 feet and is more likely to extend as much as 500 feet outside the disposal area boundary. The disposal action area then is combined with the 500-foot area on each side of the placement activity for a total of approximately 275 acres (Site B) and 184 acres (Site C).

Figure 6. Navigation Channel and ODMDSs at Siuslaw River, Oregon

Umpqua River

The action area includes the entire navigation channel from the entrance to RM 11.9 and includes the Winchester Boat Basin Access Channel, plus a 100-foot area (within the navigation channel) or a 200-foot area (Winchester Bay Boat Basin Access Channel) on each side of and downstream (or down current) of the dredging activity to account for potential turbidity during dredging (Figure 7). The entrance channel is 400 feet wide and 31 feet deep and runs from RM -1 to RM 0-10 (0.8 mile), with a maximum project footprint of approximately 38.8 acres. The navigation channel through Winchester Bay is 200 feet wide and 24 feet deep from RM 0-10 to RM 11+40 (11.9 miles), with a maximum project footprint of approximately 288.5 acres. The two boat basin access channels total approximately 20.2 acres (Figure 8).

The in-bay disposal site is within the flow-lane, on the north side of the navigation channel at approximately RM 1. The site is approximately 1,000 feet long and approximately 450 feet wide, with a project footprint of approximately 10.3 acres, and ranges in depth from approximately -35 to -75 feet in depth. The NMFS is reasonably certain the drift will exceed the Corps' predicted 200 feet and is more likely to reach 500 feet outside each in-bay disposal site boundary. The in-bay disposal action area then is combined with the 500-foot area on each side of the placement activity for a total of approximately 32.7 acres (1,500 feet long by 950 feet wide).

Each of the ODMD sites occupies approximately 533 acres (5,800 feet wide by 4,000 feet long) with depth ranging from approximately 30 to 130 feet. The action area includes this geographic area contained within the rectangular area (Figure 8) plus an area outside of the area meant to describe the extent of turbidity drift, as well as the water column from the ocean surface to the ocean floor. The NMFS is reasonably certain the drift will exceed the Corps' predicted 200 feet and is more likely to reach 500 feet outside each ODMDS' boundary. The action area then is the combined total area for each disposal site plus the additional area affected by the turbidity drift (781 acres). Thus, the total action area is 1,562 acres outside the mouth of the Umpqua River at the two sites.

Figure 7. Entrance Channel and ODMDSs at Umpqua River, Oregon

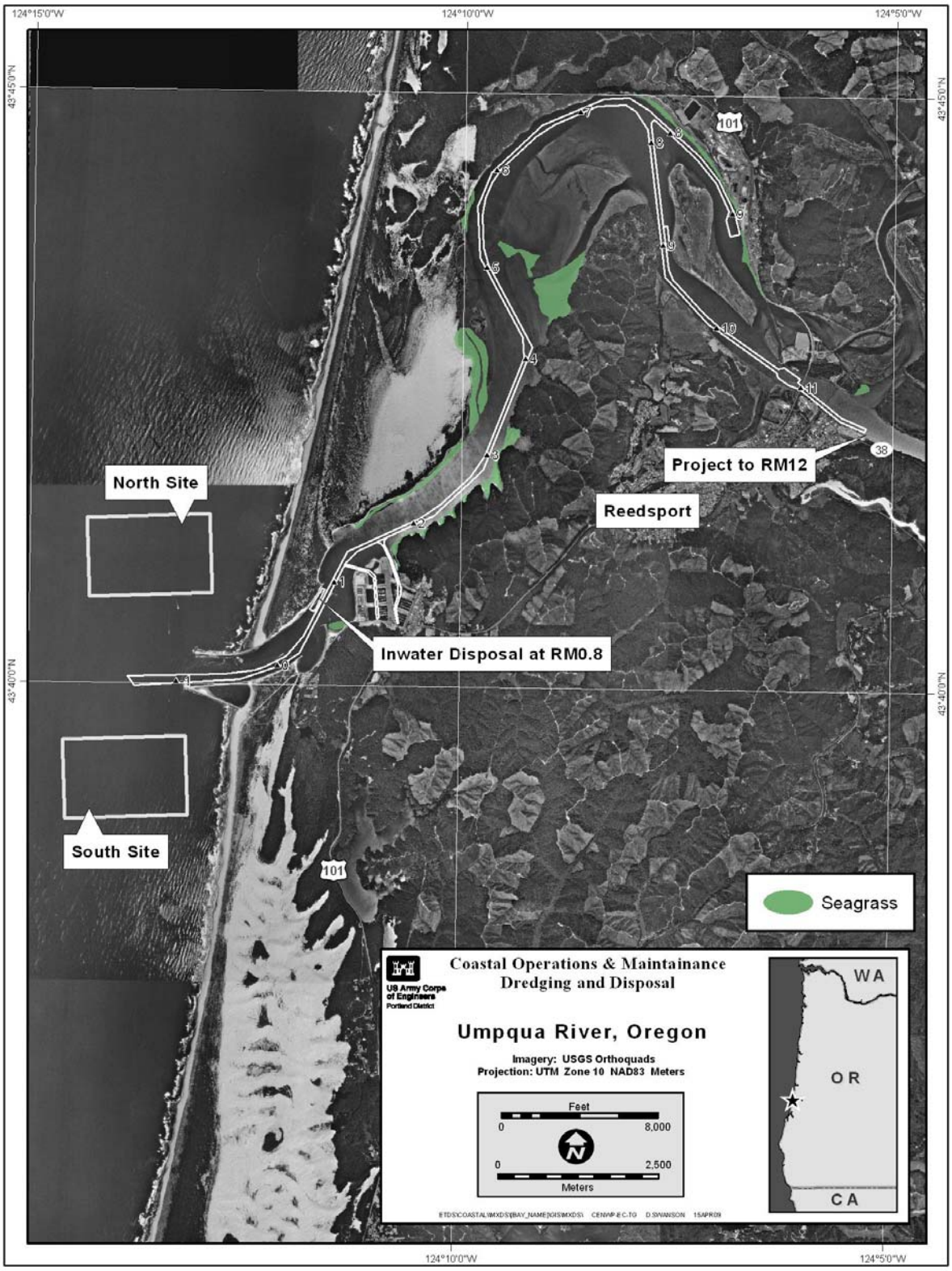


Figure 8. Boat Basin Access Channels at Winchester Bay, Umpqua River, Oregon

Coos Bay

The action area includes the entire navigation channel from the entrance to RM 15 and the Charleston access channel. Within RMs 1 - 12, the action area includes dredging up to 50 feet outside the channel in locations where there is a historical problem with infill. The action area likely extends approximately 100 feet on each side of and downstream of the dredging activity for dredging the entrance, RMs 1 – 12, and the Charleston access channel. However, the action area likely extends as much as 200 feet on each side of and downstream of the dredging activity for dredging RM 12 – 15 due to the presence of finer grained material.

The entrance channel is 700 feet wide at RM -1, tapering through the jetties to 300 feet wide at RM 1, and dredged to -52 feet, with a project footprint of approximately 121.2 acres. However, advanced maintenance will extend as much as 50 feet outside the channel at locations where in-fill has been a problem, expanding the maximum entrance channel footprint to approximately 133.3 acres. The navigation channel through Coos Bay is 300 feet wide from RM 1 to RM 9 and widens to 400 feet from RM 9 to RM 15; the channel is -37 feet in depth and covers a total of approximately 582 acres (Figure 10). The Charleston boat basin access channel is approximately 6,500 feet long and 150 feet wide, covering approximately 22.3 acres (Figure 9).

Coos Bay has multiple in-water disposal locations, including ocean and in-bay sites. The ODMDS E is approximately 116 acres (3,600 feet long by 1,400 feet wide), ODMDS H is approximately 120 acres (3,600 feet long by 1,450 feet wide), and ODMDS F is approximately 3,075 acres (trapezoidal: 14,600 feet long and 8,000 feet to 9,650 feet wide). Estuarine sites include, Site G is approximately 4.6 acres (1,000 feet long by 200 feet wide), at approximately RM 1 on the south side the channel, with a depth ranging from 40 to 45 feet deep; Site 8.4 is approximately 17 acres (3,500 feet long by 300 feet wide), on the south side of the channel, with a depth ranging from 30 to 35 feet.

For each of the in-water disposal sites, the action area includes the geographic area contained within the rectangular (or trapezoidal) area (Figure 10) plus an area outside of the area meant to describe the extent of turbidity drift, as well as the water column from the ocean surface to the ocean floor. The NMFS is reasonably certain the drift will exceed the EPAs predicted 200 feet and is more likely to reach 500 feet outside each of the in-water (both in-bay and ODMDS') boundaries. The action area then is combined with the 500-foot area on each side of the placement activity for a total of approximately 253 acres (4,600 feet long by 2,400 feet wide) at ODMDS E, 259 acres (4,600 feet long by 2,450 feet wide) at Site H, and 3,340 acres (trapezoidal: 15,600 feet long and 8,500 feet to 10,150 feet wide) at Site F, and totals 3,852 acres outside the mouth of Coos Bay. The action area combined with the 500-foot area on each side of the placement area for in-bay disposal accounts to 55 acres (2,000 feet long by 1,200 feet wide) at Site G and 134 acres (4,500 feet long by 1,300 feet wide) at Site 8.4.

Figure 9. Navigation Channel and In-Bay Disposal Site 8.4 at Coos Bay, Oregon

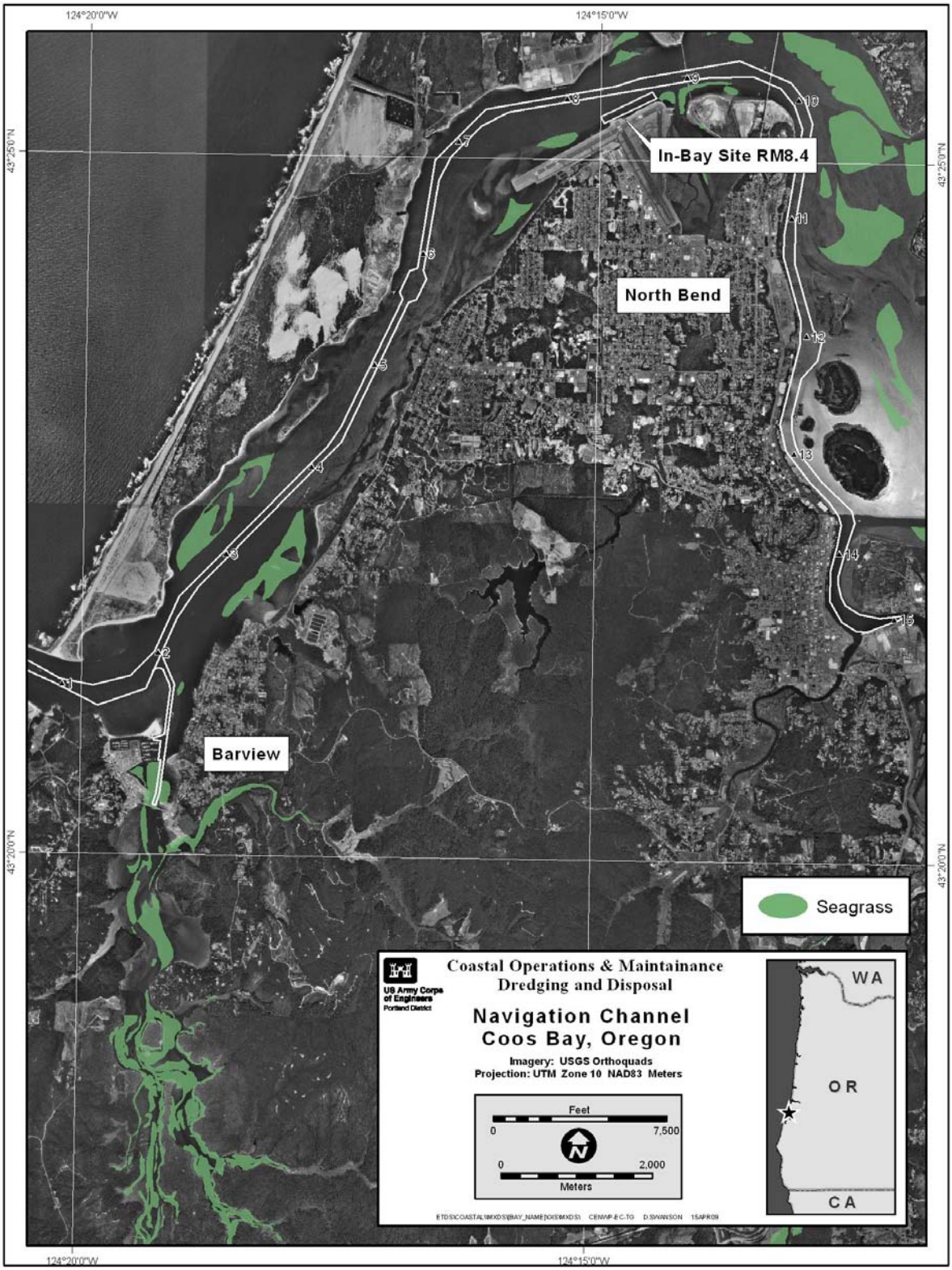
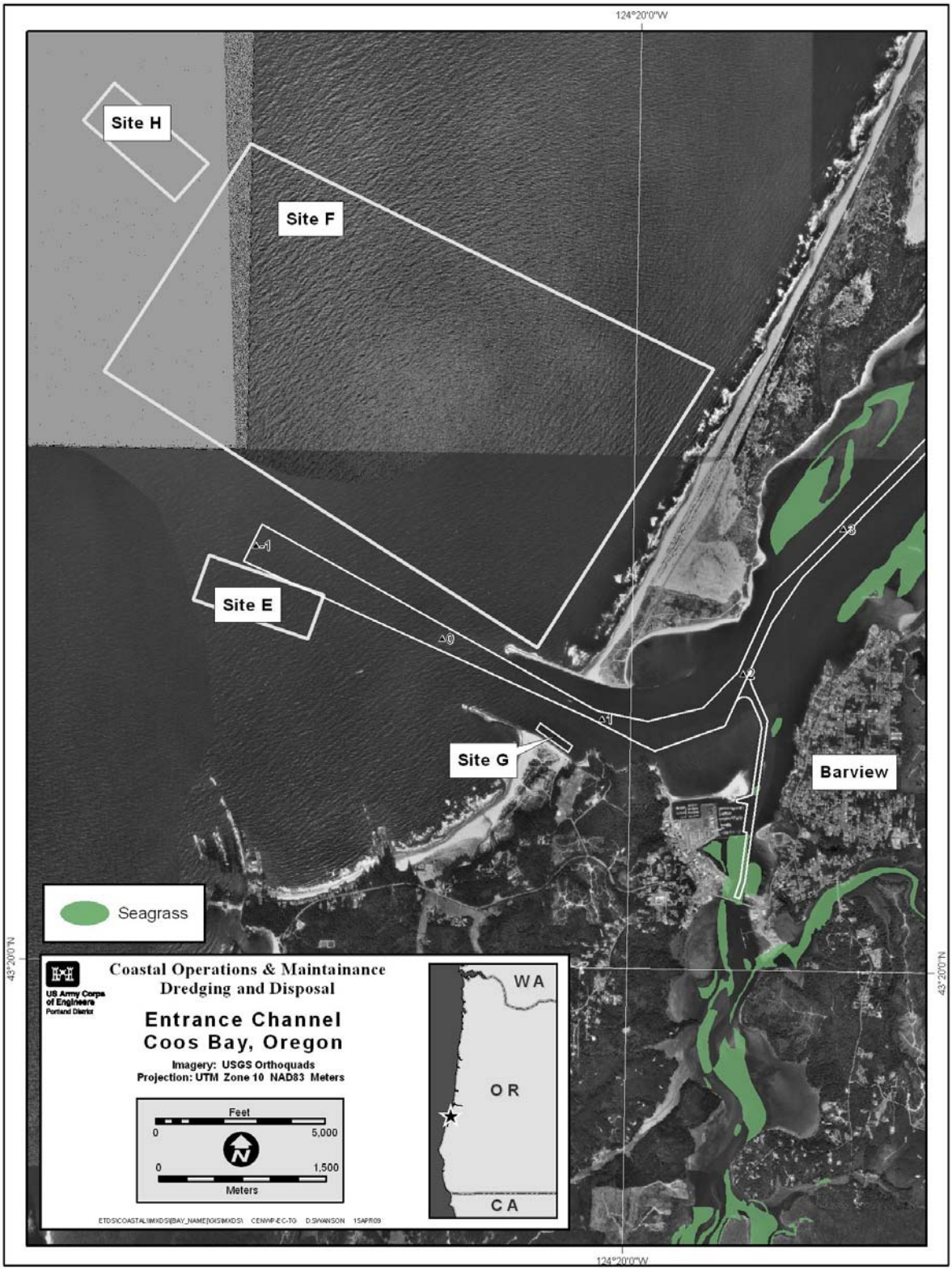


Figure 10. Entrance Channel and ODMDS locations at Coos Bay, Oregon.



Coquille River

The action area includes the entire navigation channel and the boat basin access channel plus a 100-foot area on each side of and downstream (or down current) of the main navigation channel and a 200-foot area on each side of and downstream (or down current) of the boat basin access channel (dues to finer grained sediments) during dredging activity. The entrance channel is authorized to be “of suitable width” (approximately 250 feet wide) from RM 0-20 to RM 1+15 (1.7 miles) and covers approximately 51.5 acres (Figure 12). The Bandon boat basin access channel is approximately 6,500 feet long and 150 feet wide, covering approximately 22.3 acres.

Material is occasionally disposed of at a flow-lane disposal site at approximately RM 1 Figure 11). This disposal is entirely within the navigation channel and occupies approximately 1.4 acres of the channel. The NMFS is reasonably certain the drift will exceed the Corps’ predicted 200 feet and is more likely to extend as much as 500 feet outside the flow-lane disposal area boundary based on river flows, tidal action, and ocean condition. The disposal action area then is combined with the 500-foot area on each side of the placement activity for a total maximum of approximately 12.9 acres (750 feet long by 750 feet wide).

The single ODMDS off the mouth of the Coquille River is approximately 141 acres (3,500 feet long by 1,750 feet wide), with an average depth of 60 feet. The action area includes the geographic area of the ocean disposal areas (Figure 12) plus an area outside of the area meant to describe the extent of turbidity drift, as well as the water column from the water surface to the ocean floor. The NMFS is reasonably certain the drift will exceed the Corps’ predicted 200 feet and is more likely to extend as much as 500 feet outside the disposal area boundary. The disposal action area then is combined with the 500-foot area on each side of the placement activity for a total of approximately 284 acres (4,500 feet long by 2,750 feet wide).

Figure 11. Entrance Channel and ODMDS at Coquille River, Oregon.

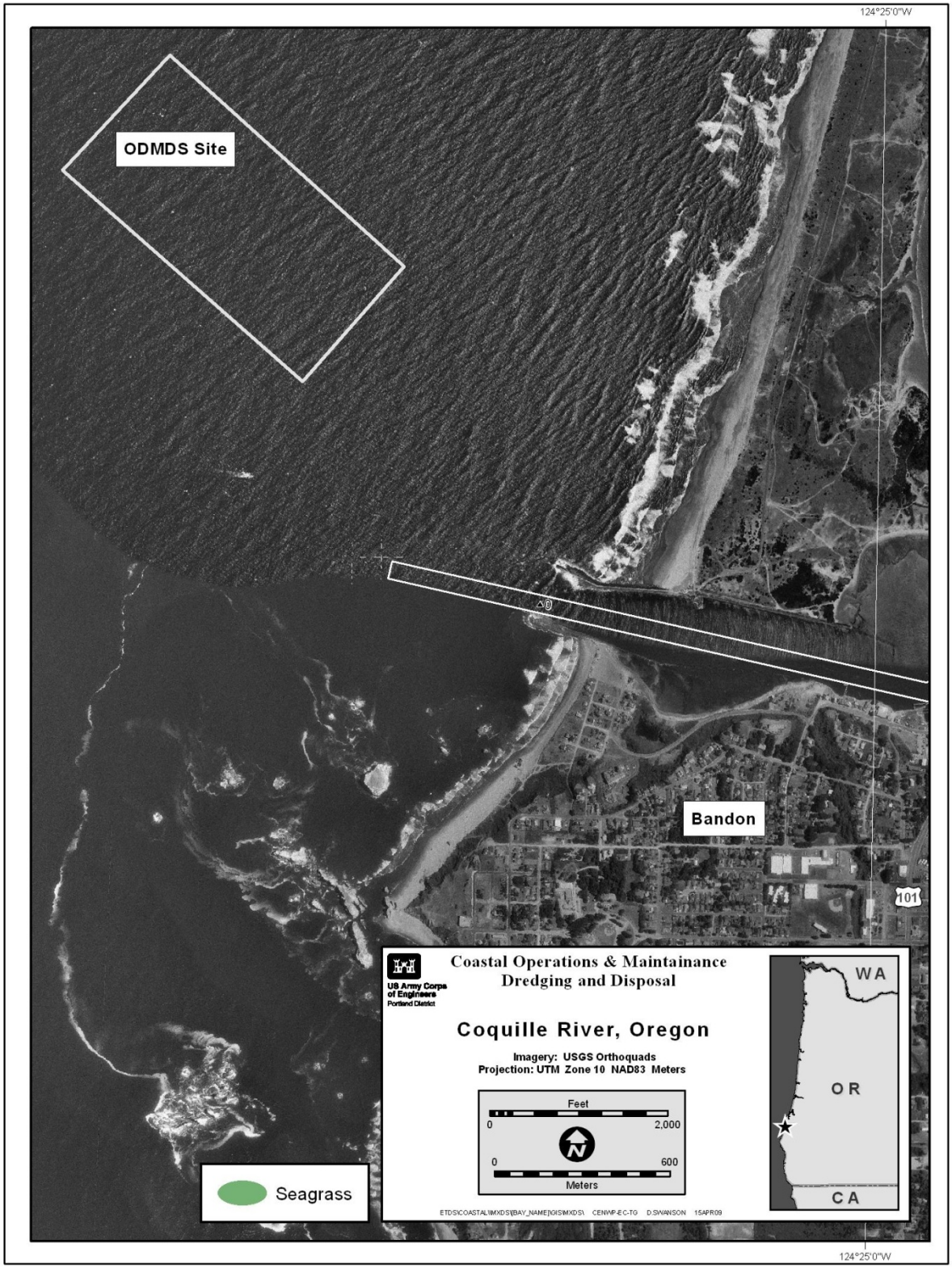


Figure 12. Navigation Channel and Boat Basin Access Channel at Coquille River, Oregon.

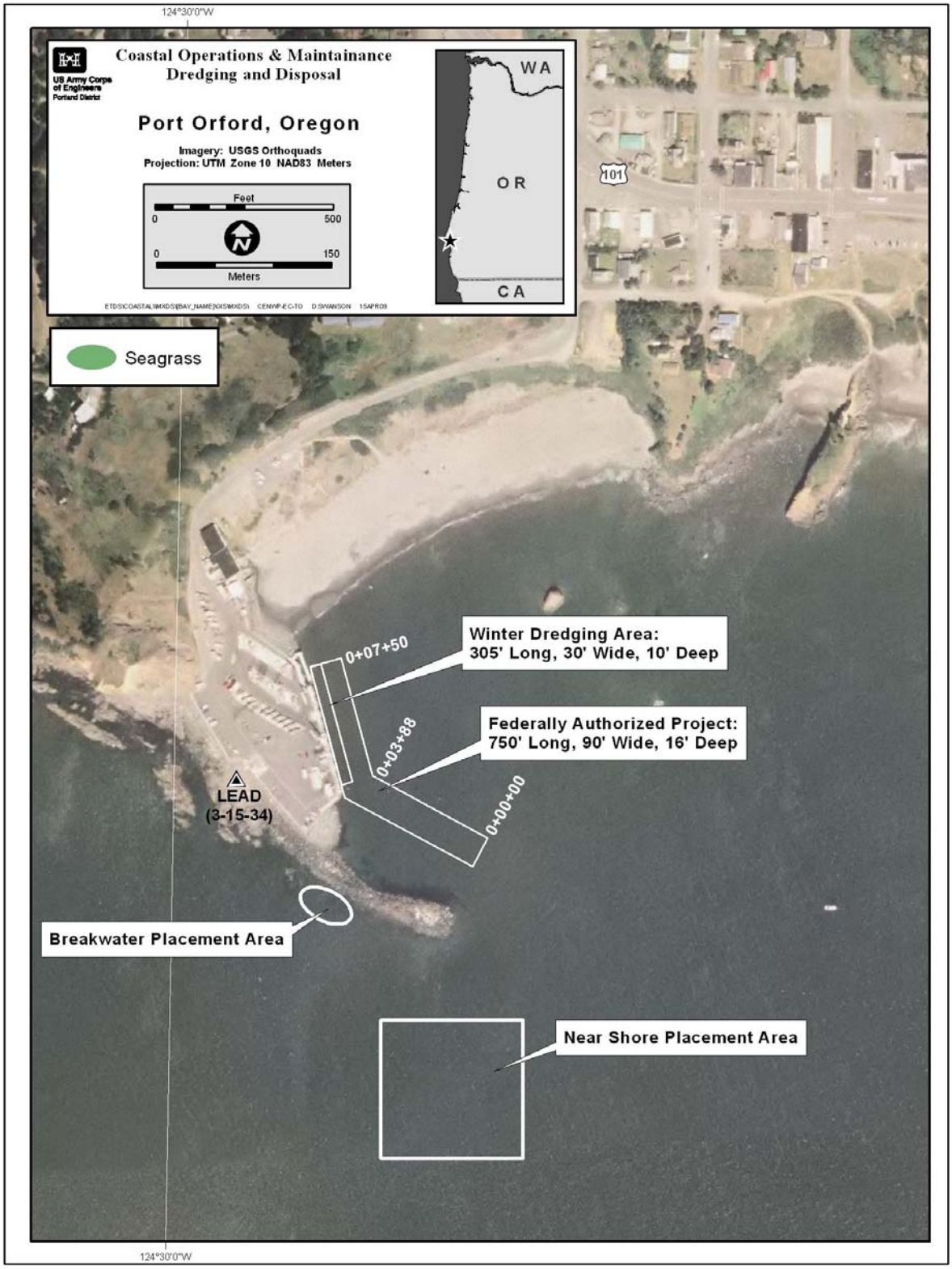
Port Orford

The action area includes the navigation channel and the area along the dock near the boat hoist, and two disposal sites in the Pacific Ocean at Port Orford (Figure 13). The navigation channel is approximately 750 feet long, and averages 90 feet wide, and is dredged to a depth of 16 feet, plus four feet advanced maintenance, for a total dredging depth of -20 feet. The dredged area along the dock near the boat hoist is approximately 305 feet long and 30 feet wide, and is authorized to a depth of -16 feet plus four feet of advanced maintenance for a total of dredge depth of -20 feet. An additional overdepth of three feet may result in disturbance to sediments up to -23 feet in depth. The entire dredging footprint occupies a total of 1.75 acres.

Two disposal areas are used at the Port Orford project. The breakwater placement site approximately 300 feet south of “Station LEAD,” where sediments are disposed through a discharge pipe situated approximately 10 feet above the water surface. There is no defined boundary for the disposal site. The NMFS is reasonably certain turbidity and fine-grained suspended sediments will extend out of this area and into the surrounding ocean due to wave action. This turbidity drift is likely to extend the action area as much as 500 feet outside the discharge area. The action area for the breakwater placement site then occupies approximately 5.7 acres (500 feet long by 500 feet wide).

The nearshore disposal site is about 200 feet south of the constructed breakwater and is approximately 400 feet square, with a footprint of approximately 3.7 acres. The NMFS is reasonably certain that turbidity and fine-grained suspended sediments will extend out of this area and into the surrounding ocean due to ocean currents, and wave and tidal action. This turbidity drift is likely to extend the action area as much as 500 feet outside the nearshore disposal area. The action area for the nearshore disposal area then occupies approximately 18.6 acres (900 feet long by 900 feet wide).

Figure 13. Dredging and Disposal Areas at Port Orford, Oregon.



Rogue River

The action area includes the entire navigation channel and the boat basin access channel plus a 100-foot area on each side of and downstream (or down current) of the main navigation channel and a 200-foot area on each side of and downstream (or down current) of the boat basin access channel (due to presence of finer-grained sediments) during dredging activity. The entrance is maintained from RM -1 to RM 0+28 (1.1 mile) and is dredged to -17 feet MLLW, including four feet of advanced maintenance, and has a project footprint of approximately 40 acres (Figure 14). An additional three feet of overdepth may be disturbed during dredging operations for a total depth of 21 feet MLLW.

The surf zone disposal area is on the beach directly south of the south jetty. This area is approximately 600 feet long and 200 feet wide, occupying approximately 2.8 acres of intertidal beach habitat (Figure 15). The NMFS is reasonably certain turbidity and fine-grained suspended sediments will extend out of this area and into the surrounding ocean due to wave action. This turbidity drift is likely to extend the action area as much as 500 feet outside the disposal boundary. The combined action area then occupies approximately 17.7 acres (1,100 feet long by 700 feet wide).

The newly designated ODMDS outside the mouth of the Rogue River is approximately 116 acres (3,600 feet long by 1,400 feet wide) with depth ranging from approximately 50 to 90 feet. The action area includes this geographic area contained within the rectangular area (Figure 15) plus an area outside of the area meant to describe the extent of turbidity drift, as well as the water column from the ocean surface to the ocean floor. The NMFS is reasonably certain the drift will exceed the Corps' predicted 200 feet and is more likely to extend as much as 500 feet outside the disposal area boundary. The disposal action area then is combined with the 500-foot area on each side of the placement activity for a total of approximately 253 acres (4,600 feet long by 2,400 feet wide).

Figure 14. Entrance Channel and ODMDS at Rogue River, Oregon.

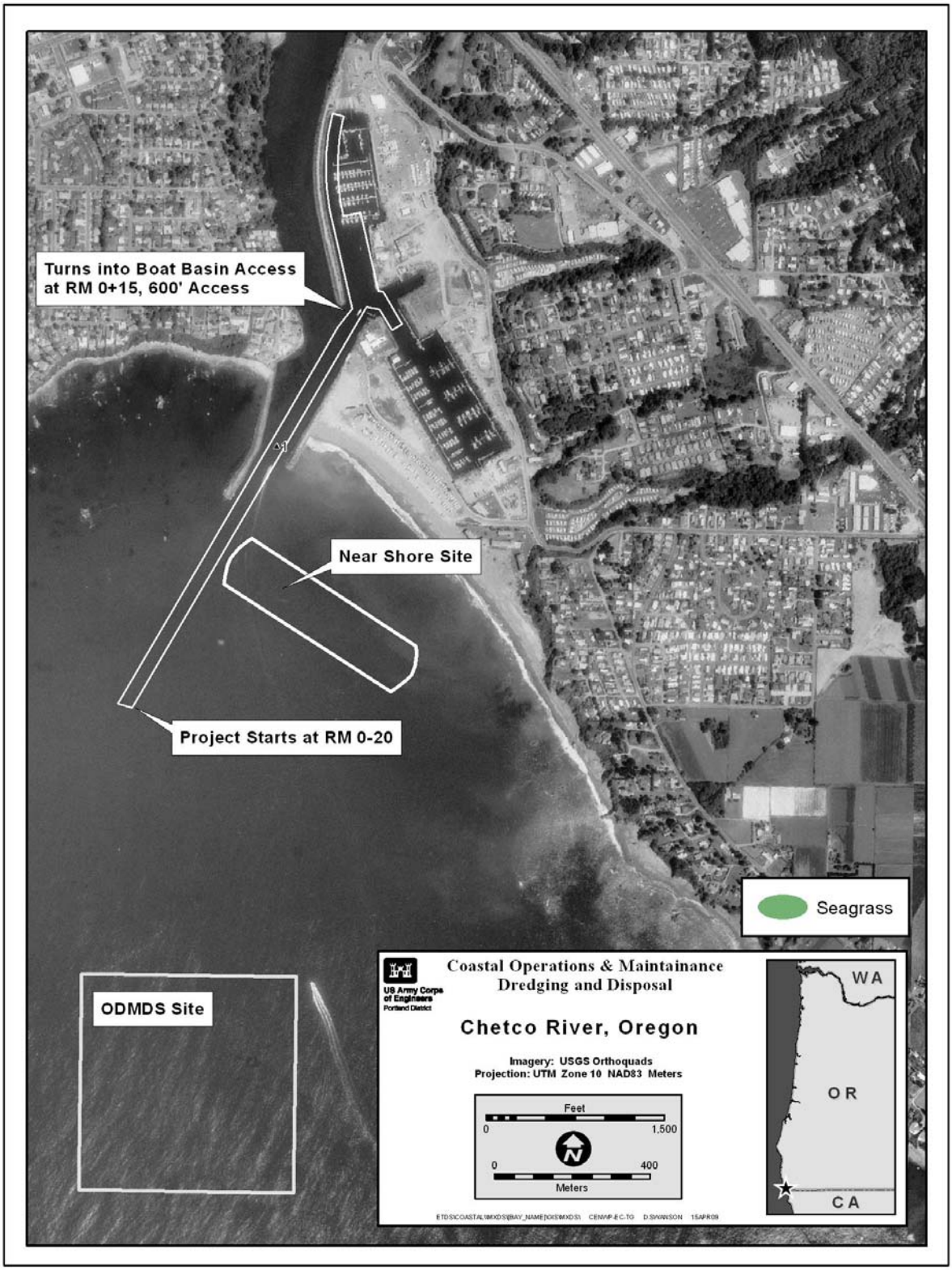
Figure 15. Entrance Channel and Boat Basin Access Channel at Rogue River, Oregon

Chetco River

The action area includes the entire navigation channel and the boat basin access channel plus a 100-foot area on each side of and downstream (or down current) of the main navigation channel and a 200-foot area on each side of and downstream (or down current) of the boat basin access channel (dues to finer grained sediments) during dredging activity. The navigation channel at the entrance of the Chetco River runs from RM 0-20 to RM 0+30 (0.9 mile), occupying approximately 13.1 acres (Figure 16). The Brookings-Harbor commercial boat basin access channel runs approximately 600 feet from RM 0+15 (Chetco River) to the south boat basin, and combined with the turning basin, occupy approximately 5.1 acres.

