Exhibit A

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

Refer to NMFS No.:
WCR-2015-2812

August 4, 2016

Robert G. MacWhorter
Forest Supervisor
Rogue River – Siskiyou National Forest
3040 Biddle Road
Medford, Oregon 97504-4119

Re: Endangered Species Act Section 7(a)(2) Programmatic Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Response for Suction Dredging and High Banking Notice of Intent Operations on National Forest System Lands within the Rogue River-Siskiyou National Forest in Oregon and California.

Dear Mr. MacWhorter:

Thank you for your letter of February 25, 2015, requesting initiation of consultation with National Oceanic and Atmospheric Administration's (NOAA's) National Marine Fisheries Service (NMFS) pursuant to section 7 of the Endangered Species Act of 1973 (ESA) (16 U.S.C. 1531 et seq.) for Programmatic Suction Dredging and High Banking Notice of Intent (NOI) Operations on National Forest System Lands within the Rogue River-Siskiyou National Forest (RRSNF) in Oregon and California. This action is in accordance with the RRSNF's authority under the Organic Administration Act of 1897.

In this opinion, NMFS concluded that the proposed action is not likely to adversely affect (NLAA) southern distinct population segment (DPS) Pacific eulachon (*Thaleichthys pacificus*). We also concluded that the proposed action is not likely to jeopardize the continued existence of Southern Oregon/Northern California Coast (SONCC) coho salmon (*Oncorhynchus kisutch*) and Oregon Coast (OC) coho salmon or result in the destruction or adverse modification of their designated critical habitats. Additionally, we concluded that the proposed action is not likely to jeopardize the continued existence of Southern DPS North American green sturgeon (*Acipenser medirostris*).

As required by section 7 of the ESA, NMFS provided an incidental take statement with the opinion. The incidental take statement describes reasonable and prudent measures NMFS considers necessary or appropriate to minimize incidental take associated with this action. The take statement sets forth nondiscretionary terms and conditions, including reporting requirements, that the RRSNF and any person who performs the action must comply with to carry out the reasonable and prudent measures. Incidental take from actions that meet these terms and conditions will be exempt from the ESA take prohibition. 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. Section 305(b) (4) (B) of the MSA requires Federal agencies to provide a detailed written response to NMFS within 30 days after receiving this recommendation.

If the response is inconsistent with the EFH conservation recommendation, the RRSNF must explain why the recommendations will not be followed, including the scientific justification for any disagreements over the effects of the action and the recommendations. In response to increased oversight of overall EFH program effectiveness by the Office of Management and Budget, NMFS established a quarterly reporting requirement to determine how many conservation recommendations are provided as part of each EFH response and how many are adopted by the action agency. Therefore, we request that in your statutory reply to the EFH portion of this consultation, you clearly identify the number of conservation recommendations accepted.

Please contact Michelle McMullin in the Oregon Coast Branch of the Oregon Washington Coastal Area Office, at 541-957-3378 or Michelle.McMullin@noaa.gov, if you have any questions concerning this section 7 consultation, or if you require additional information.

Sincerely,

William W. Stelle, Jr.
Regional Administrator

cc: Susan Maiyo, RRSNF
Karen Tarnow, ODEQ

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

Suction Dredging and High Banking Notice of Intent Operations
on National Forest System Lands
within the Rogue River-Siskiyou National Forest
in Oregon and California

NMFS Consultation Number: WCR-2015-2812

Action Agency: U.S.D.A. Forest Service, Rogue River-Siskiyou National Forest

Affected Species and NMFS' Determinations:

ESA-Listed Species	Status	Is Action Likely to Adversely Affect Species or Critical Habitat?*	Is Action Likely To Jeopardize the Species?	Is Action Likely To Destroy or Adversely Modify Critical Habitat?
Oregon Coast coho salmon *(Oncorhynchus kisutch)*	Threatened	Yes	No	No
Southern Oregon/Northern California Coast coho salmon *(O. kisutch)*	Threatened	Yes	No	No
Southern Distinct Population Segment North American green sturgeon *(Acipenser medirostris)*	Threatened	Yes	No	N/A
Southern Distinct Population Segment Pacific eulachon *(Thaleichthys pacificus)*	Threatened	No	N/A	N/A

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

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

Issued By:

William W. Stelle, Jr.
Regional Administrator

Date: August 4, 2016

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1. INTRODUCTION

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

1.1 Background

The National Marine Fisheries Service (NMFS) prepared the biological opinion (opinion) and incidental take statement portions of this document in accordance with section 7(b) of the Endangered Species Act (ESA) of 1973 (16 USC 1531 et seq.), and implementing regulations at 50 CFR 402.

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

We completed pre-dissemination review of this document using standards for utility, integrity, and objectivity in compliance with applicable guidelines issued under the Data Quality Act (section 515 of the Treasury and General Government Appropriations Act for Fiscal Year 2001, Public Law 106-554).

1.2 Consultation History

Technical assistance/pre-consultation activities began on October 19, 2012, when staff from NMFS and the Rogue River-Siskiyou National Forest (RRSNF) met to informally discuss the potential for consultation for notice of intents (NOIs) submitted by miners to the RRSNF for suction dredging and high banking operations. The NMFS had not previously completed a consultation for suction dredging or high banking operations on the RRSNF. We quickly established that the RRSNF needed to compile existing placer claims and a subset of past NOIs (i.e., 2009-2012) to determine the scope and amount of the potential action. NMFS and the RRSNF also needed to review existing state regulations for Oregon and California. In February 2013, we determined that a programmatic consultation with a limited geographic area would be the most appropriate consultation pathway for suction dredging/high banking NOIs, as NOIs are submitted on an annual basis. On February 19, 2013, we received a letter from the RRSNF stating their intent to enter into formal consultation with NMFS and informing us that a biological assessment (BA) was being prepared, based on the June 2012 ruling by the U.S. Court of Appeals for the Ninth Circuit.[1] In early 2013 we also began collaboration in compiling conservation measures to serve as design criteria for the RRSNF to use as guidance in reviewing and approving NOIs under this programmatic consultation.[2] The RRSNF continued to prepare

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[1] The processing of NOI for proposed suction dredge mining operations by the Forest Service is a Federal action for purposes of the consultation requirements of section 7 of the Endangered Species Act (Karuk Tribe of California v. U.S. Forest Service, 681 F.3d 1006 (9th Cir. 2012); 16 U.S.C. § 1536(a)(2)).

[2] Approval or authorization are used as terms in the biological assessment by the RRSNF solely in context of consultation with NMFS for suction dredging and/or high banking mining operations that have submitted NOIs, as set out in 36 CFR § 228.4. This context derives from the Ninth Circuit Court of Appeals' en banc ruling in Karuk Tribe of California v. U.S. Forest Service, 681 F.3d. 1006 (9th Cir. 2012). No other connection between NOI mining operations and high banking authorizations or approvals is intended.

their BA through February 2015 and frequently requested review, comments, and guidance which were provided by NMFS staff. Programmatic consultation for Suction Dredging and High Banking Notice of Intent Operations on National Forest System (NFS) Lands within the RRSNF in Oregon and California was initiated on February 27, 2015, when NMFS received the BA from the RRSNF with a letter requesting consultation. Throughout the consultation, RRSNF participating staff included both fisheries and minerals specialists. We did communicate with RRSNF by letter on October 15, 2015, regarding the delay in delivery of the biological opinion. Although the RRSNF did not request to review the draft programmatic biological opinion in their February 25, 2015 letter, NMFS and RRSNF did meet in June 2016 to discuss the draft programmatic biological opinion, including proposed terms and conditions, prior to completion.

The RRSNF determined that suction dredging and high banking operations implemented under the proposed action and meeting proposed design criteria would "May affect, likely to adversely affect" Oregon Coast (OC) coho salmon (*Oncorhynchus kisutch)*, Southern Oregon/Northern California Coast (SONCC) coho salmon (*Oncorhynchus kisutch*), and their designated critical habitats. They also determined the proposed action would "May affect, likely to adversely affect" Southern Distinct Population Segment (DPS) North American green sturgeon (*Acipenser medirostris*) and Southern DPS Pacific eulachon. In the programmatic biological opinion, we agreed with their effects determinations for OC coho salmon, SONCC coho salmon, and their designated critical habitats, as well as for Southern DPS North American green sturgeon. However, we did not agree with their effect determination for Southern DPS Pacific eulachon (see Section 2.11).

As part of the consultation, the Oregon Coast Branch coordinated with the Northern California North Coast Branch regarding those activities proposed for the Smith River basin.

At the time the BA was submitted for consultation, Oregon Department of Environmental Quality (ODEQ) was in the process of renewing the National Pollutant Discharge Elimination System (NPDES) 700-PM General NPDES Permit, which expired on December 31, 2014. However, ODEQ had not yet issued the renewed 700-PM as of February 27, 2015. On March 24, 2015, DEQ did issue a revised 700-PM permit, effective on May 15, 2015 (Moore 2015). The RRSNF did request NMFS to modify the language in one conservation measure to meet the 2015 700-PM permit definition for "habitat structure".[3] Where appropriate NMFS also updated the citations in the proposed conservation measures to reflect the 2015 700-PM permit.

This opinion is based on the information provided in the BA (USFS 2015) and any information collected during phone calls and e-mails between October 19, 2012 and finalization of the opinion. A complete record of this consultation is on file at the Oregon Coast Branch in Roseburg, Oregon.

This consultation was listed in a notification e-mailed to the designated contact for tribal governments within the Oregon Washington Coastal Office's geographic area of responsibility on May 1, 2015. The intent of the correspondence was to improve communication and cooperation with tribal governments regarding ESA section 7 consultation requests from Federal

[3] E-mail from Susan Maiyo, RRSNF, to Michelle McMullin, NMFS (April 22, 2015) (requesting modification of a conservation measure to match the new language in ODEQ's 2015 700-PM general permit [refer to ODEQ 2015a]).

action agencies, and to provide tribal governments with a list of open consultation received since the beginning of FY15.

1.3 Proposed Action

"Action" means all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by Federal agencies (50 CFR 402.02). In accordance with their authority under the Organic Administration Act of 1897, the RRSNF is proposing to authorize[2] NOIs for suction dredging and high banking operations in 29 fifth-field watersheds on National Forest System Lands within the RRSNF in Oregon and California (Figure 1). These NOIs will be for operations occurring in those reaches of rivers with OC and SONCC coho salmon and designated critical habitat, including National Forest System Lands 0.25 miles upstream of coho salmon and their designated critical habitat. Access and occupancy (camping) are also expected as part of operations. The proposed action also includes an annual upper limit of NOIs authorized per watershed, which the RRSNF derived from NOIs submitted during 2009-2012 and active placer claims[4] (Table 1). The annual limit per watershed only applies to reaches of rivers with OC/SONCC coho salmon and/or designated critical habitat within the RRSNF plus any reaches 0.25 mile upstream of coho salmon and critical habitat also within RRSNF.

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[4] Claims that were noted as active and filed on May 8, 2013. The number and location of active and filed claims can change on a daily basis. A filed mining claim is not a prerequisite for approval of a NOI. Typically fewer NOIs are submitted annually for a watershed than the number of active filed claims (Table 1).

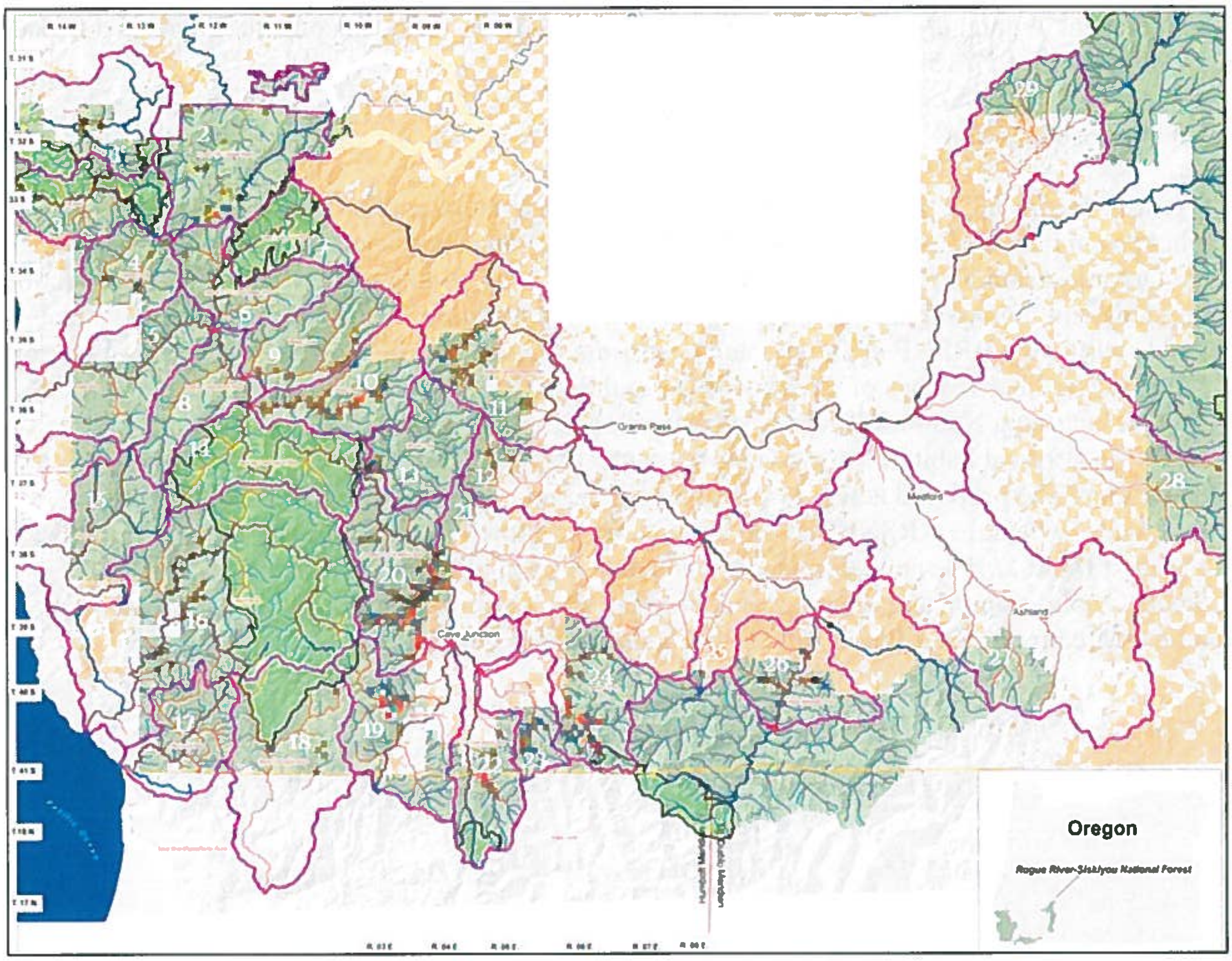

Figure 1. The Rogue River-Siskiyou National Forest (RRSNF) is in southwest Oregon. The numbers designate the 29 fifth-field watersheds in which the RRSNF is proposing to authorize Notices of Intent for suction dredging and high banking operations submitted in those reaches of rivers with OC and SONCC coho salmon and designated critical habitat, including National Forest System Lands 0.25 miles upstream of coho salmon and their designated critical habitat. See Table 1 for a complete list of fifth-field watersheds. Green lands are RRSNF land with bright green indicating wilderness areas.

Table 1. Maximum number of NOIs proposed to be authorized annually by the RRSNF by watershed, coho salmon population, coho salmon evolutionary significant unit (ESU), and total. See Figure 1 for locations of fifth-field watersheds, as identified by watershed number in column four.

Population	Subbasin (4th field)	Watershed (5th field)	Watershed number on map in Figure 1	No. of active filed claims (as of 5/8/2013) 1/4 mile from coho critical habitat	Notices of Intent		
					No. of NOI during 2009-2012 and avg. per year	Highest Number of NOI within a year occurring 2009-2012	No. of annual NOI permissible per watershed
SONCC Coho Salmon ESU							
Chetco River	Chetco	Chetco River1710031201	16	14	41/10.3	12 (2010, 2011, 2012)	17
		Chetco River - population total		**14**	**41/10.5**	**12**	**17**
Elk River	Sixes	Elk River 1710030603	3	1	2/0.5	1 (2010, 2011)	5
		Elk River - population total		**1**	**2/0.5**	**1**	**5**
Illinois River	Illinois	Althouse Creek 1710031101	23	15	0	0	15
		Briggs Creek 1710031107	13	5	0	0	5
		Deer Creek 1710031105	21	2	1/0.3	1 (2012)	5
		East Fork Illinois River 1710031103	22	19	0	0	19
		Indigo Creek 1710031110	9	13	0	0	13
		Josephine Creek-Illinois River 1710031106	20	130	18/4.5	8 (2009)	65
		Klondike Creek-Illinois River 1710031108	14	0	0	0	5
		Lawson Creek-Illinois River 1710031111	8	0	0	0	5
		Silver Creek 1710031109	10	37	1/0.3	1 (2011)	19
		Sucker Creek 1710031102	24	50	2/0.5	1 (2010, 2011)	25
		West Fork Illinois River 1710031104	19	23	0	0	12
		Illinois River - population total		**294**	**22/5.5**	**17**	**188**

Population	Subbasin (4th field)	Watershed (5th field)	Watershed number on map in Figure 1	No. of active filed claims (as of 5/8/2013) 1/4 mile from coho critical habitat	Notices of Intent		
					No. of NOI during 2009-2012 and avg. per year	**Highest Number of NOI within a year occurring 2009-2012**	**No. of annual NOI permissible per watershed**
Lower Rogue River	Lower Rogue	Lobster Creek 1710031007	4	7	1/0.3	1 (2010)	7
Lower Rogue River	Lower Rogue	Rogue River 1710031008	5	0	0	0	5
Lower Rogue River - population total				**7**	**1/0.3**	**1**	**12**
Middle Rogue / Applegate Rivers	Lower Rogue	Hellgate Canyon-Rogue River 1710031002	11	29	0	0	15
	Applegate	Lower Applegate River 1710030906	12	4	0	0	5
	Applegate	Middle Applegate River 1710030904	25	1	0	0	5
	Lower Rogue	Shasta Costa Creek-Rogue River1710031006	6	0	0	0	5
	Lower Rogue	Stair Creek-Rogue River 1710031005	7	0	0	0	5
	Applegate	Upper Applegate River 1710030902	26	17	5/1.3	2 (2010, 2012)	9
Middle Rogue/Applegate Rivers - population total				**51**	**5/1.3**	**2**	**44**
Pistol River	Chetco	Pistol River 1710031204	15	0	0	0	5
Pistol River - population total				**0**	**0**	**0**	**5**
Smith River	Smith	North Fork Smith River 1801010101	18	3	1/0.3	1 (2012)	5
Smith River - population total				**3**	**1/0.3**	**1**	**5**
Upper Rogue River	Middle Rogue	Bear Creek 1710030801	27	0	0	0	5
	Upper Rogue	Elk Creek 1710030705	29	0	0	0	5
	Upper Rogue	Little Butte Creek 1710030708	28	1	0	0	5
Upper Rogue River - population total				**1**	**0**	**0**	**15**
Winchuck River	Chetco	Winchuck River 1710031207	17	0	0	0	5
Winchuck River - population total				**0**	**0**	**0**	**5**
SONCC Coho Salmon – population total				*371*	*73/18.3*	*34*	*292*

Population	Subbasin (4th field)	Watershed (5th field)	Watershed number on map in Figure 1	No. of active filed claims (as of 5/8/2013) 1/4 mile from coho critical habitat	Notices of Intent		
					No. of NOI during 2009-2012 and avg. per year	Highest Number of NOI within a year occurring 2009-2012	No. of annual NOI permissible per watershed
OC Coho Salmon ESU							
Coquille	Coquille	South Fork Coquille River 1710030502	2	16	12/4	3 (2009,2010, 2011, 2012)	8
Coquille River – population total				**16**	**12/4**	**3**	**8**
Sixes	Sixes	Sixes River 1710030602	1	7	9/2.3	4 (2011)	7
Sixes River - population total				**7**	**9/2.3**	**4**	**7**
OC Coho Salmon – population total				*23*	*21/5.3*	*7*	*15*
SONCC and OC Coho salmon – populations' grand total				**394**	**94/23.6**	**41**	**307**

Suction dredging, for the purpose of the proposed action, involves vacuuming precious metals from underwater stream sediments using a four-inch or less diameter nozzle powered by a gasoline or diesel pump that is floated on a barge tethered over the work area. Suction dredges are motorized machines that excavate and process sediment and gravels from streams (Figure 2). Water and sediments are fed onto a sluice which settles out only the heaviest particles and spills the remainder off the end of the sluice into the stream. This processed sediment returned to the stream is called "tailings". While dredging, the operator usually tries to leave a "working pool" (i.e., an area kept free of rocks down to bedrock) usually large enough for the dredger to work in by hand-removing larger gravels and cobbles that will not fit into the suction dredge nozzle. The backside of the pool is comprised of tailings and the sides and front of the pool are considered the working face. Stream substrate is typically excavated to a depth of several feet and excavation to bedrock is a common practice. The sediment excavating capacity of a suction dredge is generally a function of the diameter of the intake nozzle and the horsepower of the engine used (HWE 2011.