There are two ocean disposal sites at the Chetco River project. The nearshore disposal site is approximately 1,750 feet long by 750 feet wide covering approximately 30.2 acres is the site typically chosen for ocean disposal (Figure 16). The ODMDS at the Chetco River is approximately 141 acres (3,500 feet long by 1,750 feet wide), with an average depth of 60 feet. The action area includes the geographic area of these ocean disposal areas (Figure 16) plus an area outside of the area meant to describe the extent of turbidity drift, as well as the water column from the water surface to the ocean floor. The NMFS is reasonably certain the drift will exceed the Corps' predicted 200 feet and is more likely to extend as much as 500 feet outside the disposal area boundary. The disposal action area then is combined with the 500-foot area on each side of the placement activity for a total of approximately 50.2 acres (2,250 feet long by 1,250) at the near shore site and 284 acres (4,500 feet long by 2,750 feet wide) at the ODMDS.

Figure 16. Entrance Channel, Boat Basin Access Channel, and Ocean Disposal Sites at Chetco River, Oregon



ENDANGERED SPECIES ACT

Section 7(a)(2) of the ESA requires Federal agencies to consult with NMFS to ensure that their actions are not likely to jeopardize the continued existence of endangered or threatened species, or adversely modify or destroy their designated critical habitat. The Opinion that follows records the results of the interagency consultation for this proposed action. An incidental take statement is provided after the Opinion that specifies the impact of any taking of threatened or endangered species that will be incidental to the proposed action, reasonable and prudent measures that NMFS considers necessary and appropriate to minimize such impact, and nondiscretionary terms and conditions (including, but not limited to, reporting requirements) that must be complied with by the Federal agency and applicant (if any) to carry out the reasonable and prudent measures.

Biological Opinion

This Opinion presents NMFS' review of the status of each listed species[3] considered in this consultation, the condition of designated critical habitat, the environmental baseline for the action area, all the effects of the action as proposed, and cumulative effects (50 CFR 402.14(g)). For the jeopardy analysis, NMFS analyzes those combined factors to conclude whether the proposed action is likely to appreciably reduce the likelihood of both the survival and recovery of the affected listed species.

The regulatory definition of "destruction or adverse modification" at 50 CFR 402.02 was not used for the critical habitat analysis in this Opinion. Instead, NMFS relied on statutory provisions of the ESA, including those in section 3 that define "critical habitat" and "conservation," in section 4 that describe the designation process, and in section 7 that sets forth the substantive protections and procedural aspects of consultation, and on agency guidance for application of the destruction or adverse modification standard.[4] Following these guides, NMFS considered the status of the entire designated area of the critical habitat considered in this consultation, the environmental baseline in the action area, the likely effects of the action on the function and conservation role of the affected critical habitat, and cumulative effects. The NMFS used that assessment to determine whether, with implementation of the proposed action, critical habitat would remain functional, or retain the current ability for the primary constituent elements (PCEs) to become functionally established, to serve the intended conservation role for the species.[5]

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[3] An "evolutionarily significant unit" (ESU) of Pacific salmon (Waples 1991) and a "distinct population segment" (DPS) of southern green sturgeon (71 FR 1757; April 7, 2006) are all "species" as defined in section 3 of the ESA.

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

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

Status of the Species and Critical Habitat

The summaries that follow describe the status of the ESA-listed species, and their designated critical habitats, that occur within the geographic area of this proposed action and are considered in this Opinion. Information presented in these summaries is based on information presented in a large body of scientific publications and reports, and is the basis for the analyses we present in the Effects of the Action section of this Opinion. More detailed information on the status and trends of these listed resources, and their biology and ecology, can be found in the listing regulations and critical habitat designations published in the Federal Register (Table 6) and in many publications available from the NMFS Northwest Region, Protected Resources Division, Portland, Oregon.

The status of species and critical habitat sections below are organized into two recovery domains to better integrate recovery planning information that NMFS is developing on the conservation status of the species and critical habitats considered in this consultation (Table 7). Recovery domains are the geographically-based areas that NMFS is using to prepare multi-species recovery plans. The southern green sturgeon are under the jurisdiction of NMFS' Southwest Region which has not yet convened a recovery team for this species.

Table 7. Recovery planning domains identified by NMFS and their ESA-listed coho salmon.

Recovery Domain	Species
Oregon Coast	OC coho salmon
	southern green sturgeon
Southern Oregon Northern California Coasts	SONCC coho salmon
	southern green sturgeon

For each recovery domain, a technical review team (TRT) appointed by NMFS has developed, or is developing, criteria necessary to identify independent populations within each species, recommend viability criteria for that species, and analyze factors that limit species survival. The definition of a population used by each TRT to analyze salmon and steelhead is set forth in the "viable salmonid population" (VSP) document prepared by NMFS for use in conservation assessments of Pacific salmon and steelhead (McElhany *et al.* 2000). The boundaries of each population are defined using a combination of genetic information, geography, life-history traits, morphological traits, and population dynamics that indicate the extent of reproductive isolation among spawning groups.

Understanding population size and spatial extent is critical for the viability analyses, and a necessary step in recovery planning and conservation assessments for any species. If a species consists of multiple populations, the overall viability of that species is a function of the VSP attributes of its constituent populations. Until a viability analysis of a species is completed, the VSP guidelines recommend that all populations should be managed to retain the potential to achieve viable status to ensure a rapid start along the road to recovery, and that no significant parts of the species are lost before the full recovery plan is implemented (McElhany *et al.* 2000).

The status of critical habitat was based primarily on a watershed-level analysis of conservation value that focused on the presence of listed ESA-listed salmon and steelhead and the biological and physical features (*i.e.*, the PCEs) that are essential to their conservation. This analysis for the 2005 designations was completed by Critical Habitat Analytical Review Teams that focused on large geographical areas corresponding approximately to recovery domains (NOAA Fisheries 2005). Each watershed was ranked using a conservation value attributed to the quantity of stream habitat with PCEs, the present condition of those PCEs, the likelihood of achieving PCE potential (either naturally or through active restoration), support for rare or important genetic or life history characteristics, support for abundant populations, and support for spawning and rearing populations. In some cases, our understanding of these interim conservation values has been further refined by the work of TRTs and other recovery planning efforts that have better explained the habitat attributes, ecological interactions, and population characteristics important to each species.

Status of the Species. Natural variations in freshwater and marine environments have substantial effects on the abundance of salmon and green sturgeon populations. Of the various natural phenomena that affect most populations of salmonids, changes in ocean productivity are generally considered the most important. Salmon are exposed to high rates of natural predation, particularly during freshwater rearing and migration stages. Ocean predation probably contributes to significant natural mortality, although the levels of predation are largely unknown. In general, salmon and steelhead are eaten by pelagic fishes, birds, and marine mammals.

Over the past few decades, the size and distribution of the salmon populations considered in this Opinion, like the other salmon and steelhead that NMFS has listed, generally have declined because of natural phenomena and human activity, including the operation of hydropower systems, over-harvest, hatcheries, and habitat degradation. Enlarged populations of Caspian terns, seals, and sea lions in the Pacific Northwest have reduced the survival of some Pacific salmon populations. It is likely that climate change will play an increasingly important role in determining the abundance of salmonids by exacerbating long-term problems related to water temperature, stream flow, habitat access, predation, and marine productivity (CIG 2004, Scheuerell and Williams 2005, Zabel *et al.* 2006, ISAB 2007).

The southern green sturgeon occur in all four coastal Recovery Domains, although they are only known to spawn in the Sacramento River system. Therefore, only subadults and adults may be present in Recovery Domains north of San Francisco Bay.

OC Coho Salmon. This species includes all naturally-spawned populations of coho salmon in Oregon coastal streams south of the Columbia River and north of Cape Blanco, and progeny of five artificial propagation programs. The OC-TRT identified 56 historical populations, grouped into five major "biogeographic strata," based on consideration of historical distribution, geographic isolation, dispersal rates, genetic data, life history information, population dynamics, and environmental and ecological diversity (Table 8) (Lawson *et al.* 2007).

Of the 56 historical populations were identified by the OC-TRT, 13 populations were identified as functionally independent, eight as potentially independent, and 35 historical populations were identified as dependent populations. Functionally independent populations are identified as high-

persistence populations whose population dynamics or extinction risk over a 100-year time frame is not substantially altered by exchanges of individuals with other populations. These populations are net “donor” populations that may provide migrants for other types of populations. Potentially independent populations are identified as high-persistence populations whose population dynamics may be substantially influenced by periodic immigration from other populations. In the event of the decline or disappearance of migrants from other populations, a potentially independent population could become a functionally independent population. Dependent populations are considered low-persistence populations that rely upon immigration from other populations. Without these inputs, dependent populations would have a lower likelihood of persisting over 100 years. Dependant populations are “receiving” populations that are dependent on sufficient immigration from surrounding populations to persist.

The OC-TRT concluded that, if recent past conditions continue into the future, OC coho salmon are moderately likely to persist over a 100-year period without artificial support, and have a low to moderate likelihood of being able to sustain their genetic legacy and long-term adaptive potential for the foreseeable future (Wainwright *et al.* 2007). The major factors limiting recovery of OC coho salmon include altered stream morphology, reduced habitat complexity, loss of overwintering habitat, excessive sediment, high water temperature, and variation in ocean conditions (NMFS 2006).

Table 8. OC coho salmon populations in Oregon. Population type "D" means dependent; "FI" means functionally independent; and "PI" means potentially independent.

Stratum	Population	Type	Stratum	Population	Type
North Coast	Necanicum	PI	Mid-Coast (cont.)	Alsea	FI
	Ecola	D		Big (Alsea)	D
	Arch Cape	D		Vingie	D
	Short Sands	D		Yachats	D
	Nehalem	FI		Cummins	D
	Spring	D		Bob	D
	Watseco	D		Tenmile	D
	Tillamook	FI		Rock	D
	Netarts	D		Big (Siuslaw)	D
	Rover	D		China	D
	Sand	D		Cape	D
	Nestucca	FI		Berry	D
	Neskowin	D		Sutton	D
Mid-Coast	Salmon	PI	Lakes	Siuslaw	FI
	Devils	D		Siltcoos	PI
	Siletz	FI		Tahkenitch	PI
	Schoolhouse	D		Tenmile	PI
	Fogarty	D	Umpqua	Lower Umpqua	FI
	Depoe	D		Middle Umpqua	FI
	Rocky	D		North Umpqua	FI
	Spencer	D		South Umpqua	FI
	Wade	D	Mid-South Coast	Threemile	D
	Coal	D		Coos	FI
	Moolack	D		Coquille	FI
	Big (Yaquina)	D		Johnson	D
	Yaquina	FI		Twomile	D
	Theil	D		Floras	PI
	Beaver	PI		Sixes	PI

Tillamook Bay Population. The Wilson, Trask, Kilchis, Miami, and Tillamook rivers all feed into Tillamook Bay, all of which support OC coho salmon. All coho salmon outmigrating or returning to Tillamook Bay likely move through both the navigation channel and the nearshore ocean portions of the action area.

Estimates of returning Tillamook Basin adult coho spawners show considerable variability in the annual abundance from year to year (Table 9**)**. Adult OC Coho are primarily present in Tillamook Bay in the fall/winter returning, migrating upstream to spawn, with a peak in November to mid-December. Peak out-migration of juveniles to the ocean occurs in mid-April to mid-June, with lesser levels year-round. The estimated number of wild adults returning to the Tillamook Bay basin since 1990 has averaged 3,058, with a range of 261 to 15,262 (Table 9). During the period from 2002 to present, these data on the number of returning adult OC coho salmon were collected using a different protocol then the previous years, and therefore, not entirely comparable. However, during the overlapping years of 2002 – 2004, the results were not extremely different, and are the best available for the purposes of this evaluation.

The number of OC coho salmon juvenile outmigrants from the Tillamook Bay basin has not been studied to provide a reliable estimate by direct sampling. However, it can be estimated by back-calculation dividing the number of returning adults by marine survival. Marine survival predictions averaged 4%, with a range of 0.5% and 11.7%, between 1970 and 1999 (PMFC 2000). The average number of outmigrants estimated by this back calculation is 76,450 with a range of 6,525 to 381,550. While this extrapolation is not optimal, NMFS considers that it is the best available information and is adequate for use in the analysis portion of this Opinion.

Table 9. Estimated wild OC coho salmon spawner abundance in the Tillamook Bay basin (http://oregonstate.edu/dept/ODFW/spawn/cohoabund.htm)

	Estimated Wild Coho Population		
	Tillamook Bay Sub-Basin		OC ESU
Year	Number of fish	Est. % of ESU	Number of fish
1990	265	2%	16,510
1991	3,000	10%	29,078
1992	261	1%	38,604
1993	860	2%	44,266
1994	652	2%	37,477
1995	289	1%	41,303
1996	661	1%	59,453
1997	388	3%	14,068
1998	271	1%	19,918
1999	2,175	6%	34,696
2000	1,983	3%	54,085
2001	1,883	1%	147,981
2002	15,262	7%	231,411
2003	14,584	7%	206,286
2004	2,290	1%	176,576
2005	1,995	1%	140,053
2006	8,774	8%	103,551
2007	Not available	NA	53,653
Average	3,058	4%	80,498
1997-2006 Avg.	5,027	4%	116,821

Depoe Bay Population. Currently, there is a small Salmon and Trout Enhancement Program (STEP) hatchbox project on North Depoe Bay Creek that is primarily focused on education but may also make a minor contribution to the ocean coho salmon fishery. North Depoe Bay Creek is a small direct ocean tributary that has no fish passage because of a reservoir that is situated on the creek. The project raises 20,000 eyed eggs, which are net penned and fed in the reservoir. Traditionally this program has used Siletz coho stock 33 from Salmon River Hatchery; however, as a function of the termination of the Salmon River Hatchery coho program, the Depoe Bay STEP project has used Trask coho stock 34 from Trask River Hatchery since the 2008 return year. In late June/ early July the fed fry are 100% fin clipped and released into the reservoir. They rear naturally for a year in the reservoir then they are volitionally released the

following spring. Approximately 10,000 – 15,000 smolts are estimated to migrate out of the reservoir annually.

Adult fish are observed returning to North and South Depoe Bay Creeks although the numbers are low, between two and 20 annually. There is some minor natural production, usually in South Depoe Bay Creek, from the hatchery adults generated by this program. While the numbers are likely very small, any naturally produced offspring would be considered listed under the ESA.

Although the number of outmigrating OC coho salmon smolts from Depoe Bay is not very significant, it can be estimated by back-calculation dividing the number of returning adults by marine survival. Marine survival predictions averaged 4%, with a range of 0.5% and 11.7%, between 1970 and 1999 (PMFC 2000). If the average number of adults ranges from two to 20, the average number of outmigrants estimated by this back calculation is 275 with a range of 50 to 500. While this extrapolation is not optimal, NMFS considers that it is the best available information and is adequate for use in the analysis portion of this Opinion.

Yaquina River Population. All coho salmon outmigrating or returning to Yaquina Bay move through both the navigation channels and the nearshore ocean portions of the action area. Estimates of returning Yaquina Basin adult coho spawners show considerable variability in the annual abundance from year to year (Table 10**)**. Adult OC coho are return to Yaquina Bay in the fall/winter, migrating upstream to spawn, with a peak in November through December. Out-migration of juveniles to the ocean occurs from mid-February through June, with a peak from mid-April to mid-May. The estimated number of wild adults returning to the Yaquina Bay basin since 1990 has averaged 4,182, with a range of 365 to 23,981 (Table 10). During the period from 2002 to present, these data on the number of returning adult OC coho salmon were collected using a different protocol then the previous years, and therefore, not entirely comparable. However, during the overlapping years of 2002 – 2004, the results were not extremely different, and are the best available for the purposes of this evaluation.

The number of OC coho salmon juvenile outmigrants from Yaquina Bay basin has not been studied to provide a reliable estimate by direct sampling. However, it can be estimated by back-calculation dividing the number of returning adults by marine survival. Marine survival predictions averaged 4%, with a range of 0.5% and 11.7%, between 1970 and 1999 (PMFC 2000). The average number of outmigrants estimated by this back calculation is 104,550 with a range of 9,125 to 599,525. While this extrapolation is not optimal, NMFS considers that it is the best information available and is adequate for use in the analysis portion of this Opinion.

Table 10. Estimated wild OC coho salmon spawner abundance in the Yaquina Bay basin (http://oregonstate.edu/dept/ODFW/spawn/cohoabund.htm)

	Estimated Wild Coho Population		
	Yaquina River Sub-Basin		OC ESU
Year	Number of fish	Est. % of ESU	Number of fish
1990	381	2%	16,510
1991	380	1%	29,078
1992	633	2%	38,604
1993	549	1%	44,266
1994	2,448	7%	37,477
1995	5,668	14%	41,303
1996	5,127	9%	59,453
1997	384	3%	14,068
1998	365	2%	19,918
1999	2,588	7%	34,696
2000	647	1%	54,085
2001	3,039	2%	147,981
2002	23,981	10%	231,411
2003	13,254	6%	206,286
2004	4,989	3%	176,576
2005	3,441	2%	140,053
2006	4,247	4%	103,551
2007	3,158	6%	53,653
Average	4,182	5%	80,498
1998-2007 Avg.	5,971	5%	116,821

Siuslaw River Population. All coho salmon outmigrating or returning to the Siuslaw River move through both the navigation channel and the nearshore ocean portions of the action area. Estimates of returning Siuslaw Basin adult coho spawners show considerable variability in the annual abundance from year to year (Table 11**)**. Adult OC coho salmon are return to the Siuslaw River in the fall/winter, migrating upstream to spawn, with a peak in October. Out-migration of juveniles to the ocean occurs from February through July, with a peak from April to mid-May. The estimated number of wild adults returning to the Yaquina Bay basin since 1990 has averaged 9,702, with a range of 668 to 57,129 (Table 11). During the period from 2002 to present, these data on the number of returning adult OC coho salmon were collected using a different protocol then the previous years, and therefore, not entirely comparable. However, during the overlapping years of 2002 – 2004, the results were not extremely different, and are the best available for the purposes of this evaluation.

Table 11. Estimated wild OC coho salmon spawner abundance in the Siuslaw River basin (http://oregonstate.edu/dept/ODFW/spawn/cohoabund.htm)

	Estimated Wild Coho Population		
	Siuslaw Sub-Basin		OC ESU
Year	Number of fish	Est. % of ESU	Number of fish
1990	2,685	16%	16,510
1991	3,740	13%	29,078
1992	3,440	9%	38,604
1993	4,428	10%	44,266
1994	3,205	9%	37,477
1995	6,089	15%	41,303
1996	7,625	13%	59,453
1997	668	5%	14,068
1998	1,089	5%	19,918
1999	2,724	8%	34,696
2000	6,767	13%	54,085
2001	11,024	7%	147,981
2002	57,129	25%	231,411
2003	29,257	14%	206,286
2004	8,443	5%	176,576
2005	16,907	12%	140,053
2006	5,869	6%	103,551
2007	3,552	7%	53,653
Average	9,702	12%	80,498
1998-2007 Avg.	14,276	12%	116,821

The number of OC coho salmon juvenile outmigrants from the Siuslaw River basin has not been studied to provide a reliable estimate by direct sampling. However, it can be estimated by back-calculation dividing the number of returning adults by marine survival. Marine survival predictions averaged 4%, with a range of 0.5% and 11.7%, between 1970 and 1999 (PMFC 2000). The average number of outmigrants estimated by this back calculation is 242,550 with a range of 16,700 to 5,737,375. While this extrapolation is not optimal, NMFS considers that it is the best available information and is adequate for use in the analysis portion of this Opinion.

Umpqua River Populations. The Umpqua River basin is the only basin in the OC coho salmon ESU that transcends the Oregon Coast Range and originates in the Cascade Range. Four populations were identified by the OC-TRT: Lower Umpqua River, Middle Umpqua River, South Umpqua River, and North Umpqua River. All four populations comprise the Umpqua River gene conservation group (GCP). All coho salmon outmigrating or returning to the Umpqua River move through both the navigation channels and the nearshore ocean portions of the action area.

Table 12. Estimated wild OC coho salmon spawner abundance in the Umpqua River basin (http://oregonstate.edu/dept/ODFW/spawn/cohoabund.htm)

	Estimated Wild Coho Population		
	Umpqua Basin		OC ESU
Year	Number of fish	Est. % of ESU	Number of fish
1990	3,737	23%	16,510
1991	3,600	12%	29,078
1992	2,152	6%	38,604
1993	9,311	21%	44,266
1994	4,485	12%	37,477
1995	11,349	27%	41,303
1996	9,749	16%	59,453
1997	2,233	16%	14,068
1998	8,426	42%	19,918
1999	6,466	19%	34,696
2000	10,395	19%	54,085
2001	32,751	22%	147,981
2002	33,176	14%	231,411
2003	26,615	13%	206,286
2004	27,639	16%	176,576
2005	44,255	32%	140,053
2006	17,274	17%	103,551
2007	11,453	21%	53,653
Average	14,184	18%	80,498
1998-2007 Avg.	21,845	19%	116,821

Estimates of returning Umpqua Basin adult coho spawners show considerable variability in the annual abundance from year to year (Table 12**)**. Adult OC coho salmon return to the Umpqua River in the fall/winter, migrating upstream to spawn, with a peak from October through November. Out-migration of juveniles to the ocean occurs from February through May. The estimated number of wild adults returning to the Umpqua River basin since 1990 has averaged 14,184, with a range of 2,152 to 44,255 (Table 12). During the period from 2002 to present, these data on the number of returning adult OC coho salmon were collected using a different protocol then the previous years, and therefore, not entirely comparable. However, during the overlapping years of 2002 – 2004, the results were not extremely different, and are the best available for the purposes of this evaluation.

The number of OC coho salmon juvenile outmigrants from the Umpqua River basin has not been studied to provide a reliable estimate by direct sampling. However, it can be estimated by back-calculation dividing the number of returning adults by marine survival. Marine survival predictions averaged 4%, with a range of 0.5% and 11.7%, between 1970 and 1999 (PMFC 2000). The average number of outmigrants estimated by this back calculation is 354,600 with a range of 53,800 to 1,106,375. While this extrapolation is not optimal, NMFS considers that it is the best available information and is adequate for use in the analysis portion of this Opinion.

Coos River Population. All coho salmon outmigrating or returning to the Coos River move through both the navigation channels and the nearshore ocean portions of the action area. Estimates of returning Coos Basin adult coho spawners show considerable variability in the annual abundance from year to year (Table 13**)**. Adult OC Coho return to Coos Bay in the fall/winter, migrating upstream to spawn, with a peak from October through December. Out-migration of juveniles to the ocean occurs from February through mid-July, with a peak from mid-March to mid-May. The estimated number of wild adults returning to the Coos Bay basin since 1990 has averaged 13,986, with a range of 1,127 to 43,301 (Table 14). During the period from 2002 to present, these data on the number of returning adult OC coho salmon were collected using a different protocol then the previous years, and therefore, not entirely comparable. However, during the overlapping years of 2002 – 2004, the results were not extremely different, and are the best available information for the purposes of this evaluation.

Table 14. Estimated wild OC coho salmon spawner abundance in the Coos Bay basin (http://oregonstate.edu/dept/ODFW/spawn/cohoabund.htm)

	Estimated Wild Coho Population		
	Coos Sub-Basin		OC ESU
Year	Number of fish	Est. % of ESU	Number of fish
1990	2,273	14%	16,510
1991	3,813	13%	29,078
1992	16,545	43%	38,604
1993	15,284	35%	44,266
1994	14,685	39%	37,477
1995	10,351	25%	41,303
1996	12,128	20%	59,453
1997	1,127	8%	14,068
1998	3,167	16%	19,918
1999	4,945	14%	34,696
2000	5,386	10%	54,085
2001	43,301	29%	147,981
2002	35,429	16%	231,411
2003	29,559	14%	206,286
2004	24,116	14%	176,576
2005	17,048	12%	140,053
2006	11,266	11%	103,551
2007	1,329	29%	53,653
Average	13,986	17%	80,498
1998-2007 Avg.	17,555	15%	116,821

The number of OC coho salmon juvenile outmigrants from the Coos Bay basin has not been studied to provide a reliable estimate by direct sampling. However, it can be estimated by back-calculation dividing the number of returning adults by marine survival. Marine survival predictions averaged 4%, with a range of 0.5% and 11.7%, between 1970 and 1999 (PMFC 2000). The average number of outmigrants estimated by this back calculation is 349,650 with a

range of 28,175 to 1,082,525. While this extrapolation is not optimal, NMFS considers that it is the best available information and is adequate for use in the analysis portion of this Opinion.

Coquille River Population. All coho salmon outmigrating or returning to the Coquille River move through both the navigation channels and the nearshore ocean portions of the action area. Estimates of returning Coquille Basin adult coho spawners show considerable variability in the annual abundance from year to year (Table 14**)**. Adult OC coho salmon return to the Coquille River in the fall/winter, migrating upstream to spawn, with a peak from October through December. Out-migration of juveniles to the ocean occurs from February through mid-June, with a peak from mid-March to mid-May. The estimated number of wild adults returning to the Coquille River basin since 1990 has averaged 10,634, with a range of 2,115 to 28,577 (Table 15). During the period from 2002 to present, these data on the number of returning adult OC coho salmon were collected using a different protocol than the previous years, and therefore, not entirely comparable. However, during the overlapping years of 2002 – 2004, the results were not extremely different, and are the best available information for the purposes of this evaluation.

Table 15. Estimated wild OC coho salmon spawner abundance in the Coquille River basin (http://oregonstate.edu/dept/ODFW/spawn/cohoabund.htm)

	Estimated Wild Coho Population		
	Coquille Basin		OC ESU
Year	Number of fish	Est. % of ESU	Number of fish
1990	2,712	16%	16,510
1991	5,651	19%	29,078
1992	2,115	5%	38,604
1993	7,384	17%	44,266
1994	5,035	13%	37,477
1995	2,116	5%	41,303
1996	16,169	27%	59,453
1997	5,720	41%	14,068
1998	2,466	12%	19,918
1999	3,001	9%	34,696
2000	6,130	11%	54,085
2001	13,130	9%	147,981
2002	8,610	4%	231,411
2003	23,909	12%	206,286
2004	22,276	13%	176,576
2005	11,806	8%	140,053
2006	28,577	28%	103,551
2007	13,968	26%	53,653
Average	10,634	13%	80,498
1998-2007 Avg.	13,959	12%	116,821

The number of OC coho salmon juvenile outmigrants from the Coquille River basin has not been studied to provide a reliable estimate by direct sampling. However, it can be estimated by back-calculation dividing the number of returning adults by marine survival. Marine survival predictions averaged 4%, with a range of 0.5% and 11.7%, between 1970 and 1999 (PMFC 2000). The average number of outmigrants estimated by this back calculation is 265,850 with a range of 52,875 to 714,425. While this extrapolation is not optimal, NMFS considers that it is the best available information and is adequate for use in the analysis portion of this Opinion.

SONCC Coho Salmon. This species includes all naturally-spawned populations of coho salmon in coastal streams between Cape Blanco, Oregon, and Punta Gorda, California; and progeny of three artificial propagation programs. The SONCC-TRT identified 50 populations that were historically present based on consideration of historical distribution, geographic isolation, dispersal rates, genetic data, life history information, population dynamics, and environmental and ecological diversity (Williams *et al.* 2006). In some cases, the SONCC-TRT also identified groups of populations referred to as "diversity strata" largely based on the geographical arrangement of the populations and basin-scale environmental and ecological characteristics. Of those populations, up to 13 strata and 17 populations may occur within the action area (Table 16).

The major factors limiting recovery of SONCC coho salmon include loss of channel complexity, loss of estuarine and floodplain habitat, loss of riparian habitat, loss of in-river wood, excessive sediment, degraded water quality, high water temperature, reduced streamflow, unscreened water diversions, and structures blocking fish passage (NMFS 2006).

Table 16. SONCC coho salmon populations in Oregon. Populations that also occur partly in California are marked with an asterisk. Population type "D" means dependent; "E" means ephemeral; "FI" means functionally independent; and "PI" means potentially independent.

Population		Population Type
River Basin	Subbasin	
Elk River		FI
Mill Creek		D
Hubbard Creek		E
Brush Creek		D
Mussel Creek		D
Euchre Creek		E
Rogue River *	Lower Rogue River	PI
	Illinois River*	FI
	Mid Rogue/Applegate*	FI
	Upper Rogue River	FI
Hunter Creek		D
Pistol River		D
Chetco River		FI
Winchuck River		PI
Smith River *		FI
Klamath River *	Middle Klamath River	PI
	Upper Klamath River	FI

Port Orford Population. There is no tributary that empties directly into Port Orford as the area is simply a natural cove in the Pacific Ocean. However, three distinct basins that drain directly into the Pacific Ocean are nearby to Port Orford. They include Garrison Lake, Hubbard Creek, and Brush Creek. These Port Orford watersheds, situated entirely within Curry County, are among the smallest on the southern Oregon coast. Garrison Lake and certain portions of Hubbard Creek are within the vicinity of the Port Orford community. Brush Creek, a few miles south of Port Orford, empties into the Pacific Ocean near Humbug Mountain. Habitat is limited in each of these three basins, with Brush Creek and Hubbard Creek being the only streams where coho salmon appear to be present; although presence of coho salmon varies from year to year.

Brush Creek supports spawning and rearing of SONCC coho salmon, with anadromous fish usage in Brush Creek extending upstream to approximately river mile (RM) 5.7 (Mazur 2003). Coho salmon juveniles are present year-round, with spawning adults generally present from early November through mid-February. While no long-term smolt emigration data set is available for Brush Creek, outmigration timing is expected to be similar to other small coastal basins in Oregon, with smolts generally entering estuaries from March through June (Lawson *et al.* 2004). ODFW installed a rotary screw trap at the mouth of Brush Creek on February 12, 2004, and operated the trap through May 12, 2004, when it was removed due to low flows. Trap data indicates that peak smolt emigration occurred in late March and early April (ODFW 2004).