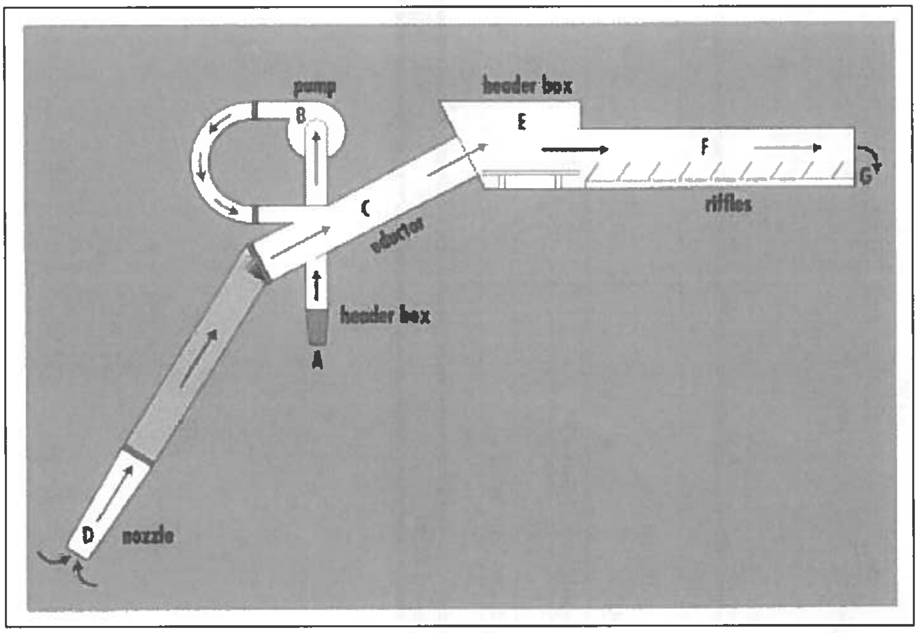

Figure 2. Suction dredge schematic (USFS 2015). Water is sucked through a screened intake (A) by a water pump (B). The force of high pressure water into the eductor (C) creates a suction at the nozzle (D). Water, sand, gravel, and gold ore are sucked through the nozzle (D), through the educator (C), into the header box (E), across the riffles (F), and out the back end of the dredge (G). Gold is trapped in the riffles (F).

High banking, for the purpose of the proposed action, is the practice of exploring for precious metals by excavating and sorting material below the ordinary high water level (OHW) but located on a gravel bar between the wetted stream and stream bank. A high banker is a stationary motorized device that is not supported by floats, but operates similarly to a suction dredge. Although in some cases water for high banking operations is taken from adjacent streams or waterbodies (WDFW 2015), this is not the case for the proposed action. For the proposed action, water for high banking operations is not allowed to be diverted from or pumped from streams. Additionally, water for high banking operations is not allowed to be disposed/discharged into the nearby stream under the proposed action.

The RRSNF approves NOIs on an annual basis. A NOI submitted to and approved by the RRSNF will cover operation of only one suction dredge per person at one time during the in-stream work period. However, multiple operators can be submitted under one NOI and a single NOI can include both suction dredging and high banking operations or only a single type of operation. The in-stream work periods vary accordingly to location, i.e., June 15 - September 15, July 1 - September 15 or July 15 - September 30, whichever is applicable for a NOI location on RRSNF lands in Oregon (ODFW 2008). Suction dredging in California is currently under a suction dredge moratorium; when the moratorium ends and suction dredging resumes, the most current in-stream work period for California[5] will be in effect. A NOI operation is not synonymous with an unpatented mining claim under the 1872 Mining Law, nor is a filed mining claim a prerequisite for approval of a NOI. Typically fewer NOIs are submitted annually for a watershed than the number of active filed claims (Table 1). This opinion only applies to operators with an approved NOI from the RRSNF.

NOIs will not be accepted for mineral withdrawn areas on the RRSNF, unless subject to valid existing rights. Mineral withdrawal removes a specific area of public land from location, entry, and operation of the 1872 Mining Law, unless a claimant had valid existing rights at the time of withdrawal. Mineral withdrawals on the RRSNF include rivers and streams within wilderness areas. Additional withdrawals from mineral entry on the RRSNF are the "wild" sections of Wild and Scenic Rivers, including all lands within 0.25 miles of the river or as established by the final river management boundary (with wider or narrower boundaries allowed, but overall the boundary must average 0.25 miles on each side of the river). Additional areas of the RRSNF have also been mineral withdrawn through administrative procedures, such as the Rogue River from the National Forest boundary near the town of Marial all the way to the National Forest boundary near the Lobster Creek bridge, and extending out to one mile on either side of the river. The RRSNF (USFS 2015) provides greater detail on specific mineral withdrawn areas on the RRSNF in Appendix A and also in Chapter IV, Section C/D (Environmental Baseline) and in Chapter V, Section F/G (Effects at the Watershed Scale).

1.3.1 Proposed Conservation Measures (PCMs)

The RRSNF proposes to apply the following conservation measures, in relevant part, to every action authorized under this programmatic consultation.

- Measures described under "Administration" apply to the RRSNF as it manages suction dredging and high banking operations: the RRSNF will review each submitted suction

[5] California Code of Regulations, Title 14, section 228; California Fish and Game Code sections 5653 and 5653.9, 2012 or newest version. If the California suction dredge use classifications are modified when the moratorium ends, any NOI submitted for California within the action area will be evaluated by both RRSNF and NMFS to ensure that there are not significant deviations in anticipated exposure of coho salmon to NOI operations and that all effects on coho salmon and their designated critical habitat are within the range of effects considered in this opinion.

dredging and high banking NOI and will ensure these PCMs are completed before authorizing the NOI.

- Measures described under "Operations" and "Record Keeping" and "Camping - Occupancy" apply, in relevant part, to the operator who submits a NOI to the RRSNF for authorization.
  - When multiple operators are submitted under one NOI, all operators are considered to be the NOI operator and no individual or combined individuals may exceed the PCMs described below.
- Measures described under "RRSNF NOI Monitoring" apply, in relevant part, to the RRSNF to ensure that the PCMs are implemented by the NOI operator.

1.3.1.1 Program Administration

1. **Submittal of a NOI to District Ranger.**
   a. A NOI must be submitted to the District Ranger from any person proposing to conduct suction dredging and/or high banking operations, which might cause significant disturbance of surface resources.
   b. The District Ranger will approve[2] the NOI after steps #2 through #5 below are completed for operations proposed in, or within a quarter mile of, coho salmon designated critical habitat or for those areas without designated critical habitat, within a quarter mile of coho salmon (i.e., South Fork Coquille River).
2. **Confirm the absence or presence of ESA-listed coho salmon, coho salmon designated critical habitat, or Pacific salmon EFH within the NOI location.**
   a. The RRSNF will confirm that each NOI authorized[2] under the suction dredging and high banking NOI operations is located in the present or historic range of ESA-listed coho salmon, coho salmon designated critical habitat or Pacific salmon designated EFH.[6]
   b. The RRSNF will confirm that all adverse effects to coho salmon and their designated critical habitat are within the range of effects considered in this opinion.
   c. The RRSNF will confirm that all adverse effects to EFH are within the range of effects considered in this opinion.
3. **Confirm the suction dredging and/or high banking NOI location is outside of prohibited areas.**
   a. The RRSNF will confirm the NOI is not located in a stream segment that is listed as water quality limited by ODEQ for sediment, turbidity or toxics on the list published by DEQ as per ODEQ 2015 Reissued 700-PM general permit requirements (Discharges Not Authorized, #5, page 4).
   b. The RRSNF will confirm that no operations will take place within 300 feet upstream or 100 feet downstream of areas where current and past stream restoration has occurred.

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[6] Under the proposed action the RRSNF will also include NOIs 0.25 mile upstream of ESA-listed coho salmon and coho salmon designated critical habitat under this programmatic biological opinion, and as such, these NOIs are also subject to steps #2 through #5 prior to authorization by the RRSNF.

4. **Required State and/or Federal Permits.** It is the responsibility of the NOI operator to obtain all necessary suction dredging and high banking State and/or Federal permits prior to beginning suction dredging and/or high banking.
5. **NOI Operator - Conservation Measures.** The RRSNF proposes to only authorize[2] NOIs that contain the conservation measures described in the next section, *Section 1.3.1.2 General conservation measures for NOI operators*.
6. **NOI Action Implementation Report.** The RRSNF will notify NMFS of a proposed NOI prior to suction dredging and/or high banking operations, by submitting a completed electronic NOI Action Implementation Report via e-mail.
7. **NOI Action Completion Report.**
    a. The RRSNF will provide NMFS a completed NOI Action Completion Report for *each* NOI submitted. Note: The NOI Action Completion Report is completed and submitted within 30 days[7] by the NOI operator to the RRSNF. The NOI operator and the RRSNF can share information to complete the report, if needed.
    b. The submittal of the NOI Action Completion Report by the RRSNF to NMFS will occur within 60 days following the end of the Oregon Department of Fish and Wildlife (ODFW) in-water work schedule (Timing of In-water work to Protect Fish & Wildlife Resources, 2008 or newest version) or the California Department of Fish and Wildlife (CDFW) in-water work schedule for suction dredging operation (CDFW 2012 or newest version), whichever State is applicable.
    c. The NOI operator will provide data for completed actions as stated in the PCMs for Record Keeping #40 and #41.
8. **RRSNF Annual NOI Suction Dredging and High Banking Operations Report.**
    a. The RRSNF will submit an annual report to NMFS by February 15 each year that describes the RRSNF's efforts in implementing the authorization[2] of suction dredging and high banking NOIs. Each annual report will include the following information:
        i. An assessment of overall operations activity will include, but is not limited to, completion of the Annual NOI Suction Dredging and High Banking Operations summary tables.
        ii. A map showing the NOI location and coho salmon and Chinook salmon habitat use type of each NOI authorized[2] and carried out under the operations.
        iii. Monitoring results from PCM #42, as required by PCM #43.
        iv. An estimate of the number of suction dredging and/or high banking operations occurring without a NOI, by watershed, that are encountered by RRSNF during normal field work.
        v. The RRSNF will develop additional content of the report in coordination with NMFS, as needed.
9. **Annual NOI Suction Dredge and High Banking Operation Coordination Meeting.**
    a. The RRSNF will attend an annual coordination meeting with NMFS by March 31 of each year.

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[7] 30 days following the end of the ODFW in-water work schedule (Timing of In-water work to Protect Fish & Wildlife Resources, 2008 or newest version) or California Department of Fish and Wildlife (CDFW) in-water work schedule (California Code of Regulations, Title 14, section 228; California Fish and Game Code sections 5653 and 5653.9, 2012 or newest version).

b. Items to discuss at the annual coordination meeting will include:
    i. The annual operations report.
    ii. Actions that will improve conservation or improve the efficiency and accountability of the operations.
c. Attendants will include, at a minimum, RRSNF Level 1 fish biologist(s), RRSNF mineral administrator, and NMFS programmatic staff lead.

1.3.1.2 General conservation measures for NOI operators

1.3.1.2.1 Operations pertaining to both suction dredging and high banking

10. **Comply with State permits.**[8] NOI operator is expected to comply with Oregon regulations and have a copy of the State's applicable permit and General Authorization in their possession, i.e., NPDES 700-PM permit (or Water Pollution Control Facility 600 permit) from ODEQ and a General Authorization or Individual Permit from Oregon Department of State Lands (ODSL), or the most recent Oregon permits/other requirements.[9]
11. **Storage of fuel, lubricants, and hazardous chemicals.**
    a. All fuels, lubricants, petroleum products, and hazardous chemicals will be stored 100 feet or more away from the OHW in impermeable and spill-proof containers that minimize the potential for accidental spillage.
    b. A fuel, lubricant, petroleum product, and hazardous chemical containment system must be used if storage within 100 feet of the OHW is otherwise unavoidable. The containment system must be sufficient in size to completely accommodate the full volume of all fuel, lubricant, petroleum product, and hazardous chemicals without overtopping or leaking.
12. **Prohibition on use of mercury, cyanide or other chemical agents.**
    a. Use of chemical agents, such as mercury, to improve mineral processing or metal extraction from ore or high-grade fines is not allowed (ODEQ 2015 Reissued 700-PM general permit requirements, Schedule C, Best Management Practices, #17, page 10).
    b. Use of chemical agents, such as cyanide or other chemical agents to improve mineral processing or metal extraction from ore or high-grade fines is prohibited.

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[8] At the time the BA was submitted for consultation, there was a moratorium on suction dredging in the state of California. If the moratorium is lifted and California does begin issuing permits for suction dredging with conditions that conflict with the conservation measures proposed here, the RRSNF will apply the most stringent requirements to NOIs authorized for California. If the California suction dredge use classifications are modified when the moratorium ends, any NOI submitted for California within the action area will be evaluated by both RRSNF and NMFS to ensure that there are not significant deviations in anticipated exposure of coho salmon to NOI operations and that all effects on coho salmon and their designated critical habitat are within the range of effects considered in this opinion.

[9] Some conservation measures proposed by the RRSNF duplicate Oregon requirements as of 2015, either under ODEQ or ODSL, and the appropriate sources are listed in parenthesis to inform NOI operators. If regulations for Oregon change following completion of the programmatic consultation and conflict with conservation measures proposed by RRSNF, the RRSNF will apply the most stringent requirements to authorized NOIs (i.e., either the conservation measures or the new Oregon requirements).

13. Protection of vegetation, wood, stream banks[10] and other habitat.

a. Undercutting, eroding, destabilization, or excavation of stream banks is prohibited (ODEQ 2015 Reissued 700-PM general permit requirements, Schedule C, Best Management Practices, #8, page 9).

b. Removal or disturbance of boulders, rooted vegetation or embedded wood, plants and other habitat structure[11] from stream banks is also prohibited. Boulders include cobbles and larger rocks that protect and prevent erosion of banks from spring runoff and storm event stream flow (ODEQ 2015 Reissued 700-PM general permit requirements, Schedule C, Best Management Practices, #8, page 9).

c. Undermining, excavating, destabilizing, or removing any wood or rocks that extend from the stream bank into the channel is prohibited. Removal of habitat structure that extends into the stream channel from the stream bank is prohibited.

d. Cutting, moving or destabilizing in-stream woody debris such as root wads, stumps or logs is prohibited.

14. Prohibition on creating dams or other passage barriers.

a. Fish must be able to swim past the operation at any stage. The operator, equipment, turbid discharge, and other operations will not prevent a migrating fish to advance up or downstream (ODEQ 2015 Reissued 700-PM general permit requirements, Schedule C, Best Management Practices, #4, page 8).

b. Constructing a dam or weir, or otherwise concentrating flow in any way that reduces the total wetted area of a river or stream, or obstructing fish passage is prohibited.

15. Protection of existing infrastructure. Operations that affect existing bridge footings, dams, and other structures in or near the stream are not allowed (ODEQ 2015 Reissued 700-PM general permit requirements, Schedule C, Best Management Practices, #11, page 9).

16. General equipment restrictions. Motorized winching or the use of any other motorized equipment to move boulders, logs, or other objects is prohibited.

17. Fill and removal <25 cubic yards annually per NOI. Dredging and high banking of up to approximately 25[12] cubic yards or less, means a combined total accounting for <25 cubic yards of fill <u>and</u> removal[13] per NOI is allowed (ODSL 2011; "Threshold. The activity will remove, fill or move less than twenty-five (25) cubic yards of material annually from or within the bed of a stream…", General Authorization for Recreational Placer Mining within Essential Salmon Habitat that is Not Designated State Scenic Waterway – Eligibility Requirements, Oregon Administrative Rule 141-089-0825(3)).

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[10] Stream bank is defined as that land immediately adjacent to and which slopes toward the bed of a watercourse and which is necessary to maintain the integrity of a watercourse. The bank is extended to the crest of the slope or the first definable break in slope lying generally parallel to the watercourse.

[11] Habitat structure means physical composition of natural or restoration material that provides function and complexity in a stream, including, but not limited to: Boulders; woody material such as living or dead trees, shrubs, stumps, large tree limbs, and logs; vegetation such as grasses, shrubs, wildflowers or weeds; and other natural features necessary to provide fish with areas for spawning, resting, food, refuge from predators, and shade (ODEQ 2015 Reissued 700-PM general permit requirements, Definitions, #8. Page 2).

[12] E-mail from Susan Maiyo, RRSNF, to Michelle McMullin, NMFS (April 10, 2015) (clarifying the amount of fill and removal proposed per NOI).

[13] We analyzed this as "the total amount allowed to be moved annually per NOI is <25 cubic yards".

18. **Avoidance of invasive species transfer.** NOI operator must ensure that equipment does not house invasive species. Equipment must be decontaminated prior to its placement in Oregon waters and when transferring from one waterbody to another. When moving between NOI locations or to different waterbodies the NOI operator will visually inspect all equipment including boots, waders, and wetsuits (ODEQ 2015 Reissued permit 700PM, Schedule C, Best Management Practices, #16, page 10).
19. **Daylight hours only.**
    a. Suction dredging and in-water non-motorized mining related operations are prohibited between 5 p.m. and 9 a.m., which are outside of designated operating hours of 9 a.m. and 5 p.m. (ODSL removal/fill general authorization, SB 838 amended regulations, 2014a).
    b. High banking is also prohibited between 5 p.m. and 9 a.m., which are outside of designated operating hours of 9 a.m. and 5 p.m., in congruency with CM 19.a.
20. **Wet weather periods.**
    a. Saturated soils and stream banks are susceptible to increased damage and erosion from mining activities during and immediately after periods of wet weather. Saturated soils and wet weather conditions are most common in fall, winter, and spring. Although typically infrequent and of short duration during summer, these conditions can also occur during the in-water work period. During these periods the NOI operator must minimize damage and erosion of stream banks and adjacent areas by meeting the following conditions:
        i. NOI operators will not haul suction dredges or other equipment in or out of the stream during rainfall and for up to approximately 12 hours following the rain event, unless using an established concrete boat ramp or similar facility.
        ii. If a stream is rapidly rising due to high-water conditions, NOI operators may remove suction dredges or other equipment out of the stream during rainfall to avoid damage or loss.
        iii. NOI operators will stop all high banking activities during rainfall and will not resume high banking activities for approximately 12 hours following the rain event.

1.3.1.2.2 Operations - suction dredging only

21. **Work windows & in-water run timing.**
    a. Suction dredging is not allowed outside the periods set in the in-water work schedule established by the ODFW (2008, or newest version; ODEQ 2015 Reissued 700-PM general permit requirements, Schedule C, Special Conditions, #2, page 8) or by CDFW (2012 or newest version).[5]
    b. Suction dredging activity will cease if an adult coho salmon is present; potentially occurring during the latter part of the in-water work period. For Oregon, follow ODFW recommended in-water work window per population/geographic area.
22. **One suction dredge per person at one time.**
    a. Operation of only one suction dredge per person is allowed at a time (ODEQ 2015 Reissued 700-PM general permit requirements, Coverage & Eligibility, #4, page 6).

b. In some circumstances, a designated person under supervision of the ODEQ permit holder may operate the suction dredge. Person covered by the permit must be present when supervising during the operation of the suction dredge by the alternate person (ODEQ 2015 Reissued 700-PM general permit requirements, Coverage & Eligibility, #4, page 6).

23. Suction dredge intake size/screening/horsepower requirements.

a. Only suction dredges with a ≤ 4-inch intake nozzle diameter and ≤ 16 horsepower engine are allowed (ODEQ 2015 Reissued 700-PM general permit requirements, Discharges Not Authorized, #2, page 3).

b. Suction dredge pump intakes must be covered with 3/32-inch mesh screen.

24. Suction dredge maintenance and fueling.

a. Discharging oil, grease, and fuel from suction dredging operation is prohibited. Spills will be reported by the NOI operator to ODEQ and then followed up with notification to RRSNF (ODEQ 2015 Reissued 700-PM general permit requirements, Schedule C, Best Management Practices, #12a, page 9).

b. Equipment used for suction dredging will not release petroleum products (ODEQ 2015 Reissued 700-PM general permit requirements, Schedule C, Best Management Practices, #12b, page 9).

c. Equipment surfaces will be free of oils and grease, and will be checked by the NOI operator for fuel and oil leaks, and all leaks repaired, prior to the start of operations on a daily basis (ODEQ 2015 Reissued 700-PM general permit requirements, Schedule C, Best Management Practices #12b, page 9).

d. Suction dredges will be located adjacent to the stream bank for fueling, so that fuel does not need to be carried out into the stream.

e. Unless the suction dredge has a detachable fuel tank (such that fueling can occur onshore), NOI operator will not transfer more than 2 gallons of fuel at a time during refilling.

f. The NOI operator will use a polypropylene pad or other appropriate spill protection and a funnel or spill-proof spout will be used when refueling to prevent possible contamination of surface waters or groundwater.

g. The NOI operator will have a spill kit available in case of accidental spills.

h. In the event a spill occurs, the NOI operator will contain, remove, and mitigate such spills immediately. All waste oil or other clean up materials contaminated with petroleum products will be properly disposed of off-site. Soil contaminated by spilled petroleum products will be excavated to the depth of saturation and removed for proper off-site disposal.