The Brush Creek coho salmon population is likely a dependent population within the SONCC coho salmon ESU. A dependent population is a low-persistent population that relies upon immigration from other populations. Without these recolonization occurrences, the population has a lower likelihood of persisting over 100 years. Brush Creek immigrants are likely from the Elk River and the Rogue River populations

Hubbard Creek has little good habitat for coho salmon and the creek's access upstream from the ocean is difficult for these fish; there may never have been a natural, self-sustaining run of SONCC coho salmon within Hubbard Creek (Maguire 2001). Attempts were made in the 1970s to start a coho salmon run with a small planting of hatchery fish, and those returning fish today are thought to be either remnants of that effort or strays from nearby rivers (Maguire 2001). According to the TRT, the population of coho salmon found in Hubbard Creek is considered ephemeral. Ephemeral populations do not have a high likelihood of sustaining themselves over a 100-year time period in isolation, and do not receive sufficient immigration to affect this likelihood. In addition, the habitat supporting an ephemeral population is expected to be occupied only rarely (Williams *et al*. 2006).

The convergence point of the estuary, mainstem and North Fork of Hubbard Creek was likely the former center of productivity but coho salmon carrying capacity there is greatly diminished due to habitat alteration. The dam for water supply for the City of Port Orford blocks access to adult coho salmon and steelhead, but only a small patch of high IP coho habitat is inaccessible. Maguire (2001) finds that access for juvenile coho in Hubbard Creek is impeded at a few locations, but in 2000 noted coho salmon spawning in the lower and middle mainstem Hubbard Creek as well as in the Middle Fork. In 2004, ODFW (2005) found coho juveniles at low densities ($0.052/m^2$) in just under half of the 21 pools surveyed in Hubbard Creek. Data are from only one year, so presence and absence of other year classes is unknown.

Although coho salmon are still well distributed in Hubbard Creek, low juvenile densities are indicative of small population size that would be correlated to restricted genetic diversity.

Williams *et al.* (2007) determined that small streams in the region can be expected to have 40 coho salmon spawners per mile, which means Hubbard Creek would produce up to 719 adults in the 17.98 km of high quality habitat, when it was all viable. The very low density of coho salmon juveniles in Hubbard Creek found by ODFW in 2004 is likely associated with low adult population size. Reduced productivity is expected, given extensive changes to stream channels due to historic and recent land use. Therefore, the Hubbard Creek coho salmon population is not expected to reliably produce significant numbers of coho salmon.

The low productivity of the Brush Creek and Hubbard Creek coho salmon populations, restricted habitat quality in former areas of highest quality, and very low adult returns equate to a high risk of extirpation. In sum, the Brush Creek is likely a dependant population and Hubbard Creek coho salmon population is considered ephemeral. Neither of these populations contributes significantly to the overall viability of SONCC coho salmon.

Rogue River Population. The four populations of SONCC coho salmon within the Rogue River basin include: the Lower Rogue River; Illinois River; Middle Rogue and Applegate rivers; and the Upper Rogue River. Historically, three of the four of these SONCC coho salmon populations were functionally independent (Williams *et al.* 2006). The Lower Rogue River population was potentially independent (Williams *et al.* 2006). The size and location of the Rogue River populations make them very important as a source population for the northern part of the SONCC coho salmon range. The three functionally independent populations represent the interior sub-basin diversity strata of the Rogue River basin. The Lower Rogue River population is part of the diversity strata identified as the "Northern" strata of the "Coastal basins and sub-basins" (Williams *et al.* 2006). All coho salmon from these populations, whether outmigrating or returning to the Rogue River move through both the navigation channels and the nearshore ocean portions of the action area.

Estimates of returning Rogue Basin adult coho spawners show considerable variability in the annual abundance from year to year (Table 17**)**. Adult SONCC coho salmon migration occurs in the fall and is concentrated in September and early October. Out-migration of juveniles to the ocean occurs from April through June, with a peak from mid-May to mid-June. The estimated number of wild adults returning to the Rogue River basin since 1980 has averaged 4,927, with a range of 361 to 24,481 (Table 16).

The number of OC coho salmon juvenile outmigrants from the Rogue River basin has not been studied to provide a reliable estimate by direct sampling. However, it can be estimated by back-calculation dividing the number of returning adults by marine survival. Marine survival predictions averaged 4%, with a range of 0.5% and 11.7%, between 1970 and 1999 (PMFC 2000). The average number of outmigrants estimated by this back calculation is 123,175 with a range of 9,025 to 612,025. While this extrapolation is not optimal, NMFS considers that it is the best available information and is adequate for use in the analysis portion of this Opinion.

Table 17. Estimated run size of wild SONCC coho salmon in the Rogue River basin at Huntley Park (http://oregonstate.edu/dept/ODFW/spawn/cohoabund.htm).

	Estimated Wild Coho Population	
Year	Number of fish	10-yr Average
1980	986	
1981	4,796	
1982	593	
1983	449	
1984	6,847	
1985	1,066	
1986	1,193	
1987	1,942	
1988	5,510	
1989	780	2,416
1990	3,051	2,623
1991	1,027	2,246
1992	2,208	2,407
1993	361	2,399
1994	5,439	2,258
1995	3,761	2,527
1996	4,622	2,870
1997	8,282	3,504
1998	2,316	3,185
1999	1,438	3,251
2000	10,966	4,042
2001	12,213	5,161
2002	7,800	5,720
2003	6,754	6,359
2004	24,486	8,264
2005	9,957	8,838
2006	3,937	8,815
2007	5,179	8,511
Average	4,927	6,215

Chetco River Population. Historically, the Chetco River SONCC coho salmon population was a functionally-independent population (Williams *et al.* 2006). The size and location of the Chetco River makes it a very important link between the Rogue River coho populations and the Northern California coho populations. The Chetco River coho population was the only functionally-independent population between the Smith River in California and the Rogue River in Oregon. The Chetco is one of only two functionally-independent populations within the northern coastal basin diversity strata. All coho salmon from this population, whether outmigrating or returning to the Chetco River move through both the navigation channels and the nearshore ocean portions of the action area.

The Chetco River is capable of supporting rearing and migration of SONCC coho salmon up to RM 42 and spawning and rearing from that point to RM 49. The first few miles of tributaries to the lower Chetco River, such as Eagle Creek, Emily Creek, Jack Creek and the North Fork Chetco River, are also capable of supporting coho salmon spawning and rearing. Adult coho salmon enter the Chetco River from October to December and spawn from November through January. Downstream juvenile coho salmon migration typically occurs from April through June. Coho salmon smolts likely begin downstream migration in March and April and pass through the estuary in May or June.

Chinook salmon spawning surveys by the ODFW document occasional presence of coho salmon within the basin. The current population of SONCC coho salmon in the Chetco River basin is extremely low. From 1991 to 2006, a total of 97 coho salmon have been observed. The ODFW[6] estimates current coho salmon abundance in Chetco River at between 50 and 100 spawning fish. Based on estimate of adult returns, using the back-calculation method with 4% marine survival, the smolt estimates would range from 1,250 to 2,500.

Southern Green Sturgeon. Green sturgeon is a widely-distributed and marine-oriented species found in nearshore waters from Baja Californian to Canada (NMFS 2008). There are two distinct population segments defined for green sturgeon – a northern DPS with spawning populations in the Klamath and Rogue rivers and a southern DPS that spawns in the Sacramento River (NMFS 2008). The southern DPS includes all naturally-spawned populations of green sturgeon that occur south of the Eel River in Humboldt County, California. When not spawning, this anadromous species is broadly distributed in nearshore marine areas from Mexico to the Bering Sea. Although it is commonly observed in bays, estuaries, and sometimes the deep riverine mainstem in lower elevation reaches of non-natal rivers along the west coast of North America, the distribution and timing of estuarine use are poorly understood.

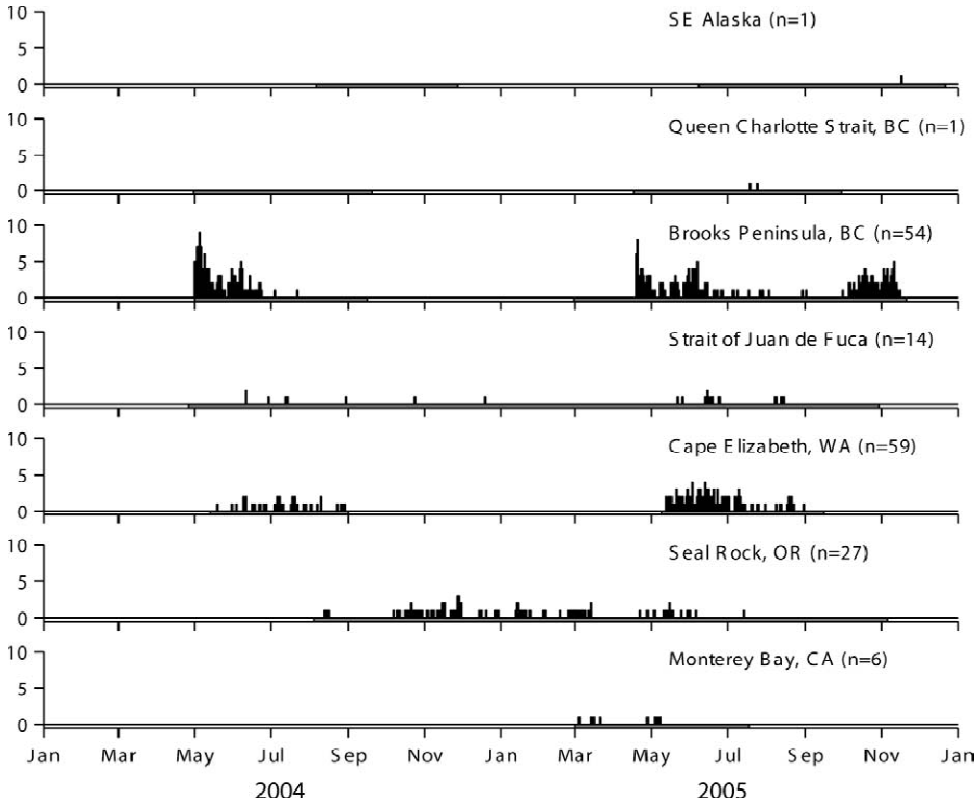
The principal factor for the decline of southern green sturgeon is the reduction of its spawning area to a single known population limited to a small portion of the Sacramento River. Other factors include artificial fish passage barriers, insufficient streamflow, increased water temperatures, water diversion, nonnative species, poaching, pesticide and heavy metal contamination, and local fishing. The viability of this species is still under assessment.

Green sturgeon estuarine/marine distribution and the seasonality of estuarine use range-wide are largely unknown. The southern green sturgeon are known to congregate in coastal waters and estuaries, including non-natal estuaries, such as the Columbia River estuary. Beamis and Kynard (1997) suggested that green sturgeon move into estuaries of non-natal rivers to feed. Information from fisheries-dependent sampling suggests that green sturgeon only occupy large estuaries during the summer and early fall in the northwestern United States. Green sturgeon are known to enter Washington estuaries during summer (Moser and Lindley 2007). Commercial catches of green sturgeon peak in October in the Columbia River estuary, and records from other estuarine fisheries (Willapa Bay and Grays Harbor, Washington) support the idea that sturgeon are only present in these estuaries from June until October (Moser and Lindley 2007). Conducting feeding

[6] Conversation with Russ Stauff and Todd Confer, Oregon Department of Fish and Wildlife (December 14, 2006) discussing coho salmon abundance in the Chetco River.

studies on green sturgeon have proven difficult. In addition to various invertebrates, green sturgeon appear to be opportunistic foragers and feed on various fish species, such as lingcod (Dumbauld *et al.* 2008), herring (Erickson and Hightower 2007), sand lance and anchovies (73 FR 52084). Invertebrates have included crangonid shrimp, burrowing thalassinidean shrimp (primarily the burrowing ghost shrimp), amphipods, clams, juvenile Dungeness crab (73 FR 52084). Lindley *et al.* (2008) described ocean migration of green sturgeon and the months in which tagged fish passed hydrophone arrays (Figure 17). It is unknown which of the individuals tagged during their study were southern green sturgeon, but those captured and tagged in the California waters were most likely, but not definitely, southern DPS. Typically green sturgeon migrate north after leaving their natal spawning rivers (Israel *et al.* 2008) further supporting these were likely southern green sturgeon. Mature green sturgeon may spawn every two to four years or possibly even less frequently. Lindley *et al.* (2008) revealed green sturgeon make rapid, long-distance seasonal migrations along the continental shelf between central California and central British Columbia. During the northern migration the fish approached 0.25 body lengths per second. The overall maximum migration rate observed was 36 miles per day but there were a range of migrations rates observed and included some as slow as 0.3 miles per day.

Figure 17. From Lindley *et al.* 2008 – detections of pinger-tagged green sturgeon by hydrophone arrays along the West Coast of North America (n=total number of unique fish observed at each location). Bar height indicates the number of unique fish observed per day.



In Oregon, green sturgeon have been documented in the Columbia River estuary, Tillamook Bay, Yaquina Bay, Winchester Bay (Umpqua River), Coos Bay, and the Rogue River estuary. Within the Oregon Coastal Project's action areas, southern green sturgeon are confirmed to be present in the Winchester Bay (Umpqua River) and Coos Bay. The final critical habitat notice (74 FR 52300) identified the presence of southern green sturgeon is likely, but not confirmed in Tillamook Bay, Yaquina Bay, the Siuslaw River, the Coquille River, and the Rogue River. These Oregon coastal bays and estuaries provide over-summering habitat for adult and subadult feeding, optimization for growth, and thermal refugia. The southern are not likely to be present at Depoe Bay or the Chetco River projects due to limited habitat availability at these locations.

Status of Critical Habitat

The NMFS reviews the status of designated critical habitat affected by the proposed action by examining the condition and trends of PCEs throughout the designated area. PCEs consist of the physical and biological features identified as essential to the conservation of the listed species in the documents that designate critical habitat (Tables 18 – 20). Critical habitat has been designated for OC and SONCC coho salmon and critical habitat is proposed for the SDPS of green sturgeon.

OC Coho Salmon. Nearly all the Corps Oregon coastal projects support significant populations of coho salmon. Critical habitat is designated in the estuarine portion of the action area at Yaquina Bay, Siuslaw River, Umpqua River and Winchester Bay, Coos Bay, and Coquille River projects; nearshore ocean areas were not identified as critical habitat. OC coho salmon use the critical habitat within the action area for feeding and migration. Table 18 identifies the PCEs and corresponding life history events affected by the Corps coastal dredging program within the action areas for OC coho salmon.

Table 18. PCEs of critical habitats designated for OC coho salmon and corresponding life history events affected by the Corps' coastal dredging program

Primary Constituent Elements		**Species Life History Event**
Site Type	**Site Attribute**	
Estuarine areas	Forage Water quality	Adult sexual maturation Adult "reverse smoltification" Adult upstream migration, holding Fry/parr seaward migration Fry/parr smoltification Smolt growth and development Smolt seaward migration

SONCC Coho Salmon. Two of the Corps' coastal projects support populations of SONCC coho salmon at the Rogue and Chetco rivers. Critical habitat is designated only within the estuarine portion of the action area at the Rogue and Chetco rivers; nearshore ocean areas

were not identified as critical habitat. SONCC coho salmon use the critical habitat within the action area for feeding and migration. Table 19 identifies the PCEs and corresponding life history events affected by the Corps coastal dredging program within the action area for SONCC coho salmon.

Table 19. PCEs of critical habitats designated for SONCC coho salmon and corresponding life history events that may be affected by the Corps' coastal dredging program

Primary Constituent Elements		**Species Life History Event**
Site	**Site Attribute**	
Juvenile migration corridors	Food Safe passage Substrate Water quality	Fry/parr seaward migration Smolt growth and development Smolt seaward migration
Adult migration corridors	Safe passage Substrate Water quality	Adult sexual maturation Adult "reverse smoltification" Adult upstream migration

Southern Green Sturgeon. Within the action area, critical habitat is designated for southern green sturgeon. Within the estuarine portions of the action area, critical habitat is proposed at Yaquina Bay, Winchester Bay (Umpqua River), and Coos Bay. The coastal marine water (within 60 fathoms depth) is the site description of critical habitat and occupied by adults and subadults for feeding and migration. The nearshore areas where critical habitat is proposed include the nearshore ocean disposal sites at the Yaquina, Siuslaw, Umpqua, Coos, Coquille, Port Orford, Rogue, and Chetco projects. Table 20 identifies the PCEs and corresponding life history events for southern green sturgeon that are affected by the Corps coastal dredging program.

Table 20. PCEs of critical habitats designated for southern green sturgeon and corresponding life history events that may be affected by the Corps' coastal dredging program

PCEs		**Life History Event**
Site Type	**Site Attribute**	
Estuarine areas	Food resources Migratory corridor Water quality Sediment quality	Juvenile/subadult growth/development Adult growth/development
Coastal marine areas	Migratory corridor Water quality Food resources	Subadult migration between marine/estuarine areas Subadult/adult migration within marine areas Subadult/adult growth and development Adult sexual maturation

Environmental Baseline for the Action Area

The Corps began collecting sediment quality data from the Oregon Coastal Projects in the late 1970s. The Corps continues to conduct sediment sampling and analysis at the most of the Coastal Projects on a 5-year cycle. Prior to 2006, sediment evaluations were conducted following the procedures set forth in the Ocean Disposal Testing Manual (1991) and the Inland Testing Manual (1998), and used contaminant screening levels identified in the DMEF, developed jointly by the Corps and EPA to asses dredged material to determine whether sediment is acceptable for in-water disposal. Currently, sediment sampling and analysis for the Coastal Projects follows theses national guidelines and the regional SL that have been adopted for use in the Northwest Regional SEF. Because of the 5-year sampling cycle, not all of the Projects have been reviewed by SEF's Project Review Group (PRG) for compliance with the SEF guidelines and SL (Table 21). However, the Oregon Coastal Projects rank "low" in potential for contaminants according to the SEF guidelines, based on historical sampling results, frequency of dredging, recency of data, and confirmation testing. The history of sediment sampling shows that concentrations of contaminants in the sediments at the Coastal Projects is consistently very low, and remain below the SLs as set forth in the DMEF or the SEF.

Table 21. Sediment sampling history for the Oregon Coastal Dredging Program.

Project	Area Sampled	Last Sampled (Year)	Evaluation Protocol (DMEF or SEF)	Last Dredged	Approved for unconfined in-water disposal
Tillamook Bay	Garibaldi Boat Basin Access Channel	2007	SEF	2009	Yes
Depoe Bay	Boat Basin	2005	DMEF	2009	Yes
	Check Dam Catch Basin	2005	DMEF	2005	Yes
Yaquina Bay	Yaquina Bay Entrance Channel	2005	DMEF	2009	Yes
	South Beach Marina Access Channel	2005	DMEF	2007	Yes
	Yaquina River (Depot Slough)	2003	DMEF	2009	Yes
Siuslaw River	Entrance and Navigation Channel	2006	SEF	2009	Yes
Umpqua River	Entrance Channel	2006	SEF	2009	Yes
	Umpqua River Navigation Channel	2006	SEF	2009	Yes
	Winchester Bay Boat Basin Access Channel	2006	SEF	2008	Yes
Coquille River	Entrance Channel	2006	SEF	2009	Yes
	Bandon Boat Basin Access Channel	2006	SEF	1997	Yes
Coos Bay	Entrance Channel	2009	SEF	2009	Yes
	Navigation Channel RM 1 - 12	2009	SEF	2009	Yes
	Navigation Channel RM 12 - 15	2009	SEF	2009	Yes
	Charleston Access Channel	2009	SEF	2009	Yes
Port Orford	Navigation Channel (Summer)	2007	SEF	2009	Yes
	Boat Hoist Area (Winter)	2007	SEF	2009	Yes
Rogue River	Entrance Channel	2007	SEF	2009	Yes
	Gold Beach Boat Basin Access Channel	2007	SEF	1998	Yes
Chetco River	Entrance Channel	2007	SEF	2009	Yes
	Brookings Boat Basin Access Channel	2007	SEF	1984	Yes

Biotic production in the nearshore Pacific Ocean off the Oregon coast is driven by many environmental factors. The habitat conditions at each of the ODMDSs may vary at a site-specific level, but in general the environmental conditions and biotic communities are quite similar. In the ocean, summer chlorophyll *a* (chl) concentration along the coast is related to winter river outflow and continental shelf widths (Chase *et al.* 2007). The winter river flows carry iron into the ocean which is later brought back into the shallows with the summer upwelling, thus fueling phytoplankton production. Chase *et al.* (2007) presented chl concentrations from the sea-viewing-wide-field-of-sensor (SeaWiFS) satellite data and the study area included this action area. Based on this SeaWiFS data presented in Chase *et al.* (2007), chl concentrations are likely moderately high in a narrow bandwidth along the Oregon Coast nearshore. The influence of the

coastal river basins and the subsequent ocean upwelling that bring the iron-rich nutrients back into the shallower water provide the basis for a rich phytoplankton community.

Bi *et al.* (2008) used increasing concentrations of chl as an indicator of primary production coupled with decreasing water depths to classify yearling coho salmon habitat quality. In their 2007 study (Bi *et al.* 2007), relied on low-zero catch probability as an indicator of habitat use; that is, they used fish sampling data and the presence or absence of yearling coho salmon to indicate habitat use and preferred quality. Given habitat use, they used step-wise regression to assess habitat condition indicators. The probability of having a zero-catch (of yearling coho salmon) decreased with increasing chl concentration and decreasing water depth. Additional environmental factors, as yet not understood, also determine yearling coho salmon abundance (Bi *et al* 2008).

Bi *et al.* (2008) characterized yearling coho salmon habitat as favorable, potentially favorable, or unfavorable based on the water depth, chl, and coho salmon yearling abundance. Year to year variation in predicting the location of these three habitat categories also varies significantly (Bi *et al.* 2008). It is likely the all of the ODMDS areas are favorable or potentially favorable habitat based on the water depth and chl concentrations, but the habitat quality will vary from year to year as observed with these studies. Some years the ODMDS areas may even be unfavorable depending on the upwelling.

Brodeur *et al.* (2004) conducted sample trawls off the Oregon and northern California coasts during June and August 2000 and 2002 as part of the U.S. Global Ocean Ecosystem Dynamics (GLOBEC) Northeast Pacific study to examine the distribution (among other things) of juvenile salmon north and south of Cape Blanco. Juvenile salmon were more abundant during the August cruise and were mainly distributed northward from Cape Blanco (Brodeur *et al.* 2004). However, coho salmon abundance tended to be higher during the June cruises. Coho abundance during the June cruises ranged from 0.0 to 45.06 juvenile coho salmon per 1,000,000 cubic meters (m^3). These data are a composite of all cruises, which includes cruises up to 30 nautical miles from shore; however, these data are the best available representative of coho salmon abundance associated with each of the Corps' Coastal Projects.

Again, site-specific variability is difficult to account for at the ODMDSs, however, in general, the environmental conditions and biotic communities should share similarities. Keister and Peterson (2003) found that the zooplankton community found off the central Oregon Coast is influenced strongly by seasonal variations in wind and current patterns. Boreal neritic copepods such as *Pseudocalanus mimus*, *Calanus marshallae*, *Centropages abdominalis*, *Acartia longiremis*, and *Acartia hudsonica* dominate the coastal plankton during summer (Peterson and Miller 1977). All of the ODMDS areas are within the continental shelf and shallow depths and likely provides adequate food resources for yearling coho salmon.

Project-Specific Environmental Baseline

Tillamook Bay

The action area includes the turning basin and boat basin access channel to the Garibaldi boat basin (approximately 3.4 acres), and approximately 32.8 acres at the in-bay disposal site within Tillamook Bay (Figure 1).

Tillamook Bay is a shallow estuary averaging only 6.6 feet deep over its 8,320 acres (Tillamook Bay CCMP 1999). The Wilson, Trask, Kilchis, Miami, and Tillamook rivers all feed into Tillamook Bay. These streams support populations of OC coho salmon. These waterways are included among those designated as critical habitat for OC coho salmon (73 FR 7816). Historically, the productivity of sub-populations of coho that spawn in upper portions of the basin may have been substantially enhanced by their ability to overwinter as juveniles in off-channel habitats in the Tillamook Bay lowlands. At present, lowland channels are thought to account for about 25% of the geographic distribution of coho salmon within the stream network draining into the bay. This decline in habitat quantity and quality, periodic downturns in oceanic productivity, and harvest rates that have at times been extraordinarily high for coho salmon, have combined to severely depress the numbers of adult coho salmon reaching spawning grounds within the Tillamook Bay basin since the late 1950s.

The north and south jetties at the entrance to Tillamook Bay create hydraulic controls to maintain a fixed channel at the interface of the Tillamook Bay and the Pacific Ocean to permit navigation of commercial and recreational traffic. The navigation channel from the entrance to the turning basin and boat basin access channel is not currently maintained as the channel is of suitable depth. The turning basin and boat basin access channel are dredged every five to eight years. The disposal site is on the north side of the navigation channel at approximately RM 2.5. The boat basin access channel does not contain preferred habitat for rearing, resting, or feeding by ESA-listed fish species. The BA describes the material in the river channel consists primarily of sand, with shell hash, and some fine-grained material.

The in-bay disposal site ranges from 10 to 20 feet deep and is in the flow-lane on the north side of the navigation channel. Sediments are disposed at this location because of the dispersive nature of the site, with sediments moving downstream from the disposal site towards the mouth of Tillamook Bay. The sediments are mostly fine-grained sands. Sources of the sediments include fluvial outflow from the rivers that flow into Tillamook Bay and marine sands from coastal erosion, and dredging disposal.

The Corps provided maps of the project that showed areas of eelgrass (*Zostera marina*) based GIS data obtained through NMFS[7] (Figure 1). That information indicates that eelgrass beds are within the existing navigation channel and in-bay/river disposal area. While there appears some shifting occurred in the placement of the eelgrass layer on the Corps' map, even after accounting for this shift, overlap of eelgrass beds and the proposed dredging and disposal areas appears

[7] Email from Bridgette Lohrman to Greg Smith transmitting a link to the correct eelgrass HAPC layer (June 24, 2009).

likely. Further, the Corps has not provided evidence contrary to that provided in their own maps, and therefore, the NMFS must presume that eelgrass is present at these locations.

Depoe Bay

The action area is within the Depoe Bay harbor (approximately 6.7 acres), South Depoe Bay Creek (approximately 0.24 acres), and an intertidal shoreline disposal area just south of the entrance to Depoe Bay (0.7 acres of intertidal rock and 3.2 nearshore ocean) (Figure 2).

The small sediment check dam on South Depoe Bay Creek intercepts sediments from entering the bay and creates a small catch basin behind the dam. The sediment check dam inhibits fish passage, although a small fish ladder was constructed; it is unclear how well the fish ladder currently functions. The disposal site is rocky intertidal is approximately 100 feet south of the entrance to Depoe Bay. Dredged sediments are placed directly on the rocks where they wash down into the ocean.

The Corps conducted pre- and post-disposal sampling of the biotic communities at the intertidal disposal site (Corps 1978). Prior to dredging, the distribution of intertidal marine life on the disposal shoreline was found to be typical of other rocky shoreline locations that experience extreme wave exposure. That study found that the disposal area, as well as areas to the north and south of the disposal, area experienced additional scour and deposition of dredged material into tidal pools and depressions during high tide following disposal. The same study also found that green algae (*Enteromorpha intestinalis*) and red algae (*Porphyra perforate*, *Endcladia muricata*, and *Gigartina papilata*) recolonize the scour areas two months following disposal and juvenile barnacles populate the area after four months. The study was not able to determine whether changes in subtidal bull kelp (*Nereocystis leutkeana*) populations were a result of disposal activities; the study attributed the changes to seasonal changes. Two years following disposal, the scour areas were still visible. No additional follow-up studies have been conducted in the 30 years since.

Yaquina Bay and River

The action area is within the entrance and navigation channel of the Yaquina River, including the turning basin (approximately 217.5 acre), the access channel to South Beach Marina (4.6 acres), the access channel into Depot Slough (approximately 8.4 acres), and approximately 861 acres in the nearshore Pacific Ocean at two ODMDSs offshore from the mouth of Yaquina Bay (Figures 3 – 6).

Land uses in the watershed of the action area include rural-residential, commercial-industrial, agricultural, recreation, and commercial forestry. Riparian areas and stream channels in the action area have been damaged by activities related to these land uses throughout the watershed (FEMAT 1993, Botkin *et al.* 1995, OCSRI 1997). Habitat changes that have contributed to the decline of ESA-listed fish species in the action area include: (1) Reduced biological, chemical, and physical connectivity between streams, riparian areas, floodplains, and uplands; (2) elevated fine sediment yields; (3) reduced instream large woody debris; (4) loss or degradation of riparian vegetation; (5) altered stream channel morphology; (6) altered base and peak stream flows; and

(7) fish passage impediments. Estuarine habitats in the Yaquina River Basin used by OC coho salmon for rearing and smoltification have been significantly degraded and reduced in size due to land use practices and development. An estimated 202 acres of intertidal habitat have been lost, 257 acres of tidal marsh have been filled, and 1240 acres of tidal marsh have been diked (Seliskar and Gallagher 1983, Boule and Bierly 1987). It is unclear how these habitat changes have affected southern DPS green sturgeon, however, NMFS (1995) identified habitat degradation as a factor for decline in listing OC coho salmon as a threatened species under the ESA.

The north and south jetties at the entrance to Yaquina Bay create hydraulic controls to maintain a fixed channel at the interface of the Yaquina Bay and the Pacific Ocean to permit navigation of marine vessel traffic. The north jetty is 7,000 feet long and the south jetty is 8,600 feet long.

The two ODMDs are to the north and south respectively of the entrance to Yaquina Bay and have an average depth that ranges from 120 to 160 feet in depth.

The navigation channel likely serves primarily as a migratory pathway into and out of the Yaquina Bay estuary and does not contain preferred habitat for rearing, resting, or feeding by ESA-listed fish species. According to the BA, the material in the river channel consists primarily of sand, with shell hash, and some fine-grained material; material in the boat basin access channel and Depot Slough consists of mostly finer-grained sediments.

Multiple studies of the benthic infauna at the Yaquina ODMDSs and surrounding areas were conducted from 1984 to 2000 (Marine Taxonomic Services 2000 and 2001). Four major taxa groups were identified during the studies and included polychaetes, mollusks, crustaceans, and echinoderms. Invertebrate fauna densities were typical of the nearshore, high-energy environments found along the Oregon coast.

The nearshore ocean environment outside the mouth of Yaquina Bay supports anadromous salmonids as well as a variety of other pelagic and demersal fish species. Summer upwelling provides the nutrients to fuel primary and secondary production that in turn determines habitat quality in the form of available yearling coho salmon forage (Bi *et al.* 2008, Chase *et al.* 2007). Based on available information regarding general water quality conditions, water depths, and primary and secondary production, the baseline conditions of the action area provide, at a minimum, sufficient conditions to support coho salmon and southern green sturgeon. The habitat quality of these conditions varies from year to year depending on the large scale ocean dynamics that determine nutrient upwelling and water quality conditions.

Siuslaw River

The action area is within the navigation channel of the Siuslaw River (approximately 160 acres) and approximately 469 acres in the nearshore Pacific Ocean about one mile offshore from the mouth of the Siuslaw River (Figure 7).

The proposed project lies within the lower reaches of the Siuslaw River basin, which drains an area of approximately 504,000 acres in the central coastal region of Oregon. Aquatic and riparian

habitat within the Siuslaw River basin was strongly affected by logging activities and land development (Ecotrust 2002). These activities contributed to erosion, increased sedimentation, and increased water temperatures. The mainstem of the Siuslaw River is considered temperature limited and is listed on ODEQ 303(d) list in need of a total maximum daily load. In addition to temperature concerns, approximately 75% of the lower five miles of the north bank of the Siuslaw River has been stabilized using riprap or a seawall.

It is estimated that the Siuslaw River estuary experienced a decrease in total estuary area from 4,316 acres to 3,060 acres, a 29% loss between 1870 and 1970, and a decrease in tidal wetlands from 2,002 acres to 746 acres; a 63% loss during the same time period (Good 2000). This decrease in estuarine area is on par with the coast-wide estimated average of a 24% reduction of total estuarine area and 68% loss of tidal wetlands among Oregon's 22 estuaries.

The north and south jetties at the entrance to the Siuslaw create hydraulic controls to maintain a fixed channel at the interface of the Siuslaw River and the Pacific Ocean to permit navigation of marine vessel traffic. The north jetty is 9,690 feet long and the south jetty is 6,000 feet long; 400-foot-long spur jetties were added in 1986.

While no specific sampling was conducted within the navigation channel, organisms typically adapted to the high-energy, frequent disturbance environment that is dominated by ocean conditions, tidal action, and river flows likely inhabit the area. The navigation channel likely serves primarily as a migratory pathway into and out of the Siuslaw River estuary and likely does not contain preferred habitat for rearing, resting, or feeding by ESA-listed fish species.

The two ODMDS' are within the nearshore area of the Pacific Ocean off the mouth of the Siuslaw River. Sediments at these sites are primarily medium- to fine-grain marine sands and shell debris. These sandy sediments are common on the Oregon coast with natural variations in percent fines due to variations in currents and riverine inputs. The benthic community is typical of nearshore, high-energy environment found along the Oregon coast, largely dominated by very mobile organisms. These mobile organisms provide an important link in the marine food web (EPA 2008).

The nearshore ocean environment outside the mouth of the Siuslaw River supports anadromous salmonids as well as a variety of other pelagic and demersal fish species. Summer upwelling provides the nutrients to fuel primary and secondary production that in turn determines habitat quality in the form of available yearling coho salmon forage (Bi *et al.* 2008, Chase *et al.* 2007). Based on available information regarding general water quality conditions, water depths, and primary and secondary production, the baseline conditions of the action area provide, at a minimum, sufficient conditions to support coho salmon and southern green sturgeon. The habitat quality of these conditions varies from year to year depending on the large scale ocean dynamics that determine nutrient upwelling and water quality conditions.

Umpqua River

The action area is within the navigation channel at the mouth of the Umpqua River (approximately 38.8 acres) and into Winchester Bay for 11.9 miles (approximately 288.5 acres), the access channel to the Winchester Bay boat basins (approximately 20.2 acres), the in-bay disposal site at RM 1 (approximately 32.7 acres) and approximately 1,562 acres in the Pacific Ocean about one mile offshore from the mouth of the Umpqua River (Figures 8 - 9).

Land uses in the Umpqua River watershed include rural, residential, agricultural, commercial, industrial, and forestry. Riparian areas and stream channels in the action area have been damaged by development activities related to these land uses, as well as by the use of splash dams, and instream gravel mining throughout the watershed (FEMAT 1993, Botkin *et al.* 1995, OCSRI 1997).

The watershed drains a varied landscape, from steep-sloped, highly-dissected headwaters to low-gradient broad floodplains. Steep slopes and rock outcrops characterize the upland terrain. Many small, high-gradient streams with deeply incised channels originate from headwalls at higher elevations. The major tributary streams within the watershed flow generally from headwaters in the Coast Range to the mainstem of the Umpqua River. Upstream of the Lower Umpqua River Watershed, the Umpqua River collects water from tributaries as far eastward as the crest of the Cascade Mountains.

Habitat changes that have contributed to the decline of OC coho salmon in the action area include: (1) Reduced biological, chemical, and physical connectivity between streams, riparian areas, floodplains, and uplands; (2) elevated fine sediment yields; (3) reduced instream large woody debris; (4) loss or degradation of riparian vegetation; (5) altered stream channel morphology; (6) altered base and peak stream flows; and (7) loss of estuarine shallow habitat, including submerged and emergent aquatic vegetated areas (OCSRI 1997). The Umpqua River is on the ODEQ 303(d) list of water quality limited water bodies for temperature.

The north and south jetties at the entrance to the Umpqua River create hydraulic controls to maintain a fixed channel at the interface of the Umpqua River and the Pacific Ocean to permit navigation of marine vessel traffic. The north jetty is 8,000 feet long and the south jetty is 4,200 feet long. The navigation channel likely serves as primarily a migratory pathway in, out, and through Winchester Bay and the Umpqua River estuary. Because of the nature of the navigational channel (relatively deep and higher flows), the area is not likely to contain preferred habitat for rearing, resting or feeding by OC coho salmon. However, the significance of the channel as habitat for southern green sturgeon is not clear at this time.

The benthic invertebrate fauna of the ODMDSs is typical of the nearshore, high-energy environment found along the Oregon coast and is similar to the benthic marine communities found near other ocean disposal sites at Siuslaw River, Coos Bay, Rogue River and Chetco River. This benthic community, largely dominated by mobile organisms, likely provides an important link in the marine food web. Many of these organisms are likely adapted to this high-energy energy environment and likely recolonize disturbed areas quickly.

The two ODMDSs are within the nearshore area of the Pacific Ocean off the mouth of the Umpqua River. The substrate consists primarily of sandy sediments and tends to be relatively uniform in texture and characteristics. The benthic community is typical of nearshore, high-energy environment found along the Oregon coast, largely dominated by very mobile organisms that provide an important link in the marine food web (EPA 2009).

The nearshore ocean environment outside the mouth of the Umpqua River supports anadromous salmonids as well as a variety of other pelagic and demersal fish species. Summer upwelling provides the nutrients to fuel primary and secondary production that in turn determines habitat quality in the form of available yearling coho salmon forage (Bi *et al.* 2008, Chase *et al.* 2007). Based on available information regarding general water quality conditions, water depths, and primary and secondary production, the baseline conditions of the action area provide, at a minimum, sufficient conditions to support coho salmon and southern green sturgeon. The habitat quality of these conditions varies from year to year depending on the large scale ocean dynamics that determine nutrient upwelling and water quality conditions.

Coos Bay

The action area is within the navigation channel from the Mouth of the Coos Bay and upriver to RM 15 (approximately 715.3 acres), the access channel to the Charleston boat basin (approximately 22.3 acres), approximately 55 acres near the mouth of Coos Bay (disposal site G), 134 acres adjacent to the navigation channel at disposal site 8.4, and approximately 4,364 acres in the Pacific Ocean between 0.5 and 1.5 miles offshore from the mouth of the Coos Bay (Figures 10 – 11).

The Coos Bay estuary is the second largest estuary in Oregon. It is approximately 13,300 acres in size, averaging nearly 0.6 mile wide by 15 miles long. The bay has approximately 30 tributaries. The major tributary flowing into Coos Bay is the Coos River. The Coos Bay estuary is classified as a drowned river mouth-type estuary, where winter flows discharge high volumes of sediment through the estuary. In summer, when discharge is lower, seawater inflow dominates this type of estuary. Extensive filling and diking of Coos Bay and its sloughs, estuaries, and tributaries have changed the form and function of the estuary. Approximately 90% of Coos Bay marshes have been lost to dikes and landfills (Proctor *et al.*1980). Approximately 72,000 tons of sediment, mainly silts and clays, pour into the Coos Bay estuary every year (Schultz 1990).

Tributaries to Coos Bay exhibit evidence of bed degradation and are disconnected with their floodplains. Bank erosion is common throughout their lengths, and bedrock is the predominant substrate. Urban, rural residential, and agriculture uses are impacting Coos Bay and its tributaries. Riparian vegetation is mostly limited to a narrow strip alongside the rivers. Bank erosion has elevated turbidity to levels that injure coho salmon and impair their feeding and sheltering. Limiting factors to the OC coho salmon population within the action area include degraded water quality and limited quantity of productive shallow-water habitat such as saltwater marsh and eelgrass beds.

The north and south jetties at the entrance to Coos Bay create hydraulic controls to maintain a fixed channel at the interface of Coos Bay and the Pacific Ocean to permit navigation of marine

vessel traffic. The original jetties were constructed in 1878; the north jetty is 9,600 feet long and the south jetty is 3,900 feet long. The navigation channel likely serves as primarily a migratory pathway in, out, and through the Coos Bay estuary. Because of the nature of the navigational channel (relatively deep and higher flows), the area is not likely to contain preferred habitat for rearing, resting or feeding by OC coho salmon; although the significance of the channel as habitat for southern green sturgeon is not clear at this time.

Macroinvertebrate species are abundant in the nearshore ocean portion of the action area; important species include shellfish, Dungeness crab, and shrimp. The invertebrate species present in this high-energy environment, with frequent disturbance events, are likely adapted to rapidly recolonize areas following disturbance events. A variety of demersal and pelagic fish species are present. Common demersal fish are flatfish, sole, and smelt. Anadromous salmon, herring, and anchovy are representative of pelagic fishes present in the coastal waters.

The nearshore ocean environment outside the mouth of Coos Bay supports anadromous salmonids as well as a variety of other pelagic and demersal fish species. Summer upwelling provides the nutrients to fuel primary and secondary production that in turn determines habitat quality in the form of available yearling coho salmon forage (Bi *et al.* 2008, Chase *et al.* 2007). Based on available information regarding general water quality conditions, water depths, and primary and secondary production, the baseline conditions of the action area provide, at a minimum, sufficient conditions to support coho salmon and southern green sturgeon. The habitat quality of these conditions varies from year to year depending on the large scale ocean dynamics that determine nutrient upwelling and water quality conditions.

Coquille River

The action area is within the entrance/navigation channel at the mouth of the Coquille River (approximately 51.5 acres), the access channel to the Bandon boat basin (approximately 22.3 acres, and approximately 284 acres the Pacific Ocean one mile offshore from the Mouth of the Coquille River (Figures 12 – 13).

The Coquille River watershed is the third largest river system along the Oregon Coast, covering approximately 677,760 acres. The majority of the Coquille watershed lies in Coos County, Oregon. The remainder is in Douglas County and a small area of Curry County. The Coquille's three major tributaries; the North (including the East Fork), Middle, and South Forks; join the main stem within a few miles up- and down-stream of the town of Myrtle Point and flow into the Pacific Ocean at Bandon. Although the watershed is large, the estuary of the Coquille River is one of the smaller in the state. The lower bay of the Coquille is long and narrow, measuring about 763 acres. The estuary contains over 380 acres of tidelands, and 383 acres of permanently submerged land. Eelgrass beds, wetlands, and tidal flats provide feeding, spawning, breeding, nesting, and nursery areas for many species of terrestrial and aquatic life. Despite the historical diking and filling of many acres of wetlands, creek, and slough environments, the lower river area continues to be a very important rearing environment for anadromous salmonids.

The mainstem of the Coquille River stretch extends 36 miles from the confluence of the South Fork to the mouth, and drains an area of approximately 110,080 acres. It has a very low gradient

of about one foot per mile and is entirely tidally influenced. The ODEQ lists 37 streams or stream segments in the Coquille River system that do not meet water quality standards under section 303(d) of the CWA.

The north and south jetties at the entrance to the Coquille River create hydraulic controls to maintain a fixed channel at the interface of the Coquille River and the Pacific Ocean to permit navigation of marine vessel traffic. The south jetty was initially constructed in 1887 and is currently 2,700 feet long; construction of the north jetty began in 1905 and is currently 3,450 feet long. The navigation channel likely serves primarily as a migratory pathway into and out of the Coquille River estuary and does not contain preferred habitat for rearing, resting, or feeding by ESA-listed fish species. The substrate is primarily sand, with finer-grained material within the boat basin access channel, which is protected from river flows which typically scour the main channel.

The ODMDS is within the nearshore area of the Pacific Ocean off the Coquille River. The substrate consists of fine sand with courser material on the western side of the site. The benthic community is typical of nearshore, high-energy environment found along the Oregon coast, and including polychaetes, and amphipods (EPA 1990). The nearshore ocean environment supports anadromous salmonids as well as a variety of other pelagic and demersal fish species.

The nearshore ocean environment outside the mouth the Coquille River supports anadromous salmonids as well as a variety of other pelagic and demersal fish species. Summer upwelling provides the nutrients to fuel primary and secondary production that in turn determines habitat quality in the form of available yearling coho salmon forage (Bi *et al.* 2008, Chase *et al.* 2007). Based on available information regarding general water quality conditions, water depths, and primary and secondary production, the baseline conditions of the action area provide, at a minimum, sufficient conditions to support OC coho salmon and southern green sturgeon. The habitat quality of these conditions varies from year to year depending on the large scale ocean dynamics that determine nutrient upwelling and water quality conditions.

Port Orford

The action area is approximately 1.75 acres within the natural cove of Port Orford and approximately 3.7 acres in the Pacific Ocean used for disposal (Figure 14). The cove is protected from the north and west by a headland that extends seaward on a southerly direction for approximately one mile. A breakwater was constructed in 1935 at the southern end of the cove and later extended to its current length of 550 feet in 1968. Dredging the turning basin began in 1971 and dredging the boat hoist area began in 1988.

The disposal area is offshore from the breakwater. This nearshore ocean environment is subject to extreme wave energy during winter storms and likely mobilizes and transports significant volumes of marine sediments during these events. While no specific information regarding presence and/or abundance of marine benthic organisms in this area has been conducted, it is reasonable to expect that typical marine life adapted to this environment is present, including flatfish, sculpins, sea perch, and rocky reef fish associated with neritic jetties. Dominant species likely include English sole, sanddab, and starry flounder.

Three distinct basins that drain directly into the Pacific Ocean are nearby to Port Orford. They include Garrison Lake, Hubbard Creek, and Brush Creek. In total, these three watersheds drain approximately 13,339 acres of land. The Port Orford watersheds, situated entirely within Curry County, are among the smallest on the southern Oregon coast. Garrison Lake and certain portions of Hubbard Creek are within the vicinity of the Port Orford community. Brush Creek, a few miles south of Port Orford, empties into the Pacific Ocean near Humbug Mountain. Elevations in the Port Orford watersheds range from sea level to approximately 3,040 feet on Rocky Peak, in the Brush Creek basin (Maguire 2001). Land uses include urban, forestry, agriculture, range and rural residential development, with a reservoir, on the North Fork of Hubbard Creek, serving as the primary water source for the City of Port Orford. In total, approximately 69% of the watersheds are in private ownership (Maguire 2001).

Habitat is limited in each of these three basins, with Brush Creek and Hubbard Creek being the only streams where coho salmon appear to be present; although presence and abundance of coho salmon varies from year to year. Hubbard Creek has little good habitat for coho salmon and the creek's access upstream from the ocean is difficult for these fish; there may never have been a natural, self-sustaining run of SONCC coho salmon within Hubbard Creek (Maguire 2001). Attempts were made in the 1970s to start a coho salmon run with a small planting of hatchery fish, and those returning fish today are thought to be either remnants of that effort or strays from nearby rivers (Maguire 2001). Brush Creek supports spawning and rearing of SONCC coho salmon, with anadromous fish usage in Brush Creek extending upstream to approximately RM 5.7 (Mazur 2003). Coho salmon juveniles are present year-round, with spawning adults generally present from early November through mid-February.

Rogue River

The action area is within the navigation channel entrance at the mouth of the Rogue River (approximately 40 acres), the access channel to the Gold Beach boat basin (approximately 6.9-acre), and approximately 254 acres in the Pacific Ocean offshore from the mouth of the Rogue River (Figures 15 – 16).

The Rogue River has a drainage area of 3,302,400 acres, but the estuary is one of the smallest in Oregon at approximately 1,856 acres. Furthermore, between 1960 and 1972, approximately 13 acres of intertidal and 14 acres of subtidal land were filled in to build the boat basin dike, the marina, north shore riprap and the other north shore developments (Hicks 2005).

Construction of the South Jetty at the Rogue River was completed in 1959 and the North Jetty completed in 1960 to create hydraulic controls to maintain a fixed channel at the interface of the Rogue River and the Pacific Ocean to permit navigation of commercial traffic. The entrance to the Rogue River has been maintained by the Corps since construction of the navigation channel in 1961, with dredging occurring on a near annual basis. The Rogue River ODMDS, or areas in the same vicinity, have been used by the Corps for dredged material disposal since 1962. The existing Rogue River ODMDS received an interim designation in 1977, and has been in-use continuously for disposal of dredged material since that time.

The ODMDS is within the nearshore area of the Pacific Ocean off the Rogue River. The nearshore ocean environment supports anadromous salmonids including SONCC coho salmon, winter steelhead, and spring and fall Chinook salmon, as well as a variety of other pelagic and demersal fish species, of which, only the SONCC coho salmon are ESA-listed. The ODMDS lies approximately 1.75 miles outside of the mouth the mouth of the Rogue River.

Summer upwelling provides the nutrients to fuel primary and secondary production that in turn determines habitat quality in the form of available yearling coho salmon forage (Bi *et al.* 2008, Chase *et al.* 2007). Based on available information regarding general water quality conditions, water depths, and primary and secondary production, the baseline conditions of the action area provide, at a minimum, sufficient conditions to support SONCC coho salmon and the SDPS of green sturgeon. The habitat quality of these conditions varies from year to year depending on the large scale ocean dynamics that determine nutrient upwelling and water quality conditions.

Chetco River

The action area is within the navigation channel entrance at the mouth of the Chetco River (approximately 13.1 acres), the turning basin and access channel to the Brookings/Harbor boat basin (approximately 5.1 acres), and approximately 284 acres of the Pacific Ocean offshore from the mouth of the Chetco River (Figure 17).

The Chetco River is in the southwest corner of Oregon, almost entirely within Curry County, and drains approximately 352 square miles. The Chetco River mainstem is about 57 miles long, with the upper 28 miles within the Kalmiopsis Wilderness. Elevations in the watershed range from sea level to approximately 5,098 feet on Pearsoll Peak. The upper portion of the basin is characterized by steep, sloping forested areas with narrow valleys and tributary streams that have moderately steep to very steep gradient. The lowest 11 miles of the river are bordered by private land in rural/residential, forestry, and urban land uses. The Chetco River from RM 0.0 to RM 57.1 is on ODEQ 303(d) list for stream temperature (ODEQ 2006). The Chetco River is moderately impaired for phosphates, excess nutrients and high temperatures from urban and agricultural runoff that contribute to high algal growth and anoxic conditions in the estuary in the summer (Maguire 2001). The Chetco River is also listed on ODEQ 303(d) list for flow modification and habitat modification (ODEQ 2006).

The lower part of reach one has been significantly modified from its historical condition. The river was a bar bound system that likely included a very productive freshwater lagoon with the tidal marsh. The Corps erected jetties in 1957, which stabilized and deepened the mouth of the river. A boat basin and marina were built in the late 1950s, eliminating most of the functional tidal marsh. The modifications eliminated shallow-water habitats and vegetation in favor of deeper water and banks stabilized with riprap. Since then, nearly all of the rest of the shoreline of the lower estuary has been stabilized with riprap.

The Chetco River ODMDS is approximately 1.5 miles offshore from the mouth of the Chetco River and ranges from 60 to 80 feet in depth (EPA 1989). The nearshore ocean environment supports anadromous salmonids including SONCC coho salmon, as well as a variety of other pelagic and demersal fish species. Summer upwelling provides the nutrients to fuel primary and

secondary production that in turn determines habitat quality in the form of available yearling coho salmon forage (Bi *et al.* 2008, Chase *et al.* 2007). Based on available information regarding general water quality conditions, water depths, and primary and secondary production, the baseline conditions of the action area provide, at a minimum, sufficient conditions to support coho salmon. The habitat quality of these conditions varies from year to year depending on the large scale ocean dynamics that determine nutrient upwelling and water quality conditions. The bottom sediments range from fine sediments to rock outcrops; about half the disposal site is consists of scattered rock exposures while the remainder consists of sand, coarse sand and gravel (EPA 1989). The area is dispersive, with no long-term accumulation of sediments.

Effects of the Action

'Effects of the action' means the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated or interdependent with that action, that will be added to the environmental baseline (50 CFR 402.02).

The proposed action will affect the ESA-listed fish species by causing physical and biological changes to the environmental baseline, and through direct and indirect effects to these species. These effects include entrainment into dredges, dumping on and burial of fish migrating through or rearing within the action area during in-water work, effects to benthic forage, and short-term negative water quality effects from turbidity.

The effects of dredging and disposal on physical habitat features include modification of bottom topography. Removal of eelgrass, whether through dredging or disposal, will result in a loss of important feeding and rearing habitat. Dredging may convert intertidal habitats to subtidal, or shallow subtidal habitats to deeper subtidal. The proposed dredging of the navigational channels within the existing, authorized channels will affect bottom topography, but is unlikely to cause large-scale or long-term effects to habitat features. In some cases, disposal may result in the mounding of sediments on the bed of the disposal site. Such conversions may affect plant and animal assemblages uniquely adapted to the particular site conditions these habitats offer.

Water Quality – Suspended Fine-grained Solids. Suspended sediments are not likely to significantly increase as a result of the majority of dredging activities. Most of the dredging will be conducted by hydraulic dredges, and this technique generally does not produce large amounts of turbidity or total suspended solids during dredging because of the suction action of the dredge pump and the dragheads are buried in the sediment during dredging operations. Some increases in turbidity and suspended solids will occur when dredging is conducted by mechanical means. The amount of turbidity produced by mechanical dredging depends on sediment composition and the type of bucket used. The greater the proportion of fine sediments being dredged and disposed of, the more likely the activity will result in an increase in suspended sediments. An open-bucket dragline can produce higher amounts of turbidity, while a closing bucket generally produces less turbidity. However, this impact should be localized and of short duration because the majority of the dredged material is sand, which does not stay suspended in the water column for a significant length of time. In addition, although finer-grained material dredged from some of the boat basin access channels and upriver areas may stay suspended in the water column for a longer time; these areas are primarily dredged on a five to eight year rotation, so the effects from this activity

are relatively infrequent, and typically occur outside of the time period when ESA-listed fish species are likely to be exposed.

Increased turbidity will occur when dredged sediments are disposed in-water, either at estuarine flow-lane or ocean disposal sites. Turbidity, including that due to suspended sediment at moderate levels, can reduce primary and secondary productivity, and at high levels can injure or kill adult and juvenile fish, and interfere with feeding (Bjornn and Reiser 1991, Servizi and Martins 1991, Spence *et al.* 1996). The NMFS anticipates turbidity will dissipate due to river flow, tidal action, currents, and wave action within a few hours. The NMFS is reasonably certain increases in turbidity levels will exceed 17 milligrams per liter (mg/L) concentrations in areas dredged mechanically, particularly if the area contains high levels of finer-grained matter, such as many of the boat basin access channels and for the majority of the in-water disposal discharge fields. The plume of turbidity will be spread by the river flow, tidal action, currents, and wave activity relative to the dredging and/or disposal location. The NMFS is reasonably certain the turbidity plume will migrate outside of the specific project areas and dissipate within 200 feet outside the specific dredging areas and 500 feet outside the boundary of disposal areas within a few hours. Reduced primary production in the action area is not reasonably certain to occur if the resulting duration (hours), concentration, and small areal coverage of the increased turbidity concentrations which result in minimal impacts to primary production. Should elevated turbidity levels occur for extended periods of time (days), a reduction in primary production is expected to occur and result in decreased habitat suitability for OC and SONCC coho salmon and southern green sturgeon.

Elevated Chemical Contamination. The Corps conducts sediment sampling and analysis at the Coastal Projects on a five-year cycle. Sediment analysis at each project shows that the sediments contain very minute concentrations of contaminants and that material is suitable for unconfined in-water disposal. Samples are submitted for physical analysis including total volatile solids. Select samples containing higher percent fine-grained material are analyzed for metals, TOC, pesticides and PCBs, phenols, phthalates, and miscellaneous extractables, PAHs, and organotin. Although trace levels of various heavy metals, PAHs, and other compounds do occur with the sediments; these concentrations are consistent with historical sampling results and meet the guidelines established in the DMEF and SEF for unconfined in-water disposal. Therefore, although trace levels of various heavy metals and other compounds will occur with the dredged sediments, these levels will not exceed concentrations harmful to organisms occupying the action area.

Physical Habitat Modifications. The effects of dredging and disposal on physical habitat features include modification of bottom topography. The significance of the effects is a function of the ratio of the size of the dredged area to the size of the bottom area and water volume (Morton 1977). Dredging may convert intertidal habitats to subtidal, or shallow subtidal habitats to deeper subtidal. In some cases, disposal may result in the mounding of sediments at the disposal location. Such conversions may affect plant and animal assemblages uniquely adapted to the particular site conditions these habitats offer.

Disposal sites vary by project and include in bay/river sites, surf zone sites, and ocean disposal sites. Dredged material is placed at in-bay/river sites that are adjacent to the navigation channels

(Coos Bay and Umpqua), in the flow-lane (Tillamook and Coquille), and near-shore (Port Orford and Chetco). Material is sometimes placed on the beach within the surf zone at Rogue and directly on rocks at Depoe Bay. Annual bathymetry surveys are conducted at in-bay/river sites and compared to baseline surveys from the previous year's survey to monitor changes and trends in bathymetry, and insure site capacity is not exceeded. Typically, these sites are dispersive and the material is transported out of these locations by river flow and/or tidal fluctuations.

Disposal occurs at ocean disposal sites at the Yaquina, Siuslaw, Umpqua, Coos Bay, Coquille, Rogue, and Chetco projects. The ocean disposal sites are between one and three miles offshore in waters 45 to 205 feet deep. Annual bathymetry surveys are conducted at ocean disposal sites and compared to baseline surveys for the previous year's survey. The annual surveys verify placement of material within the sites, monitor changes and trends in bathymetry, and insure site capacity is not exceeded. The annual assessment report prepared by the Corps and provided to EPA indicate that the ocean disposal sites are behaving as expected and are not limited in capacity at this time.

Estuary and riverbed morphology. A purpose of maintenance dredging is lowering the elevation of the estuary and riverbed. This is the result of extracting sediments from the riverbed at a faster rate than recruits to the area. The main channel dredging prisms for the Coastal Projects varies in depth from zero to three feet, with an occasional shoal reaching four to five feet in depth. The entrance and navigation channels at the Yaquina, Siuslaw, Umpqua, Coos, Coquille, Rogue, and Chetco projects are typically dredged every year, so the maintenance dredging is removing the annually-accumulated sediments that are transported from upstream locations or through the entrance as a result of ocean and tidal action. The boat basin access channels at the Umpqua (Winchester Bay) and Coos Bay (Charleston) are also dredged annually. The remaining Project's boat basin access channels, and Depot Slough at Yaquina Bay, are typically dredged every five years. Because of this on-going aggradation of sediments with the Coastal Project main navigation channels, despite the annual extraction of sediments, suggests that these estuary's bed elevations may be at equilibrium and may not be resulting in upstream bed level lowering.

Mounding in the ODMDS. In the past, disposal of dredged material at the ODMDSs at some projects created temporary mounds on the ocean floor immediately following disposal, but surveys occurring in the spring the following summer/fall disposal have documented that these mounds disperse over the winter due to natural ocean conditions. Based on the dynamic, high-energy environment found along the Oregon coast, sediment transport, erosion, and accretion are more dependent upon surrounding ocean forces that operate independent of the proposed action. Therefore, long-term mounding due to these actions are not likely in the future at current disposal rates. Further, annual bathymetry surveys will be conducted at in-water disposal sites and compared to baseline surveys for previous year's survey. The annual surveys will verify placement of material within the sites, monitor changes and trends in bathymetry, and ensure the site capacity is not exceeded.

Annual bathymetry surveys are also conducted at in-bay/river sites and compared to baseline surveys from the previous year's survey to monitor changes and trends in bathymetry, and insure site capacity is not exceeded. Typically, these sites are dispersive and the material is transported

out of these locations by river flow and/or tidal fluctuations. The exception is in-bay disposal Site 8.4 in Coos Bay where material is disposed of annually and then removed by hydraulic dredge every five to ten years and disposed of at ODMDS F.

Coarse-grain Material Deposition. Unconfined in-water disposal of coarse-grain dredged material is reasonably certain to result in the exposure of all organisms in its descent path to adverse environmental conditions. All the projects may dispose of dredged material in-water, with the exception of Depoe Bay where the material is placed on the rocky shoreline and sometimes at the Rogue where material is placed on the beach within the surf-zone. The coarse-grain material will move through the water column rapidly at a descent rate of 11 feet/second to start with and 7 feet/second near the end of the load. As water is added to the dredged material to help wash it out of the hopper, the slurry mixture becomes more neutrally buoyant and descends at a slower rate. It is the NMFS' judgment that any planktonic organisms in the path of this material will become entrained within the material and carried to the bottom. Pelagic species are likely to try and avoid the descending material, but some are reasonably certain to be entrained and convected to the ocean floor with the coarse-grain dredged material. A more detailed discussion of this interaction is provided in the "effects to the species section." An unknown number of individuals of various vertebrate and invertebrate species are reasonably certain to be exposed and likely injured and killed by this material.

Reduction in Prey Availability. The removal of sediment from the navigation and access channels by dredging will cause immediate mortality of all organisms present at the site including polychaetes, oligochaetes, clams, and amphipods. However, the navigational channels tend to be areas of higher energy, with localized deposition and scour, as well as transport of bed material based on river flow, ocean conditions, and tidal fluctuations. This environment is not as biologically productive as the surrounding off-channel, subtidal and intertidal habitats; the navigational channels are likely to contain less diversity and abundance of invertebrate prey. Also, dredging typically occurs at specific locations within the navigational channels where annual shoaling has occurred and does not routinely occur across the entire navigational channel footprint equally or uniformly. It is likely that the invertebrate infaunal and epifaunal species that are present will recolonize the area following dredging. Recolonization varies depending upon the organism. Recovery of shorter-lived benthic invertebrates (*e.g.* amphipods) will likely occur in several months to a year in comparison with the larger benthic macroinvertebrates (*e.g.* mollusks and larger polychaetes), which may take a year or longer based on their reproductive cycles.

Dredging can disrupt benthic prey populations used by green sturgeon and juvenile salmon if repeated dredging in the same location exceeds the recovery rate of benthic food organisms or causes a permanent shift in substrate texture or other topographic condition. However, the importance of the navigation channels as a rearing area for juvenile salmonids is limited, and the disturbance to the benthic community within these areas likely will not alter feeding opportunities for salmonids moving through the Oregon Coastal Projects to access the ocean. Further, sediment movement in coastal bays and estuaries is a very dynamic process, and the organic content and particle size will likely return to background within several days to weeks in the project area. Because the entire footprint of the navigation channels is not typically dredged

every year, portions of the channel remain undisturbed, and these areas may assist in recolonization by macroinvertebrates in disturbed areas follow dredging operations.

Removal of eelgrass beds from the bays and estuaries associated with the Oregon Coastal Projects (*e.g*. Tillamook Bay, Yaquina Bay and River, Siuslaw River, Umpqua River, Winchester Bay, Coos Bay) will reduce primary production in the area where dredging occurs and potentially reduce prey availability to OC coho salmon and green sturgeon by removing habitat that contributes to the system at multiple trophic levels. Eelgrass functions as important structural environment that forms the base of the detridal-based food webs, and is a source of secondary production, supporting epiphytic plants, animals, and microbial organisms that in turn are grazed upon by other invertebrates, and larval and juvenile fish (NMFS 1991). The rate of recovery for the eelgrass beds is not clear, however, the authorized navigation channels and the proposed disposal site are likely to never fully recover as a result of the frequency of dredging and disposal. However, the effects to prey availability from a relatively small reduction in eelgrass habitat (should it even be present) compared to the amount of eelgrass habitat available in the Oregon Coastal Project's bays and estuaries are likely minimal.

Unconfined in-water disposal of dredged sediments will cover infaunal and epifaunal invertebrates with a layer of sandy sediment because disposal of dredge materials contributes a layer of unconsolidated sediment on the floor of the disposal location. The ODMDSs at the Oregon Coastal Projects are monitored annually to assess mounding, which was previously discussed. Although long-term mounding is not apparent from the monitoring, the short-term deposition of this material before the winter storms disperse the material is likely to result in some reduction of invertebrates at these locations. The result would be a change in the food source and habitat available to marine organisms in the area for up to 6 or 7 months between the disposal and when the winter storms disperse the material. The change in invertebrate prey species is dependent then on the recolonization rate of this area.

Rates of recovery listed in the literature range from several months for estuarine muds, and up to two to three years for sands and gravels (Hitchcock *et al.* 1999). Recolonization may take longer in areas with lower current (Van der Veer *et al.* 1985). The ODMDSs for the Oregon Coastal Projects are indicative of a dynamic nearshore ocean ecological zone that naturally would be characterized by a disturbance-based ecosystem. Disturbance-based ecosystems are indicative of rapid recolonization rates by opportunistic organisms tolerant of conditions that are physiologically stressful (Pemberton and MacEachern 1997).