25. Lateral edge buffer – stream bank protection. No person will operate the nozzle of a suction dredge or remove material within 3 feet of the lateral stream edge of the current water level, including at the gravel bar edge or under any overhanging banks.

26. Habitat protection.

a. NOI operator is required to conduct all suction dredging 50 feet or more away from Coho and Chinook salmon spawning habitat areas, which are located at a pool tail crest (or defined at the head of a riffle[14]).

[14] A pool tail crest is also called the riffle crest (Kappesser 2002).

b. NOI operator will not remove rocks or large wood from the wetted perimeter[15] to the stream bank or remove off site at any time.
c. NOI operator will not operate a suction dredge in such a way that the stream current or the discharge from the sluice is directed into the stream bank, causing erosion or destruction of the natural form of the channel, undercutting the stream bank, or widening the channel.
d. NOI operator will not divert the flow of a river or stream into the bank.

27. **Minimum suction dredge spacing.** NOI operator must maintain a minimum spacing of at least 500 linear feet of stream channel between suction dredging operations (ODSL removal/fill general authorization, SB 838 amended regulations, 2014a). For the purpose of these regulations, "operating" shall mean that the motor on the suction dredge is creating a vacuum through the hose and nozzle.

28. **Other equipment restrictions.**
   a. Motorized wheeled or tracked equipment is prohibited below the OHW (ODEQ 2015 Reissued 700-PM general permit requirements, Schedule C, Best Management Practices, #15, page 10).
   b. NOI operator may not leave unattended motorized equipment within the wetted waterway (ODSL removal/fill authorization, SB 838 amended regulations, 2014a).

29. **Extent of visible turbidity.**
   a. Suction dredging will not create visible turbidity beyond any point more than 300 feet downstream or down current (ODEQ 2015 Reissued 700-PM general permit requirements, Schedule A, #1, page 6).
   b. Visible turbidity will not cover the entire wetted perimeter of the stream (ODEQ 2015 Reissued 700-PM general permit requirements, Schedule A, Discharge Limitations, #1, page 6).
   c. No visible turbidity is allowed at the point of a drinking water intake (ODEQ 2015 Reissued 700-PM general permit requirements, Schedule C, Best Management Practices, #13, page 10).
   d. If any visible increase in turbidity is observed above background turbidity beyond any point more than 300 feet downstream or down current from the operation; covers the entire wet perimeter of the stream; or occurs at the point of a drinking water intake; suction dredging must be modified, curtailed, or stopped immediately (ODEQ 2015 Reissued 700-PM general permit requirements, Schedule A, Discharge Limitations, #2, page 6).
   e. Where more than one piece of mining equipment operates in the same location, turbidity plumes cannot overlap (ODEQ 2015 Reissued 700-PM general permit requirements, Schedule C, Best Management Practices, #1, page 8).

30. **Suction dredge holes.**
   a. Each individual suction dredge hole will be backfilled by the NOI operator and tailings spread before moving to a new individual work site (suction dredge hole).
   b. Backfilling by the NOI operator and tailing spread will occur by the end of the in-water work window (ODFW 2008, CDFW 2012[5], or newest versions, as relevant).
   c. Natural pools may not be filled in.

[15] Wetted perimeter is defined as the area of stream underwater during the time of the mining operation.

31. Suction dredge tailings.

a. Any tailings remaining after the suction dredge holes are filled must be redistributed locally to avoid creating unstable spawning gravels.

b. NOI operator will obliterate (rake or otherwise spread out) all suction dredge tailings piles so that they are no more than 4-inches in depth and conform to the contour of the natural stream bottom.

32. Redds or spawning fish/willful entrainment.

a. No person shall disturb any redds or actively spawning coho salmon.

b. If adult salmon or its respective redds (spawning beds) are encountered while operating a suction dredge, suction dredging operations must be stopped and relocated.

c. The willful entrainment of coho salmon is prohibited.

1.3.1.2.3 Operations - high banking only

33. Below ordinary high water level.

a. High banking *below* the OHW will only occur in large-sized streams[16] (excluding medium-sized streams or smaller) with the following specific conservation measures and buffers as depicted in Figure 3 (schematic drawing of high banking operations buffers to maintain water quality and bank stability):

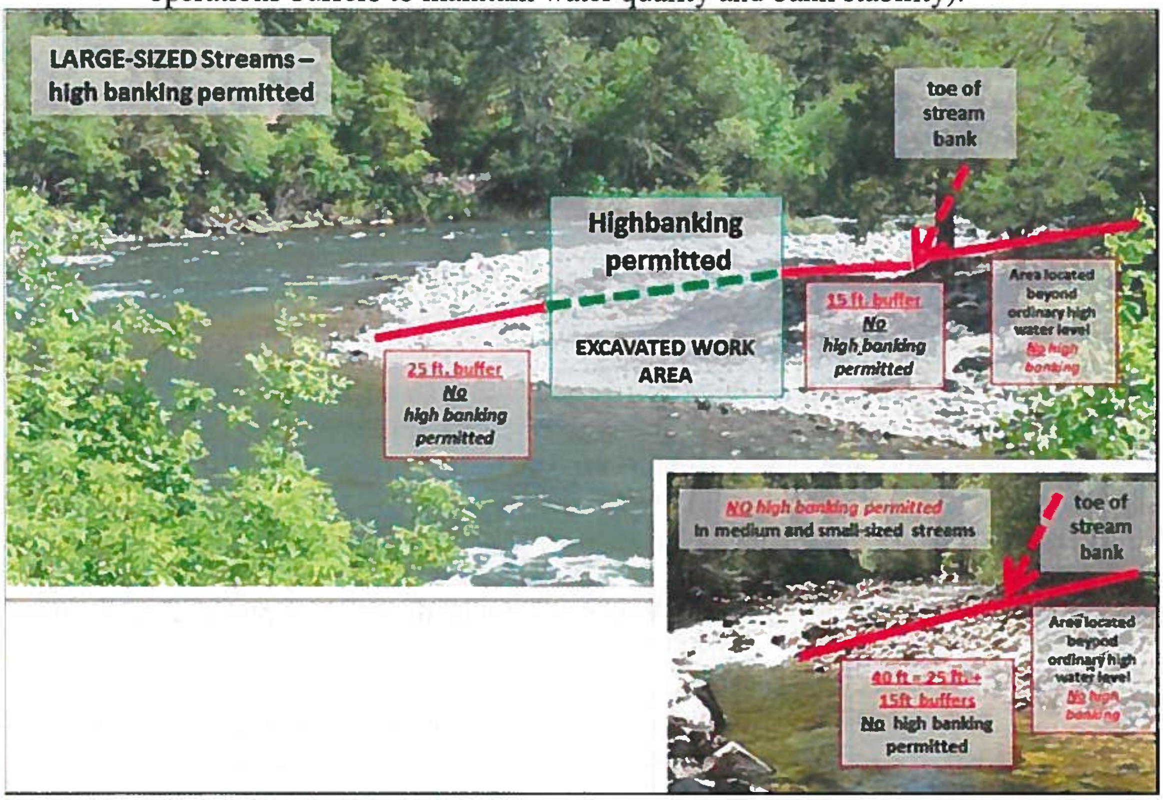

Figure 3. High banking operations: schematic drawing depicting PCM #33a-b.

[16] A large-sized stream is classified by USFS (2015) for this consultation as having an OHW width greater than 70 feet (personal communication between Chris Park, RRSNF Forest Hydrologist and Susan Maiyo, June 12, 2014).

i. Settling ponds or excavated work areas between the wetted stream and the stream bank will be limited in size and can only be created during the periods set in the in-water work schedule (ODFW 2008, CDFW 2012[5] or newest versions, as relevant).

ii. A minimum of a *25 foot buffer* will exist between the wetted stream and all excavated work areas (Figure 3). The 25 foot buffer would ensure that high banking does not crowd the adjacent aquatic habitat in large-sized streams[16] with less of a flood plain. In some cases, high banking may not be feasible in large-sized streams since the *toe of a stream bank* can imply the water's edge.

iii. A minimum of a *15 foot buffer* will exist between all excavated work areas within the channel and a *toe (bottom) of a stream bank* (Figure 3). The 15 foot buffer would ensure that high banking does not impact or compromise the adjacent stream bank in large-sized streams[16] with less of a flood plain since the toe of a stream bank can imply the water's edge.

b. High banking is not allowed beyond the toe (bottom) of a stream bank including the terrace and beyond (away from stream channel and above the OHW) (Figure 3).

c. High banking will not occur when coho and Chinook salmon spawners or redds are present.

34. High banking holes.

a. Each individual high banking hole will be backfilled by the NOI operator and tailings spread before moving to a new individual work site (high banking hole).

b. Backfilling by the NOI operator and tailings spread will occur by the end of the in-water work window (ODFW 2008, CDFW 2012[5] or newest versions, as relevant).

35. High banking tailings.

a. Any tailings remaining after the high banking holes are filled must be redistributed locally.

b. NOI operator will obliterate (rake or otherwise spread out) all high banking tailings piles so that they are no more than 4-inches in depth and conform to the contour of the natural stream channel.

36. Riparian vegetation protection. NOI operator must avoid all riparian vegetation. No cutting or removal of riparian vegetation will occur; this includes exposure of tree roots within the canopy width.

37. Prohibition on water diversion. Water will not be diverted [or pumped] from streams to enable high banking operations.

38. Wastewater restrictions.

a. All wastewater will be disposed of by evaporation or seepage with no traceable discharge of water or turbidity to groundwater or surface water.

b. Discharge of processing water to streams will not occur.

39. Vehicle use of existing fords. For all operations, the use of existing fords for vehicular access will only occur during the periods set in the in-water work schedule (ODFW 2008, CDFW 2012[5] or newest versions, as relevant).

1.3.1.3 Record Keeping for NOI operators

Record Keeping pertains to both suction dredging and high banking - NOI contains both operation types, only one NOI Action Completion Report will be submitted, describing both operation types as needed.

40. Suction dredging.
   a. NOI operator will record dates, mining locations, equipment size (intake nozzle diameter and horsepower), and estimated volumes of material mined for all suction dredging operations.
   b. NOI operator will record if measures were needed to ensure that the 300-foot turbidity limit was not exceeded.
   c. NOI operator will work with the RRSNF to report collected data for the NOI Action Completion Report (see also Program Administration #7).
   d. NOI operator will submit NOI Action Completion Report to RRSNF within 30 days of completing suction dredging operations[7] (see also Program Administration #7).

41. High banking.
   a. NOI operator will record dates, mining locations, and estimated volumes of material mined for all high banking operations.
   b. NOI operator will work with RRSNF to report collected data for NOI Action Completion Report (see also Program Administration #7).
   c. NOI operator will submit a NOI Action Completion Report to RRSNF within 30 days of completing high banking operations[7] (see also Program Administration #7).

1.3.1.4 RRSNF NOI Monitoring for both suction dredging and high banking

42. The RRSNF will conduct the following monitoring:
   a. Inspect a percentage of NOI operations:
      i. during the operation (75% of suction dredging NOI and 100% of high banking NOI)
      ii. post-operation (100% of all NOI)
   b. Note if the operations are within the parameters stated in the NOI Action Completion Report. If operations deviate from report (under or over), record differences and report.
   c. Photo points will be taken during and post operation.

43. Monitoring results. Results from monitoring will be reported by the RRSNF in the RRSNF Annual NOI Suction Dredging and High Banking Operations Report (see also Program Administration #8).

1.3.1.5 General conservation measures for Camping & Occupancy (for all NOI operators)

44. Woody material. Woody material will not be cut or removed for firewood or other purposes within 150 feet from the stream.

45. **Human waste.** Human waste must be kept a distance greater than 200 feet from any live water. All refuse, trash, litter or other items must be removed from the site and properly disposed.
46. **Camp sites.** Camp sites and any related material must be cleared within 7 days of the end of the suction dredging and/or high banking operation.
47. **Motorized access.** Motorized access will be restricted to existing roads and trails open to other users of NFS lands who are not required to obtain a RRSNF Special Use Permit, contract or other written authorization.
48. **Riparian areas.** Minimize disturbances to riparian areas from camping and paths between camping areas and the stream by using existing/established dispersed camp sites and paths. Locate new camping areas and paths away from the stream and stream banks. Prevent creating new areas of exposed soil along streams and stream banks. The RRSNF will assist in camping area selection, if requested.
49. **Wet weather conditions.**
    a. The NOI operator must cease mining related operations during and after precipitation when operations are causing excessive ground disturbance or excessive damage to roads.
    b. The NOI operator will evaluate daily during these wet weather periods if the following road conditions are occurring and shall cease at any time the NOI operator or RRSNF observes that either of the following are occurring:
        i. Travel way of the road is wet and turbid water or fines are observed moving off the road surface to ditch lines that deliver water to any stream;
        ii. Gravel road surface rutting is occurring, indicating the subsurface is wet.

"Interrelated actions" are those that are part of a larger action and depend on the larger action for their justification. "Interdependent actions" are those that have no independent utility apart from the action under consideration (50 CFR 402.02). We did not identify any interrelated or interdependent actions because the proposed action also includes access to mining locations and occupancy during mining operations.

The NMFS relied on the foregoing description of the proposed action, including all PCMs, to complete this consultation. Gold mining operations that do not fall within the parameters of the current programmatic consultation procedures, or are not found to be within the range of effects, are not covered by this programmatic opinion, but the RRSNF can request consultation with NMFS for individual gold mining operations.

1.4 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 program action area consists of the combined action areas for each NOI to be authorized within the range of ESA-listed coho salmon, green sturgeon, and eulachon, their designated critical habitat, or designated EFH where the environmental effects of actions authorized under the RRSNF Suction Dredging and High Banking Notice of Intent (NOI) Operations will occur in Oregon and California. This includes the 29 fifth-field watersheds in Table 1 where the RRSNF proposes to authorize NOIs (see also Figures 4-11), plus two additional fifth-field watersheds in Table 2. The action area includes all riparian and aquatic areas affected by suction dredging, mining, access, and occupancy for each NOI. The action area is within Jackson, Josephine, and Curry counties in Oregon, and in Siskiyou and Del Norte Counties in California, but the majority of the action area is in Oregon.

Every NOI authorized by the RRSNF will have a NOI-level project action area that exists within the program action area and includes all effects in the immediate area. These individual project areas include riparian areas, stream banks, and the stream channel extending approximately 500 feet downstream, where effects from mining, occupancy, and access are likely to occur. This estimate includes mining holes, tailing piles, scour and erosion of the stream bed, suspended sediment, sedimentation, substrate deposition and embeddedness, unintentional chemical contamination, and forage reduction, in addition to direct effects (e.g., entrainment, impingement, trampling, and disturbance); see Section 2.4 for the full analysis used to estimate this extent. Although we cannot accurately predict the location of every NOI authorized by the RRSNF, given the small downstream distance of the most downstream effects, we anticipate that an individual NOI-level project area will be contained within the fifth-field watershed where NOI operations occur. However, indirect downstream effects in estuarine areas will also occur (i.e., methylmercury production in estuary tidelands from mercury remobilized by mining operations and immeasurable effects from sediment transport) and therefore the affected estuaries are also included in the action area for this consultation. Additionally, we are also including areas in-between the NOI-level project areas and the downstream estuaries as part of the action area because immeasurable environmental effects are anticipated during late fall, winter, and early spring from the suspension and transport of sediments.

Overall, the extent of the action area contains (1) rivers with OC and SONCC coho salmon and designated critical habitat on National Forest System Lands within the RRSNF, including National Forest System Lands 0.25 miles upstream of coho salmon and their designated critical habitat in the 29 fifth-field watersheds described by the RRSNF (Table 1), (2) downstream estuaries (Table 2), and (3) four mainstem Rogue-River watersheds that are not listed in either table (Rogue River-Shady Cove 17100030707, Rogue River-Gold Hill 1710030802, Rogue River –Grants Pass 1710030804, Rogue River – Horseshoe Bend 1710031004). The estuaries are designated as critical habitat for OC and SONCC coho salmon and also contain OC and SONCC coho salmon, Southern DPS North American green sturgeon, and Southern DPS Pacific eulachon. In the action area, critical habitat is not designated for Southern DPS green sturgeon or Southern DPS eulachon. The proposed action will have no effect on green sturgeon or eulachon critical habitat. Therefore, critical habitat for these species will not be discussed in Section 2.2.2, Section 2.6, or in Section 2.11.

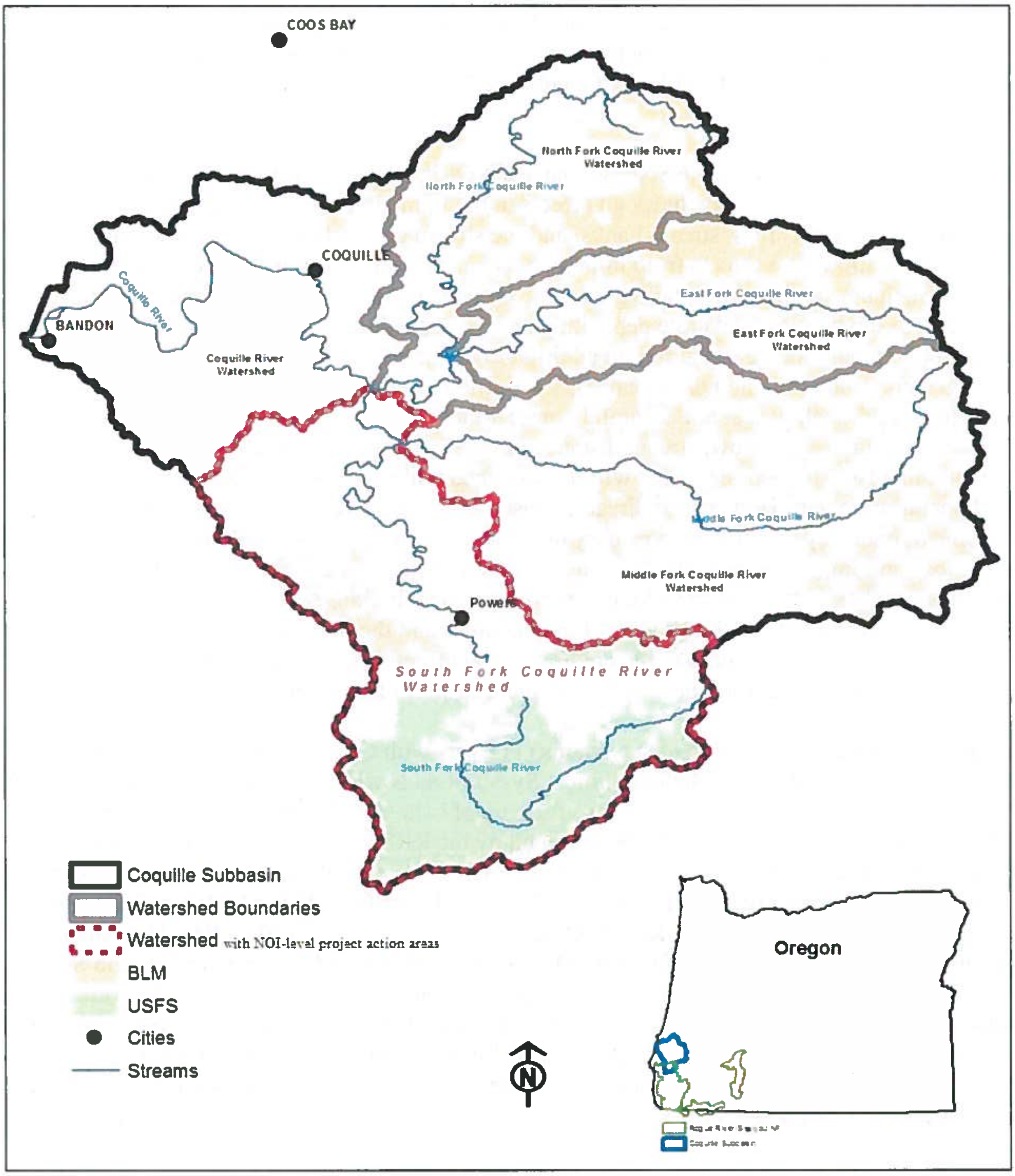

Figure 4. The South Fork Coquille fifth-field watershed in which the RRSNF is proposing to authorize Notices of Intent for suction dredging and high banking operations submitted in those reaches of rivers with OC coho salmon and designated critical habitat, including National Forest System Lands 0.25 miles upstream of coho salmon and their designated critical habitat. Green lands are RRSNF land. Not shown are wilderness areas or mineral withdrawn areas.

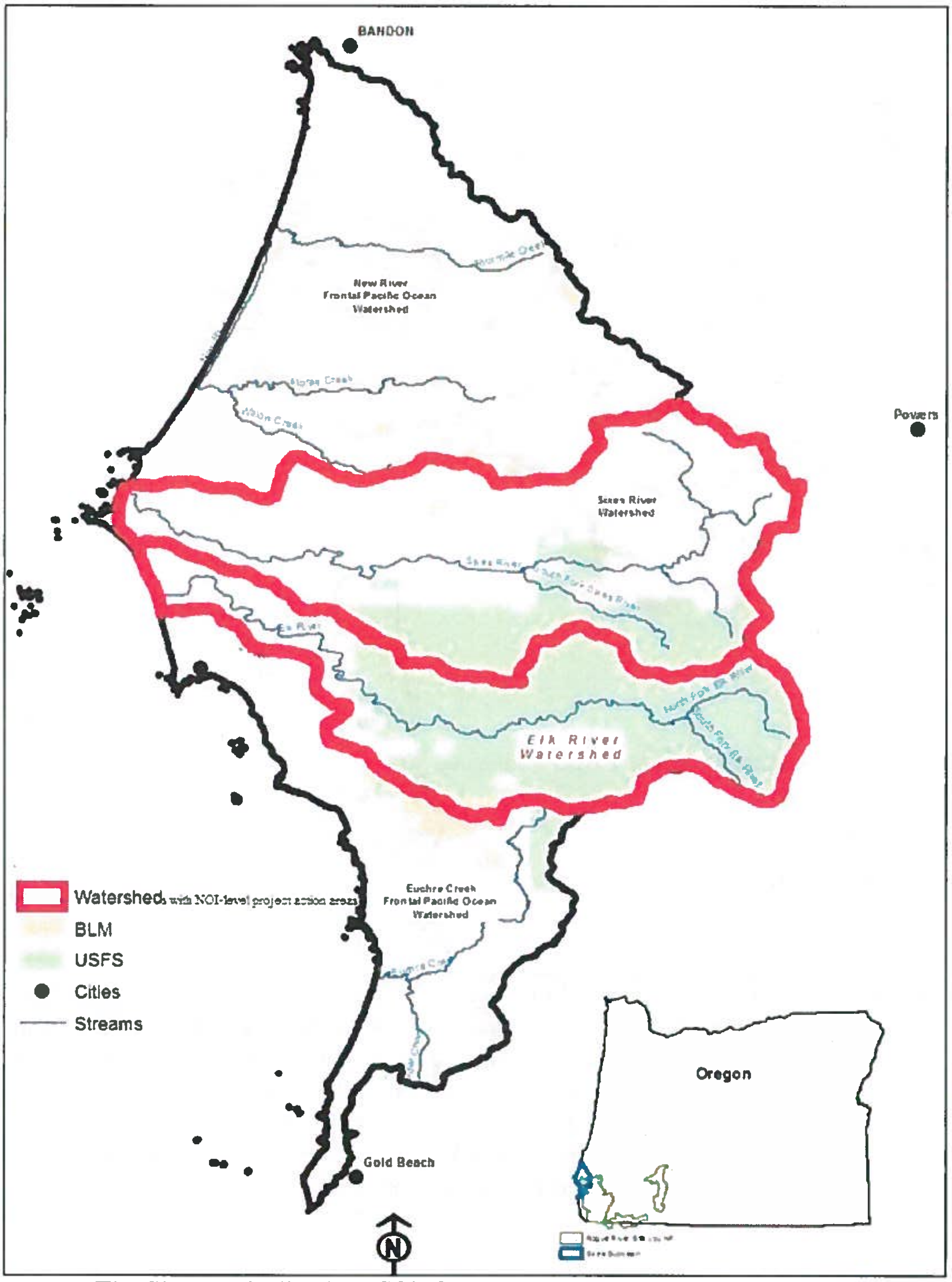

Figure 5. The Sixes and Elk River fifth-field watersheds in which the RRSNF is proposing to authorize Notices of Intent for suction dredging and high banking operations submitted in those reaches of rivers with OC or SONCC coho salmon and designated critical habitat, including National Forest System Lands 0.25 miles upstream of coho salmon and their designated critical habitat. Green lands are RRSNF land. Not shown are wilderness areas or mineral withdrawn areas.

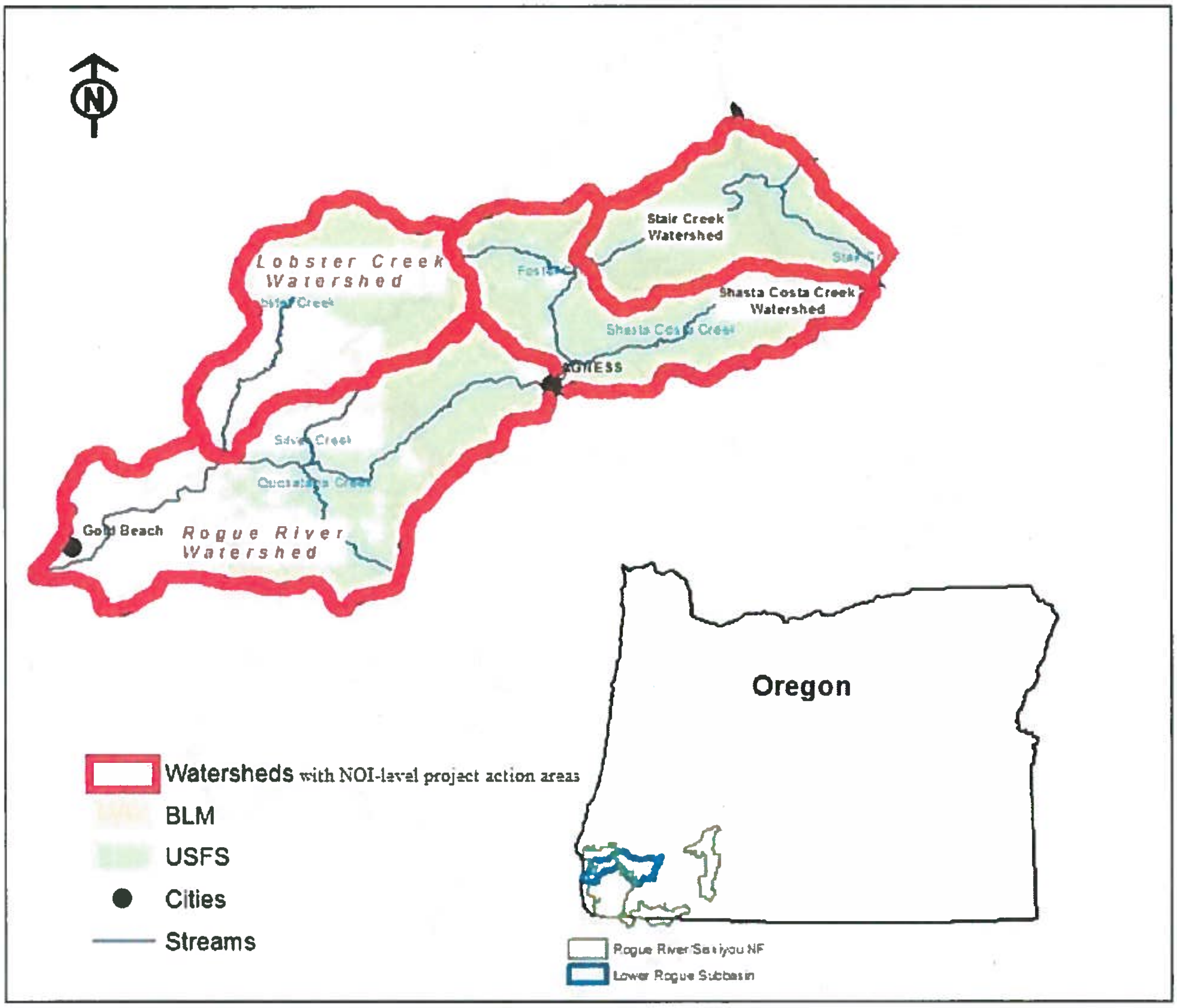

Figure 6. The Rogue River, Lobster Creek, Shasta Costa Creek, and Stair Creek fifth-field watersheds in which the RRSNF is proposing to authorize Notices of Intent for suction dredging and high banking operations submitted in those reaches of rivers with SONCC coho salmon and designated critical habitat, including National Forest System Lands 0.25 miles upstream of coho salmon and their designated critical habitat. Green lands are RRSNF land. Not shown are wilderness areas or mineral withdrawn areas.

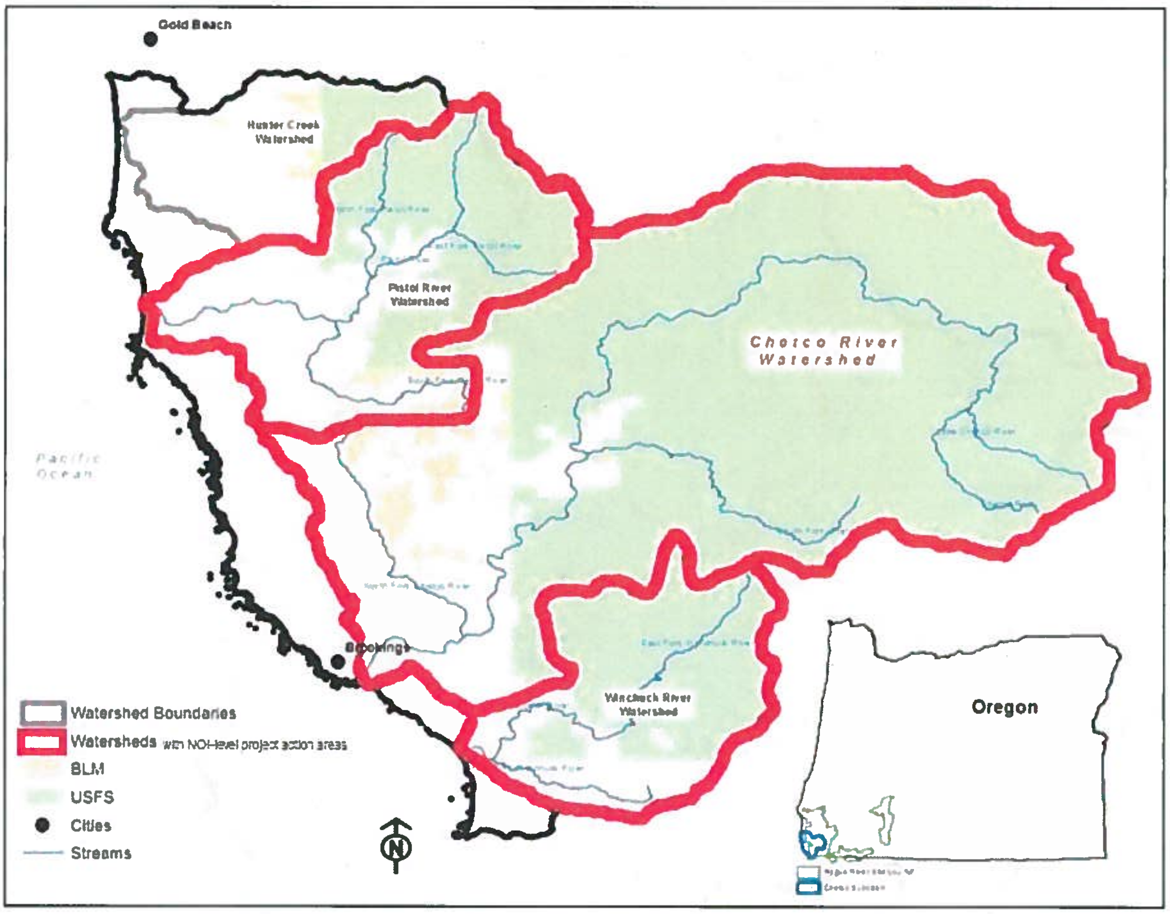

Figure 7. The Pistol, Chetco, and Winchuck River fifth-field watersheds in which the RRSNF is proposing to authorize Notices of Intent for suction dredging and high banking operations submitted in those reaches of rivers with SONCC coho salmon and designated critical habitat, including National Forest System Lands 0.25 miles upstream of coho salmon and their designated critical habitat. Green lands are RRSNF land. Not shown are wilderness areas or mineral withdrawn areas.

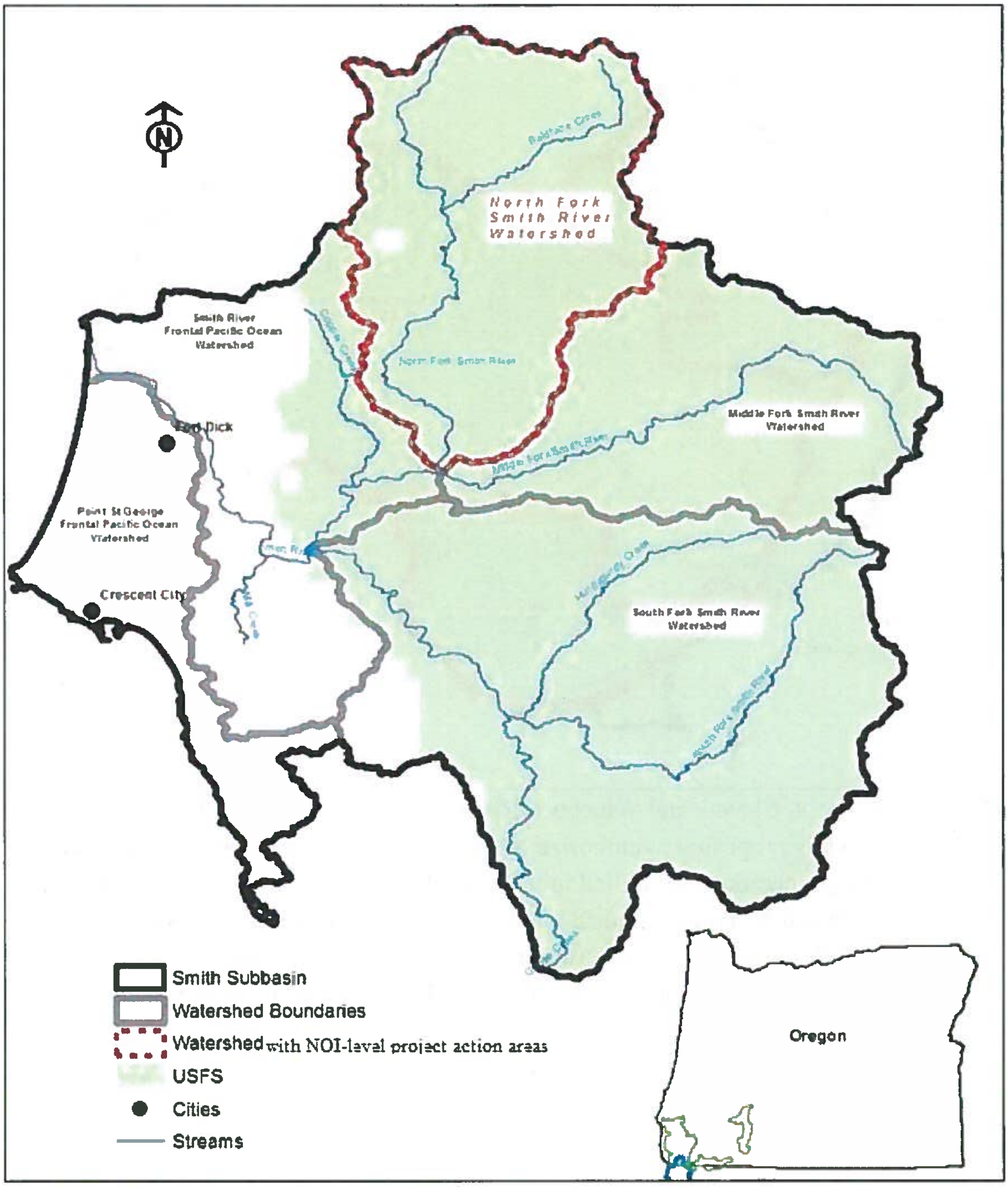

Figure 8. The North Fork Smith River fifth-field watershed in which the RRSNF is proposing to authorize Notices of Intent for suction dredging and high banking operations submitted in those reaches of rivers with SONCC coho salmon and designated critical habitat, including National Forest System Lands 0.25 miles upstream of coho salmon and their designated critical habitat. Green lands are RRSNF land. Not shown are wilderness areas or mineral withdrawn areas.

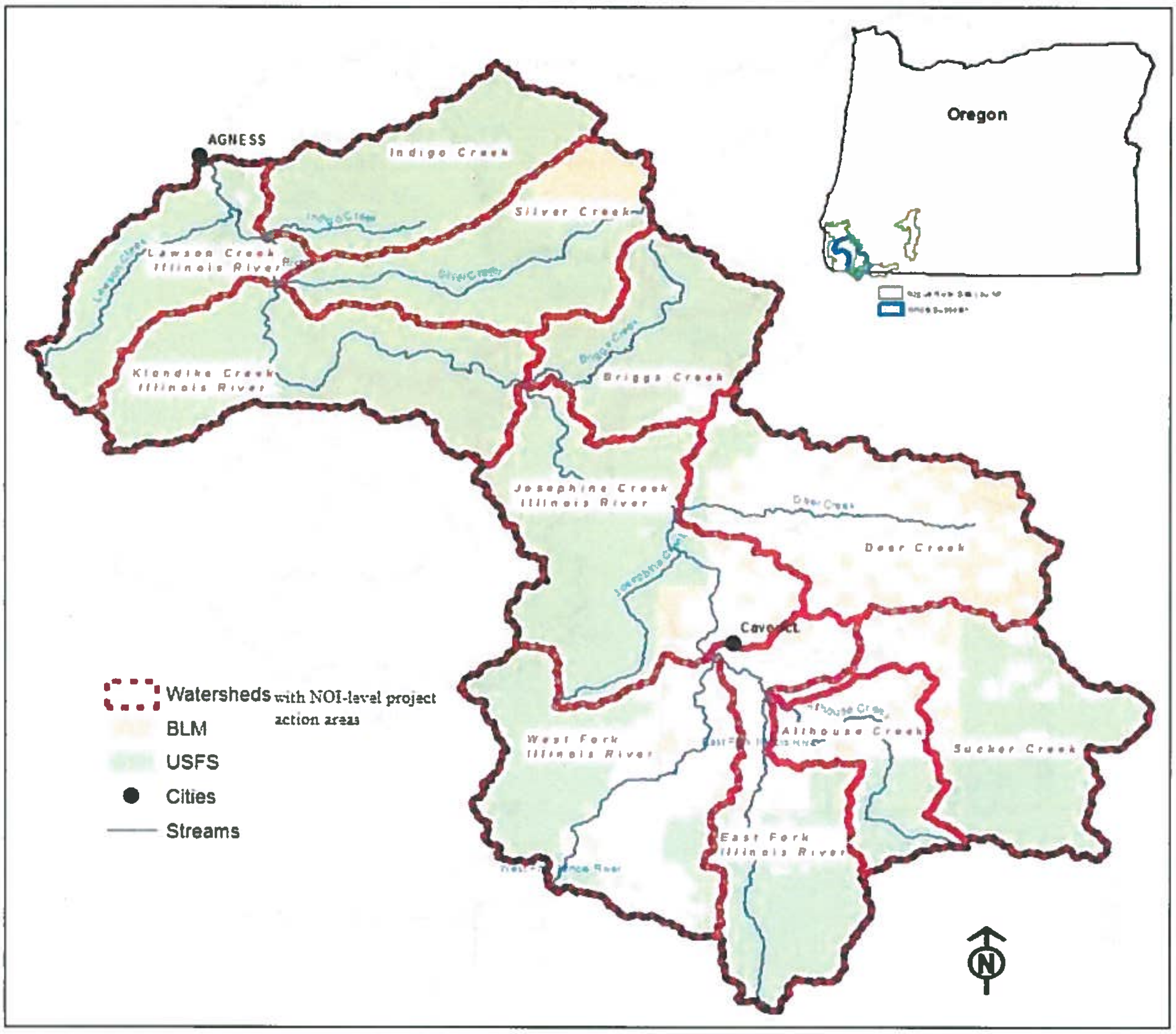

Figure 9. The eleven Illinois River fifth-field watersheds in which the RRSNF is proposing to authorize Notices of Intent for suction dredging and high banking operations submitted in those reaches of rivers with SONCC coho salmon and designated critical habitat, including National Forest System Lands 0.25 miles upstream of coho salmon and their designated critical habitat. Green lands are RRSNF land. Not shown are wilderness areas or mineral withdrawn areas.