Fish species that are forage for salmon and green sturgeon may also be impacted by this action due to the coarse-material descending through the water column. In addition to various invertebrates, green sturgeon appear to be opportunistic foragers and feed on various fish species, such as lingcod (Dumbauld *et al.* 2008), herring (Erickson and Hightower 2007), sand lace and anchovies (Moyle 2002) that may also be adversely impacted by the disposal. Adult coho salmon may also forage on similar pelagic species. Individuals of these forage species may be physically harmed by the disposed dredged material. Typically, these fish are smaller species that are less likely to avoid physical harm than larger and faster swimming species. Although the precise number of forage fish impacted is difficult to estimate, it is reasonably certain that dredging or disposal location would not significantly deplete the overall abundance of forage

available to listed species; forage fish are not limited in number, forage fish are well distributed, and the impact of the dredging or disposal is localized and affects a small area relative to the surrounding habitat. Further, it is possible that a slight, temporary increase in available forage may occur during dredging and disposal actions as benthic prey species are exposed along the river bed and discharged into the water column during disposal.

Effects to ESA-Listed Species

Coho salmon smolts from each of the Coastal Project's river basins pass through the estuarine portions of the individual project action areas and, along with other nearby populations enter the ocean and reside in the nearshore ocean portion of the individual project action areas and the surrounding ocean for several months before migrating north. The timing and number of days of actual dredging and disposal activities varies by project. Tables 22 and 23 compare OC and SONCC coho salmon life history timing to proposed dredging and disposal timeframes. The majority of the Corps' coastal dredging occurs outside the migration period for coho salmon smolts; however, at some projects, the migration period for OC and SONCC coho salmon smolts does overlap with proposed project activities.

While the majority of the dredging and disposal activities occur outside of the time when coho salmon smolts are outmigrating from their natal river basins, OC and SONCC coho salmon smolts are likely to be present in the nearshore Pacific Ocean off the Oregon coast at all times of the year and may encounter the disposal activities at projects where ocean disposal of dredged sediments is proposed. Therefore, the spatial and temporal overlap of ocean disposal activities and coho salmon smolt presence is likely to occur even after coho salmon have completed outmigration.

Because there is temporal overlap between smolt presence in the nearshore Pacific Ocean and project activities the NMFS is reasonably certain some of these individual will be exposed to potential entrainment, turbidity plumes and suspended sediments, and the disposed coarse-grain dredged material as it falls through the water column at the ODMDS associated with the Corps' Coastal Projects. The ocean disposal locations are all relatively close to the mouth of the respective river that is being dredged. This proximity to the river mouth creates a higher likelihood coho salmon smolts exiting their natal river basins could pass through these nearshore ocean portions of individual project action areas when compared to random locations along the Oregon coast, thereby increasing the likelihood for smolt (yearling) coho salmon to be near the discharge field of the hopper dredge vessel.

Adult OC and SONCC coho salmon return to their natal river basins generally beginning in early fall, with specific timing varying by river basin (Tables 22 and 23. Dredging and disposal activities are typically completed before adults return, however some spatial overlap occurs depending on the project, therefore exposure cannot be discounted.

Adult and subadult SDPS of green sturgeon could be exposed to these activities. Adult and subadult green sturgeon are known to use the larger coastal bays and estuaries along the Oregon coast during the summer and into fall, and may use the smaller bays and estuaries identified in this opinion, although the extent of use is not fully understood. Adult and subadult SDPS of

green sturgeon could be exposed to dredging and/or disposal activities during the time that they are present in the coastal bay or estuary. The SDPS of green sturgeon follow a north and south migration route along the continental shelf, and are known to enter some of Oregon's larger coastal bays and estuaries, and may possibly enter the smaller coastal bays and estuaries identified in this Opinion, leads the NMFS to conclude that it is reasonably certain that spatial and temporal overlap between dredging and disposal activities and the SDPS of green sturgeon presence at individual project action areas will occur.

It was previously concluded that changes in channel morphology, mounding, and chemical contamination are unlikely to change the environmental baseline sufficiently to be considered further in this document. Water quality degradation during disposal due to fine-grain suspended solids, and reduction in forage base for ESA-listed species may affect listed species and are analyzed further in the Opinion. Physical injury from entrainment and the deposition of coarse-grain material may adversely affect OC and SONCC coho salmon and southern green sturgeon and is analyzed in detail by project.

Table 22. Life history timing for OC coho salmon corresponding to the proposed action at the Corps' Oregon Coastal projects. (http://nrimp.dfw.state.or.us/nrimp/default.aspx?p=326).

Represents periods of peak use (90% of life history stage use

Represents periods of lesser use (10% of life history stage use

Represents period of presence, either with no level of use, OR uniform distribution.

Represents timing of Corps' dredging and disposal activities

Project	Coho Salmon life stage AND Corps Dredging Actives	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Tillamook Bay	Upstream Adult Migration												
	Downstream Juvenile Migration												
	Boat Basin Access Channel (45 days)												
Depoe Bay	Upstream Adult Migration												
	Downstream Juvenile Migration												
	Boat Basin (30 days)												
	Sediment Check Dam (7 days)												

Project	Coho Salmon life stage AND Corps Dredging Actives	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Yaquina Bay	Upstream Adult Migration												
	Downstream Juvenile Migration												
	Entrance Channel (32 days) (includes 6 days in Apr or May)												
	Boat Basin Access Channel (30 days)												
	Depot Slough (30 days)												
Siuslaw River	Upstream Adult Migration												
	Downstream Juvenile Migration												
	Entrance and Navigation Channel (20 days)												
Umpqua River	Upstream Adult Migration												
	Downstream Juvenile Migration												
	Entrance and Navigation Channel (20 days) (includes 4 days in Apr or May)												
	Boat Basin Access Channel (30 days)												

Project	Coho Salmon life stage AND Corps Dredging Actives	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Coos Bay	Upstream Adult Migration												
	Downstream Juvenile Migration												
	Entrance (20 days) (includes 5 days in Apr or May)												
	Navigation Channel RM 1-12 (35 days) (includes 6 days each Apr and May)												
	Navigation Channel RM 12-15 (100 days)												
	Boat Basin Access Channel (30 days) (includes 3 days each Apr, May, & Jun)												
Coquille River	Upstream Adult Migration												
	Downstream Juvenile Migration												
	Entrance (7 days)												
	Boat Basin Access Channel (14 days)												

Table 23. Life History Timing for SONCC Coho Salmon at the Corps' Oregon Coastal Projects. (http://nrimp.dfw.state.or.us/nrimp/default.aspx?p=326).

Project	Coho Salmon life stage AND Corps Dredging Actives	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Port Orford	Upstream Adult Migration												
	Downstream Juvenile Migration												
	Port Orford Dock (30 days)												
	Port Orford Channel (50 days)												
Rogue River	Upstream Adult Migration												
	Downstream Juvenile Migration												
	Entrance (12 days)												
	Boat Basin Access Channel (18 days)												
Chetco River	Upstream Adult Migration												
	Downstream Juvenile Migration												
	Entrance (7 days)												
	Boat Basin Access Channel (14 days)												

Represents periods of peak use (90% of life history stage use

Represents periods of lesser use (10% of life history stage use

Represents period of presence, either with no level of use, OR uniform distribution.

Represents timing of Corps' dredging and disposal activities

Water Quality – Suspended Solids From Fine-Grained Material. The NMFS previously concluded that suspended sediments from dredging are not likely to increase significantly (at most of the Corps' Coastal Projects) as a result of dredging activities because most of the sediment proposed for dredging is sand and dredging methods typically do not produce large amounts of turbidity or suspended solids. However, turbidity and increases in suspended solids will occur as a result when fine-grained sediments are dredged at some of the boat basin access channels and upriver locations (*e.g.* Depot Slough) and during all unconfined in-water disposal of dredged material regardless of where material was dredged from.

An increase in suspended sediment concentrations as low as 17 mg/L can result in increases of gill inflammation and can lead to respiratory stress, when juvenile coho salmon are exposed for periods of time as short as 4 hours (Berg and Northcote 1985). The NMFS is reasonably certain suspended sediment concentrations caused by the disposal of fine-grained sediments will exceed the 17 mg/L effects threshold for injury within and surrounding the descending sediment plume. However, NMFS is reasonably certain most yearling coho salmon that may be exposed will not remain in the sediment plume for a period (4 to 96 hours) sufficient to elicit an adverse physiological or behavioral response, although some individuals may remain and be adversely affected through prolonged exposure. The duration of the turbidity plume and the dispersion of this plume are dependent on variables such as river flow velocities, tidal fluctuations, ocean currents, size composition of the dredged materials, wave action, dredge vessel speed, and disposal rate. Turbidity drift will likely extend approximately 500 feet outside of the disposal areas.

Salmonids have been observed in lotic environments to move laterally and downstream to avoid sediment plumes (McLeay *et al.* 1984, 1987, Sigler *et al.* 1984, Lloyd 1987, Scannell 1988, Servizi and Martens 1991). Coho salmon should not be inhibited from moving away from suspended sediment plumes because the plumes will be localized; only affecting a small portion of the immediate river, estuary, or ocean environment. Therefore, while some coho salmon may be affected from exposure to project-related sediment plumes, these effects will not occur on a large spatial or temporal scale to significantly disrupt their normal behavioral patterns. The physical effects from being exposed to these fine-grained caused elevated turbidity levels are insignificant to yearling coho salmon. The NMFS is reasonably certain the increased concentrations of suspended sediment are unlikely to physically harm or disrupt adult coho salmon normal behavioral patterns and conclude the effects are insignificant.

Adult and subadult green sturgeon are likely less sensitive to turbidity and suspended solids than salmonids. The NMFS is also reasonably certain these elevated suspended sediment concentrations will result in insignificant behavioral and physical response due to the higher tolerance of green sturgeon, which usually inhabits much more turbid environments than do salmonids. Erickson and Hightower (2007) observed green sturgeon typically occupying depths from 130 to 230 feet and making occasional rapid ascents toward the surface during their migration journey. Green sturgeon are likely to occupy the lower regions of the water column within both the ocean and estuarine portions of the action areas. If green sturgeon are occupying the lower reaches of the water column they will likely be exposed to lower turbidity levels because much of the fine material will have suspended higher in the water column. Because southern green sturgeon have higher tolerances for suspended sediment and the suspended

sediment caused turbidity is in the upper water column, green sturgeon's normal behavioral patterns are unlikely to be disrupted by suspended fine sediment and it can be concluded these effects are insignificant.

Prey Availability. Yearling coho salmon forage on zooplankton and other planktonic species and the action is unlikely to reduce the overall abundance of these prey species. Impacts to benthic invertebrate species that are forage for southern green sturgeon are unlikely to reduce abundance levels that would result in limiting forage availability to southern green sturgeon. The action is also unlikely to limit the availability of forage fish species to a level that would limit survival or growth potential of southern green sturgeon or adult OC or SONCC coho salmon. Nonetheless, some forage species will be entrained and lost from the navigation channels during dredging. The loss of aquatic invertebrates in portions of the navigation channels will result in a small decrease in food available for OC and SONCC coho salmon and southern green sturgeon. This reduction of food may displace these species from individual project action areas. However, given the higher-energy environments found in the project navigation channels, most migrating OC or SONCC coho salmon and/or southern green sturgeon will likely keep moving past affected areas.

Within the estuarine and nearshore ocean portions of individual project action areas, the actions are unlikely to limit availability of forage fish species to a level that would limit survival or growth potential of southern green sturgeon or adult OC or SONCC coho salmon. The NMFS is reasonably certain the reduction in prey species is insignificant relative to the abundance of prey available to southern green sturgeon and OC or SONCC coho salmon because: (1) Prey abundance is determined by larger scale physical and biological factors; and (2) the action area is small compared to the available surrounding habitat for these prey species in Oregon's coastal bays and estuaries and the Pacific Ocean.

Physical Injury. During the course of dredging and disposal activities, it is probable that the proposed action will result in adverse affects to yearling coho salmon, adult coho salmon, and adult and subadult green sturgeon if they are present in the action area and encounter dredge equipment and disposal activities. Dredging activities are known to entrain fish and other organisms through dragheads or cutterheads. Unconfined in-water disposal will occur at some projects in the presence of yearling coho salmon, adult coho salmon, and adult and subadult green sturgeon.

If these fish are present and cannot avoid the dredging activity or disposed material, then the other factors are important for the response to this exposure. Because coho smolts reside in the nearshore ocean environment for several months after migrating from their natal river basins, they are likely to be present within the ocean disposal sites during disposal. If individuals are not present, or it is reasonable to conclude that presence would be extremely rare, then effects of physical injury to individuals at that particular project will not be evaluated further.

The factors important to assessing the likelihood for dredging or disposal of dredged material to adversely affect yearling coho salmon, adult coho salmon, and adult and subadult green sturgeon include: (1) Presence in the area at the time of the activity; (2) avoidance response to the dragheads or cutterheads; (3) avoidance of the ship; (4) avoidance response to the disposal

material; (5) discharge field size; (6) fish swimming speed; (7) material's descent rate; (8) quantity of material; (9) material weight; and (10) physical interaction of the fish and the material. The potential impacts from dredging and disposal will be evaluated separately. The avoidance response from the activity will be considered first because if the fish can avoid the exposure, then there would not be physical consequences. If the fish cannot avoid the activity, then the other factors are important for the response to this exposure. This impact would occur at the point of dredging in the navigation channels and within the in-water disposal sites.

Dredging. For a fish to avoid entrainment into the draghead it must first detect and react to the ship, the extended dragarms, or the draghead itself, and then the fish must react quickly to avoid exposure to the zone of influence around the draghead. Yearling OC and SONCC coho salmon will be passing through the riverine/estuarine portions of the individual project action areas en-route to the ocean, and therefore are at an increased risk of exposure due to the presence of the draghead or cutterhead within the migratory corridor. Noise and vibration from the dredge vessel and draghead or cutterhead during operation may discourage most fish from getting close to the draghead and thereby avoid encountering the zone of influence.

When juvenile salmonids come within the zone of influence of the cutter head, they may be drawn into the suction pipe (Dutta 1976, Dutta and Sookachoff 1975a). Dutta (1976) reported that salmon fry were entrained by hydraulic pipeline dredging in the Fraser River and recommended that hydraulic pipeline dredging during juvenile migration be controlled. Almost 99% of entrained juveniles were killed in studies by Braun (1974a, 1974b). Hydraulic pipeline dredging operations caused a partial destruction of the anadromous salmon fishery resource of the Fraser River (Dutta and Sookachoff 1975b). Hydraulic pipeline dredges operating in the Fraser River during fry migration took substantial numbers of juveniles (Boyd 1975). Further testing in 1980 by Arseneault (1981) found entrainment of chum and pink salmon but in low numbers relative to the total of salmonids outmigrating (0.0001 to 0.0099%).

The Corps conducted extensive sampling during hydraulic dredging within the Columbia River in 1985-88 (Larson and Moehl 1990) and again in 1997 and 1998 in Oregon coastal bays and estuaries. In the 1985-88 study no juvenile salmon were entrained, and in the 1997-98 study two juvenile salmon and a white sturgeon were entrained (R2 Resource Consultants 1999). Examination of fish entrainment rates in Grays Harbor from 1978 to 1989 detected only one juvenile salmon entrained (McGraw and Armstrong 1990). Dredging was conducted outside peak migration times. No evidence of fish mortality was found while monitoring dredging activities along the Atlantic Intracoastal Waterway (Stickney 1973). These conflicting Fraser and Columbia River studies examined deep-water areas associated with main channels. There is little information on the extent of entrainment in shallow-water areas, such as those associated with the proposed action.

In the absence of definitive information, the NMFS makes the biologically conservative assumption that hydraulic and/or pipeline dredging in shallow-water areas of the navigational channels is likely to entrain some juvenile OC and SONCC coho salmon, if they are present during operations. The timeframe for dredging operations vary by project, but some are scheduled to occur during the OC and SONCC coho salmon outmigration period, and will continue into the over-summer period when green sturgeon are present. The proposed

conservation measure to maintain the cutterheads and dragheads in the sediment, or no more than 3 feet above the river bottom, is likely to reduce, but not eliminate, the probability for entrainment of juvenile salmonids and other fishes. Adult coho salmon are not expected to be entrained because they will be able to swim away from the disturbance.

Dredging studies on the Columbia River captured a single juvenile white sturgeon, indicating that there is a risk to small sturgeon becoming physically entrained during dredging operations (R2 Resource Consultants 1999). Evaluating the potential that adult and subadult southern green sturgeon will encounter a draghead or cutterhead during dredging operations needs to consider the probability that an individual fish will be present at the time and in the location that the draghead is in the water and engaged. Current information suggests that the southern green sturgeon are present in the larger bays and estuaries along the Oregon coast in the summer months, and they are thought to be present, but not yet confirmed in many of the smaller bays and estuaries. In order to access and exit the rivers and estuaries associated with the Oregon coastal projects, southern green sturgeon would need to pass through the entrances and may utilize the navigational channels. This spatial overlap with project activities increases the probability that should southern green sturgeon be present within any of the Oregon coastal projects during dredging operations, they may encounter the zone of influence near an active draghead or cutterhead. However, because southern green sturgeon do not spawn in any of the rivers associated with the Oregon coastal projects, small juvenile green sturgeon are not considered to be present, and the subadult and adult southern green sturgeon that may be present are likely large to swim away from the disturbance.

Disposal. There are two primary dredged material disposal methods that involve unconfined in-water disposal that may be employed at the Oregon coastal project, dumping from a hopper dredge or dump barge or discharge from a pipeline dredge. A dumping creates a discharge field from the bottom of the vessel hull to the bottom of the disposal area, and is done at a separate location from where the material was dredged. Discharge of dredged materials using pipeline-discharge would occur simultaneously with dredging and typically occurs nearer the actual dredging location.

The in-water disposal by pipeline will create a discharge field that may range from 150 to 500 feet in length and 100 to 200 feet wide, depending on dredged material, discharge rate, tidal conditions, and river velocities. Juvenile coho salmon are likely to use the upper 20 to 25 feet of the water column, although they may use water column depths ranging from 22 to 37 feet (Carlson *et al.* 2001, Beeman *et al.* 2003). Pipeline dredges typically use a 30-inch pipeline with discharge velocities of at least 25 feet/second. However, the outfall is typically placed at a minimum of 20 feet below the water surface elevation, although greater depths are possible. While it is possible that individuals may be present at the initial start-up, NMFS is reasonably certain that during operations, OC and SONCC coho salmon or southern of green sturgeon could easily move out of the area to avoid the discharge plume. Further, it seems unlikely that individuals would swim into the discharge field, but would avoid the area and thereby avoid injury. The effects to individuals from the unconfined in-water disposal of dredged material from a hopper dredge vessel are discussed in greater detail below.

Ship detection and avoidance response. For a fish to avoid the disposal material it may first detect and react to the approaching disposal vessel. An early detection and avoidance response to a vessel would increase the probability a fish could avoid the disposal material descending around them. Behavior studies related to other water vessels would suggest that unless the juvenile coho salmon are near the surface, they are unlikely to react to a ship passing above them (Satterthwaite 1995). Fernandes *et al.* (2000) contend fish do not avoid survey vessels in their study of vessel avoidance by herring. There is no clear conclusion with this premise based on study results for other species (Gerlotto and Freon 1992; Misund 1996, 1993; Jorgensen *et al.* 2004). In these other studies, vertical and horizontal avoidance responses were observed where some fish reacted to the noise of the vessel by diving, others moved horizontally from the noise, and some moved away ahead of the vessel. Based on the conflicting results, the NMFS is reasonably certain not all yearling coho salmon or southern green sturgeon will react to the vessel and move away from the discharge field.

Avoidance of disposed material. It is unknown whether the coho salmon or green sturgeon will elicit an avoidance response to the disposed material. The Corps (2005) speculates pelagic salmon would not be adversely affected by disposal material, but the NMFS is not aware of any research or observations to document yearling coho salmon or green sturgeon response to this material. The NMFS is reasonably certain the fish will detect the descending material and will attempt to evade the material, because the fish will likely perceive the material as a threat. Based on the observed ship avoidance response research, it is the NMFS' judgment the likely initial movement by the fish will be to dive and then initiate horizontal evasion. The determining factor then will be whether the fish can swim fast to move out of the discharge field.

Discharge field size. The size of the discharge field is primarily determined by the size of the dredge material disposal vessel, the volume of disposal material, the depth of water, and the length of the disposal run, although water depth appears to be the most significant variable in determining overall discharge field size. In-water disposal by hopper dredge or scow will create a discharge field from the bottom of the vessel's hull to the ocean or estuary floor. The depths of the ODMDS range from -30 to -205 feet, in-river and in-bay disposal sites range from -10 to -75 feet deep, and the nearshore disposal site at Chetco is approximately -24 feet deep.

As dredged material is released from a hopper dredge, it falls through the water column and mixes with the ambient water to create a plume. This process is called convective descent and it is anticipated that the greatest risk to pelagic fish species occurs when these organisms interact with this descending column of dredged material. The discharge field during each disposal run will vary based on the depth of the disposal site; with the volume of water exposed increasing with depth. Because actual disposal locations within each ODMDS will vary based on site-specific bathymetric conditions at the time of disposal, for the purposes of this consultation, estimates of the volume of water exposed to the convective descent column have been calculated by the Corps for both the *Yaquina* and *Essayons* based on the typical volume of dredged material disposed in 60 feet of water. The beam of the dredge ship Yaquina, the ship primarily used for dredging the Oregon coastal projects, is approximately 58 feet wide. When the depth of the disposal site is -60 feet, the disposal plume will begin at approximately -16 feet (bottom of hull) and be approximately 10 feet in diameter. As the plume descends to the bottom, the radius of the

plume will be approximately 92 feet.[8] This discharge field will extend along the travel route. The dredge Essayons, used exclusively at the entrance to Coos Bay, has a 68-foot beam, and while the discharge volume is greater, the discharge field size tends to only increase slightly, with a radius of approximately 16 feet at the bottom of the hull and expanding to 120 feet as it approaches the sea floor.[8]

The amount of dredged and subsequently disposed material depends on many factors including the sediment characteristics and dredging conditions. While the specific volume of sediment dredged may vary at any given time as a result of these variables, the goal of any dredging operation is to work as efficiently as possible to complete the job. Therefore, for the purposes of this consultation, a "typical" volume of dredged material disposed during a single disposal event is considered approximately 800 cy for the *Yaquina* and 4,500 cy for the *Essayons*. The volume of water exposed during disposal of this amount of material then is approximately 25,000 m^3 for the *Yaquina* and 30,000 m^3 for the *Essayons*. The volume of the discharge field size will be smaller at the in-bay/river disposal sites, due to shallower depths at these sites.

Spatial overlap between fish and the discharge field. The distance from the bottom of the hopper dredge to the surface of the water will vary depending on the specific dredge and how loaded the dredge is and will change as the material is discharged into the disposal location. Fish occurring near the water surface, above the discharge doors, will not be exposed to the material. However, the hopper dredge will start rising as dredge materials are released thereby increasing the area of the discharge field throughout most of the water column. Yearling salmonids have been identified to using the upper 20 to 25 feet of the water column, although they may use water column depths ranging from 22 to 37 feet (Carlson *et al.* 2001, Beeman *et al.* 2003). Off of the Oregon coast, yearling coho salmon were collected in surface trawls that sampled from the surface down to 54 feet below the surface (Brodeur *et al.* 2004). Green sturgeon may use various portions of the water column, but are likely at a much deeper depth than the coho salmon. Erickson and Hightower (2007) observed green sturgeon typically occupying depths from 130 to 230 feet, making occasional rapid ascents toward the surface.

At the in-river and in-bay disposal sites, the discharge field size and spatial over lap will be smaller due to shallower depths at these sites. However, these sites are significantly smaller than any of the ODMDS and it is reasonable to conclude that the entire footprint at any of these sites will be exposed every day that disposal occurs at these locations. Further, when disposal occurs during out-migration of coho salmon smolts, there is a greater likelihood that some of these fish may be exposed to disposal events due to the constraining channel geometry.

Swimming speed of coho salmon and green sturgeon. Successful avoidance will depend on the swimming speed of the fish, the distance it must travel to get outside the discharge field, and the descent speed of the dredged material. Although the Corps theorizes that the juvenile coho salmon would either avoid the dispersal area or the physics of the disposal plume would displace the fish laterally, no direct evidence supports such an assertion (Corps 2005). Yearling coho salmon are approximately five inches in length when they enter the ocean from the

[8] Conversation between Rod Moritz, U.S. Army Corps of Engineers (February 3, 2010) and Greg Smith, U.S. Army Corps of Engineers regarding the volume of water associated with the discharge field from the Essayons and Yaquina dredge vessels.

Oregon's coastal river basins. Their "darting" or "burst" swimming speed, the likely response when the disposal material is detected, is estimated at 4 to 5 feet/second (Bell Fisheries Handbook 1990). The darting speed of adult coho salmon may exceed 20 feet/second (Bell Fisheries Handbook 1990). The darting or burst speed of southern green sturgeon is unknown. Cruising speed, a sustained swimming speed, for green sturgeon is estimated at 1 body length/second (Niggemyer and Duster 2003). Darting or burst speed would likely be higher than this, possibly twice as fast. Adult green sturgeon captured in various research studies range from 3.9 to 7.4 feet in length (Moser and Lindley 2007, Erickson and Webb 2007). Juvenile green sturgeon may enter the ocean environment when they are 2- to 3-years old and possibly 2 feet long (Adams *et al.* 2002). Based on the body lengths, burst speed for adult green sturgeon of this reported size would be 8 to 15 feet/second (2 body length/second) and 4 feet/second for small subadults.

Relationship between the discharge field and coho salmon and green sturgeon swimming speed. The Corps predicts the initial plume velocity just before impact will reach 11 feet/second. They also predict material last to leave the hopper to have a maximum velocity of 7 feet/second because the slurry mixture would have a greater proportion of neutral buoyant water. Assuming a central location in the discharge field (29 feet from edge of the field) and direct movement to the edge of the field, it would take a yearling coho salmon 5.8 seconds to traverse to the edge of the plume. The maximum time a fish can sustain a darting speed is 5 to 10 seconds. The yearling coho salmon may not be able to reach the edge of the plume in the allotted time, even if they choose the correct direction and move directly toward the edge. With the material descending at 7 to 11 feet/second, it will be challenging for the yearling coho salmon to avoid the descending plume. In five seconds the plume will descend 35 to 55 feet, and in the shallower disposal locations the material will have already made contact with the bottom of the disposal area. Conversely, adult coho salmon have a high likelihood of reaching the edge of the discharge field ahead of the plume due to their speed. Based on a central location and given a darting speed of 20 feet/second, an adult coho salmon would reach the edge of the 58-foot wide field in slightly over 1 second. Larger green sturgeon with burst speeds of 8 to 14 feet/second are also more likely to evade the descending material. These fish, given the same conditions previously described and similar response, may reach the edge of the discharge field in 2 to 3.6 seconds. In 3.6 seconds, the plume will descend 25 to 40 feet. Younger and smaller green sturgeon may not have the capability of reaching the edge. Small subadult green sturgeon may be closer to 2 feet long, therefore their speed would be possibly 4 feet/second, similar to that of the yearling coho salmon; therefore NMFS concludes with reasonable certainty younger green sturgeon could be exposed and physically harmed by this material.

Given that the fish cannot sustain darting speeds for longer than five seconds; the fish may also have to rely on sustained speed to avoid the plume. The sustained speed of a five-inch yearling coho salmon is predicted to be 2.1 feet/second (Bell Fisheries Handbook 1990). It would require almost 14 seconds for the fish to reach the edge of the 58-foot wide plume if they started in the center of the plume. In 14 seconds the plume would descend 98 to 154 feet. The ODMDS range in depth from -30 to -205 feet deep, with in-river and in-bay sites as shallow as -17 feet at Coquille, so the plume will hit the floor of the disposal area before a yearling coho could evade. The expectation is that given these swimming speed challenges and the descent rate, many yearling coho salmon are not going to be able to avoid the disposal plume. A confounding

problem is that these yearling coho salmon may be exhibiting schooling behavior; therefore, numerous fish may be exposed at one time. Typical avoidance response may also include an initial dive to avoid the material and then horizontal movement, thus losing time to evade the descending material. Based on this discussion, NMFS concludes adult coho salmon can evade the sediment plume, but some of the yearling coho salmon will occur in locations relative to the discharge plume and not be able to avoid the descending material. The NMFS concludes the interaction between the fish and the material must be analyzed and assessed to determine the risk to these individuals.

The affects to southern green sturgeon are likely different. Individuals of this species will include subadult and adults that are much larger in size than coho salmon. Evasion by green sturgeon is also likely more probable due to their expected location in the water column. Whether relying on burst or sustained speed the green sturgeon occupying the deeper depths of the water column have more time to detect the descending sediments and initiate an avoidance response. It is assumed that green sturgeon, given their larger size, faster swimming speed, and inhabiting deeper depth will avoid the discharge plume. An exception to this will be the youngest and smallest migrants. These younger subadults that may only be 2 feet in length would have a sustained swimming speed of 2 feet/second and may still not be able to successfully avoid the descending plume, despite their deeper depth location. The NMFS is reasonably certain that adult and larger subadult southern green sturgeon are unlikely to be physically harmed because these individuals will avoid the descending sediments. Smaller individuals, those near to the 2-foot length, are more likely to be unsuccessful in avoiding the descending material and NMFS is reasonably certain this action poses physical risk to any of these individuals directly exposed to the disposed dredge material.

Quantity and weight of dredged material. Disposal quantities and discharge time are important variables to consider while assessing the likelihood for OC and SONCC coho salmon juveniles or small subadult southern green sturgeon to be adversely affected through a physical injury from disposal material. Based on the previous discussion, NMFS concludes exposure to this disposed material is inevitable for yearling coho salmon and small subadult green sturgeon. The *Yaquina* dredge capacity is 1,042 cy, however, the Corps used a value of 800 cy per load as an estimate of a volume in a typical disposal load for the purposes of calculating the volume of water exposed to the disposal plume. A cubic yard of wet sand may weigh as much as 4,000 pounds (lbs). At 800 cy of sand, a maximum of 3,200,000 lbs of material may be discharged during a single event. For the *Essayons*, the Corps used a typically disposal volume of 4,500cy per trip, therefore a typical maximum of 18,000,000 lbs of material may be discharged during a single event. If a typical load on the Yaquina is discharged over a period of five minutes, this equates to over 10,000 lbs per second of discharge. A typical load on the Essayons, if discharged over a period of eight minutes, equates to over 37,000 lbs per second of discharge. The amount and weight of this material is significant for a small fish to resist from being entrained by the descending material and dragged down to the ocean floor. The quantity of dredge material displaces a large volume of water; therefore, if some fish are pushed ahead of the discharge plume they would be entrained within the vortices of the turbulent flow. In order to assess the physical risk posed by the exposure to disposed dredge material the physical interaction between the fish and the material is of most interest.

Physical interaction between fish and disposed dredged material. The Corps theorizes in their assessment entitled Parameters Describing the Convective Descent of Dredged Material Placed in Open Water by a Hopper Dredge, which was developed by the Corps in March 4, 2005, as an amendment letter to another dredge disposal consultation (refer to NMFS No.: 2004/01041, Corps 2005), that the fish that come into contact with the material and are unable to escape will either resist the material and be exposed to a drag force caused by the material or the fish will not resist and will be displaced by the material plume. If the fish does not resist, the Corps theorized, a boundary layer at the leading edge of the plume would reduce the likelihood of the fish becoming entrained in the material plume. If the fish does become entrained, then the Corps expects the fish will be carried with the plume toward the bottom. In that assessment, the Corps' conclusion for any of the scenarios is that it is unlikely the fish would be adversely affected because the fish would: (1) Allow the material to move around them and only be pulled down by the material but not injured; (2) be pushed ahead of the plume due to a boundary layer and then laterally as the plume reached the ocean floor; or (3) be moved aside by the material. The NMFS considers that a high degree of uncertainty exists regarding the response and risk of fish exposed to disposed materials. Without substantial supporting evidence the Corps' assessment can be considered representative of possible outcomes, but not all outcomes.

NMFS considers that enough uncertainty exists regarding the physical interaction between fish and disposal material that it is reasonably certain to conclude that listed species are subject to physical risk. Additional outcomes include a fish being carried along with the downward movement of the sediment and buried under the deposited material and the physical abrasion of their epidermis.

Several adverse physical consequences for fish may occur, even given the Corps' possible outcomes. The Corps' first outcome described above would require the fish to spend a length of time surrounded by dredge material and would result in the respiration of this material past the gills. Very high concentrations of suspended sediments will occur within the water column of the plume. Physical damage to gill membranes is the likely result of this exposure to the material and the subsequent increased probability of indirect effects of disease and infection would lead to increased mortality. The Corps' second and third outcomes described above are also likely to lead to similar adverse physical effects. The fluid dynamics and characteristics of the plume result in significant turbulence of the water along the edge and within the plume. A fish caught in this turbulence and the collapse phase of the discharge field will be entrained in an environment with very high suspended sediment concentrations for a time that would require the fish to respire this damaging sediment. In addition to the gill damage, some fish are likely to receive abrasion from material passing around them that would remove some of the protective epidermal mucus or when they are forced down to the ocean floor, which is most likely the point where mucus would be removed. Whether the fish is forced into the ocean floor or pushed along the bottom with the collapsing front of the plume, the fish will likely have physical abrasions that are susceptible to secondary infections. Another possible outcome with these scenarios is the disorientation of a fish caught in the turbulence of the plume. These fish are likely to be more susceptible to predation due to the disorientation. The NMFS is reasonably certain exposing yearling coho salmon and smaller green sturgeon to disposed material could result in increased predation or physical harm to the fish from either becoming entrained and buried in the material

when it settles on the ocean floor; respiring high concentrations of suspended sediments; being physically abraded by the material; and/or harmed by collision with the bottom substrate.

Number exposed. The NMFS is required to evaluate the magnitude of the adverse effect to determine the potential level of mortality and to assess the potential for jeopardy. The magnitude of the adverse effects from entrainment during dredging and disposal of dredged material will be evaluated separately. The following approaches are intended to assess the upper limits of the magnitude for the purposes of determining the potential that the proposed impacts are significant to result in jeopardy to ESA-listed fish species. However, it is important to note that due to the uncertainty associated with these methods, these values should be considered estimates and are not precise. There is a range of adverse effects based on day-to-day abundance of yearling coho salmon in the action area at the time of dredging and/or disposal. This analysis builds upon conservative assumptions for the purpose of understanding the potential magnitude of the adverse effects due to dredging and disposal of dredged material resulting from the proposed action.

Entrainment. Estimating the number of individual fish adversely affected by dredging activity at the Oregon coastal projects is difficult because the number of fish passing through each of the individual project action areas will vary from day-to-day and the number of individuals moving into the site between dredging bouts is unknown. Further, dredging does not typically occur over the entire navigational channel footprint. In particular, annual dredging focuses on those areas within the channel where shoals have developed since the previous year's dredging. Some locations that will only be dredged once every five to eight years may be dredged more uniformly. Most of the dredging at the Oregon coastal projects will not commence until after OC and SONCC coho smolts have outmigrated from their natal river basins.

Using the previously developed methodology to estimate the number of individuals exposed to the effects of dredging (NMFS 2005), the NMFS estimated the number of individuals exposed to the adverse effects of dredging at each of the Oregon coastal projects (Table 23). The first step is calculating the percent area of the navigation channel to be dredged in a given year relative to the total navigation channel area. The total navigation channel area was then multiplied by the average channel depth to calculate a relative volume. The average estimated number of smolts was then divided into the relative cross-sectional volume to generate a fish density. Then a volumetric dredge cell was estimated to calculate a fish density relative to a given dredge cell within the cross section. After factoring minimum dredge elevations, equipment operations, and dredge intake velocities, a percent of the water column relative to the entrainment zone and fish use potential was calculated to estimate a number of fish in the entrainment zone. Relative fish abundance at peak outmigration and non-peak outmigration was then calculated over the proposed dredging season to estimate the number of fish subject to entrainment relative to season. This number was then divided by the number of likely hours that dredging occurs per year. This number was then multiplied by a residence time coefficient and then multiplied by an error coefficient calculated from the total estimate of juvenile salmonids abundance in the lower river reaches of the project.

The number of OC coho salmon outmigrants from the Oregon Coastal Projects has not been studied to provide a reliable estimate by direct sampling. As previously presented in the status of

the species section, this number can be estimated by back-calculation dividing the number of returning adults by marine survival. Using the average number of adults returning in the period 1990 to 2007, the average number of outmigrants can be estimated. While this extrapolation is not optimal, the NMFS considers that it is the best information and is adequate for use in the analysis portion of this Opinion.

Based on this analysis, the NMFS estimated that a maximum of 75 (range 0 – 75) OC coho salmon smolts may be entrained during dredging operations each year (Table 24). A maximum of eight SONCC coho salmon may be adversely affected through entrainment (Table 24). Of those individuals entrained during dredging, the NMFS assumes 100% mortality rate due to the nature and characteristics of being entrained through the draghead and/or cutterhead.

Table 24. Number of yearling OC and SONCC coho salmon outmigrating from Oregon coastal project river basins (estimated by back-calculation) and associated numbers of coho smolts entrained during dredging.

Project	Average number of adult returns	Average number of outmigrating smolts	Maximum number of smolts adversely affected per year
Tillamook Bay	3,279	81,975	0
Depoe Bay	Unknown	Unknown	0
Yaquina Bay	4,182	104,550	17
Siuslaw River	9,702	242,550	8
Umpqua River	14,184	254,600	25
Coos Bay	14,796	369,900	0 / 17 / 8*
Coquille River	10,634	264,850	0
OC coho salmon total			75
Port Orford	NA	NA	0
Rogue River	5,258	131,450	8
Chetco River	75	1,875	0
SONCC coho salmon total			8

* Number of individuals entrained at Coos Bay was calculated for three separate reaches; entrance, RM1-RM12, and the Charleston access channel;

Most of the Corps dredging operations are complete prior to the return of adult OC coho salmon to their natal river basins, but in some cases there is overlap of dredging activities with returning adults. It is not clear how they would respond to the draghead and the zone of influence around the draghead should they be in proximity to an active dredging operation. The darting speed of adult coho salmon may exceed 20 feet/second (Bell Fisheries Handbook 1990), and due to the larger size and faster swimming speeds of adult OC coho salmon, they are likely able to swim away from active dragheads and/or cutterheads. Therefore, NMFS concludes entrainment of adults is not likely to occur and therefore they are not subject to the adverse effects of entrainment.

Green sturgeon migrate past the Oregon coast, and are known to enter Oregon's larger bays and estuaries. They are suspected to enter the smaller bays and estuaries, although this has not yet

been confirmed. These migrating fish are likely moving through the area at a high rate of speed (Lindley *et al.* 2008) and therefore not likely to stay within one area very long. In order to access and exit the bays and estuaries associated with the Oregon coastal projects, southern green sturgeon would need to pass entrance channels and likely negotiate the navigation channels to access upstream locations. Given that green sturgeon are expected to be found lower in the water column, near the bottom, this spatial overlap with project activities increases the probability that if southern green sturgeon are present they may encounter the draghead during dredging operations.

While it may be possible that southern green sturgeon are present during dredging operations, it is not clear how they would respond to the draghead and the zone of influence around the draghead. Even if adult and subadult southern green sturgeon did encounter an actively dredging draghead and/or cutterhead they are likely able to avoid or evade the draghead and/or cutterhead because of their size and swimming speed. Adult green sturgeon captured in various research studies range from 3.9 to 7.4 feet in length (Moser and Lindley 2007, Erickson and Webb 2007). Juvenile green sturgeon may enter the ocean environment when they are 2 to 3 years old and possibly two feet long (Adams *et al.* 2002). Based on the body lengths, burst speed for adult green sturgeon of this reported size would be 8 to 15 feet/second (2 body length/second) and 4 feet/second for small subadults. Therefore, should adult and/or subadult southern green sturgeon encounter an actively dredging draghead, they are likely capable of avoiding and/or escaping from the zone of influence around the draghead and avoid becoming physically entrained.

Therefore, the NMFS does not anticipate that adult or subadult southern green sturgeon will be adversely affected by this action because: (1) Migrating green sturgeon spend limited time in one area as they move from estuary to estuary and are more likely to be present offshore; (2) the majority of southern green sturgeon are in more northern bays and estuaries; (3) none of the rivers associated with the Oregon coastal projects are used as spawning, therefore small, juvenile sturgeon will not be present; and (4) subadult and adult green sturgeon are likely capable of avoiding entrainment, even if they encounter a draghead and/or cutterhead, due to their size and swimming speed.

Disposal. At the Oregon coastal projects, most of the dredged material disposal occurs at ocean disposal sites. In-river/bay disposal occurs at the Tillamook, Umpqua, Coos Bay, and Coquille River projects. Disposal in these estuaries primarily occurs following the outmigration of OC coho smolts; there is no estuarine disposal at the Rogue or Chetco projects where SONCC coho occur. In some cases, particularly the boat basin access channel, dredging and disposal will occur every five to eight years. At some projects, material may be disposed of at an upland location, and this would reduce the magnitude of adverse effects from disposal. However it is not clear where or when material would ultimately be disposed of upland or how much material would be disposed of in this manner. Therefore, NMFS must evaluate the impact to individuals with the reasonable assumption that all dredged material will be disposed of in-water.

During disposal, the primary exposure pathway for pelagic fish during an encounter with the sediment plume associated with the convective descent phase of disposal. The volume of sediment disposed per event is variable, however work is typically conducted in the most effective manner possible and therefore we estimated that a typical disposal load consists of 800

cy for the *Yaquina* and 4,500 cy for the *Essayons*. Using these volumes, we then calculated the number of disposal loads that would be necessary to complete dredging work at each Coastal Project based on the maximum anticipated dredging volume provided by the Corps.

In-river / in-bay disposal. In-water disposal at the in-river/in-bay disposal sites will create a discharge field from the bottom of the ship's hull to the bottom of the river. The *Yaquina* may draw as deep as 17 feet below water surface elevation when fully loaded and approximately eight feet below the surface when empty. However, the hopper dredge will start rising as dredge materials are released thereby increasing the area of the discharge field throughout most of the water column. While draw depths of -17 feet reduce the probability of discharge-related effects to salmonids in the upper strata of the water column, juvenile salmonids are likely to use the upper 20 to 25 feet of the water column, although they may use water column depths ranging from 22 to 37 feet (Carlson *et al.* 2001, Beeman *et al.* 2003) or possibly even deeper. Therefore, the potential for juvenile salmonids to be in or near the discharge field is reasonably certain. For adult salmonids their potential for injury from in-water disposal of dredged materials is extremely low because of their migration behavior, larger size, and swimming speed.

Discharge time for hopper dredges may range from four to eight minutes per disposal activity. The discharge field at the smaller in-river/in-bay locations likely would range from 250 to 550 feet in length by 100 to 250 feet wide depending on vessel length, dredged material, load capacity, discharge rate, tidal conditions, and river current velocities.

In-river/bay disposal occurs at the Tillamook, Umpqua River, Coos Bay, and Coquille River projects. Only at the Umpqua River and Coos Bay sites does this disposal activity overlap with the presence of outmigrating coho salmon smolts. To assess the potential risk of exposure to descending dredged material at flowlane disposal sites, we used the average number of smolts reaching the lower estuary at these two coastal projects, an estimated typical disposal volume and the number of days needed to dispose of the maximum proposed dredging volume, the number of minutes in a typical disposal event, and an even distribution of fish in a representative cross-sectional area of the disposal site relative to the cross-sectional area of the entire channel, estimated maximum disposal time, and assuming 100% of fish exposed to in-water disposal are adversely affected. An estimated rate of 2.09 OC coho smolts per minute are outmigrating from the Umpqua River during the peak outmigration period and an estimated rate of 3.65 fish per minute and 0.27 fish per minute are outmigrating from Coos Bay during peak and non-peak outmigration periods respectively. Based on the total number of dredge days, typical dredge capacity, estimated trips per day, timing, disposal method, disposal locations, and the potential number of fish likely to be present per disposal activity, up to 44 yearling OC coho salmon could be injured or killed per year at the Umpqua River project and 687 yearling OC coho salmon per year at the Coos Bay project.

Subadult and adult southern green sturgeon are known to be present in both the Umpqua River and Coos Bay, and considered likely to be present, but not yet confirmed in Tillamook Bay and the Coquille River. It is unknown whether younger and smaller individuals from the southern green sturgeon population actually migrate in to these coastal bays and estuaries. The NMFS is unable to estimate the number of individual southern green sturgeon adversely affected by this action, but expects this number to be low because: migrating green sturgeon appear to spend

limited time in one area as they move from estuary to estuary, the majority of green sturgeon are in more northern bays and estuaries, and southern green sturgeon do not spawn in any of Oregon's coastal rivers, and therefore, small juvenile green sturgeon will not be present.

Ocean disposal. Estimating the number of individual fish adversely affected by ocean disposal activity is difficult because the number of fish in the disposal areas will vary from day-to-day; the number of individuals moving into the site between loads is unknown; and the habitat condition varies from season to season. In addition to habitat condition determining yearling coho salmon abundance, on a daily basis during the months of coho salmon outmigration, smolts will be passing through the action areas to enter the ocean and moving into and through the disposal areas. With the lack of site-specific studies, accurate estimates of the number of OC or SONCC coho salmon or southern green sturgeon impacted are not possible, but will be estimated based on assumptions related to abundance, habitat conditions, and reoccupation rates.

For the purposes of this consultation, we used information obtained from Global Ocean Ecosystem Dynamics (GLOBEC) and the Northwest Fisheries Science Center (NWFSC) cruises off the northern California and Oregon coasts to determine relative abundance of coho salmon in the nearshore Pacific Ocean off the coast of Oregon (NWFSC 2000 and 2002). This information was used to estimate the likely number of yearling coho salmon exposed to the disposed dredge material at the Oregon coastal project's ocean disposal sites. Estimates for small subadult green sturgeon will rely on best judgment based on the use of this area by southern green sturgeon. The NMFS recognizes that these estimates are not exact; however, they provide a relative estimate of the potential impact from ocean disposal on coho salmon, allowing NMFS to better evaluate these impacts and inform the final jeopardy analysis.

The NMFS assumes some of the individuals in the area of disposal will avoid direct exposure to the discharge plume by: (1) Avoiding the ship; (2) randomly being positioned in the action area away from the direct path of the ship; (3) exhibiting some avoidance to the discharge field due to their position in relation to the discharge plume; and (4) being randomly near the edge of the discharge field thereby facilitating avoidance. However, we assumed that all coho salmon directly exposed to the convective descent phase of in-water disposal would be adversely affected, likely leading to mortality for those individual yearling coho salmon caught directly in the plume because they will experience physical harm and death due to this exposure to the discharged dredged sediments.

Based on the NWFSC data an estimated range of 0.0 coho smolts/1,000,000 m^3 (Rogue River trawls) to 45.06 coho smolts/1,000,000 m^3 (Yaquina Bay) may be present in the nearshore Pacific Ocean associated with the Coastal Projects (NWFSC 2000 and 2002). The total maximum number of fish that may be exposed to the Corps' disposal activity then is based on the water volume exposed to a disposal event and the density of coho salmon smolts in the ocean. No evidence exists to provide an assessment as to whether individuals from adjacent ocean areas may move into or out of the ODMDS between disposal loads, whether within the same day or different days. If fish leave the area due to an avoidance of the discharge field, some of these individuals, or others nearby, are likely to reoccupy the disposal site after some short, but uncertain period of time; it is likely that the longer the time between disposal loads the higher the probability that the ODMDS will be reoccupied to the base abundance. When disposal is

occurring during the months when OC and SONCC coho salmon smolts are entering the ocean, there is a higher likelihood these individuals may enter the ODMDs immediately upon ocean entry. When disposal occurs after most OC or SONCC coho salmon smolts have completed outmigration, yearling coho salmon may still be present, residing in the nearshore ocean for several months before migrating north (NWFSC 2000 and 2002). Disposal of dredged material from some locations (notably the boat basin access channels) will only occur once every five to eight years.

Assuming that the disposal areas repopulate between loads, the total maximum number of yearling coho salmon exposed to the disposal activities is based on the upper limit number of coho salmon that could occupy an ODMDS multiplied by the number of disposal loads that occurs at each ODMDS. This assumption is based on the expectation that the turbidity plume and the ship activities related to disposing the material will not dissuade fish from moving back into the area between loads. While it is unknown how many coho salmon would move into the action area after each daily operation, NMFS is reasonably certain reoccupation could occur at a high level and for the purpose of conducting a jeopardy analysis, assumed the highest abundance level of smolts entering the action area.

Some variability is evident in the number of exposed and injured or killed among the Oregon Coastal Projects. In 2000, more coho salmon yearlings were captured in the trawls in August than June (Brodeur *et al.* 2004). In the combined data reviewed for the two years of trawl data, the abundance of coho salmon yearlings varied and for most stations the average abundance was highest during June (NFWSC 2000 and 2002). For this analysis, we considered the June densities represented the highest abundance based on the outmigration of coho smolts from the rivers and the combined two years of ocean trawl data. NMFS assumes fewer coho salmon are exposed in September and October when the majority of the yearling coho salmon have migrated north. Table 25 summarizes the range of exposure and the number of OC or SONCC coho salmon potentially injured or killed at each of the Oregon Coastal Projects. This variability is driven by differences in the volume of material scheduled for ocean disposal and the relative abundance of coho salmon off the northern California and Oregon coast. For the Yaquina Bay, Coquille River, Rogue River, and Chetco River, additional dredging will occur every five to eight years. The additional volume of material is relatively small and does not significantly increase the number of coho salmon yearlings potentially exposed to disposal of dredged material as a result of increased disposal volume.

Table 25. Estimated number of coho salmon exposed to ocean disposal of dredged sediments at the Corps' Coastal Projects.

Project	Average number of outmigrating smolts	GLOBEC* Ocean abundance (June) (coho salmon smolts / 1,000,000 m^3)	Number of coho salmon smolts exposed to ocean disposal (Annually / once every 5 -8 years)
Tillamook Bay	81,975	NA	NA
Depoe Bay	Unknown	NA	NA
Yaquina Bay	104,550	45.06	522 / 176
Siuslaw River	242,550	6.07	19 / 19
Umpqua River	254,600	12.55	344
Coos Bay	369,900	3.12	152
Coquille River	264,850	3.12	4 / 0
OC coho salmon total			1041 / 195
Port Orford	NA	NA	0
Rogue River	131,450	0.75	0 / 0
Chetco River	1,875	0.75	2 / 0
SONCC coho salmon total			2 / 0

*NWFSC 2000 and 2002 trawl data

The maximum dredging volume and dredge days was provided by the Corps based on their records, with this maximum level of dredging effort only occurring once in the last 10 years. The number of disposal loads to complete dredging operations was based on an estimated volume of 800 cy per load for the *Yaquina* and 4,500 cy per load for the *Essayons*. Because of year-to-year variability in the amount of material needed to be dredged from the navigation channels, an assessment of the impacts from the potential maximum was necessary. Therefore, it is unlikely that the estimated number of individuals exposed and/or killed in any one year would continue year after year, but rather, would most likely only occur once in the next 10 years.

The number of southern green sturgeon present in the entire species is unknown (Adams *et al.* 2007), therefore the abundance of the southern green sturgeon within each of the ODMDS is unknown but likely to be very low. Lindley *et al.* (2008) tracked the migrating tagged green sturgeon along the west coast (Figure 17). It is apparent green sturgeon are migrating along the Oregon coast, but whether they actually enter each of the ODMDS is unknown. While the southern green sturgeon are known to use the larger coastal bays and estuaries on the Oregon coast (*e.g.* Coos Bay and Winchester Bay), it is unknown to what extent southern green sturgeon use the smaller bays and estuaries. In addition to their exact location, these migrating fish are likely moving through the area at a high rate of speed (Lindley *et al.* 2008) and therefore not likely to stay within an individual action area very long. The most likely migration scenario where green sturgeon might enter the action area would be for green sturgeon that are headed into one of the Oregon Coastal Project's bay or estuary. The NMFS is unable to estimate the number of green sturgeon adversely affected by this action, but expects this number to be low because: (1) Based on limited information, few southern green sturgeon use Oregon's coastal bays and estuaries; (2) migrating green sturgeon spend limited time in one area as they move

from estuary to estuary and are possibly further offshore; (3) the majority of southern green sturgeon are in more northern bays and estuaries; and (4) the southern green sturgeon do not spawn in any of Oregon coastal river basins, and therefore, small juvenile green sturgeon will not be present. Nonetheless, the NMFS is reasonably certain adverse effects will occur to some smaller subadult southern green sturgeon if they occur at an ODMDS at the time of the material disposal.

Summary of Effects to OC Coho Salmon. The effects to the OC coho salmon populations would be the integrated response of individual organisms to environmental change. 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 a similar change in each of these population characteristics.

Outmigrating yearling OC coho salmon are likely to be exposed to dredging activities as they pass through the estuarine portion of each coastal project action area en-route to the ocean. The dredging activities and the proposed conservation measures, as described in the proposed action, reduce the possibility that OC coho salmon smolts will be adversely affected. However, some coho salmon smolts are likely to be entrained during dredging activities because of their proximity to the work area and their migration pathway to the Pacific Ocean. Smolt OC coho salmon from the Yaquina River, Siuslaw River, Umpqua River and Coos Bay projects will be exposed to the dredging activity. Dredging will be completed at the remaining projects either following the outmigration period or at the very end when number are expected to be very low. The risk to adult OC coho salmon is low based on dredging methodologies and their ability to avoid the dragheads. Because the majority of the Corps dredging program occurs outside of the main outmigration period for OC coho salmon smolts, the impacts from dredging and in-bay/river disposal activities has been greatly reduced. Nonetheless, approximately 75 (range 0 - 75) yearling OC coho smolts are expected to be entrained; the NMFS expects 100% mortality of all fish entrained during dredging activities. As a result of in-bay/river disposal activity, an estimate of up to 731 individual OC coho salmon smolts will be exposed to descending dredged material and is likely to result in the injury or death to these individuals (range 0 – 731).

Adult and yearling OC coho salmon are likely to be exposed to the dredged material disposal activities and some yearling coho salmon will experience adverse effects from the disposal of these dredged sediments in the ocean. The risk to adult coho salmon was determined to be low based on their ability to avoid the sediment plume using their superior swimming speed. The exposure of some yearling coho salmon to the disposal material was determined to be inevitable based on the expectation that the fish will exhibit minimal avoidance behavior from the ship and may exhibit avoidance behavior from the descending material but cannot swim fast to evade the descending material. NMFS is reasonably certain exposing yearling coho salmon and smaller green sturgeon to disposed material could result in increased predation or physical harm to the fish from either becoming entrained and buried in the material when it settles on the ocean floor; respiring high concentrations of suspended sediments; being physically abraded by the material; and/or harmed by collision with the bottom substrate.

The number of OC coho salmon smolts exposed to the disposal of dredged material in the ocean per year is based on the abundance of coho salmon smolts in the nearshore Pacific Ocean, the volume of water exposed during a disposal event and an assumed reoccupation of the nearshore ocean portions of the action area following each disposal event. Given that all of these yearling coho salmon directly exposed to the discharge plume during the convective descent phase will result in 100% mortality, approximately 1,041 (range 0 – 1,041) yearling OC coho salmon may be killed by ocean disposal activities annually (Table 25). Further, in those years when additional dredging and disposal occurs, up to approximately 176 (range 0 – 176) additional yearling OC coho salmon are likely to be injured or killed by ocean disposal activity (Table 25).

Individuals from each of Oregon Coastal Project's river basin OC coho salmon populations, as well as, possibly other Oregon Coast populations are likely to be exposed to the disposal material. No population should be impacted inequitably, such that the total impact will be spread between the populations and perhaps a few other Oregon Coast populations. The annual production of OC coho salmon juvenile outmigrants from the entire OC coho salmon has not been studied to provide a reliable estimate by direct sampling. However, it can be estimated by back-calculation dividing the number of returning adults by marine survival. Marine survival predictions averaged 4%, with a range of 0.5% and 11.7%, between 1970 and 1999 (PMFC 2000). The average number of outmigrants estimated by this back calculation is 2,012,450 with a range of 351,700 to 5,785,275. While this extrapolation is not optimal, NMFS considers that it is the best available information and is adequate for use in the analysis portion of this Opinion.

The total annual mortality from dredging and disposal at the species level represents a maximum of up to 0.09% of the average number of yearling coho salmon produced. In those years when additional dredging and disposal activities occur, up to approximately 0.1% of the average number of yearling OC coho salmon produced for the entire species may be injured or killed as a result of the Corps' dredging program.

The effects on abundance and productivity at the population scale will be insignificant because such a small proportion of each population will be affected. The impacts at Tillamook Bay and Depoe Bay are negligible based on project timing and the lack of presence/abundance of coho salmon at a life history stage that may be adversely affected during activities. The Corps dredging program may impact a maximum of approximately 0.52% of the average Yaquina Bay OC coho salmon smolt population on an annual basis, with impacts to up to 0.68% of the average OC coho salmon smolt production in the Yaquina Bay population every five to eight years when additional dredging and disposal activities occur. A maximum of approximately 0.01% of the average number of Siuslaw River OC coho salmon smolts may be adversely affected annually with an insignificant increase in those years when sediment dredged from the turning basin is disposed of at the ODMDS. Up to a maximum of approximately 0.12% of the average smolt production in the Umpqua River basin may be adversely affected. Up to approximately a maximum of 0.25% of the average number of OC coho smolts in the Coos Bay population may be adversely affected annually. Up to a maximum of approximately 0.002% of the average OC coho smolt production in the Coquille River basin may be adversely affected annually, with an insignificant increase in those years when sediment dredged from the boat basin access channel is disposed of at the ODMDS. These estimated impacts are based on the maximum volume of dredged material and the estimated number of disposal loads necessary to

complete dredging operations, and are likely an overestimate when evaluated on an annual basis. It is most likely that the level of impact identified above will only occur once in a 10-year period and the remaining years will be significantly less impact. Therefore, the effects on distribution or genetic diversity are not expected to be measurable or meaningfully expressed at the population scale.

At the species level, biological effects of the proposed action include the combined demographic responses of all populations (McElhany *et al.* 2000). As described above, it is unlikely that the proposed action will measurably affect the productivity, abundance, distribution or genetic diversity of any of the populations at the Oregon Coastal Projects associated river basins or OC coho salmon populations as a whole. The impacts at the species range from virtually non-detectable (Siuslaw and Coquille) up to 0.03 % of the average smolt production within the entire OC coho salmon species (Yaquina and Coos). Therefore it is unlikely that OC coho salmon will be significantly affected at the species level.

Summary of Effects to SONCC Coho Salmon. The effects to the SONCC coho salmon populations would be the integrated response of individual organisms to environmental change. 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 a similar change in each of these population characteristics.

Outmigrating yearling SONCC coho salmon are likely to be exposed to dredging activities as they pass through the estuarine portion the Rogue River project en-route to the ocean; the timing dredging activities does not significantly overlap with the outmigration period for smolts at either Port Orford or Chetco River. The dredging activities, as described in the proposed action, reduce the possibility that SONCC coho smolts will be adversely affected. However, some smolts are likely to be entrained during dredging activities because of their proximity to the work area and their migration pathway to the Pacific Ocean. The risk to adult coho salmon is low based on dredging methodologies and their ability to avoid the dragheads. The NMFS estimated a range of 0 to 8 yearling SONCC coho salmon will be exposed to dredging activities and entrained into the hopper dredge at the Rogue River project. The NMFS expects 100% mortality of all fish entrained during dredging activities.

Adult and yearling SONCC coho salmon are likely to be exposed to the dredged material disposal activities and some yearling coho salmon will experience adverse effects from the disposal of these dredged sediments from the hopper dredge. The risk to adult coho salmon was determined to be low based on their ability to avoid the sediment plume using their superior swimming speed. The exposure of some yearling coho salmon to the disposal material was determined to be inevitable based on the expectation that the fish will exhibit minimal avoidance behavior from the ship and may exhibit avoidance behavior from the descending material but cannot swim fast to evade the descending material. NMFS is reasonably certain exposing yearling coho salmon and smaller green sturgeon to disposed material could result in increased predation or physical harm to the fish from either becoming entrained and buried in the material

when it settles on the ocean floor; respiring high concentrations of suspended sediments; being physically abraded by the material; and/or harmed by collision with the bottom substrate.

The nearest known SONCC coho spawning streams to Port Orford are Brush Creek and Hubbard Creek. Natural production is low in these systems and it is unclear to what degree these smolts contribute to the overall newly ocean-entered population of yearling SONCC coho salmon. Also, disposal techniques at Port Orford (pipeline) reduce the risk of injury to SONCC coho salmon smolts. Therefore, the NMFS expects the effects to individuals from these basins to minimal.

The number of SONCC coho salmon smolts exposed to the disposal of dredged material in the ocean per year is based on the abundance of coho salmon smolts in the nearshore Pacific Ocean, the volume of water exposed during a disposal event and an assumed reoccupation of the nearshore ocean portions of the action area following each disposal event. However, based on the GLOBEC trawl data, no coho salmon were captured at any of the Rogue River sampling efforts, and the numbers were very low for the Crescent City trawls (closest location to the Chetco River) (NWFSC 2000 and 2002). Therefore, it was determined that the effects from ocean disposal on SONCC coho salmon at these projects is likely very minor with very little overlap with the individuals of this species.

Individuals from each of Oregon Coastal Project's River basin SONCC coho salmon populations, as well as, possibly other southern Oregon coast populations may be exposed to the disposal material. However, the best available abundance data suggests that the number of coho salmon exposed is likely very low. Therefore, no population should be impacted inequitably, such that any potential impact will be spread between the populations and perhaps a few other southern Oregon coast populations. The total annual mortality is extremely limited, with mortality limited to an estimated eight smolts annually. The annual mortality from dredging and disposal at the Rogue River represents up to 0.006% of the average number of wild yearling SONCC coho salmon produced in the Rogue basin; this level of mortality is not likely to increase measurably once every five to eight years when additional dredging and disposal occurs. Therefore, effects on abundance and productivity at the population scale will be very minor because such a small proportion of the population will be affected. Therefore, effects on distribution or genetic diversity will not be measurable or meaningfully expressed at the population scale.

At the species level, biological effects of the proposed action include the combined demographic responses of all populations (McElhany *et al.* 2000). As described above, it is unlikely that the proposed action will measurably affect the productivity, abundance, distribution or genetic diversity of any of the southern Oregon SONCC coho salmon populations. Therefore it is unlikely that SONCC coho salmon will be appreciably affected at the species level.

Summary of Effects to Southern DPS Green Sturgeon. The effects to southern green sturgeon populations would be the integrated response of individual organisms to environmental change. 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 a similar change in each of these population characteristics.

The southern green sturgeon are known to frequent Oregon's larger coastal bays and estuaries (*e.g.* Winchester Bay and Coos Bay) and are thought to use the smaller bays and estuaries as well However, the degree to which southern green sturgeon frequent Oregon's coastal bays and estuaries is unclear, although it remains possible that some southern green sturgeon may enter and/or exit the river associated with the Oregon Coastal Projects through the entrance channel where dredging occurs and likely pass through the nearshore ocean environment of the ODMDS. Adult and subadult southern green sturgeon that may be present in the Oregon Coastal Project's navigation channels are likely of a large size and capable of swimming speeds that allow them to avoid the disturbance. Therefore, should adult and/or subadult SDPS green sturgeon encounter an actively dredging draghead, they are likely capable of avoiding and/or escaping from the zone of influence around the draghead and can avoid becoming physically entrained.

Adult and subadult green sturgeon may inhabit the nearshore ocean portion of the action area during their migration from their natal rivers in California to northern waters in Oregon, Washington, and Canada. Therefore, a possible overlap in time and space with the dredging and disposal activity has some likelihood of occurring. The potential use, behavior and abundance of southern green sturgeon is not known for the ocean disposal sites associated with the Coastal Projects. Based on general abundance, capture information, and migration routes few southern green sturgeon may use the nearshore ocean portion of the Coastal Projects. For those that do occur within the Coastal Project ocean disposal sites, the exposure of green sturgeon to the disposal material was determined to be inevitable based on the expectation that the fish will not exhibit avoidance behavior from the ship. Larger adult and subadult green sturgeon will successfully evade the sediment plume without significant physical injury that would result in death because their faster swimming speed and occupation of deeper water depths will facilitate evasion. Younger, smaller subadults that are approximately two feet or less in length have a higher risk than the larger fish due to their slower swimming speed, although individuals this small should be rare given the southern green sturgeon are not known to spawn in any of Oregon's coastal rivers. The NMFS is reasonably certain smaller southern green sturgeon exposed to the disposed dredged material will have a higher likelihood of experiencing physical injury and death. Although NMFS is unable to estimate the number per year killed, NMFS is reasonably certain this number is very low due to the limited use of the Oregon Coastal Projects bays and estuaries and the migratory behavior of green sturgeon.