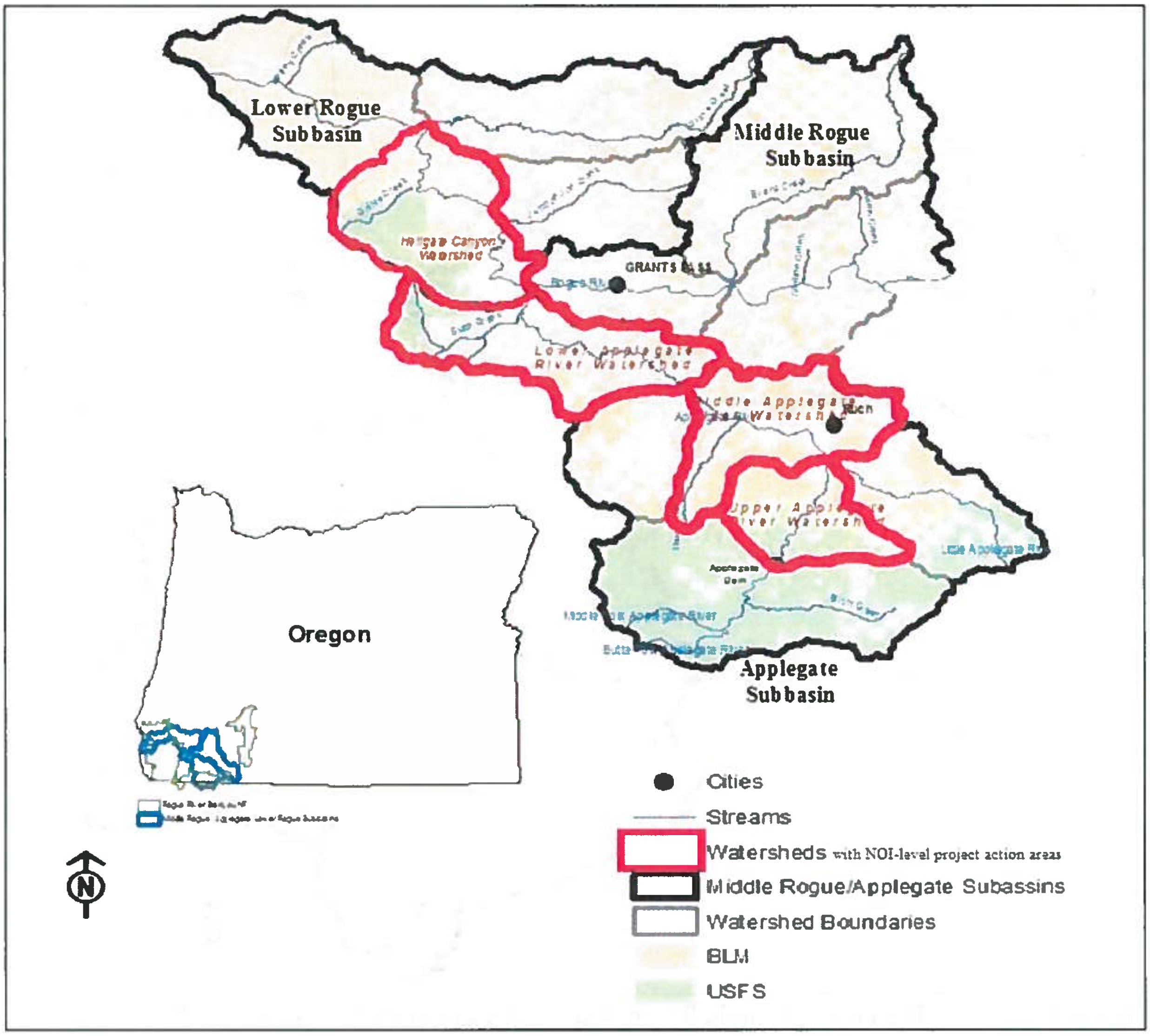

Figure 10. The Hellgate Canyon, Lower Applegate River, Middle Applegate River, and Upper Applegate River fifth-field watersheds in which the RRSNF is proposing to authorize Notices of Intent for suction dredging and high banking operations submitted in those reaches of rivers with SONCC coho salmon and designated critical habitat, including National Forest System Lands 0.25 miles upstream of coho salmon and their designated critical habitat. Green lands are RRSNF land. Not shown are wilderness areas or mineral withdrawn areas.

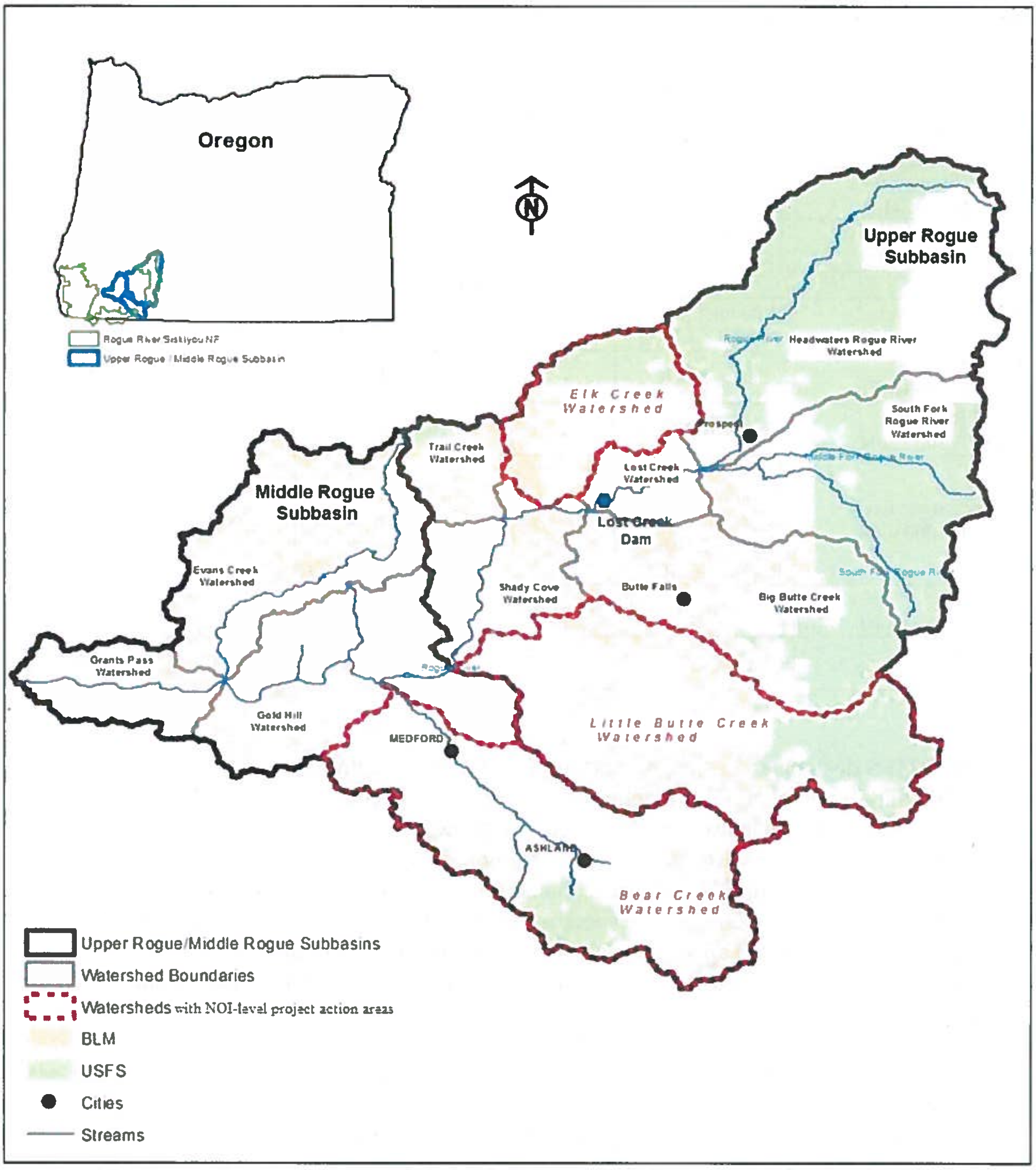

Figure 11. The Bear, Little Butte, and Elk Creek fifth-field watersheds in which the RRSNF is proposing to authorize Notices of Intent for suction dredging and high banking operations submitted in those reaches of rivers with SONCC coho salmon and designated critical habitat, including National Forest System Lands 0.25 miles upstream of coho salmon and their designated critical habitat. Green lands are RRSNF land. Not shown are wilderness areas or mineral withdrawn areas.

Table 2. Estuarine components of the action area.

Estuarine Fifth-field Watershed	Population and ESU of coho salmon	Designated critical habitat for coho salmon	Southern DPS eulachon use	Southern DPS green sturgeon use	Designated critical habitat for eulachon or green sturgeon
Lower Smith River HUC 1801010104	Smith River, SONCC	Yes	Rare	Yes	No
Lower Coquille River HUC 1710030505	Coquille River, OC	Yes	Possible	Yes	No
From Table 1					
Winchuck River HUC 1710031207	Winchuck, SONCC	Yes	Possible	Yes	No
Chetco River HUC 1710031201	Chetco, SONCC	Yes	Rare	Yes	No
Pistol River HUC 1710031204	Pistol, SONCC	Yes	Possible	Yes	No
Lower Rogue River HUC 1710031008	Upper Rogue, Middle Rogue/ Applegate, Illinois, Lower Rogue; SONCC	Yes	Rare	Yes	No
Elk River HUC 1710030603	Elk, SONCC	Yes	Possible	Yes	No
Sixes River HUC 1710030602	Sixes, OC	Yes	Rare	Yes	No

In 1999, NMFS designated critical habitat for SONCC coho salmon as "only the current range" of the ESU and included all river reaches accessible to listed coho salmon, with some specific exceptions. Accessible reaches were considered those within the historical range of the ESU that can still be occupied by any life stage of coho salmon. Inaccessible reaches are those above longstanding, naturally impassible barriers (i.e., natural waterfalls in existence for at least several hundred years) or those reaches above specified dams. Therefore, SONCC coho salmon designated critical habitat is an appropriate surrogate for the distribution of the ESU. For this consultation, the RRSNF used the best available information to determine the extent of SONCC coho salmon critical habitat for NOI watersheds.

Unlike the earlier designations, the OC coho salmon critical habitat ruling determined that NMFS can now be more precise in about the ''geographical area occupied by the species'' because Federal, state, and tribal fishery biologists have made progress documenting and mapping actual species distribution at the level of stream reaches (FR 73 7816). For OC coho salmon critical habitat NMFS could identify occupied stream reaches where the species has been observed and identified stream reaches where the species is presumed to occur based on the professional judgment of biologists familiar with the watershed. Furthermore, each watershed was reviewed by the critical habitat analytical review team (CHART) to verify occupancy, primary constituent elements, and special management considerations (FR 73 7816). As such, only occupied areas were designated as critical habitat for OC coho salmon because no unoccupied areas with the historical range of the ESU were identified to be essential to its conservation. Some occupied areas were not included in the critical habitat designation due to consideration of economic, national security or other relevant benefits despite known presence (i.e., portions of the South Fork Coquille River). Additionally, Indian lands were excluded from designated critical habitat (FR 73 7816).

Adult and sub-adult Southern DPS green sturgeon are present in estuaries from June until October and use these areas as habitat for growth, feeding, development to adulthood, and migration (Moser and Lindley 2007). Eulachon larvae and adults use the action area for migration and feeding. Adult Southern DPS eulachon are likely only present in the action area from mid-December through May and larvae are likely only present from February through June. Attempts to evaluate the status of eulachon have been challenging due to the lack of reliable long-term data; interpretations of available abundance data for eulachon are confounded by intermittent reporting, fishery-dependent data, and the lack of directed sampling (USDC 2013). However, for estuaries in the action area (Table 2), the status of Southern DPS eulachon is either (1) possible (Coquille, Elk, Pistol, Winchuck; Willson *et al.* 2006, Gustafson *et al.* 2010), or (2) observed but on an infrequent basis and in small numbers (Sixes, Rogue, Chetco, Smith; Monaco *et al.* 1990, Gustafson *et al.* 2010). Until recently, most fish biologists have not specifically targeted Southern DPS eulachon during surveys and were unlikely to be sampling with the appropriate gear or at the appropriate times. Southern DPS eulachon runs also vary annually, thus making directed sampling even more necessary. Based on this information, we cannot conclude that Southern DPS eulachon are not present in estuaries in the action area, but their likely presence and abundance are sporadic and low.

The overall action area is also designated by the Pacific Fishery Management Council (PFMC) as EFH for Pacific Coast groundfish (PFMC 2005), coastal pelagic species (PFMC 1998), and Pacific Coast salmon (PFMC 2014), or is in an area where environmental effects of the proposed action is likely to adversely affect designated EFH for those species.

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

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

The proposed action is not likely to adversely affect Southern DPS Pacific eulachon. The analysis to support this determination is found in the "Not Likely to Adversely Affect" Determinations in Section 2.11.

2.1 Analytical Approach

This biological opinion includes both a jeopardy analysis and an adverse modification analysis. The jeopardy analysis relies upon the regulatory definition of "to jeopardize the continued existence of a listed species," which is "to engage in an action that would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species" (50 CFR 402.02). Therefore, the jeopardy analysis considers both survival and recovery of the species.

The adverse modification analysis considers the impacts of the Federal action on the conservation value of designated critical habitat. This biological opinion relies on the definition of "destruction or adverse modification", which "means a direct or indirect alteration that appreciably diminishes the value of critical habitat for the conservation of a listed species. Such alterations may include, but are not limited to, those that alter the physical or biological features essential to the conservation of a species or that preclude or significantly delay development of such features" (81 FR 7414).[17]

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

- Identify the rangewide status of the species and critical habitat likely to be adversely affected by the proposed action.
- Describe the environmental baseline in the action area.
- Analyze the effects of the proposed action on both species and their habitat using an "exposure-response-risk" approach.
- Describe any cumulative effects in the action area.
- Integrate and synthesize the above factors to assess the risk that the proposed action poses to species and critical habitat.
- Reach jeopardy and adverse modification conclusions.
- If necessary, define a reasonable and prudent alternative to the proposed action.

[17] By this rule NMFS adopted the statutory phrase "physical or biological features" to use for descriptions of critical habitat going forward. The rules designating critical habitat for these species of coho use the terms "essential habitat features," for SONCC coho, and "primary constituent elements" for Oregon Coast coho. All of these terms refer to the same attributes of critical habitat. This opinion will use the terms from the rules designating critical habitat with the understanding that the designation terms are equivalent to the term "physical or biological features" used by the regulatory definition of "destruction or adverse modification".

2.2 Rangewide Status of the Species and Critical Habitat

This opinion examines the status of each species that would be adversely affected by the proposed action. The status is determined by the level of extinction risk that the listed species face, based on parameters considered in documents such as recovery plans, status reviews, and listing decisions. This informs the description of the species' likelihood of both survival and recovery. The species status section also helps to inform the description of the species' current "reproduction, numbers, or distribution" as described in 50 CFR 402.02. The opinion also examines the condition of critical habitat throughout the designated area, evaluates the conservation value of the various watersheds and coastal and marine environments that make up the designated area, and discusses the current function of the essential physical and biological features that help to form that conservation value.

One factor affecting the rangewide status of OC and SONCC coho salmon, Southern DPS green sturgeon, and aquatic habitat at large is climate change. Climate change is likely to play an increasingly important role in determining the abundance of ESA-listed species, and the conservation value of designated critical habitats, in the Pacific Northwest. These changes will not be spatially homogeneous across the Pacific Northwest. Areas with elevations high enough to maintain temperatures well below freezing for most of the winter and early-spring will be less affected. Low-elevation areas are likely to be more affected.

During the last century, average regional air temperatures increased by 1.5°F, and increased up to 4°F in some areas. Warming is likely to continue during the next century as average temperatures increase another 3°F to 10°F. Overall, about one-third of the current cold-water fish habitat in the Pacific Northwest is likely to exceed key water temperature thresholds by the end of this century (USGCRP 2009).

Precipitation trends during the next century are less certain than for temperature but more precipitation is likely to occur during October through March and less during summer months, and more of the winter precipitation is likely to fall as rain rather than snow (ISAB 2007, USGCRP 2009). Where snow occurs, a warmer climate will cause earlier runoff so stream flows in late spring, summer, and fall will be lower and water temperatures will be warmer (ISAB 2007, USGCRP 2009).

Higher winter stream flows increase the risk that winter floods in sensitive watersheds will damage spawning redds and wash away incubating eggs. Earlier peak stream flows will also flush some young salmon and steelhead from rivers to estuaries before they are physically mature, increasing stress and the risk of predation. Lower stream flows and warmer water temperatures during summer will degrade summer rearing conditions, in part by increasing the prevalence and virulence of fish diseases and parasites (USGCRP 2009). Other adverse effects are likely to include altered migration patterns, accelerated embryo development, premature emergence of fry, variation in quality and quantity of tributary rearing habitat, and increased competition and predation risk from warm-water, non-native species (ISAB 2007).

The earth's oceans are also warming, with considerable interannual and inter-decadal variability superimposed on the longer-term trend (Bindoff *et al.* 2007). Historically, warm periods in the coastal Pacific Ocean have coincided with relatively low abundances of salmon and steelhead, while cooler ocean periods have coincided with relatively high abundances (Scheuerell and Williams 2005, Zabel *et al.* 2006, USGCRP 2009). Ocean conditions adverse to salmon and steelhead may be more likely under a warming climate (Zabel *et al.* 2006). Moreover, as atmospheric carbon emissions increase, increasing levels of carbon are absorbed by the oceans, changing the pH of the water. Marine fish species have exhibited negative responses to ocean acidification conditions that include changes in growth, survivorship, and behavior. Marine phytoplankton, which are the base of the food web for many oceanic species, have shown varied responses to ocean acidification that include changes in growth rate and calcification (Feely *et al.* 2012).

2.2.1 Status of the Species

For Pacific salmon, steelhead, and certain other species, we commonly use the four "viable salmonid population" (VSP) criteria (McElhany *et al.* 2000) to assess the viability of the populations that, together, constitute the species. These four criteria (spatial structure, diversity, abundance, and productivity) encompass the species' "reproduction, numbers, or distribution" as described in 50 CFR 402.02. When these parameters are collectively at appropriate levels, they maintain a population's capacity to adapt to various environmental conditions and allow it to sustain itself in the natural environment.

"Spatial structure" refers both to the spatial distributions of individuals in the population and the processes that generate that distribution. A population's spatial structure depends on habitat quality and spatial configuration, and the dynamics and dispersal characteristics of individuals in the population.

"Diversity" refers to the distribution of traits within and among populations. These range in scale from DNA sequence variation in single genes to complex life history traits (McElhany *et al.* 2000).

"Abundance" generally refers to the number of naturally-produced adults (*i.e.*, the progeny of naturally-spawning parents) in the natural environment (*e.g.*, on spawning grounds).

"Productivity," as applied to viability factors, refers to the entire life cycle (*i.e.*, the number of naturally-spawning adults produced per parent). When progeny replace or exceed the number of parents, a population is stable or increasing. When progeny fail to replace the number of parents, the population is declining. McElhany *et al.* (2000) use the terms "population growth rate" and "productivity" interchangeably when referring to production over the entire life cycle. They also refer to "trend in abundance," which is the manifestation of long-term population growth rate.

For species with multiple populations, once the biological status of a species' populations has been determined, we assess the status of the entire species using criteria for groups of populations, as described in recovery plans and guidance documents from technical recovery teams. Considerations for species viability include having multiple populations that are viable, ensuring that populations with unique life histories and phenotypes are viable, and that some viable populations are both widespread to avoid concurrent extinctions from mass catastrophes and spatially close to allow functioning as metapopulations (McElhany *et al.* 2000).

The summaries that follow describe the status of OC and SONCC coho salmon, and their designated critical habitats, and Southern DPS green sturgeon, all of which occur within the geographic area of this proposed action and are considered in this opinion. More detailed information on the status and trends of these listed resources, and their biology and ecology, are in the listing regulations and critical habitat designations published in the Federal Register (Table 3) and in the SONCC coho salmon recovery plan (NMFS 2014).

Table 3. Listing status, status of critical habitat designations and protective regulations, and relevant Federal Register (FR) decision notices for ESA-listed species considered in this opinion. Listing status: 'T' means listed as threatened.

Species	Listing Status	Critical Habitat	Protective Regulations
Coho salmon *(Oncorhynchus kisutch)*			
Oregon Coast	T 6/20/11; 76 FR 35755	2/11/08; 73 FR 7816	2/11/08; 73 FR 7816
Southern Oregon/Northern California Coast	T 6/28/05; 70 FR 37160	5/5/99; 64 FR 24049	6/28/05; 70 FR 37160
Green sturgeon (*Acipenser medirostris*)			
Southern DPS	T 4/07/06; 71 FR 17757	10/09/09; 74 FR 52300	6/2/10; 75 FR 30714

Status of OC Coho Salmon

We are developing a recovery plan for this species. A proposed recovery plan was released for public comment on October 13, 2015 (80 FR 61379). NMFS listed OC coho salmon as threatened and has recently determined this listing status remains appropriate (NMFS 2016a).

Spatial Structure and Diversity. This species includes populations of coho salmon in Oregon coastal streams south of the Columbia River and north of Cape Blanco. The Cow Creek Hatchery Program (South Umpqua population) is included as part of the ESU because the original brood stock was founded from the local, natural origin population and natural origin coho salmon have been incorporated into the brood stock on a regular basis. The OC-Technical Recovery Team identified 56 populations, including 21 independent and 35 dependent populations in five biogeographic strata; biogeographic strata represent both genetic and geographic similarities (Table 4) (Lawson *et al.* 2007). Independent populations are populations that historically would have had a high likelihood of persisting in isolation from neighboring populations for 100 years and are rated as functionally independent or potentially independent. Dependent populations (D) are populations that historically would not have had a high likelihood of persisting in isolation for 100 years. These populations relied upon periodic immigration from other populations to maintain their abundance (McElhany *et al.* 2000, Lawson *et al.* 2007). Most recently, spatial structure conditions have improved in terms of spawner and juvenile distribution in watersheds; none of the geographic area or strata within the ESU appear to have considerably lower abundance or productivity (NWFSC 2015).

Table 4. OC coho salmon populations. Population types included functionally independent (FI), potentially independent (PI) and dependent populations (D) (McElhany *et al.* 2000, Lawson *et al.* 2007). "*" indicates populations included in this consultation.

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

A 2010 biological recovery team (Stout *et al.* 2012) noted significant improvements in hatchery and harvest practices had been made, although harvest and hatchery reductions had changed the population dynamics of the ESU. Recent re-evaluation of hatchery influence on diversity criteria resulted in increased scores with even the lowest ranked population showing improvement since the previous assessment (NWFSC 2015). Additional ESU diversity criteria were not updated in 2015 although the recent increases in abundance and diversity across all the strata suggest that ESU diversity has not decreased since 2012 (NWFSC 2015).

Abundance and Productivity. It has not been demonstrated that productivity during periods of poor marine survival is now adequate to sustain the ESU. Recent increases in adult escapement do not provide strong evidence that the century-long downward trend has changed. There is concern that increased abundances are being incorrectly credited to stream restoration activities when the increases are a result of recent high marine survival. The ability of the OC coho salmon ESU to survive another prolonged period of poor marine survival remains in question. When future conditions are taken into account, the OC coho salmon ESU, as a whole, is at moderate risk of extinction, but the recent risk trend is stable and improving (Stout *et al.* 2012, NWFSC 2015).

Limiting Factors. Information about limiting factors at the species scale can be gleaned from the discussion of factors for decline and threats in Stout *et al.* (2012). Also, the state of Oregon provided "population bottlenecks" (*i.e.*, limiting factors at the population scale) in its coastal coho assessment (ODFW 2005). Based on these two sources, limiting factors for this species include:

- Degraded stream complexity
- Reduced recruitment of wood to streams
- Increased fine substrate sediment
- Loss of beaver dams
- Increased water temperature
- Reduced stream flow
- Human disturbance of the landscape
- Loss of wetlands and estuarine habitat
- Fish passage barriers
- Effects of global climate change
- Periodic reduction in marine productivity
- Hatchery effects
- Effects from exotic fish species

According to the proposed recovery plan for OC coho salmon (NMFS 2015b), climate change is a threat, of medium-high concern, with effects on primary limiting factors including further habitat degradation and productivity; a biological review team (BRT) reached the broad conclusion that the rising temperatures anticipated with global climate change will have an overall negative effect on the status of the ESU (Stout *et al.* 2012). The main predicted effects in terrestrial and freshwater habitats include warmer, drier summers, reduced snowpack, lower summer flows, higher summer stream temperatures, and increased winter floods, which would affect coho salmon by reducing available summer rearing habitat, increasing potential scour and egg loss in spawning habitat, increasing thermal stress, and increasing predation risk. In estuarine habitats, the main physical effects are predicted to be rising sea level and increasing water temperatures, which would lead to a reduction in intertidal wetland habitats, increasing thermal stress, increasing predation risk, and unpredictable changes in biological community composition.

Coquille River population. The Coquille River coho salmon population includes individuals in the Coquille River and its tributaries. The Coquille River comprises 1,059 square miles in southwestern Oregon and extends almost 100 miles in length. The total drainage area is exceeded in Oregon only by the Columbia, Rogue, and Umpqua River basins. The Coquille River forms an estuary in its lower ten miles before converging with the Pacific Ocean in the west. The lower section of the mainstem Coquille River, from the mouth to RM 21, is likely influenced by cooler ocean waters and saltwater intrusion, while the head of tide occurs near Myrtle Point at RM 41 (Mayer 2012).

The Coquille River population is a functionally independent population in the Mid-South Coast stratum (Table 4). The potential historical smolt abundance for the Coquille River population is 4,169,000 with a potential adult population at 10% marine survival of 417,000 (Lawson *et al.* 2007). The wild coho salmon spawner abundance estimates for the Coquille River from 1996 to 2013 are displayed in Figure 12. There appears to be a slight, positive trend in abundance when evaluating the slope of regression of the number of natural spawners (natural logarithm-transformed) over the time series (Figure 13). Using the updated population scores (NWFSC 2015), there is a high certainty that the Coquille River population will persist for the next 100 years because it has sufficient diversity and distribution to ensure continued fitness in the face of environmental change. Nickelson *et al.* (1992) listed the Coquille River coho salmon as healthy. The Coquille River population is distributed across all five watersheds in the subbasin (approximately 550 miles[18]).

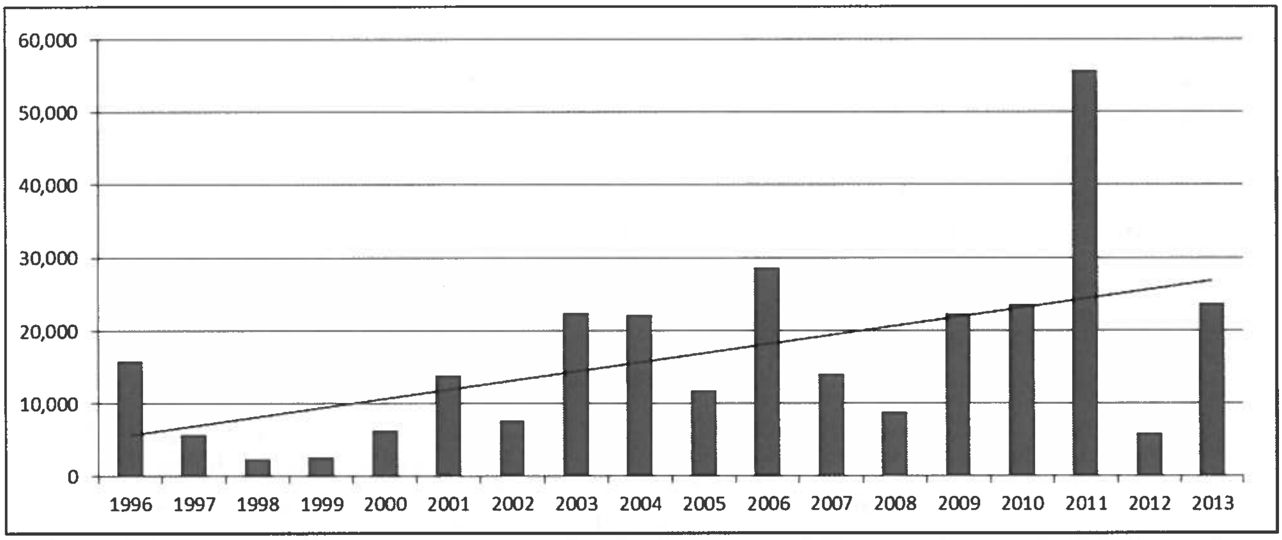

Figure 12. Estimated abundance of wild adult OC coho salmon spawners in the Coquille River population from 1996 to 2013.[19]

[18] E-mail from Barbara Seekins, NMS, to Michelle McMullin, NMFS (January 6, 2014)(providing estimates for approximate coho salmon distribution in the Coquille subbasin, by fifth-field watershed). Estimates for distribution were derived from two data sets that were not generated from the same hydrography layers. NMFS used a 2010 data set for critical habitat and then added areas of coho salmon distribution that exceeded critical habitat from the second data set.

[19] ODFW data available at: http://oregonstate.edu/dept/ODFW/spawn/cohoabund.htm

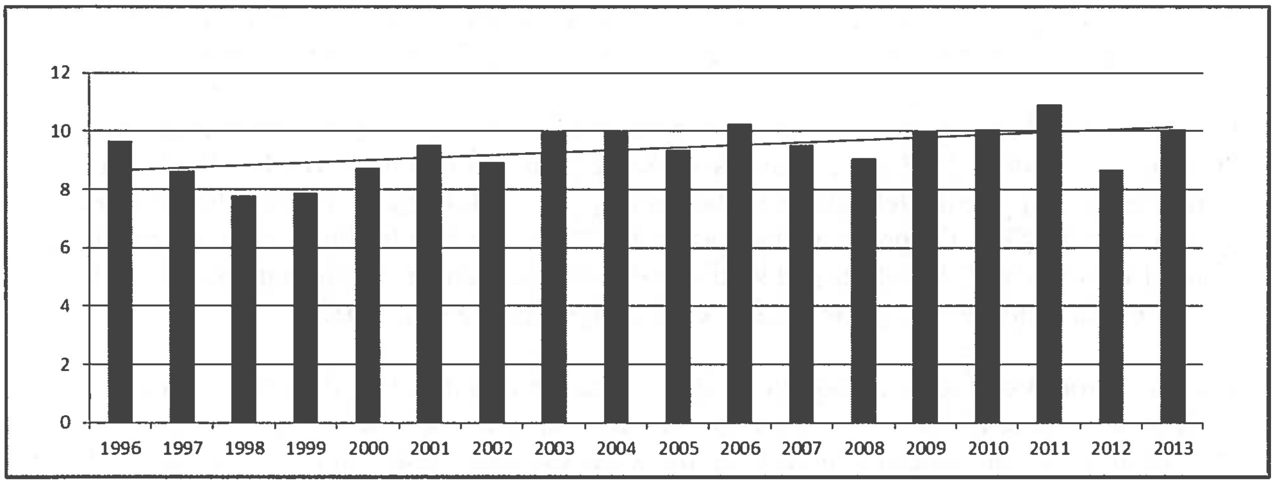

Figure 13. Estimated abundance of wild adult OC coho salmon spawners (ln-transformed) in the Coquille River population and population trend.

In 2009, ODFW developed a fisheries management and evaluation plan (FMEP) and proposed recreational fishing on wild OC coho salmon fisheries in select rivers. The harvest is implemented under Amendment 13 of the Pacific Coast Salmon Management Plan, is exempt from the prohibitions of sections 9 of the ESA, and the applicable 4(d) rule will not apply to this harvest as long as harvest in managed in accordance with the FMEP (NMFS 2009). Additionally, the FMEP requires population specific-abundance forecasts, annual cumulative impacts from ocean, and freshwater fisheries must not exceed the maximum population harvest rates defined in Amendment 13, and ODFW must submit annual reports describing the previous years' coho fisheries and containing the next years' proposed recreational harvest (NMFS 2009). NMFS must issue written concurrence to ODFW before the next years' recreation harvest can be implemented. NMFS approved the implementation of the FMEP as qualifying for Limit 4 of the ESA in 2009. FMEP harvest actions impacting populations that are functioning at or above the viable threshold must be designed to maintain the population or management unit at or above that high level (65 FR 42422). Additionally, required FMEP criteria ensure that for each population, habitat would be appropriately seeded by adult spawners after all of the fishery impacts; implementation of the FMEP has resulted in prudent management of fisheries that respond to the status of individual coho salmon populations from year to year and design harvest opportunities to ensure fisheries do not adversely affect spawning escapements (NMFS 2015a).

A fishery for wild coho salmon was initiated in the Coquille River in 2009. It was one of the first targeted harvests of non-hatchery coho salmon in Oregon rivers and bays since 1993 (Gray *et al.* 2013). The fishery in Coquille River has occurred annually since 2009. In 2012, the fishery continued through the entire season without attaining the 1,500 quota.

The ODFW proposed a 2013 Coquille River wild coho salmon fishery with no quota (although bag limits were one fish per day and two per season) and they predicted full seeding would be 5,400 with a projected spawner abundance of 15,223, resulting in 282% of full seeding. In 2013, Coquille River coho salmon returns were 155% of the predicted forecast; total 2013 spawners for the Coquille population were 23,637 fish or 438% of the full seeding spawner escapement; inside harvest was estimated at 899 wild coho salmon, prior to catch card analysis (Gray *et al.* 2014).

For 2014, ODFW again proposed a fishery with no quota for the Coquille River population with the same bag limit as 2013 and running from September 15 through November 30. Projected spawners were approximately 460% of full seeding. In 2014, Coquille River coho spawner returns were 168% of the predicted forecast; total 2014 spawners for the Coquille population were 41,669 fish or 771% of the full seeding spawner escapement; inside harvest was estimated at 2,319 wild coho salmon, prior to catch card analysis (Gray *et al.* 2015).

The fishery proposed for the Coquille in 2015 is the same as the 2014 fishery. Essentially, as evidenced by these continuing harvest opportunities since 2009, ODFW expects that the number of wild coho salmon returning to the Coquille River exceeds the amount of available habitat. The Coquille River coho salmon population can be considered habitat-limited, in terms of productivity.

The primary and secondary limiting factors for the Coquille River coho salmon population are stream complexity and water quality (Oregon 2005). Stream complexity was defined as the variety of physical habitat conditions that provide overwinter shelter conditions. According to CIT (2007), the state describes habitat conditions that create sufficient shelter for wintering juvenile coho salmon as having one or more of the following features: large wood; a lot of wood; pools; connected off-channel alcoves, beaver ponds, pasture trenches, lakes, reservoirs, wetlands and well-vegetated floodplains; and other conditions afforded by complex channel form. They further noted that water quality (i.e., water temperature) was limiting survival of summer parr, but this condition was not currently preventing the population from reaching the desired status. Gravel mining is of particular concern to the Coquille River population (Stout *et al.* 2012). Additional threats include floodplain development, exotic fish management, fishing, forestry, historic channeling for navigation, road management, and historic large wood removal (CIT 2007). Several introduced fish species inhabit the Coquille River and adjacent habitats, many of which pose predation or competition impacts to juvenile salmonids, including the following: striped bass (*Morone saxatilis*), largemouth bass (*Micropterus salmoides*), yellow perch (*Perca flavescens*), bluegill (*Lepomis macrochirus*), brown bullhead (*Ameiurus nebulosus*), mosquito fish (*Gambusia affinis*) and American shad (*Alosa sapidissima*). Smallmouth bass (*Micropterus dolomieu*) presence in the Coquille River has been confirmed by ODFW.

Sixes River population. The Sixes River coho salmon population is the southernmost population in the OC coho salmon ESU and includes individuals in the Sixes River and its tributaries. The Sixes River drains approximately 134 square miles and is almost entirely contained within Curry County. It extends approximately 28 miles in length and head of tide is at RM 2.5 (Adamus *et al.* 2005).

The Sixes River is a potentially independent population in the Mid-South Coast (Table 4). The potential historical smolt abundance for the Sixes River population is 372,000 with a potential adult population at 10% marine survival of 37,000 (Lawson *et al.* 2007). The wild coho salmon spawner abundance estimates for the Sixes River from 1996 to 2013 are displayed in Figure 14. There appears to be a slight, negative trend in abundance when evaluating the slope of regression of the number of natural spawners (natural logarithm-transformed) over the time series (Figure 15). Using the updated population scores (NWFSC 2015), diversity levels still remain low for the Sixes River population, although productivity and distribution scores have increased. Nickelson *et al.* (1992) listed the Sixes River coho salmon population as depressed. The primary and secondary limiting factors for the Sixes River coho salmon population are stream complexity and water quality. The Sixes River population is distributed within the Sixes River watershed (approximately 58.4 miles; NMFS 2007).

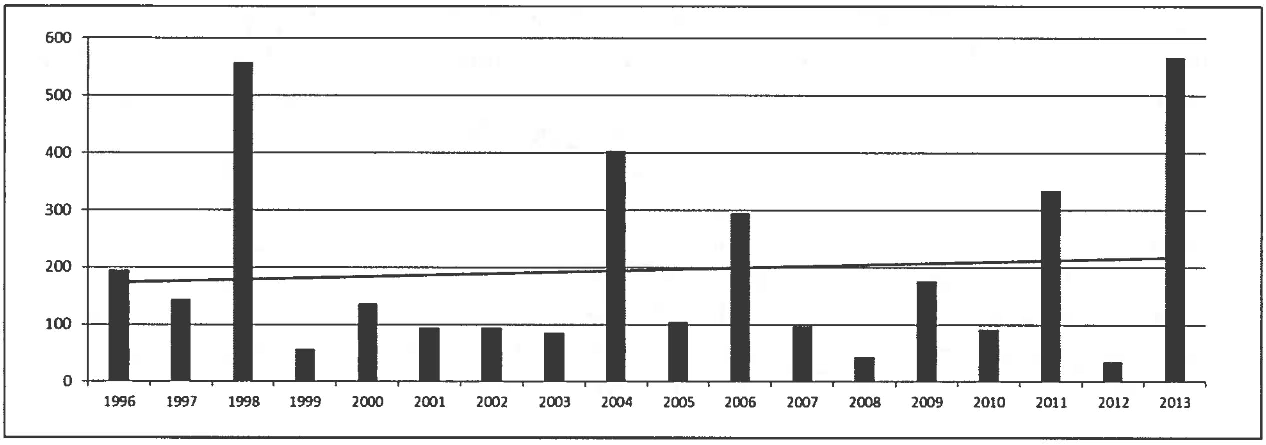

Figure 14. Estimated abundance of wild adult OC coho salmon spawners in the Sixes River population from 1996 to 2013.[19]

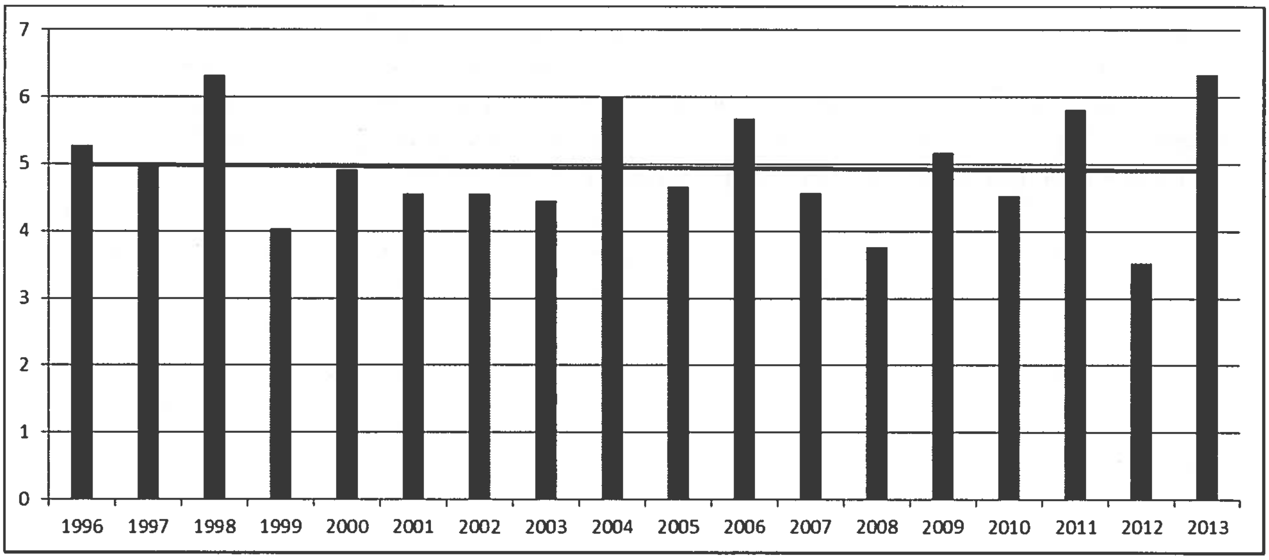

Figure 15. Estimated abundance of wild adult OC coho salmon spawners (ln-transformed) in the Sixes River population and population trend.

Status of SONCC Coho Salmon

A recovery plan is available for this species (NMFS 2014). NMFS listed SONCC coho salmon as threatened and has recently determined this listing status remains appropriate (NMFS 2016b).