The effects on abundance and productivity at the population scale will be insignificant because such a small number of individuals could be exposed to the activity. The NMFS is reasonably certain the proportion of the population that will be affected is small based on the research results that have demonstrated large numbers southern green sturgeon are present in Canadian waters, the Washington estuaries and the Columbia River during the summer months (Lindley *et al.* 2008; Moser and Lindley 2007; Adams *et al.* 2007; Grimes 2006). Therefore, effects on distribution or genetic diversity will not be measurable or meaningfully expressed at the population scale.

At the species level, biological effects of the proposed action include the combined demographic responses of all populations (McElhany *et al.* 2000). As described above, it is unlikely that the proposed action will measurably affect the productivity, abundance, distribution or genetic diversity of any of the southern green sturgeon populations. Therefore it is unlikely that southern green sturgeon will be meaningfully affected at the species level.

Effects to OC Coho Salmon Critical Habitat. Critical habitat for OC coho salmon is designated at Tillamook Bay, Depoe Bay, Yaquina Bay, Siuslaw River, Umpqua River (Winchester Bay), Coos Bay, and the Coquille River. Critical habitat for OC coho salmon is identified as Estuarine Areas (Table 18). The habitat features required to support successful smolt growth, development, and seaward migration and adult upstream migration in estuarine areas include forage, water quality, and that the area is free of obstruction. Of these, forage, water quality, and that the area is free of obstruction will likely be affected by the proposed action as described below. The nearshore ocean, where most of the disposal sites are, are not designated critical habitat for OC coho salmon.

1. Forage. The action areas are primarily used as a migratory pathway by yearling coho smolts entering the ocean and by adults returning to migrate upriver to spawn. Yearlings will forage within the estuary, but likely pass quickly through the action areas en-route to the ocean as there is little of the preferred complex, off-channel habitat elements within the entrance and/or navigation channels or boat basin access channels. Nonetheless, dredging will result in the loss of some aquatic invertebrates in portions of these channels and will result in a small decrease in food available for yearling OC coho salmon. Given the dynamic, high-energy environment at the mouths of the Coastal Project's rivers, the presence of organisms likely adapted to frequent disturbance, the likely limited foraging opportunities with the navigational channels, and that most migrating coho salmon (both smolts and adults) likely keep moving past the affected areas during migration, the proposed dredging will not alter the conservation value of this PCE.

2. Water Quality. Hydraulic dredges generally do not produce large amounts of turbidity or total suspended solids during dredging because of the suction action of the dredge pump and that the draghead is buried in the sediment during operations. Some very minor increases of suspended sediments may occur in the direct vicinity of the draghead during dredging operations. This activity may occur annually on average for five hours per day for an anticipated maximum of 32 days per year at Yaquina Bay, 20 days at Siuslaw River, 50 days at Umpqua River, 185 days at Coos Bay, and 7 days at the Coquille River. Once every five to eight years an additional 18 days and 14 days of dredging will occur at the Rogue and Chetco projects respectively to remove accumulated sediment in the boat basin access channel. Dredging at Tillamook Bay is completed after July 15, which is after the period when OC coho salmon smolts have typically completed out-migration. Dredging at Depoe Bay, Coos Bay Reach 2 (RM 12 – 15), and the remaining boat basin access channels is completed after July 1, which is after the peak period of outmigration by OC coho salmon from each of the respective projects. Proposed dredging activities may overlap with the timing of adult returns; however, adults likely move past or just avoid areas of higher concentrations of suspended sediments.

At projects where flow-lane or estuarine disposal will occur (Umpqua River, Coos Bay, and Coquille River) turbidity and suspended solids will temporarily increase from the time of disposal until material settles out of the water column. The duration and extent of the turbidity plume that results from disposal activities is dependent on variables such as tidal fluctuations, river flow, and wave activity, but is likely to dissipate within a few hours following disposal. Any reductions in primary production that may result from the increases in turbidity are likely short term and very localized, relative to the estuarine environment surrounding the disposal area and will result in insignificant change to this PCE.

Sediment sampling is completed at the Coastal Projects on a five-year cycle. Samples from navigational channels are collected and submitted for chemical and physical analyses including total volatile solids. Samples are analyzed for metals (inorganic), total organic carbon, pesticides and PCBs, phenols, phthalates, miscellaneous extractables, PAHs, and organotin. Physical analysis for material within the river entrance and navigation channels indicates the material is primarily sand, the boat basin access channels being composed primarily of sandy-silt material, and Depot Slough at Yaquina being primarily silt. The chemical analyses indicated only trace levels of contamination in any of the samples, with all levels below their respective DMEF or SEF SL and suitable for unconfined in-water disposal. Therefore, because dredge- and disposal-induced turbidity is expected to be localized, short-lived and temporary, and disturbed sediments do not contain significant contaminants of concern, the water quality PCE will not be functionally changed from the resuspension of trace amounts of contaminants.

3. Free of Obstruction. Yearling coho salmon that swim into the zone of influence around the draghead may become entrained and killed as they are drawn through the dredge. Adult OC coho salmon will likely avoid the draghead or cutterhead because of their larger size and swimming speed and will not be entrained. Because the dredging activities take place in discrete locations within the navigation channels, occur for a relatively short period of time where dredging occurs concurrently with smolt outmigration (ranging from four days at Umpqua to 18 days at Coos Bay), and will primarily be conducted when coho salmon smolts are not present, this PCE will not be functionally changed.

Effects to SONCC coho salmon Critical Habitat. Critical habitat is designated at two of the Oregon Coastal Projects: Rogue River and Chetco River. Critical habitat for SONCC coho salmon is identified as providing habitat to support successful juvenile and adult migration, and juvenile rearing (Table 18). Critical habitat is not designated in the nearshore ocean environment. In the Rogue and Chetco Rivers, the habitat features required to support successful juvenile rearing and juvenile and adult migration includes water quality, water quantity, food resources, riparian vegetation, space, substrate, water temperature, water velocity and safe passage. Of these, substrate, water quality, and safe passage will likely be affected by the proposed action as described below.

1. Substrate. The total footprint of the Rogue River portion of the action area is approximately 50.7 acres; the total footprint for the Chetco River portion of the action area is 18.2 acres. Dredging will occur annually within the entrance channels at the

Rogue and Chetco projects, approximately 40 acres and 13.1 acres in size respectively. The turning areas and boat basin access channels will be dredged once every five years; these areas encompass 10.7 acres at the Rogue River and 5.1 acres at the Chetco River. However, dredging does not typically occur over the entire footprint of the navigation channels equally. At the entrance channels this impact will occur at specific locations where shoals have developed since the previous year's dredging. In the case of the turning areas and boat basin access channel, these areas may be dredged more equally due to the time between dredging events. The sediments to be removed are evaluated on a five-year cycle, and both current and historic analysis indicates that the substrate in the entrance channel is primarily composed of sand and the boat basin access channels composed primarily of sandy-silt material; these sediments contain only trace concentrations of contaminants. The substrate likely serves as habitat for benthic and epibenthic organisms that inhabit the river channel and boat basin access channel bottom. The organisms that inhabit the entrance channels are likely adapted to recolonize quickly after disturbance, although it may take longer to recolonize the boat basin access channel substrate as these areas are protected from peak river flows and ocean conditions due to their location behind breakwaters. Nonetheless, because the disturbance to the substrate is expected to be localized, short-lived, and temporary, and the organisms that live in the substrate are likely adapted to recolonize areas following disturbance, the proposed dredging will not alter the conservation value of this PCE.

2. Food Resources. The action areas are primarily used as a migratory pathway by yearling coho smolts entering the ocean and by adults returning to migrate upriver to spawn. Yearling will forage within the estuary, but likely pass quickly through the action area en-route to the ocean as there is little of the preferred complex, off-channel habitat elements within either of the entrance channels or boat basin access channels. Nonetheless, dredging will result in the loss of aquatic invertebrates in portions of these navigation channels and will result in a small decrease in food available for yearling SONCC coho salmon. Therefore, given the dynamic, high-energy environment at the mouths of the Rogue and Chetco rivers, the presence of organisms likely adapted to frequent disturbance, lack of preferred habitat within the navigational channels, and that most migrating coho salmon likely keep moving past the affected areas during migration, the proposed dredging will not alter the conservation value of this PCE.

3. Water Quality. Hydraulic dredges generally do not produce large amounts of turbidity or total suspended solids during dredging because of the suction action of the dredge pump and that the draghead is buried in the sediment during operations. Some very minor increases of suspended sediments may occur in the direct vicinity of the draghead during dredging operations. This activity may occur on average for five hours per day for an anticipated maximum of 12 days per year at the Rogue and 12 days per year at the Chetco; once every five years an additional 18 days and 14 day of dredging will occur at the Rogue and Chetco projects respectively to remove accumulated sediment in the boat basin access channel. Dredging the boat basin access channels is completed after July 15, which is after the period when SONCC coho salmon smolts have typically completed out-migration. Proposed dredging activities may overlap with the timing of adult returns; however, adults likely just avoid areas of higher concentrations of suspended sediments.

Sediment sampling in the Rogue and Chetco River navigation channels are collected and submitted for physical analyses including total volatile solids. Select samples containing higher percent of fine-grained material were analyzed for metals (inorganic), total organic carbon, pesticides and polychlorinated biphenyls, phenols, phthalates, miscellaneous extractables, polynuclear aromatic hydrocarbons and organotin on a five-year cycle. Current physical analysis for material within the river channel is primarily sand and the boat basin access channels being composed primarily of sandy-silt material. The chemical analyses indicated only very low levels of contamination in any of the samples, with all levels below their respective SEF SL. Nickel has historically been detected at levels higher than most Oregon coastal rivers. The levels of nickel detected at the Rogue River Project are determined to be from natural sources and are considered background levels. Therefore, because dredge-induced turbidity is expected to be localized, short-lived and temporary, disturbed sediments do not contain significant contaminants of concern, and dredging within the boat basin access channels (the area with higher concentrations of fine-grained material) will be completed once every five years and when SONCC coho salmon smolts are not present, the water quality PCE will not be functionally changed from the resuspension of contaminants.

4. Safe Passage. Yearling coho salmon that swim into the zone of influence around the draghead may become entrained and killed as they are drawn through the dredge. Adult SONCC coho salmon will likely avoid the draghead or cutterhead and will not be entrained because of their larger size and swimming speed. Therefore, because the dredging activities take place in discrete locations within the navigation channel, and will only occur annually for a maximum of 12 days at each project when coho salmon smolts may be present, this PCE will not be functionally changed.

Effects to the SDPS of Green Sturgeon Critical Habitat. Critical habitat has been designated at three of the Corps' Coastal Projects (Yaquina Bay, Umpqua River (Winchester Bay), and Coos Bay and in the nearshore Pacific Ocean. These areas may support the maturation of subadults to the adult life stage. Critical habitat for southern green sturgeon is identified as Coastal Bays and Estuaries and Coastal Marine Waters (within 110 meters depth) (Table 20). The habitat features required to support successful subadult and adult rearing and migration include food, passage, water quality, and sediment quality.

1. Food Resources. Food resource availability will temporarily within the navigational and access channels of Yaquina, Winchester (Umpqua) and Coos bays following dredging activities. The navigation channels at these three projects are likely used primarily as a migratory route in-and-out of and through the estuaries. Subadult and adult southern green sturgeon may forage in the channels, but likely pass through the action areas to more optimal habitat within these estuaries. Nonetheless, dredging will result in the loss of aquatic invertebrates in portions of the navigational channels and will result in a small decrease in food availability for subadult and adult southern green sturgeon. However, these temporary reductions in prey are confined to the navigational channels, and are not expected to significantly decrease prey availability within the estuary as a whole.

Food resource availability will temporarily decrease at the unconfined in-water disposal locations due to dredged material covering the substrate and any substrate dwelling organisms being buried. Except for the in-bay disposal site 8.4 at Coos Bay, the other disposal sites are in high-energy, dispersive locations that are typically inhabited by opportunistic organisms adapted to frequent disturbance.

Disposal of dredge materials contributes a layer of unconsolidated sediment on the river and/or ocean floor. In doing this, infaunal and epifaunal invertebrates will be covered with a layer of sandy sediment. All the in-water disposal sites are monitored annually to assess mounding, which was previously discussed. Although long-term mounding is not apparent from the monitoring, the short-term deposition of this material before the winter storms disperse the material may result in some reduction of invertebrates on the river and/or ocean floor. The result would be a change in the food source and habitat available to benthic organisms in the area for up to 6 or 7 months between the disposal and when the winter storms disperse the material. The likely change in prey species is dependent then on the recolonization rate of this area.

Recolonization is uncertain at any of the sites while the site is in active use for dredged material disposal. The maximum interval between disposal events is approximately one year, except at Tillamook Bay where disposal will occur every five to eight years. Recolonization potential is affected by the length of intervals between deposition events, particle size, river flows, currents, and compaction/stabilization following deposition (Newell *et al.* 1998; Van der Veer *et al.* 1985). Rates of recovery listed in the literature range from several months for estuarine muds, and up to two to three years for sands and gravels (Hitchcock *et al.* 1999). Recolonization may take longer in areas with lower current (Van der Veer *et al.* 1985). These sites (except for Coos Bay Site 8.4) are indicative of a dynamic ecological zone that naturally would be characterized by a disturbance-based ecosystem. Disturbance based ecosystems are indicative of rapid recolonization rates by opportunistic organisms tolerant of conditions that are physiologically stressful (Pemberton and MacEachern 1997).

At Coos Bay Site 8.4, dredged sediments added annually, and then dredged every five to ten years and disposed of at ODMDS F. Because this site is not dispersive suggests lower flow and potentially slower recolonization rate. Even if rates of recolonization are slower than other disposal areas, the total of this site is 17.2 acres. According to the Coos Bay Estuary Plan (1975), the Coos Bay embayment, including South Slough, contains about 10,500 acres. Therefore, the affected area represents approximately 0.2% of the Coos Bay estuary.

Although conducting feeding studies on green sturgeon have proven difficult some information is available. In addition to various invertebrates, green sturgeon appear to be opportunistic foragers and feed on various fish species, such as lingcod (Dumbauld *et al.* 2008), herring (Erickson and Hightower 2007), sand lace and anchovies (Moyle 2002) that may also be adversely impacted by the disposal. Similar exposure, avoidance response, and risks are likely with forage fish species as were described for the coho salmon and green sturgeon. Typically these fish are smaller species and also less likely to

avoid physical harm. The number of individuals impacted is difficult to estimate, but NMFS is reasonably certain the number adversely affected would not significantly deplete the overall abundance of forage available to southern green sturgeon. Because these impacts to forage base is highly localized, the likely decrease in forage abundance is considered insignificant to the total food resources available to green sturgeon.

Because impacts to forage base, both invertebrate and vertebrate are localized and temporary, food resources PCE will not be functionally changed.

2. Safe Passage. Noise and vibration from the dredge vessel and dragheads or cutterheads may delay or modify migration of subadult and adult southern green sturgeon but will not prevent it. Both subadult and adult southern green sturgeon are likely present within the Yaquina, Winchester (Umpqua River), and Coos Bay estuaries at some time during dredging operations. Green sturgeon are expected to occupy the lower reaches of the water column, near the bottom, and this spatial overlap with project activities increases the probability that if southern green sturgeon are present they may encounter a draghead or cutterhead actively dredging. However, despite this spatial overlap, southern green sturgeon are likely able to avoid or evade the zone of influence around an active draghead or cutterhead because of their size and swimming speed. Research indicates that adult green sturgeon range from 3.9 to 7.4 feet in length (Moser and Lindley 2007, Erickson and Webb 2007). Juvenile green sturgeon enter the ocean when they are 2 to 3 years old and possibly two feet long (Adams *et al.* 2002). Based on body length, burst speed for adult green sturgeon of this reported size would be 8 to 15 feet per second (two body lengths per second) and four feet per second for small subadults. Therefore, should adult or subadult southern green sturgeon encounter an actively dredging draghead or cutterhead, they are likely capable of avoiding and/or escaping the zone of influence around the draghead or cutterhead due to their size and swimming speed.

   Some individual adult and subadult southern green sturgeon will likely experience effects from the discharge of dredged sediments from the hopper dredge at unconfined in-water disposal sites. Adult and subadult green sturgeon may temporarily inhabit the in-bay sites during the summer or any of the ODMDS during their migration from their natal rivers in California to northern waters in Oregon and Washington. Southern green sturgeon are assumed to use Oregon's coastal estuaries and due to the close proximity of the Coastal Project's ODMDS to the river and/or bay entrances, a possible overlap in time and space with ocean disposal activity has some likelihood of occurring. The exposure of green sturgeon to the disposal material was determined to be inevitable based on the expectation that the fish will not exhibit avoidance behavior from the ship. Adult and subadult green sturgeon are likely to successfully evade the sediment plume without significant physical injury because their faster swimming speed and occupation of deeper water depths will facilitate evasion; therefore the safe passage PCE will not be functionally changed by designating this ODMDS and the subsequent dredge material disposal.

3. Water Quality. Suspended sediment levels will be increased over background due to fine sediment mobilized by disposal from a hopper dredge vessel. Turbidity levels are likely

to increase for a short time with the highest concentrations occurring at the ship's disposal point and dispersing from that point depending on river flow, tidal fluctuations, ocean currents, disposal material size composition, wave action, dredge ship speed, and disposal rate. The NMFS predicts the turbidity will drift approximately 500 feet outside of unconfined in-water disposal areas. It is likely that suspended sediment concentrations generated by dredge material disposal will exceed the 17 mg/L effects threshold for injury as described above for salmonids, but because adult and subadult green sturgeon inhabit much more turbid environments than do salmonids, they are likely far less sensitive to turbidity and suspended solids than salmonids. Therefore NMFS is reasonably certain these elevated turbidity concentrations will occur, but the exposure will be short term and result in insignificant change to this PCE.

As described below, sediments dredged from the Oregon Coastal Projects are primarily large-grained sands and while trace levels of various contaminants may occur in the sediments, these levels will not exceed concentrations harmful to the organisms occupying the action area; therefore disposal of this dredge material will not alter the conservation value of this PCE.

4. Sediment Quality. Dredging and disposal of accumulated sediments from the Oregon Coastal Projects will disturb and resuspend potentially contaminated sediments. The Corps began collecting sediment quality data from the Oregon Coastal Projects in the late 1970s. The Corps continues to conduct sediment sampling and analysis at the Coastal Projects on a 5-year cycle. Currently, sediment sampling and analysis for the Coastal Projects follows regional SL that have been adopted for use in the SEF. The history of sediment sampling shows that concentration of contaminants in the sediments at the Coastal Projects is extremely low, and remains below the SL as set forth in the DMEF or the SEF. The Corps intends to continue to sample the sediments at the Oregon Coastal Project, which rank "low" in potential for contaminants according to the SEF guidelines, on the five-year cycle, which exceeds the sampling frequency guidance in the SEF. Therefore, because the current and historical sediment characterization at the Oregon Coastal Projects has detected only very small amounts of contaminants and sampling will continue on the five-year cycles, the NMFS is reasonably certain trace concentrations of contaminants will continue to occur, but the exposure will not be significant to change this PCE.

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). Current non-Federal activities in the action areas are assumed to be limited recreational and commercial fishing from the various ports in the bays and estuaries associated with the Oregon Coastal Projects. It is believed that these activities will continue at the current levels balanced with recreational demands and fishing regulations. The NMFS is not aware of any specific future non-Federal activities within the action area that would cause greater adverse effects to listed species than presently occur in the area.

Conclusion

After reviewing the status of OC coho salmon and their designated critical habitat, the status of SONCC coho salmon and their designated critical habitat, the status of southern green sturgeon and their designated critical habitat, the environmental baseline for the action areas, and the effects of the proposed action, and cumulative effects, NMFS concludes that the proposed action is not likely to jeopardize the continued existence of OC coho salmon, SONCC coho salmon, or southern green sturgeon and is not likely to destroy or adversely modify designated critical habitat for OC coho salmon, SONCC coho salmon, or southern green sturgeon. These conclusions are based on the following considerations:

The effects of the proposed action will not occur on a large enough spatial or temporal scale to significantly disrupt OC and SONCC coho salmon or southern green sturgeon normal behavioral patterns. The physical threat to coho salmon and green sturgeon from the proposed action is related to the exposure of these fish to the zone of influence around the draghead and from the disposal of the dredged material.

Dredging and disposal activities will occur in a high-energy migratory pathway and will not modify off-channel rearing habitat or significantly reduce potential prey resources. Conservation measures employed during dredging operations will reduce the risk of fish being exposed to entrainment and being injured or killed.

The consequences of the proposed dredging and disposal actions include injury and death of up to 1,847 yearling OC coho salmon annually and up to a maximum of 2,042 yearling OC coho salmon every five to eight years when additional dredging and disposal activities may occur. Individuals from at least 13 Oregon coast OC coho salmon river basin populations will be exposed to this action. The NMFS concludes effects on abundance and productivity at the species scale will be insignificant because such a small proportion of each population will be affected annually (ranging from 0 to 0.25% of yearlings from the river basins affected), with potentially minimal increased impacts every five to eight years. No population should be impacted inequitably, such that the total impact will be spread between the populations and perhaps a few other Oregon Coast populations. The total annual mortality from dredging and disposal at the species level represents a maximum of up to 0.09% of the average number of yearling coho salmon produced for the species. In those years when additional dredging and disposal activities occur, up to approximately 0.1 of the average number of yearling OC coho salmon produced within the entire ESU may be injured or killed as a result of the Corps' dredging program. Finally, these estimated impacts are based on the maximum volume of dredged material and an estimated number of disposal loads, and are likely an overestimate when evaluated on an annual basis. The Corps determined the maximum dredging volume and estimated the number of disposal loads necessary to remove that volume of material based on the largest dredge event to occur at each given project in the previous ten years. Therefore, it is most likely that the level of impact identified above will only occur once in a 10-year period and the remaining years will be result in less impact. Therefore, the effects on distribution or genetic diversity are not expected to be measurable or meaningfully expressed at the population scale over the time frame for which this Opinion covers.

The consequences of the proposed dredging and disposal actions include injury and death of up to 10 yearling SONCC coho salmon annually as a result of dredging activities. The SONCC coho salmon population from the Rogue River is the largest and will likely be impacted inequitably. However, the total numbers are small (maximum of eight smolts annually). The annual mortality from dredging and disposal at the Rogue River represents up to 0.006% of the average number of wild yearling SONCC coho salmon produced in the Rogue basin. The populations at the Chetco River and Brush and Hubbard Creeks (near Port Orford) are extremely small and are not present at the densities to significantly contribute to abundance levels in the ocean and therefore the probability is low that they would be exposed to the adverse affects of ocean disposal activities. The total annual mortality from dredging and disposal at the ESU level is not clear. However, because the numbers of individuals affected is so small, it is unlikely that the effects on distribution or genetic diversity will not be measurable or meaningfully expressed at the population scale.

The proposed action will result in injury and death of small subadult southern green sturgeon, but effects on abundance and productivity at the population scale will be insignificant because such a small proportion of the green sturgeon populations will be exposed.

No specific future non-Federal activities have been identified within the action area that would cause greater effects to a listed species or a designated critical habitat than presently occurs. Limiting habitat factors for SONCC coho salmon and southern green sturgeon in the Pacific Ocean are controlled by large-scale factors not affected by this action.

Three PCEs will be affected for designated OC coho salmon critical habitat but none will functionally change because the effects will be localized, short term, or unlikely. Four PCEs will be affected for designated SONCC coho salmon critical habitat but none will be functionally changed because the effects will be localized, short term, or unlikely. Four PCEs will be affected for designated southern green sturgeon critical habitat, but will not functionally change because effects will be localized, short-term, or unlikely. Since the effects will not adversely affect the specific rivers, bays, estuaries, or ocean habitat functions at the site scale, the effects from the proposed project will not adversely affect functions at the larger scale either. The critical habitat would remain functional and retain its current ability to support the conservation values of the PCEs.

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.

1. The NMFS recommends the Corps use any logs, root wads, or other woody debris found during dredging for instream restoration projects within the watershed in which the dredging activity occurred.
2. The NMFS recommends the Corps collaborate with NMFS to improve the methodology to evaluate the effects of dredging and disposal on the ESA-listed species covered in this consultation.

3. Investigate ways to avoid spring dredging during peak migration season in Yaquina, Umpqua, Coos, and Chetco entrance channel, *e.g.*, consider advance maintenance or over-dredging.
4. The NMFS recommends that the Corps collaborate with NMFS to investigate the seasonal distribution and abundance of eulachon at the Umpqua River to confirm that early dredging at this project is not adversely affecting spawning habitat or impeding with adult and/or larval migration.
5. Record observations made of marine mammals or marine turtles during dredging and disposal activities. At a minimum, record the following information:
    a. Time of observation;
    b. Date of observation;
    c. Location;
    d. Name of observer; and
    e. Photo, if possible.

Reinitiation of Consultation

Reinitiation of formal consultation is required and shall be requested by the Federal agency or by NMFS where discretionary Federal involvement or control over the action has been retained or is authorized by law and: (a) If new information reveals effects of the action that may affect listed species or designated critical habitat in a manner or to an extent not previously considered; (b) if the identified action is subsequently modified in a manner that has an effect to the listed species or designated critical habitat that was not considered in the biological opinion; (c) <u>if the amount or extent of taking specified in the incidental take statement is exceeded</u> or (d) if a new species is listed or critical habitat is designated that may be affected by the identified action (50 CFR 402.16).

To reinitiate consultation, contact the Oregon State Habitat Office of NMFS and refer to the NMFS Number assigned to this consultation (2009/01756).

Incidental Take Statement

Section 9(a)(1) of the ESA prohibits the taking of ESA-listed species without a specific permit or exemption. Protective regulations adopted pursuant to section 4(d) extend the prohibition to threatened species. Among other things, an action that harasses, wounds, or kills an individual of a listed species or harms a species by altering habitat in a way that significantly impairs its essential behavioral patterns is a taking (50 CFR 222.102). Incidental take refers to 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(o)(2) exempts any taking that meets the non-discretionary terms and conditions of a written incidental take statement from the taking prohibition.

Amount or Extent of Take

The NMFS has not prohibited take of southern green sturgeon; therefore this Incidental Take Statement does not pertain to the take of southern green sturgeon identified in this Opinion.

However, once the final section 4(d) rules become effective, the Incidental Take Statement and implementing Terms and Conditions (T&Cs) will apply to southern green sturgeon. The action area includes two components at each of the Coastal Projects, the dredging area and the disposal area where the proposed action will occur and each component has specific activities that will likely injure or kill ESA-listed OC or SONCC coho salmon.

OC Coho Salmon. The project will modify habitat and/or directly injure or kill smolt/yearling OC coho salmon because their presence will overlap with the adverse impacts from dredging the navigation channels, including possible destruction of eelgrass area used for feeding and rearing, and disposing of dredged sediments either within estuarine or designated ocean disposal locations at Tillamook Bay, Depoe Bay, Yaquina Bay, Siuslaw River, Umpqua River, Coos Bay, and Coquille River. Individual smolt OC coho salmon that are exposed to the zone of influence near the draghead are likely to become physically entrained and result in mortality. Individual yearling OC coho salmon that are entrained in the discharge plume associated with the convective descent phase of dredged sediment disposal are likely to receive physical injury and result in mortality.

For the purposes of the jeopardy analysis, an estimated number of yearling coho salmon adversely affected during dredging and disposal events was calculated based on the best scientific and commercial data available, using coho salmon abundance and the volume of water affected during sediment discharged into the ODMDS; but there is no feasible way to directly observe and count individual fish adversely affected by entrainment into the dredge or buried by the disposal field. NMFS is not aware of any existing device or practicable technique that would allow safe observation during dredging and disposal operations while yielding reliable counts. However, dredging sediment is likely to increase turbidity within the water column in proportion to the amount of materials removed and then subsequently disposed. Since entrainment and the actual physical motion of the disposed sediment through the water column are identified as the primary sources of take in the proposed action, NMFS will consider the volume of dredged material removed and discharged, the number of days that disposal occurs, and the number of work stoppages due to turbidity as reasonable extent of take and indirect measures to estimate the take of yearling OC coho salmon for the proposed action. The maximum volume of dredged material and maximum number of dredge material disposal days is presented in Table 26. Should any of these limits be exceeded, the reinitiation provisions of this Opinion apply. Additionally, if dredging operations in three or more of the locations listed in table 26 exceed four cease work events (as described in the attached Term and Condition number 1) during a single dredging season due to turbidity, the reinitation provisions of this Opinion shall apply.

SONCC Coho Salmon. The project will modify habitat and/or directly injure or kill smolt/yearling SONCC coho salmon because their presence will overlap with the adverse impacts from dredging the navigation channels, including possible destruction of eelgrass area used for feeding and rearing, and disposing of dredged sediments at ocean disposal locations at the Rogue River and Chetco River Projects. Individual smolt SONCC coho salmon that are exposed to the zone of influence near the draghead at the Rogue River Project are likely to become physically entrained and result in mortality to those individuals.

For the purposes of the jeopardy analysis, an estimated number of yearling coho salmon adversely affected during dredging and during each disposal event was calculated based on the best scientific and commercial data available, using coho salmon abundance and the volume of water affected during sediment discharged into the ODMDS; but there is no feasible way to directly observe and count individual fish adversely affected by entrainment into the dredge or buried by the disposal field. NMFS is not aware of any existing device or practicable technique that would allow safe observation while yielding reliable counts. However, dredging sediment is likely to increase turbidity within the water column in proportion to the amount of materials removed and then subsequently disposed. Since entrainment and the actual physical motion of the disposed sediment through the water column are identified as the primary sources of take in the proposed action, NMFS will consider the volume of dredged material removed and discharged, the number of days that disposal occurs, and the number of work stoppages due to turbidity as reasonable extent of take and indirect measures to estimate the take of yearling SONCC coho salmon for the proposed action. The maximum volume of dredged material and maximum number of dredge material disposal days is presented in Table 27. Should any of these limits be exceeded, the reinitiation provisions of this Opinion apply. Additionally, if dredging operations in three or more of the locations listed in table 27 exceed four cease work events (as described in the attached Term and Condition number 1) during a single dredging season due to turbidity, the reinitation provisions of this Opinion shall apply.

Table 26. Maximum volume of dredged material and dredging days possible and the corresponding level of incidental take of OC coho salmon smolts that will occur at each of the Oregon Coastal Projects.

Project	Location	Maximum extent of dredge area (acres)	Maximum volume of dredged material	Maximum number of dredging and disposal days
Tillamook Bay	Garibaldi Access Channel	2.75	50,000	45
Depoe Bay	Boat Basin	6.7	25,000	30
	Check Dam Catch Basin		2,000	7
Yaquina Bay	Entrance Channel	217.5	370,000	32
	Boat Basin Access Channel	4.6	25,000	32
	Yaquina River (Depot Slough)	8.3	100,000	30
Siuslaw River	Entrance and Nav. Channel	160	100,000	20
	Turning Basin	5.5	100,000	20
Umpqua River	Entrance and Nav. Channel	40 288.5	250,000	20
	Boat Basin Access Channels	20.2	25,000	30
Coos Bay	Entrance Channel	60.6	1,000,000	20
	Navigation Channel RM 1 - 15	570	1,300,000	135
	Charleston Access Channel	22	40,000	30
Coquille River	Entrance Channel	51.5	38,000	7
	Boat Basin Access Channel	22.3	6,000	14

Table 27. Maximum volume of dredged material and dredging days possible and the corresponding level of incidental take of SONCC coho salmon smolts that will occur at each of the Oregon Coastal Projects.