Spatial Structure and Diversity. This species includes all naturally-spawned populations of coho salmon in coastal streams from the Elk River near Cape Blanco, Oregon, through and including the Mattole River near Punta Gorda, California, and progeny of three artificial propagation programs (NMFS 2014). Williams *et al.* (2006) designated 45 populations of coho salmon in the SONCC coho salmon ESU as dependent or independent based on their historical population size. Independent populations are populations that historically would have had a high likelihood of persisting in isolation from neighboring populations for 100 years and are rated as functionally independent or potentially independent. Dependent populations historically would not have had a high likelihood of persisting in isolation for 100 years; these populations relied upon periodic immigration from other populations to maintain their abundance. Two populations are both small enough and isolated enough that they are only intermittently present (McElhany *et al.* 2000, Williams *et al.* 2006, NMFS 2014). These populations were further grouped into seven diversity strata based on the geographical arrangement of the populations and basin-scale genetic, environmental, and ecological characteristics (Table 5).

NMFS (2014) determined each independent population will serve a role in recovery (Table 5). Independent populations likely to respond to recovery actions and most quickly achieve a low risk of extinction are designated "Core" populations. We based this designation on current condition, geographic location in the ESU, a low risk threshold compared to the number of spawners needed for the entire stratum, and other factors. Independent populations with little to no documentation of coho salmon presence in the last century, and thus, poor prospects for recovery, were designated as non-core 2. All other independent populations are designated non-core 1. With improved data from 2006, NMFS (2014) determined five of the 45 populations are ephemeral. We also established biological recovery objectives and criteria for each population role (Table 6) in our recovery plan for this species (NMFS 2014).

Table 5. Independent and dependent SONCC coho salmon populations by stratum and role of each population in recovery (Williams *et al.* 2006). Ephemeral populations per NMFS (2014) not listed. "*" indicates populations included in this consultation.

Diversity Stratum	Independent Population	Population Role
Northern Coastal Basins	**Elk River***	**Independent - Core**
	Brush Creek	Dependent
	Mussel Creek	Dependent
	Lower Rogue River*	**Independent - Non-Core 1**
	Hunter Creek	Dependent
	Pistol River*	**Dependent**
	Chetco River*	**Independent - Core**
	Winchuck River*	**Independent - Non-Core 1**
Interior Rogue River	**Illinois River***	**Independent - Core**
	Middle Rogue and Applegate Rivers*	**Independent - Non-Core 1**
	Upper Rogue River*	**Independent - Core**
Central Coastal Basins	**Smith River***	**Independent - Core**
	Elk Creek	Dependent
	Wilson Creek	Dependent
	Lower Klamath River	Independent - Core
	Redwood Creek	Independent - Core
	Maple Creek/Big Lagoon	Independent - Non-Core 2
	Little River	Independent - Non-Core1
	Strawberry Creek	Dependent
	Norton/Widow White Creek	Dependent
	Mad River	Independent - Non-Core 1
Interior Klamath River	Middle Klamath River	Independent - Non-Core 1
	Upper Klamath River	Independent - Core
	Salmon River	Independent - Non-Core 1
	Scott River	Independent - Core
	Shasta River	Independent - Core
Interior Trinity River	Lower Trinity River	Independent - Core
	Upper Trinity River	Independent - Core
	South Fork Trinity River	Independent - Non-Core 1
Southern Coastal Basins	Humboldt Bay tributaries	Independent - Core
	Lower Eel and Van Duzen rivers	Independent - Core
	Guthrie Creek	Dependent
	Bear River	Independent - Non-Core 2
	Mattole River	Independent - Non-Core 1

Diversity Stratum	Independent Population	Population Role
Interior Eel River	South Fork Eel River	Independent - Core
	Mainstem Eel River	Independent - Core
	Middle Fork Eel River	Independent - Non-Core 2
	North Fork Eel River	Independent - Non-Core 2
	Middle Mainstem Eel River	Independent - Core
	Upper Mainstem Eel River	Independent - Non-Core 2

Table 6. Biological recovery objectives and criteria to measure whether recovery objectives are met for SONCC coho salmon (NMFS 2014).

VSP Parameter	Population Role	Biological Recovery Objective	Biological Recovery Criteria[a]
Abundance	Core	Achieve a low risk of extinction	The geometric mean of wild adults over 12 years meets or exceeds the "low risk threshold" of spawners for each core population[b]
	Non-Core 1	Achieve a moderate or low risk of extinction	The annual number of wild adults is greater than or equal to four spawners per IP-km for each non-core population[b]
Productivity	Core and Non-Core 1	Population growth rate is not negative	Slope of regression of the geometric mean of wild adults over the time series ≥ zero[b]
Spatial Structure	Core and Non-Core 1	Ensure populations are widely distributed	Annual within-population distribution ≥ 80%[d] of habitat[c,d] (outside of a temperature mask[e])
	Non-Core 2 and Dependent	Achieve inter- and intra-stratum connectivity	≥ 80% of accessible habitat[c] is occupied in years[f] following spawning of cohorts that experienced high marine survival[g]
Diversity	Core and Non-Core 1	Achieve low or moderate hatchery impacts on wild fish	Proportion of hatchery-origin adults (pHOS) < 0.05
	Core and Non-Core 1	Achieve life-history diversity	Variation is present in migration timing, age structure, size, and behavior. The variation in these parameters[h] is retained.

[a]All applicable criteria must be met for each population in order for the ESU to be viable.
[b]Assess for at least 12 years, striving for a coefficient of variation (CV) of 15% or less at the population level (Crawford and Rumsey 2011).
[c]Based on available rearing habitat within the watershed (Wainwright *et al.* 2008). For purposes of these biological recovery criteria, "available" means accessible. 70% of habitat occupied relates to a truth value of approximately 0.60, providing a "high" certainty that juveniles occupy a high proportion of the available rearing habitat (Wainwright *et al.* 2008).
[d]The average for each of the three year classes over the 12 year period used for delisting evaluation must each meet this criterion. Strive to detect a 15% change in distribution with 80% certainty (Crawford and Rumsey 2011).
[e]Williams *et al.* (2008) identified a threshold air temperature, above which juvenile coho salmon generally do not occur, and identified areas with air temperatures over this threshold. These areas are considered to be within the temperature mask.
[f]If young-of-year are sampled, sampling would occur the spring following spawning of the cohorts experiencing high marine survival. If juveniles are sampled, sampling would occur approximately 1.5 years after spawning of the cohorts experiencing high marine survival, but before juveniles outmigrate to the estuary and ocean.
[g]High marine survival is defined as 10.2% for wild fish and 8% for hatchery fish (Sharr *et al.* 2000). If marine survival is not high, then this criterion does not apply.
[h]This variation is documented in the population profiles in Volume II of the recovery plan (NMFS 2014).

Abundance and Productivity. Although long-term data on abundance of SONCC coho salmon are scarce, available evidence from shorter-term research and monitoring efforts indicate that conditions have worsened for populations since the last formal status review was published (Williams *et al.* 2011). Additionally, the best available data indicate that none of the seven diversity strata appear to support a single viable population (NMFS 2014). Because the extinction risk of the ESU depends upon the extinction risk of its constituent independent populations and because the population abundance of most independent populations are below their depensation threshold, the SONCC coho salmon ESU is at high risk of extinction and is not viable (NMFS 2014). The decline in abundance from historical levels and the poor status of population viability criteria are the main factors behind the extinction risk of the ESU.

Quantitative population-level estimates of adult spawner abundance are scarce for SONCC coho salmon, especially long-term datasets (NMFS 2014). In Oregon, the best data are from the Huntley Park seine estimates of naturally produced coho salmon spawner abundance in the Rogue River basin, incorporating all four populations (Figure 16). The Huntley Park data have a significant positive trend ($p = 0.01$) over the past 35 years and a non-significant negative trend ($p > 0.05$) over the past 12 years or four generations (Williams 2016). However, it is impossible to determine, with existing information, how many of the estimated coho salmon at Huntley Park are returning to an area occupied by a specific Rogue River population.

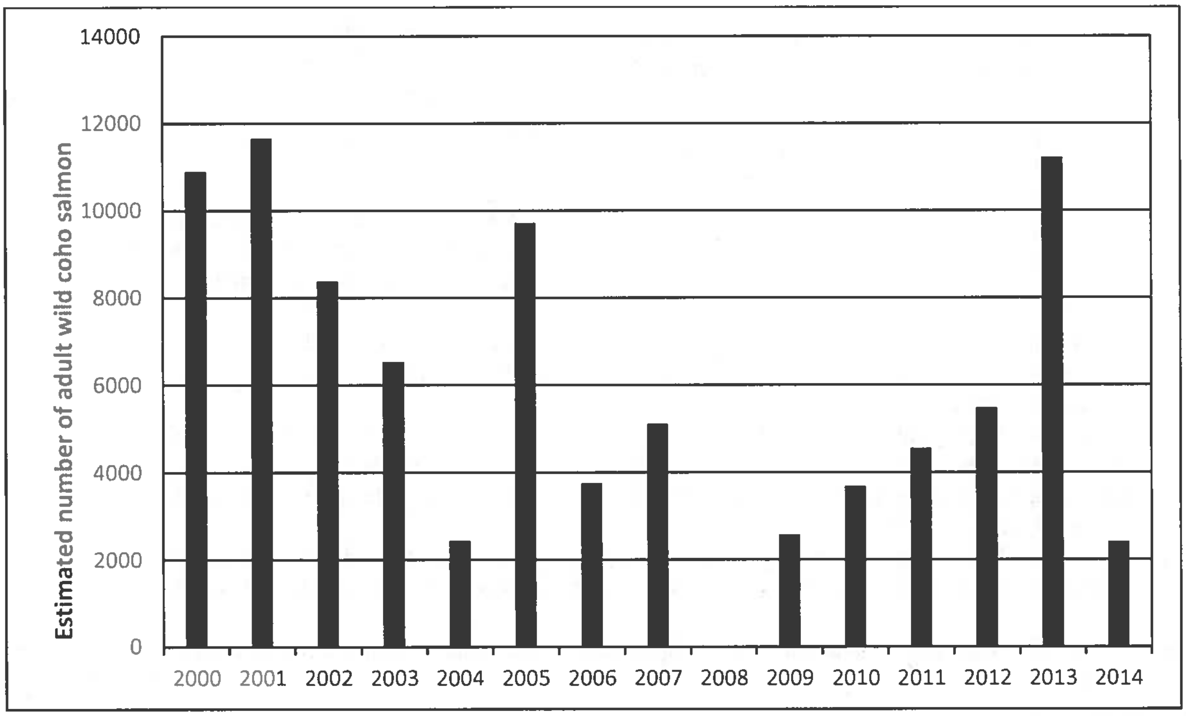

Figure 16. Estimated number of wild adult coho salmon in the Rogue River basin (Huntley Park sampling), 2000 to 2014.[20]

ODFW also conducted adult coho salmon spawning surveys for the Upper Rogue River, Middle Rogue/Applegate River, and the Illinois River, beginning in 2002 (Tables 7 – 9). Data were not collected in 2005 or in 2009-2014, which complicates efforts to track the strength of year classes. Additionally, for the Lower Rogue River, ODFW estimated a maximum wild coho salmon escapement of 235 during the period of 1998 to 2012 (Table 10). Adult spawner escapement estimates for the Elk River from 1998-2007 are listed in Table 11, although in many years

[20] 2008 data were excluded from consideration because the extremely low numbers were not consistent with that seen upstream at Gold Ray Dam, suggesting other reasons (sampling issues, data errors, etc.) for the dramatic drop in fish numbers from 2007 to 2008.

estimated returns were zero (NMFS 2014). ODFW did not survey the Chetco River, Winchuck River or Pistol River coho salmon populations. In the North Fork Smith River, coho salmon have been observed in a number of tributaries (NMFS 2014).

Table 7. Illinois River subbasin coho salmon spawning surveys for 2002-2014[21] and estimated number of wild spawners.

Year	Number of surveys	Number of mile surveyed miles	Wild estimated spawners	95% Confidence Interval
2002	15	13	1316	630
2003	13	11.7	1574	987
2004	9	7.5	3837	2305
2005			No surveys	
2006	3	2.7	1031	1777
2007	4	3.8	2117	1301
2008	3	2.7	745	787
2009			No surveys	
2010			No surveys	
2011			No surveys	
2012			No surveys	
2013			No surveys	
2014			No surveys	

Table 8. Middle Rogue/Applegate River subbasin coho salmon spawning surveys for 2002-2014[21] and estimated number of wild spawners.

Year	Number of surveys	Number of mile surveyed miles	Wild estimated spawners	95% Confidence Interval
2002	16	14.8	792	605
2003	21	17.3	142	91
2004	24	21.3	2695	1195
2005			No surveys	
2006	8	9.1	No data	N/A
2007	11	10	1930	479
2008	16	12.7	459	291
2009			No surveys	
2010			No surveys	
2011			No surveys	
2012			No surveys	
2013			No surveys	
2014			No surveys	

[21] Data from ODFW available online at: http://oregonstate.edu/dept/ODFW/spawn/pdf%20files/coho/2002-12FinalSONCCEstimates.pdf (Last Accessed January 2015).

Table 9. Upper Rogue River subbasin coho salmon spawning surveys for 2002-2014[21] and estimated number of wild spawners.

Year	Number of surveys	Number of mile surveyed miles	Wild estimated spawners	95% Confidence Interval
2002	18	17.3	2929	1911
2003	22	21.4	1350	434
2004	18	18.5	2580	1388
2005			No surveys	
2006	14	13.1	319	179
2007	7	6.9	No data	N/A
2008	5	5.3	No data	N/A
2009			No surveys	
2010			No surveys	
2011			No surveys	
2012			No surveys	
2013			No surveys	
2014			No surveys	

Table 10. Estimates of annual spawning escapement of wild coho salmon for the Lower Rogue River (NMFS 2014).

Year	Population Estimate
1998	0
1999	0
2000	59
2001	235
2002	205
2003	75
2004	127
2005	127
2006	35
2007	193
2008	184
2009	193
2010	0
2011	44
2012	0

Table 11. Estimates of annual spawning escapement of wild coho salmon for Elk River (NMFS 2014).

Year	Population Estimate
1998	501
1999	Not estimate
2000	0
2001	Not estimated
2002	104
2003	187
2004	0
2005	0
2006	0
2007	230
2008	Not estimated

For the Chetco River population, the only available data on coho salmon spawner returns comes from the ODFW Chinook salmon spawning surveys (1998-2012) which occasionally document coho salmon.[22] ODFW estimates coho salmon annual returns based on these surveys, but the reliability and utility of the data and the associated estimates is low because, the surveys did not target coho salmon, their geographic scope misses a lot of the coho spawning grounds, and coho salmon spawning may not occur at the same times as that of Chinook salmon (NMFS 2014).[23] The average of ODFW's annual estimates of adult returns is 148 adult coho salmon. In light of the poor reliability of the data and to give the benefit of doubt to the species, we assume the actual population is below this level.

Little information is available for juvenile coho salmon abundance in the Chetco River, as well. Juveniles were found at only three locations and at very low densities within the basin during snorkeling surveys conducted in 2003 and 2004 (Jepsen and Rodgers 2004, Jepsen 2006). In a trapping operation on Jack Creek between March 9 and May 10, 2007; ODFW captured 69 out-migrant coho salmon smolts. Operation of this trap between March 13 and May 16, 2008 caught 163 coho salmon smolts. The trap did not provide enough data for ODFW to make estimates of the total outmigration for either year, but due to inefficiencies in trapping (Newcomb and Coon 2001) it is likely four to five times the number caught. In addition, low water levels stopped the trap in mid-May, while the coho salmon smolt outmigration likely lasts to mid-June.

The Winchuck River coho salmon population is not well studied and there are no historic data sets with which to evaluate distribution (NMFS 2014). However, juvenile coho salmon were observed during snorkeling surveys conducted in 2003 and 2004 in Fourth of July Creek, East

[22] E-mail from Todd Confer, Oregon Department of Fish and Wildlife, to Chuck Wheeler, NMFS (June 10, 2013) (attaching Rogue Watershed District estimates of annual spawning escapement of coho salmon spawning in the coastal strata of the Oregon portion of the SONCC coho salmon recovery domain, 1998-2012).
[23] In years where estimates are zero, the Chinook salmon surveyors either did not see any coho salmon, did not distinguish the difference between Chinook salmon and coho salmon, or did not mark them down as they were not the target of their work. It is highly unlikely that the actual number of spawners in those years was zero because adults returned three or six years later (indicating successful spawning the year in which a zero was recorded).

Fork Winchuck River, Fouth Fork Winchuck River, and the mainstem Winchuck River (Jepsen and Rodgers 2004, Jepsen 2006).

Similarly, the Pistol River coho salmon population also lacks historic data sets. During 2003 and 2004 snorkeling surveys, juvenile coho salmon were observed in the mainstem Pistol River and South Fork Pistol River, albeit at few locations and in very low abundance (Jepsen and Rodgers 2004, Jepsen 2006).

Limiting Factors. Threats from natural or man-made factors have worsened in recent years, primarily due to four factors: small population dynamics, climate change, multi-year drought, and poor ocean conditions (NOAA Fisheries 2011, NMFS 2014). Mining activities are specifically considered as one of the major factors (eleven total) responsible for the decline of SONCC coho salmon (62 FR 24588, May 6, 1997) and are still considered to be a current threat (NMFS 2014). Limiting factors for this species include:

- Lack of floodplain and channel structure
- Impaired water quality
- Altered hydrologic function (timing of volume of water flow)
- Impaired estuary/mainstem function
- Degraded riparian forest conditions
- Altered sediment supply
- Increased disease/predation/competition
- Barriers to migration
- Fishery-related effects
- Hatchery-related effects

However, NMFS (2014) did not identify gold mining as a key limiting threat for any of the SONCC coho salmon populations in the action area (Table 12) and as such, gold mining is not currently considered to be one of the most pressing factors restricting the recovery of SONCC coho salmon populations or the ESU.[24] Productivity, abundance, and key limiting factor information for the nine SONCC coho salmon populations in the action area are displayed in Table 12.

[24] Mining/Gravel extraction is considered a key limiting threat for only one population in the SONCC ESU (NMFS 2014); that population is the Mad River in California and the current threat is from gravel mining.

Table 12. SONCC coho salmon populations affected by the proposed action.

Population	Extinction Risk	Spawner Level	IP-km[25]	Key Limiting Stresses	Key Limiting Threats
Elk	High	Likely below depensation threshold	63	• Lack of Floodplain and Channel Structure • Impaired Water Quality	• Agricultural Practices • Channelization/Diking
Lower Rogue	High	Likely below depensation threshold	81	• Lack of Floodplain and Channel Structure • Impaired Water Quality	• Roads • Urban/Residential/ Industrial Development
Illinois	High	Likely above depensation threshold	590	• Altered Hydrologic Function • Degraded Riparian Forest Conditions	• Roads • Dams/Diversions
Middle Rogue/ Applegate	High	Likely above depensation threshold	603	• Degraded Riparian Forest Conditions • Altered Hydrologic Function	• Dams/Diversions • Urban/Residential/ Industrial Development
Upper Rogue	Moderate	Likely above depensation threshold	689	• Altered Hydrologic Function • Impaired Water Quality	• Agricultural Practices • Urban/Residential/ Industrial Development
Pistol	N/A	N/A	30	• Lack of Floodplain and Channel Structure • Degraded Riparian Forest Conditions	• Roads • Timber Harvest
Chetco	High	Likely below depensation threshold	135	• Lack of Floodplain and Channel Structure • Degraded Riparian Forest Conditions	• Channelization/Diking • Urban/Residential/ Industrial Development
Winchuck	High	Likely below depensation threshold	57	• Lack of Floodplain and Channel Structure • Impaired Water Quality	• Channelization/Diking • Urban/Residential/ Industrial Development
Smith	High	Likely below depensation threshold	325	• Impaired Estuary/Mainstem Function • Lack of Floodplain and Channel Structure	• Channelization/Diking • Agriculture

[25] Intrinsic potential (IP) is a measure of habitat size and a proxy of abundance within the population (Williams *et al.* 2008). Intrinsic potential per kilometer is the intrinsic potential of a stream and is a modeled index of a potential habitat suitability based on the underlying geomorphology and hydrology of the watershed for rearing juvenile SONCC coho salmon. The output of this model is in terms of IP per kilometer and written as IP-km.

Status of Southern DPS Green Sturgeon

We have released a recovery outline for this species (NMFS 2010). This preliminary document identifies important threats, including exposure to contaminants, loss of estuarine and delta function, and other activities that impact spawning, rearing and feeding habitats. Key recovery needs are restoring access to suitable habitat, improving potential habitat, and establishing additional spawning populations. We are in the process of developing a recovery plan for this species.

Spatial Structure and Diversity. Two DPSs have been defined for green sturgeon, a Northern DPS (spawning populations in the Klamath and Rogue rivers) and a Southern DPS (spawners in the Sacramento River). 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 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. ESA-listed southern green sturgeon occur in four salmon recovery domains in Oregon and Washington: the Puget Sound, Willamette and Lower Columbia, OC, and SONCC.