Project	Location	Maximum extent of dredge area (acres)	Maximum volume of dredged material	Maximum number of dredging and disposal days
Port Orford	Navigation Channel	1.55	45,000	50
	Boat Hoist Area	0.21	7,000	30
Rogue River	Entrance Channel	40	73,000	12
	Boat Basin Access Channel	5.3	24,000	18
Chetco River	Entrance Channel	13.8	70,000	24
	Boat Basin Access Channel	4.1	5,000	14

Reasonable and Prudent Measures

Reasonable and prudent measures are nondiscretionary measures to avoid or minimize take that must be carried out by cooperators for the exemption in section 7(o)(2) to apply. The Corps has the continuing duty to regulate the activities covered in this incidental take statement where discretionary Federal involvement or control over the action has been retained or is authorized by law. The protective coverage of section 7(o)(2) may lapse if the Corps fails to exercise its discretion to require adherence to terms and conditions of the incidental take statement, or to exercise that discretion as necessary to retain the oversight to ensure compliance with these terms and conditions.

Full application of conservation measures included as part of the proposed action, together with use of the reasonable and prudent measures and terms and conditions described below, are necessary and appropriate to minimize the likelihood of incidental take of listed species due to completion of the proposed action.

The following reasonable and prudent measures are necessary and appropriate to minimize take of listed species resulting from completion of the proposed action. The Corps shall:

1. Minimize incidental take from dredging operations by applying conditions to the proposed action that minimize disturbed area and dredge impacts.
2. Ensure completion of an annual monitoring and reporting program, for review and approval by NMFS, to confirm that the take exemption for the proposed action is not exceeded, and that the terms and conditions in this ITS are effective in minimizing incidental take.

Terms and Conditions

To be exempt from the prohibitions of section 9 of the ESA, the Corps must fully comply with conservation measures described as part of the proposed action and the following terms and conditions that implement the reasonable and prudent measures described above. Incomplete compliance with these terms and conditions may invalidate this take exemption.

1. To implement reasonable and prudent measure #1 (dredging) the Corps shall ensure that:

    a. <u>Minimize Impact Area</u>. The dredge operator will confine the dredge prism to the minimum area necessary to achieve project goals and the resulting depth of the entrance channel will not be deeper than the authorized project depth including advanced maintenance and overdepth.
    b. <u>Dredge Equipment Operation</u>. Dredge equipment shall operate as follows: Dragheads and/or cutterheads shall not exceed three feet above the bottom of the channel with the dredge pumps running more than three times per eight hours of dredging at the Yaquina Bay, Siuslaw River, Umpqua River, Coos Bay, and Rogue River Projects.
    c. <u>Turbidity Monitoring</u>. Complete turbidity monitoring when dredging in areas of fine-grained sediments (equal to, or greater than, 20% silts/clays) as follows:

i. Equipment.

(1) For fine-grained sediments, use an appropriate and regularly calibrated turbidimeter to quantify change as nephlometic turbidity units (NTUs).

(2) In areas with coarse-grained sediments, use visual observation to determine if there is significantly detectable change.

ii. Interval. A reading must be taken during daylight hours, at the intervals described below, to ensure that each work area is not contributing excessive sediment to the stream or surrounding habitat. Whenever in-water work involving fine material (equal to, or greater than, 20% fines) is in progress, a sample must be taken every four hours.

iii. Sites. Each sample consists of a visual observation or a turbidimeter reading, made at a baseline site upcurrent of each work area, and a corresponding reading or observation made downcurrent of each work area. Establish a baseline and a compliance site for each work area as follows.

(1) Select a baseline site at a relatively undisturbed area approximately 200 feet upcurrent from each work area and make a surface observation (for visual monitoring) or take a sample at approximately mid-depth (when using a turbidimeter) and within any visible plume to determine background turbidity. Record the location of the baseline site, the date, time of day, tidal stage of the turbidity sample, and the turbidity before monitoring downstream. Note any other relevant sampling conditions (*e.g.*, weather, river stage, upstream activity, onsite activity).

(2) Select a compliance site approximately 200 feet downcurrent of each work area and make a surface observation (for visual monitoring) or take a sample at approximately mid-depth (when using a turbidimeter) and within any visible plume to compare with the baseline. Record the location of the compliance site, the date, time, and tidal stage of the turbidity sample, and the turbidity. Note any other relevant sampling conditions.

iv. Compliance.

(1) Compare results from the baseline and compliance sites for each sample to determine whether turbidity increased below the work area.

(2) If turbidity increased to any visible extent (plainly apparent changes in water color or clarity), continue to monitor every two hours and carry out BMPs or other corrective action as necessary to reduce turbidity, including any work necessary to repair, replace or reinforce sediment controls. BMPs to minimize sediment disturbance and distribution through the water column include, but are not limited to, the following:

(a) Sequence or phase work activities to minimize the extent and duration of in-water disturbances;

(b) Employ an experienced equipment operator;

(c) Use bucket control techniques, such as:

(i) Do not overfill the bucket.

(ii) Close the bucket as slowly as possible on the bottom.

(iii) Pause before hoisting the bucket off of the bottom to allow any overage to settle near the bottom.

(iv) Hoist load very slowly.

(v) If dewatering is permissible, pause bucket at water surface to minimize distance of discharge.

(vi) "Slam" open the bucket after material is dumped on a barge to dislodge any additional material that is potentially clinging to the bucket.

(vii) Ensure that all material has dumped into the barge from the bucket before returning for another bite.

(viii) Do not dump partial or full buckets of material back into the wetted stream.

(ix) Vary the volume, speed, or both of digging passes to minimize siltation to the maximum extent practicable.

(3) If turbidity reaches any of the following thresholds, cease work for the remainder of that 24-hour period: (a) 30 NTUs above background for two consecutive two-hour samples for fine-grained sediments; (b) 50 NTUs or more above background for any sample, or (c) for coarse-grained sediments, continues to exhibit plainly apparent changes in water color or clarity (discernable by visual observation) after the application of corrective measures.

(4) If any dredging operations in any of the locations exceed two cease work events during a single dredging season due to turbidity, the Corps must provide additional BMPs, change operations, or both in order to reduce sediment disturbances and distribution.

v. Reporting. Prepare and submit a summary of the turbidity monitoring, including a photograph of the baseline and compliance sites; a copy of turbidity measurements or observations with the date and time that each was taken; other relevant sampling conditions; and description of any sediment control failure, sediment release, correction efforts, BMPs attempted, and any time work was stopped or restarted.

2. To implement reasonable and prudent measure #2 (monitoring), the Corps shall ensure:

a. Prepare Dredging Project Completion Report. The Corps will prepare and submit a Project Completion report to NMFS by February 15 each year that describes the Corps efforts in carrying the proposed action and the success in meeting the terms and conditions contained in this Opinion. Since this Opinion covers actions for multiple dredge seasons, the Corps shall submit the following information upon completion of each dredging season at the Oregon Coastal Projects:

i. Project identification and information.

(1) Project name and description of specific work carried out (e.g. entrance channel, navigation channels, access channels, etc).

(2) Project manager name and contact information.

(3) Contractor (if any), name and contact information.

(4) Dredge type (hopper, pipeline, mechanical).

(5) Start and end date of dredging.

(6) Turbidity monitoring log.

(7) And up-to-date Sediment Analysis Plan and PRG Final Technical Memorandum prepared as described in the SEF (Corps et al. 2009).

(8) Volume of dredged material.

(9) Disposal area used.

(10) Annual bathymetric surveys of in-water disposal sites.

(11) Description of non-sediment debris, *i.e.*, logs, wood, other large materials, during dredging and how that material was dealt with.

(12) Any other information the Corps deems necessary or helpful to assess habitat trends because of actions authorized under this Opinion.

ii. Eelgrass Conservation Strategy. The Corps shall develop and implement a conservation strategy by March 31, 2011 to conserve eelgrass habitat that may be adversely affected through implementation of their maintenance dredging program at the Oregon Coastal Projects. The eelgrass conservation strategy shall include the following information:

(1) a survey protocol to determine the extent of eelgrass habitat within the action area at each of the Oregon Coastal Projects;

(2) identify appropriate conservation actions that will avoid or minimize to the maximum extent practicable impacts to existing eelgrass beds either by:

(a) transplanting eelgrass that would be adversely affected to appropriate locations within the estuary; or

(b) use existing eelgrass beds as a source population to create new eelgrass habitat;

(3) identify success criteria for newly established (including transplanted) eelgrass beds to ensure they are properly functioning; and

(4) a monitoring plan for a period of five years following establishment new eelgrass beds to evaluate whether these sites are meeting the success criteria

(5) an annual eelgrass restoration or mitigation report to be included in their Project Completion Report for each dredging action that adversely affects eelgrass and includes the following information:

(a) The Corps contact person.

(b) Contractor (if any) name and address

(c) Restoration or mitigation site by latitude and longitude (including degrees, minutes, and seconds), and 6th field hydrologic unit code.

(d) Start and end date for the restoration or mitigation work.

(e) Photos of habitat condition before, during, and after restoration or mitigation completion; and

(f) A list of any eelgrass mitigation projects that are underway, and a list of restoration or mitigation projects which the Corps has approved as "complete."

b. Annual coordination meeting. The Corps' Coastal Project Manager and Environmental Branch representative will attend an annual coordination meeting with NMFS by March 31 each year to discuss the annual monitoring and Project Completion Report, including actions planned for the following year, final SEF PRG reports for those planned actions, and any other actions that will improve conservation under this Opinion, or make the program more efficient or more accountable

c. Submit Reports. To submit the Project Completion Report or to reinitiate consultation, contact:

Oregon State Habitat Office
National Marine Fisheries Service
Attn: 2009/01756
1201 NE Lloyd Blvd., Ste. 1100
Portland, Oregon 97232-1274

d. Failure to provide reporting may trigger reinitiation. If the Corps fails to provide an annual dredging completion report, eelgrass restoration or mitigation report (as necessary, or fails to participate in the annual coordination meeting, NMFS may assume the action has been modified in a way that constitutes a modification of the proposed action in a manner and to the extent not previously considered, and may recommend reinitiation of this consultation.

e. NOTICE. If a sick, injured or dead specimen of a threatened or endangered species is found in the project area, the finder must notify NMFS through the contact person identified in the transmittal letter for this Opinion, or through NMFS Office of Law Enforcement at 1-800-853-1964, and follow any instructions. If the proposed action may worsen the fish's condition before NMFS can be contacted, the finder should attempt to move the fish to a suitable location near the capture site while keeping the fish in the water and reducing its stress as much as possible. Do not disturb the fish after it has been moved. If the fish is dead, or dies while being captured or moved, report the following information: (1) The NMFS consultation number (found on the top left of the transmittal letter for this Opinion), (2) the date, time, and location of discovery, (3) a brief description of circumstances and any information that may show the cause of death, and (4) photographs of the fish and where it was found. The NMFS also suggests that the finder coordinate with local biologists to recover any tags or other relevant research information. If the specimen is not needed by local biologists for tag

recovery or by NMFS for analysis, the specimen should be returned to the water in which it was found, or otherwise discarded.

MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT

The consultation requirement of section 305(b) of the MSA directs Federal agencies to consult with NMFS on all actions, or proposed actions that may adversely affect EFH. Adverse effects include the direct or indirect physical, chemical or biological alterations 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 to EFH may result from actions occurring within EFH or outside EFH, and may include site-specific or EFH-wide impacts, including individual, cumulative, or synergistic consequences of actions (50 CFR 600.810). Section 305(b) also requires NMFS to recommend measures that may be taken by the action agency to conserve EFH.

The Pacific Fishery Management Council (PFMC) designated EFH for groundfish (PFMC 2006), coastal pelagic species (PFMC 1998), and Chinook salmon, coho salmon, and Puget Sound pink salmon (PFMC 1999). The proposed action and action area for this consultation are described in the Introduction to this document. The action area includes areas designated as EFH for various life-history stages of 24 species of groundfish, five coastal pelagic species, and two species of Pacific salmon (Table 28) (PFMC 2006, PFMC 1998, PFMC 1999). All of the bays and estuaries associated with the Corps' Coastal Projects are designated by the PFMC as a Habitat Area of Particular Concern for groundfish species because estuaries are nutrient-rich and biologically-productive, providing a critical nursery ground for many groundfish species managed by the PFMC.

Table 28. Species with designated EFH in the action area.

Species Common Name	*Species Scientific Name*	Lifestage	Prey	Likelihood of suitable habitat in the estuary or nearshore.[9]	Seasonality
Groundfish					
Arrowtooth flounder	*Atheresthes stomias*	Eggs		Nearshore – high Estuary – high	
		Larvae	Copepod eggs, Copepod nauplii, Copepods	Nearshore – high Estuary – high	Year round
Big skate	*Raja binoculata*	Adults	Crustaceans, Fish	Nearshore - medium.	Year round
		Juveniles		Nearshore – high	Year round
		Eggs		Nearshore – medium	Year round
Blue rockfish	*Sebastes mystinus*	Larvae		Nearshore – high Estuary - low	Year round
Butter sole	*Isopsetta isolepis*	Adults	Amphipods, Decapod crustaceans, Fish, Molluscs, polychaetes, Sea stars, Shrimp	Nearshore – high	Year round
California skate	*Raja inornata*	Adults		Estuary - high	Year round
		Juveniles		Nearshore – juveniles	Year round
		Eggs		Estuary – high	Year round
Curlfin sole	*Pleuronichthys decurrens*	Adults	Crustacean eggs, Echiurid proboscises, Nudibranchs, polychaetes	Nearshore - medium	Year round
Dover sole	*Microstomus pacificus*	Juveniles		Nearshore – medium.	Year round
English sole	*Parophrys vetulus*	Juveniles	Amphipods, Copepods, Cumaceans, Molluscs, Mysids, polychaetes	Nearshore – medium	Year round
		Larvae		Nearshore – medium Estuary – medium	Year round
		Larvae	Amphipods, Brachyuran, Copepod nauplii, Copepods, Euphausiids, fish larvae	Nearshore – high Estuary – medium.	Stronger in spring in estuary

[9] Pacific Fishery Management Council. 2006. Amendment 19 to the Pacific Coast Groundfish Fishery Management Plan. Habitat Suitability Maps. http://www.pcouncil.org/habitat/habsuitmaps.html

Species Common Name	*Species Scientific Name*	Lifestage	Prey	Likelihood of suitable habitat in the estuary or nearshore.[9]	Seasonality
Kelp greenling	*Hexagrammos decagrammus*	Juveniles		Nearshore - medium	Year round
Lingcod	*Ophiodon elongatus*	Larvae	Amphipods, Copepod eggs, Copepod nauplii, Copepods, decapod larvae, Euphausiids	Nearshore – medium	Spring
		Eggs		Nearshore – high Estuary – high	Winter
		Adults		Nearshore – high	Year round
Longnose skate	*Raja rhina*	Juveniles		Nearshore - medium	Year round
		Eggs		Nearshore – medium Estuary – medium	Year round
		Larvae	Copepods	Nearshore - high	Spring and summer
Pacific cod	*Gadus macrocephalus*	Eggs		Estuary - medium	Spring, summer, and winter
		Adults	Amphipods Clupeids, Crabs, Merluccius productus, Rockfish, Squids	Nearshore - medium Estuary - medium	Year round
Pacific hake	*Merluccius productus*	Adults	Clupeids, Crab larvae, Octopi, Squids	Nearshore – high	Year round
Pacific sanddab	*Citharichthys sordidus*	Adults	Eopsetta jordani, Euphausiids, Ophiuroids, Pelagic fishes, Shrimp		Year round
Petrale sole	*Eopsetta jordani*	Adults	echinoderms, Echiurans, Fish, Molluscs, polychaetes, tunicates	Nearshore - medium	Year round
Rock sole	*Lepidopsetta bilineata*	Adults		Nearshore - medium	Year round

Species Common Name	*Species Scientific Name*	Lifestage	Prey	Likelihood of suitable habitat in the estuary or nearshore.[9]	Seasonality
Sablefish	*Anoplopoma fimbria*	Juveniles	Amphipods, Cephalopods, Copepods, Demersal fish, Euphausiids, krill, Small fishes, Squids, tunicates	Nearshore – medium	Year round
		Eggs		Nearshore – medium Estuary – medium	Year round
		Adults	Clupeids, Crabs, Fish, Molluscs, Mysids, polychaetes, Shrimp	Nearshore – high	Year round
Sand sole	*Psettichthys melanostictus*	Juveniles	Euphausiids, Molluscs, Mysids, polychaetes, Shrimp	Nearshore – high	Year round
		Adults	Fish, Invertebrates	Nearshore – medium Estuary - medium	Year round
Soupfin shark	*Galeorhinus galeus*	Juveniles		Nearshore – medium Estuary – medium	Year round
		Adults	Invertebrates, Pelagic fishes	Nearshore – high Estuary – high	Spring
Spiny dogfish	*Squalus acanthias*	Juveniles		Nearshore – medium Estuary – medium	Year round
		Juveniles	Amphipods,Cladocerans,Cope pods	Nearshore - medium	Year round
Splitnose rockfish	*Sebastes diploproa*	Larvae		Nearshore – high Estuary – high	Year round
		Adults	algae, Amphipods, Annelids, Brittle Stars, Fish, Hydrolagus colliei, Molluscs, Nudibranchs, Opisthobranchs, Ostracods, Small Crustacea, Squids	Nearshore – medium	Year round
Spotted ratfish	*Hydrolagus colliei*	Juveniles	algae, Amphipods, Annelids, Brittle Stars, Fish, Hydrolagus colliei, Molluscs, Nudibranchs, Opisthobranchs, Ostracods, Small Crustacea, Squids	Nearshore – medium	Year round
		Eggs		Nearshore - medium	Year round
		Adults	Crabs, fish juveniles, Molluscs, polychaetes	Nearshore – high	Year round

Species Common Name	*Species Scientific Name*	Lifestage	Prey	Likelihood of suitable habitat in the estuary or nearshore.[9]	Seasonality
Starry flounder	*Platichthys stellatus*	Juveniles	Amphipods, Copepods, polychaetes	Nearshore - medium	Year round
		Eggs		Nearshore – medium	Year round
		Juveniles	Copepod eggs, Copepods, Euphausiid eggs	Nearshore - medium	Year round
Widow rockfish	*Sebastes entomelas*	Juveniles	Copepod eggs, Copepods, Euphausiid eggs	Nearshore - medium	Year round
Pacific Salmon					
Chinook salmon	*Oncorhynchus tshawytscha*				
Coho Salmon	*Oncorhynchus kisutch*				
Coastal Pelagics					
Northern Anchovy	*Engraulis mordax*				
Jack Mackerel	*Trachurus symmetricus*				
Pacific Sardine	*Sardinops sagax*				
Pacific (Chub) Mackerel	*Scomber japonicas*				
Market Squid	*Loligo opalescens*				

The adverse effects to coho salmon from the proposed action are described in detail in the ESA portion of this document. The ESA analysis of effects to coho salmon habitat is also relevant to EFH of other species. The NMFS concludes that the proposed action will have the following adverse effects on EFH designated for groundfish, coastal pelagics and coho and Chinook salmon:

1. Water Quality. Suspended sediment levels will be increased over background due to fine sediment mobilized by disposal from a hopper dredge transport ship. Turbidity levels are likely to increase for a short time with the highest concentrations occurring in the area of dredging of fine-grained sediments and at the ship's disposal point and dissipating from that point depending on current velocities and vectors. It is likely that suspended sediment concentrations generated by dredge material disposal will exceed the 17 mg/L effects threshold for injury as described above for salmonids. Some EFH management species are far less sensitive to turbidity and suspended solids than salmonids (Wilbur and Clarke 2001). It is also reasonable to conclude that groundfish and coastal pelagic species found nearshore will be of sufficient age and size to initiate avoidance behavior and move out of the turbidity plume and will not experience adverse effects from the elevated turbidity.

   Sediment sampling occurs at the Corps' Coastal Projects at 5-year intervals. Sediment samples are collected and submitted for physical analyses including total volatile solids. Select samples containing higher percent of fine-grained material were analyzed for metals 10 (inorganic), total organic carbon, pesticides and PCBs, phenols, phthalates, miscellaneous extractables, PAHs, and organotin. Physical analysis for material within the main navigation channels are primarily sand, with high concentration of fine sediments and organic material in the boat basin access channels and up-river / off-channel areas such as Depot Slough. The chemical analyses indicate only very low levels of contamination in any of the samples, with all levels below their respective DMEF or SEF SLs and suitable for unconfined in-water disposal. Therefore, dredging sediments from the Federally-authorized navigation channels and the unconfined, in-water disposal of dredged material will not create significant additional risk to the environment, beyond what naturally exists in the area.

   In conclusion, although trace levels of various contaminants will occur with the sediments; these levels will not exceed concentrations harmful to the organisms occupying the action area; therefore disposal of this dredge material will not alter the habitat value of the EFH.

2. Food Resources. Availability of food resources will temporarily decline within the navigation channel prisms as they are physically entrained into the dredge. Food resources will also temporarily decline at the dredge material disposal site because disposal will cover the substrate and any substrate dwelling organisms will be buried. The majority of these areas are identified as high-energy, nearshore zones that are typically inhabited by opportunistic organisms tolerant of disturbance.

   Disposal of dredge materials at ODMDS contributes a layer of unconsolidated sediment on the ocean floor. In doing this, infaunal and epifaunal invertebrates will be covered with a layer of sandy sediment. The ODMDS' associated with the Corps' Coastal

Projects will be monitored annually to assess mounding, which was previously discussed. These annual surveys will verify placement of material within the boundaries of the sites, monitor changes in bathymetry, and ensure site capacity is not exceeded. If mound heights appear to be increasing over time, more intensive monitoring and/or management of the site, including restricting placement of material to only certain portions of the ODMDS may occur. Nonetheless, the short-term deposition of this material before the winter storms disperse the material may result in some reduction of invertebrates on the ocean floor. The result would be a change in food source and habitat available to marine organisms in the area for up to 6 or 7 months between the disposal and when the winter storms disperse the material. The likely change in prey species is dependent then on the recolonization rate of this area.

Recolonization potential is affected by the length of intervals between deposition events, particle size, currents, and compaction/stabilization following deposition (Newell *et al.* 1998; Van der Veer *et al.* 1985). Rates of recovery listed in the literature range from several months for estuarine muds, and up to two to three years for sands and gravels (Hitchcock *et al.* 1999). Recolonization may take longer in areas with lower current (Van der Veer *et al.* 1985). This site is indicative of a dynamic nearshore ecological zone that naturally would be characterized by a disturbance-based ecosystem. Disturbance based ecosystems are indicative of rapid recolonization rates by opportunistic organisms tolerant of conditions that are physiologically stressful (Pemberton and MacEachern 1997).

Similar exposure, avoidance response, and risks are predicted with forage fish species as were described for the coho salmon and green sturgeon. Typically, these fish are smaller species and also less likely to avoid physical injury. Juveniles of larger species are also less likely to be able to avoid physical injury. The number of individuals impacted is difficult to estimate, but it is reasonable to conclude the number adversely affected would not significantly deplete the overall abundance of forage available to EFH species in the surrounding ocean. Because this impact to the forage base is highly localized, the decrease in forage abundance is considered insignificant to the total food resources available to EFH management species.

3. Safe Passage. EFH managed species are subject to the physical threat of entrainment into the dredge and into the sediment plume during disposal. Some individuals of the various species will be entrained and experience effects from the discharge of these dredged sediments from the hopper dredge. The exposure of EFH management species to the dredging activity and the disposal material was determined to be inevitable based on the expectation that the fish will not exhibit avoidance behavior from the vessel. Larger specimens are more likely to successfully evade the draghead and the sediment plume without significant physical injury that would result in death because their faster swimming speed allows evasion. The NMFS is reasonably certain some risk to the safe passage of eggs, larvae, young-of-the-year, and juveniles exists due to this action, but the action is spatially and temporally limited at each of the Corps' Coastal Projects. Most of the dredging and disposal will within a relatively small spatial area relative to the coastal bay, estuary, or nearshore ocean environments; therefore the safe passage of the EFH managed species will not be significantly changed to affect population structure by dredging and disposal for one year.

EFH Conservation Recommendations

The NMFS considers five conservation recommendations are appropriate for this proposed action. The Corps' navigational dredging and disposal program is an ongoing activity authorized and funded through Congressional mandates that will continue into the foreseeable future to maintain safe navigation for commerce and recreational activity. Given this understanding of the Corps' program, the first conservation recommendation will utilize navigational debris as a resource to improve designated EFH for salmonids; the second conservation recommendation will further the understanding of the impacts of ocean disposal of dredged material on EFH and lead to refined and targeted conservation recommendations for future Corps navigational actions on the Oregon Coast. By itself, the NMFS realizes this recommendation does not achieve our objectives to avoid, mitigate, or offset adverse effects to EFH, but considers this recommendation, if followed, will result in the knowledge and ability to accomplish these objectives. The third conservation measure will first avoid, if not avoidable, then mitigate for impacts to eelgrass. The fourth and fifth conservation recommendations are necessary to avoid, mitigate, or offset the impact of the proposed action on EFH. These conservation recommendations are a subset of the ESA terms and conditions.

EFH Conservation Recommendations

1. The NMFS recommends the Corps use any logs, root wads, or other woody debris found during dredging for instream restoration projects within the watershed in which the dredging activity occurred.

2. The NMFS recommends the Corps collaborate with NMFS to improve the methodology to evaluate the physical and biological effects to the water column which may adversely affect EFH designated for Pacific Salmon, groundfish, and coastal pelagic species. This may include field or laboratory testing of dredge disposal to determine dispersal of material, velocity, and reaction by fish species to such changes in the water column and on the substrate.

3. The NMFS recommends that the Corps develop and implement a conservation strategy to conserve eelgrass habitat that may be adversely affected through implementation of their maintenance dredging program at the Oregon Coastal Projects. The conservation strategy is the same as identified in the ESA terms and conditions, but is summarized here: :
    a. A survey protocol to determine the extent of eelgrass habitat within the action area at each of the Oregon Coastal Projects;
    b. Identify appropriate conservation actions that will avoid or minimize to the maximum extent practicable impacts to existing eelgrass either by:
        i. transplanting eelgrass that would be adversely affected to appropriate locations within the estuary; or
        ii. use existing eelgrass beds as a source population to create new eelgrass habitat;
    c. Identify success criteria for newly established eelgrass habitat to ensure they are properly functioning; and
    d. A monitoring plan for a period of five years following establishment of new eelgrass beds to evaluate whether these sites are meeting the success criteria.

4. Dredging Activities.
   a. Minimize Impact Area. The dredge operator will confine the dredge prism to the minimum area necessary to achieve project goals and the resulting depth of the entrance channel will not be deeper than the authorized project depth including advanced maintenance and overdepth.
   b. Dredge Equipment Operation. Dredge equipment shall operate as follows: Dragheads and/or cutterheads shall not exceed three feet above the bottom of the channel with the dredge pumps running more than three times per eight hours of dredging at the Oregon Coastal Projects.
   c. Turbidity Monitoring. Complete turbidity monitoring as described in the ESA term and conditions 1(c).

5. Monitoring and Reporting. Follow the ESA term and condition #2 (monitoring) with the exception of reporting sick, injured, or dead specimens of ESA-listed species.

Statutory Response Requirement

Federal agencies are required to provide a detailed written response to NMFS' EFH conservation recommendations within 30 days of receipt of these recommendations [50 CFR 600.920(j) (1)]. The response must include a description of measures proposed to avoid, mitigate or offset the adverse affects of the activity on EFH. If the response is inconsistent with the EFH conservation recommendations, the response must explain the reasons for not following the recommendations. The reasons must include the scientific justification for any disagreements over the anticipated effects of the proposed action and the measures needed to avoid, minimize, mitigate or offset such effects.

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.

Supplemental Consultation

The Corps 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(k)].

DATA QUALITY ACT DOCUMENTATION AND PRE-DISSEMINATION REVIEW

Section 515 of the Treasury and General Government Appropriations Act of 2001 (Public Law 106-554) (Data Quality Act) specifies three components contributing to the quality of a document. They are utility, integrity and objectivity. This section of the Opinion addresses these Data Quality Act (DQA) components, documents compliance with the DQA, and certifies that this Opinion has undergone pre-dissemination review.

Utility: Utility principally refers to ensuring that the information contained in this consultation is helpful, serviceable and beneficial to the intended users.

This ESA consultation concludes that the proposed dredging of the Federally-authorized navigation channels at the Corps' Oregon Coastal Projects and the in-water disposal of that material will not jeopardize the affected listed species. Therefore, the Corps may implement this action in accordance with their authority pursuant to provisions of sections 102 and 103 of the Marine Protection Reserve and Sanctuaries Act of 1972, sections 401 and 404 of the Clean Water Act of 1977, and in accordance with Regulations 33 CFR parts 335 – 338. The intended users are the Corps and the EPA.

Individual copies were provided to the Corps and the EPA. This consultation will be posted on the NMFS Northwest Region website (http://www.nwr.noaa.gov). The format and naming adheres to conventional standards for style.

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

Objectivity:

Information Product Category: Natural Resource Plan.

Standards: This consultation and supporting documents are clear, concise, complete and unbiased; and were developed using commonly accepted scientific research methods. They adhere to published standards including the NMFS ESA Consultation Handbook, ESA regulations, 50 CFR 402.01, *et seq.*, and the MSA implementing regulations regarding EFH, 50 CFR 600.920(j).

Best Available Information: This consultation and supporting documents use the best available information, as referenced in the Literature Cited section. The analyses in this Opinion/EFH consultation contains 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 Northwest Region ESA quality control and assurance processes.

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Appendix A. Marine Mammal Determinations

Marine Mammals (Steller sea lions, blue whales, fin whales, humpback whales, Southern Resident killer whales):

The above ESA-listed marine mammal species may occur in the proposed disposal areas. Blue whales and fin whales are not generally distributed nearshore, and their presence in the proposed action area is unlikely. Humpback whales and Southern Resident killer whales may occur nearer to the shore but their presence is likely to be infrequent and transitory. Steller sea lion rookeries and haul outs are sufficiently distant from the proposed action area (at least five miles away from the dredge locations and at least three miles away from the disposal sites) that NMFS does not anticipate any effects to breeding our haul out behavior. In the event marine mammals are present during disposal activities, vessel operations and dredge discharge procedures associated with the proposed action may cause temporary disturbance. The proposed action may indirectly affect the quantity and quality of prey available to marine mammals (*i.e.*, salmonid prey of Southern Resident killer whales and Steller sea lions) by changes to water quality and physical injury, discussed in detail above for OC and SONCC coho salmon.

Vessel transits will be associated with the proposed action (i.e, hopper dredge). An estimated 3,014 trips would occur to and from the sites (range of 0 - 1,898 trips per site, annually), and up to a maximum of 3,215 trips every 5-7 years, when more disposal activities are anticipated. Barge-sized vessels, such as a hopper dredge, used for the proposed action would require short transits to the nearshore or ocean dredged material disposal sites (ODMDS), where the vessel would remain relatively immobile until work is complete, with minimal sound or potential for disturbance. Any temporary disturbance would be short-term and localized, with no lasting effects, and therefore insignificant. Vessel strikes are extremely unlikely because the barge-sized vessels are slow moving, follow a predictable course, do not target marine mammals, and should be easily detected and avoided by marine mammals. Potential effects from vessel strikes are therefore discountable.

Changes in water quality associated with incidental take of OC and SONCC coho are primarily related to habitat changes contributed by dredge discharge and disposal, such as turbidity and covered food resources for salmonids. As described in detail above, sediment quality standards for open ocean disposal would be met. Only “clean” dredged material can be placed into the ocean under current statutes and regulations. Sediment suitability must be documented prior to disposal at the disposal sites.

As described in the analysis for OC and SONCC coho, the proposed action is not likely to jeopardize the continued existence of OC or SONCC coho or destroy or adversely modify their critical habitat. Approximately 1,847 yearling OC coho may be annually injured or killed by the dredging and disposal activities, and up to a maximum of 2,023 yearling OC coho every five to eight years. As many as eight yearling SONCC coho may be annually injured or killed. In addition to the ESA-listed species, the analysis presented in the document’s EFH section also describes the general magnitude of the resulting adverse effects on this habitat and management species. Anticipated localized take of yearling salmonids and other species associated with the proposed action would result in an insignificant reduction in adult equivalent prey resources for marine mammals that may intercept OC and SONCC coho and other prey species within their range (*i.e.*, Southern Resident killer whales or Steller sea lions).

The NMFS finds that all potential adverse effects to ESA-listed marine mammals are discountable or insignificant and concurs with your determination of “may affect, not likely to adversely affect” for Steller sea lions, blue whales, fin whales, humpback whales, and Southern Resident killer whales.