Limiting Factors. The principal factor for the decline of Southern DPS green sturgeon is the reduction of its spawning area to a single known population limited to a small portion of the Sacramento River. It is currently at risk of extinction primarily because of human-induced ''takes'' involving elimination of freshwater spawning habitat, degradation of freshwater and estuarine habitat quality, water diversions, fishing, and other causes (USDC 2010). Adequate water flow and temperature are issues of concern. Water diversions pose an unknown but potentially serious threat within the Sacramento and Feather Rivers and the Sacramento River Delta. Poaching also poses an unknown but potentially serious threat because of high demand for sturgeon caviar. The effects of contaminants and nonnative species are also unknown but potentially serious. Retention of green sturgeon in both recreational and commercial fisheries is now prohibited within the western states, but the effect of capture/release in these fisheries is unknown. There is evidence of fish being retained illegally, although the magnitude of this activity likely is small (NOAA Fisheries 2011).

2.2.2 Status of the Critical Habitats

This section examines the status of designated critical habitat affected by the proposed action by examining the condition and trends of essential physical and biological features throughout the designated areas. These features are essential to the conservation of the listed species because they support one or more of the species' life stages (*e.g.*, sites with conditions that support spawning, rearing, migration and foraging). In the action area, critical habitat is not designated for Southern DPS green sturgeon.

Coho salmon. The NMFS ranked watersheds within designated critical habitat at the scale of the fifth-field hydrologic unit code (HUC_5) in terms of the conservation value they provide to each listed species they support.[26] The conservation rankings are high, medium, or low. To determine the conservation value of each watershed to species viability, NMFS' critical habitat analytical review teams (CHARTs) evaluated the quantity and quality of habitat features (for example, spawning gravels, wood and water condition, side channels), the relationship of the area compared to other areas within the species' range, and the significance to the species of the population occupying that area (NOAA Fisheries 2005). Thus, even a location that has poor quality of habitat could be ranked with a high conservation value if it were essential due to factors such as limited availability (*e.g.*, one of a very few spawning areas), a unique contribution of the population it served (*e.g.*, a population at the extreme end of geographic distribution), or if it serves another important role (*e.g.*, obligate area for migration to upstream spawning areas).

The physical or biological features of freshwater spawning and incubation sites, include water flow, quality and temperature conditions and suitable substrate for spawning and incubation, as well as migratory access for adults and juveniles (Tables 13 and 14). These features are essential to conservation because without them the species cannot successfully spawn and produce offspring. The physical or biological features of freshwater migration corridors associated with spawning and incubation sites include water flow, quality and temperature conditions supporting larval and adult mobility, abundant prey items supporting larval feeding after yolk sac depletion, and free passage (no obstructions) for adults and juveniles. These features are essential to conservation because they allow adult fish to swim upstream to reach spawning areas and they allow larval fish to proceed downstream and reach the ocean.

[26] The conservation value of a site depends upon "(1) the importance of the populations associated with a site to the ESU conservation, and (2) the contribution of that site to the conservation of the population through demonstrated or potential productivity of the area" (NOAA Fisheries 2005).

Table 13. 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 growth and development
Freshwater rearing	Floodplain connectivity Forage Natural cover Water quality Water quantity	Fry emergence from gravel Fry/parr/smolt growth and development
Freshwater migration	Free of artificial obstruction Natural cover Water quality Water quantity	Adult sexual maturation Adult upstream migration and holding Kelt (steelhead) seaward migration Fry/parr/smolt growth, development, and seaward migration
Estuarine areas	Forage Free of artificial obstruction Natural cover Salinity Water quality Water quantity	Adult sexual maturation and "reverse smoltification" Adult upstream migration and holding Kelt (steelhead) seaward migration Fry/parr/smolt growth, development, and seaward migration
Nearshore marine areas	Forage Free of artificial obstruction Natural cover Water quantity Water quality	Adult growth and sexual maturation Adult spawning migration Nearshore juvenile rearing

Table 14. Essential features of critical habitats designated for SONCC coho salmon and corresponding species life history events.

Essential Features		Species Life History Event
Site	**Site Attribute**	
Spawning and juvenile rearing areas	Cover/shelter Food (juvenile rearing) Riparian vegetation Space Spawning gravel Water quality Water quantity	Adult spawning Embryo incubation Alevin growth and development Fry emergence from gravel Fry/parr/smolt growth and development
Adult and juvenile migration corridors	Cover/shelter Food (juvenile) Riparian vegetation Safe passage Space Substrate Water quality Water quantity Water temperature Water velocity	Adult sexual maturation Adult upstream migration and holding Kelt (steelhead) seaward migration Fry/parr/smolt growth, development, and seaward migration
Areas for growth and development to adulthood	Ocean areas – not identified	Nearshore juvenile rearing Subadult rearing Adult growth and sexual maturation Adult spawning migration

Oregon Coast Recovery Domain. In this recovery domain, critical habitat has been designated for OC coho salmon. Many large and small rivers supporting significant populations of coho salmon flow through this domain, including the Nehalem, Nestucca, Siletz, Yaquina, Alsea, Siuslaw, Umpqua, Coos, and Coquille.

The historical disturbance regime in the central Oregon Coast Range was dominated by a mixture of high and low-severity fires, with a natural rotation of approximately 271 years. Old-growth forest coverage in the Oregon Coast Range varied from 25% to 75% during the past 3,000 years, with a mean of 47%, and never fell below 5% (Wimberly *et al.* 2000). Currently, the Coast Range has approximately 5% old-growth, almost all of it on federal lands. The dominant disturbance now is logging on a cycle of approximately 30 to 100 years, with fires suppressed.

Oregon's assessment of OC coho salmon (Nicholas *et al.* 2005) mapped how streams with high intrinsic potential for rearing are distributed by land ownership categories. Agricultural lands and private industrial forests have by far the highest percentage of land ownership in high intrinsic potential areas and along all coho salmon stream miles. Federal lands have only about 20% of coho salmon stream miles and 10% of high intrinsic potential stream reaches. Because of this distribution, activities in lowland agricultural areas are particularly important to the conservation of OC coho salmon.

The OC coho salmon assessment concluded that at the scale of the entire domain, pools are generally abundant, although slow-water and off-channel habitat (which are important refugia for coho salmon during high winter flows) are limited in the majority of streams when compared to reference streams in minimally-disturbed areas. The amount of large wood in streams is low in all four ODFW monitoring areas and land-use types relative to reference conditions. Amounts of fine sediment are high in three of the four monitoring areas, and were comparable to reference conditions only on public lands. Approximately 62% to 91% of tidal wetland acres (depending on estimation procedures) have been lost for functionally and potentially independent populations of coho salmon.

As part of the coastal coho salmon assessment, the ODEQ analyzed the status and trends of water quality in the range of OC coho salmon using the Oregon water quality index, which is based on a combination of temperature, dissolved oxygen, biological oxygen demand, pH, total solids, nitrogen, total phosphates, and bacteria. Using the index at the species scale, 42% of monitored sites had excellent to good water quality, and 29% show poor to very poor water quality (ODEQ 2005). Within the four monitoring areas, the North Coast had the best overall conditions (six sites in excellent or good condition out of nine sites), and the Mid-South coast had the poorest conditions (no excellent condition sites, and only two out of eight sites in good condition). For the 10-year period monitored between 1992 and 2002, no sites showed a declining trend in water quality. The area with the most improving trends was the North Coast, where 66% of the sites (six out of nine) had a significant improvement in index scores. The Umpqua River basin, with one out of nine sites (11%) showing an improving trend, had the lowest number of improving sites.

For each watershed, the NMFS CHART identified the key management activities affecting the PCEs and rated watershed conservation values and migratory corridor conservation values. The watershed conservation value is the relative importance of the watershed to conservation of the ESU (NMFS 2007). The corridor conservation value reflects the conservation value of the spawning areas to which it connects and the fish it serves (NMFS 2007). Within the Oregon Coast Recovery domain, there are three fifth-field watersheds in the action area (Table 15).

Table 15. OC coho salmon CHART ratings of the critical habitat units (fifth-field watersheds) affected by the proposed action (NMFS 2007).

Fifth-field watershed (HUC)	Key Management Activities affecting PCEs	Watershed Conservation Value	Corridor Conservation Value
South Fork Coquille River*	Agriculture, Forestry, Grazing	High	High
Lower Coquille River	Agriculture, Forestry	High	High
Sixes River	Agriculture, Forestry, Grazing, Irrigation Impoundments, Sand and Gravel Mining	High	----

*Critical habitat is not designated above Powers, Oregon, at RM 34, approximately four miles downstream of the RRSNF boundary.

<u>Southern Oregon/Northern California Coast Recovery Domain</u>. In this recovery domain critical habitat has been designated for SONCC coho salmon. Many large and small rivers supporting significant populations of coho salmon flow through this area, including the Elk, Rogue, Chetco, Smith and Klamath. The following summary of critical habitat information in the Elk, Rogue (including the Illinois subbasin), and Chetco Rivers also generally applies to habitat characteristics and limiting factors in other basins in this area.

The Elk River flows through Curry County, and drains approximately 92 square miles (or 58,678 acres) (Maguire 2001a). Historical logging, mining, and road building have degraded stream and riparian habitats in the Elk River basin. Limiting factors identified for salmon and steelhead production in this basin include sparse riparian cover, especially in the lower reaches, excessive fine sediment, high water temperatures, and noxious weed invasions (Maguire 2001a).

The Rogue River drains approximately 5,160 square miles within Curry, Jackson, and Josephine counties in southwest Oregon. The mainstem is about 200 miles long and traverses the coastal mountain range into the Cascades. The Rogue River estuary has been modified from its historical condition. Jetties were built by the U.S. Army Corps of Engineers (USACE) in 1960, which stabilized and deepened the mouth of the river. A dike that extends from the south shore near Highway 101 to the south jetty was completed in 1973. This dike created a backwater for the large shallow area that existed here, which has been developed into a boat basin and marina, eliminating most of the tidal marsh.

The quantity of estuary habitat is naturally limited in the Rogue River. The Rogue River has a large drainage area, but its 1,880 acre estuary is one of the smallest among Oregon's coastal rivers. 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). Jetties constructed in 1960 to stabilize the mouth of the river and prevent shoaling have altered the Rogue River, which historically formed a sill during summer months (Hicks 2005).

The Lower Rogue Watershed Council's watershed analysis (Hicks 2005) lists factors limiting fish production in tributaries to the Lower Rogue River watershed. The list includes water temperatures, low stream flows, riparian forest conditions, fish passage and over-wintering habitat. Limiting factors identified for the Upper Rogue River basin include fish passage barriers, high water temperatures, insufficient water quantity, lack of large wood, low habitat complexity, and excessive fine sediment (Rogue Basin Coordinating Council 2006).

The Illinois River is an important tributary to the Rogue River with the confluence at River Mile 27.1. The total area drained by the Illinois River is approximately 989 square miles and makes up about one-fifth of the Rogue River basin (Rogue Basin Coordinating Council 2006). The headwaters primarily flow from the Kalmiopsis Wilderness and the Siskiyou Crest in southern Oregon, but a small portion also stems from the Siskiyou Wilderness in northern California (USFS 2015). Ownership in the Illinois River subbasin is mainly Federal, at 81%, and the remainder split between private ownership (18%) and state ownership (1%). The dominant land uses are agriculture, residential, urbanization, logging, mining, and recreation. Early placer and hydraulic mining profoundly altered riparian habitats and resulted in extensive channel modification and elimination of stream complexity that are still in various degrees of recovery (USFS 1999, Rogue Basin Coordinating Council 2006). While the Illinois River subbasin has better ambient water quality than many other Rogue River subbasins, it has widespread temperature impairment. Much of the subbasin has summer temperatures that exceed conditions desirable for salmonid rearing (McHugh 1999). Average water quality is generally considered good (ODEQ 2008). However, low flows and high temperatures in the summer increase total solids, biochemical oxygen demand, and pH (Cude undated). Hydrologic function in the Illinois River subbasin is altered by water diversion, roads, and riparian disturbance. The three watersheds in the Illinois River subbasin with the highest proportion of high value core coho salmon areas are the East Fork Illinois River, Sucker Creek, and Althouse Creek (Oregon Plan 1997). Areas of high intrinsic potential are located in the mainstem Illinois River, East Fork Illinois River, West Fork Illinois River, Althouse Creek, Sucker Creek, and Deer Creek (NMFS 2014).

The Chetco River estuary has been significantly modified from its historical condition. Jetties were erected by the USACE in 1957, which stabilized and deepened the mouth of the river. These jetties have greatly altered the mouth of the Chetco River and how the estuary functions as habitat for salmon migrating to the ocean. A boat basin and marina were built in the late 1950s and eliminated most of the functional tidal marsh. The structures eliminated shallow water habitats and vegetation in favor of banks stabilized with riprap. Since then, nearly all remaining bank habitat in the estuary has been stabilized with riprap. The factors limiting fish production in the Chetco River appear to be high water temperature caused by lack of shade, especially in tributaries, high rates of sedimentation due to roads, poor over-wintering habitat due to a lack of large wood in tributaries and the mainstem, and poor quality estuary habitat (Maguire 2001b).

Designation-wide, critical habitat for SONCC coho salmon includes all areas accessible to any life-stage up to long-standing, natural barriers and adjacent riparian zones (64 FR 24049). SONCC coho salmon critical habitat within this geographic area has been degraded from historical conditions by ongoing land management activities. Habitat impairments recognized as factors leading to decline of the species were included in the original listing notice for SONCC coho salmon: (1) Channel morphology changes; (2) substrate changes; (3) loss of in-stream roughness; (4) loss of estuarine habitat; (5) loss of wetlands; (6) loss/degradation of riparian areas; (7) declines in water quality; (8) altered stream flows; (9) fish passage impediments; and (10) elimination of habitat (62 FR 24588).

Within the Southern Oregon Recovery domain, there are 32 fifth-field watersheds in the action area, consisting of those listed in Table 1 and the Lower Smith River (HUC: 1801010104), Rogue River-Shady Cove (HUC: 17100030707), Rogue River-Gold Hill (HUC: 1710030802), Rogue River –Grants Pass (HUC: 1710030804), and Rogue River – Horseshoe Bend (HUC: 1710031004).

2.3 Environmental Baseline

The "environmental baseline" includes the past and present impacts of all Federal, state, or private actions and other human activities in the action area, the anticipated impacts of all proposed federal projects in the action area that have already undergone formal or early section 7 consultation, and the impact of state or private actions which are contemporaneous with the consultation in process (50 CFR 402.02).

As described above in the Status of the Species and Critical Habitat sections, factors that limit the recovery of species considered in this opinion vary with the overall condition of aquatic habitats on private, state, and federal lands. Within the program-level action area, many stream, estuarine, and riparian areas have been degraded by the effects of land and water use, including road construction, forest management, agriculture, mining, urbanization, and water development. Each of these economic activities has contributed to a myriad of interrelated factors for the decline of species considered in this opinion. Among the most important of these are changes in stream channel morphology, degradation of spawning substrates, reduced in-stream roughness and cover, loss and degradation of estuarine rearing habitats, loss of wetlands, loss and degradation of riparian areas, water quality (e.g., temperature, sediment, dissolved oxygen, contaminants) degradation, blocked fish passage, direct take, and loss of habitat refugia. Climate change is likely to play an increasingly important role in determining the abundance of ESA-listed species, and the conservation value of designated critical habitats, in the Pacific Northwest.

Gold mining on the RRSNF dates back to 1850 and the RRSNF is where gold was first discovered in Oregon. Manual mining methods were applied in the early years when production of one ounce per day was considered nominal. Hundreds of thousands of prospectors and miners flooded into southern Oregon operating their rockers, "Long Toms", and sluice boxes. Mining was intensive, often with thousands of miners working in the same drainage in the same year. The area was rich, with one stream, Althouse Creek, recorded as producing over 0.5 ounces of gold for every five-gallon bucket of dirt. These mining methods were employed primarily within the stream bed and nearby bench deposits. By the 1860s, this early gold rush was fading, with many areas considered to be "worked-out." Industrial operations, using hydraulic water cannons, and bucket and dragline dredging followed the individual miners. Intensive operations that blasted, dredged, turned, and piled millions of cubic yards of silt, sand, gravel, and boulders were common. Many of the richer streams such as Galice Creek, Briggs Creek, Josephine Creek, Althouse Creek, and Sucker Creek were worked bank to bank their entire length a number of times. Operations such as this continued into the early 1900s, reshaping the stream courses many times. Effects from legacy mining are still visible throughout the watersheds and contribute to degraded abundance and habitat conditions for coho salmon. However, since the early 1900s, comparatively little mining occurred on the RRSNF until the advent of the portable, "one-man", suction dredge in the 1960s. In the 1970s and 1980s, suction dredging developed into a popular recreational activity with interest spiking in the early 1980s when gold prices were high, similar to recent high gold prices. Extensive historical mining also occurred in the upper Chetco River and Upper Applegate River.

Mercury was widely used in gold and silver amalgamation in Oregon's historical mining areas. Mercury also occurs naturally in southwest Oregon and was commercially mined in the Rogue Basin (Figure 17) and along Oregon's south coast (Brooks 1959, Meyers 2011, Blake 2013). Mercury is not naturally occurring in the Sixes River drainage (USFS 2015).

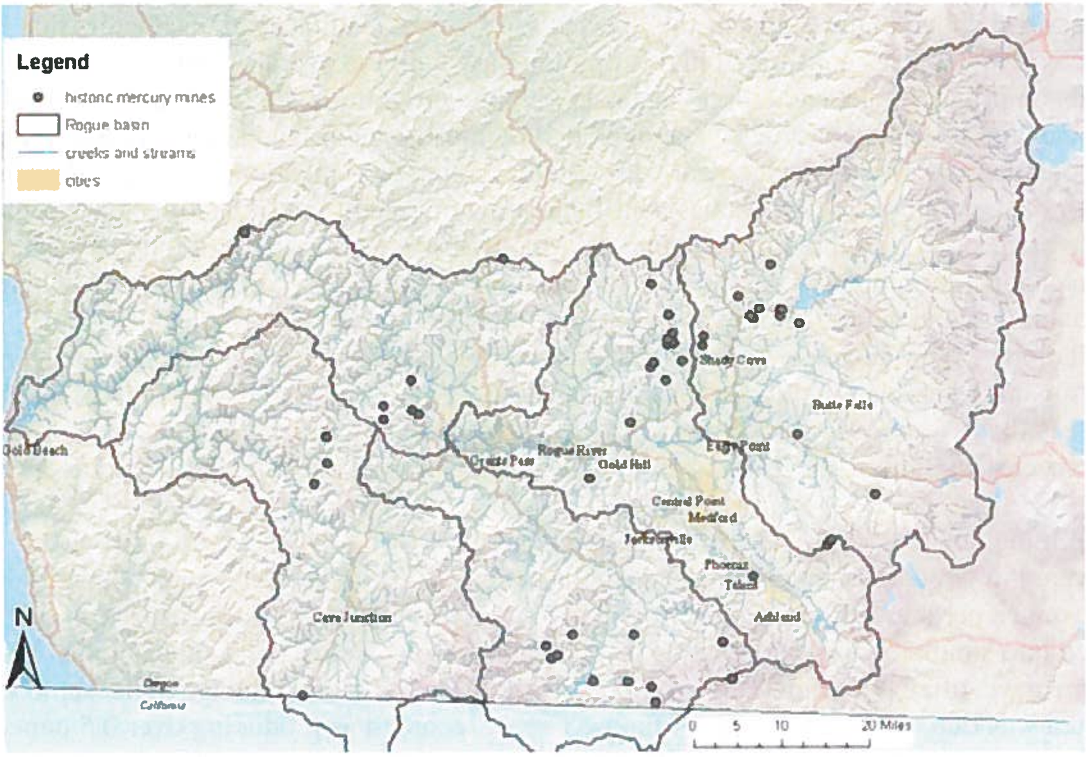

Figure 17. Historic commercial mercury mines in the Rogue River basin (Meyers 2011).

In 2013, ODSL noted that the greatest suction dredge activity levels take place in the southwest and northeast quarter of Oregon. The Rogue River is one of the rivers experiencing the most use (Figures 18 and 19). As of March 4, 2013, 72 reports had been submitted to ODSL for the Rogue River, indicating 447 days mined and 445 cubic yards (cy) of volume disturbed during the 2012 operating season. In the summer of 2013, ODEQ issued approximately 1,337 suction dredge 700-PM general permits (ODSL 2014b). However, numbers decreased in 2014 with 536 DEQ-issued 700PM permits (ODEQ 2015b). The ODSL issued 414 recreational placer mining general authorizations (GA) in 2005 and 1,538 were issued during 2013 (ODSL 2013, ODSL 2014b). The ODSL stated that this increase has been fueled by rising gold prices and "according to data collected by ODEQ they are not seeing a disproportionate increase in applicants from other states" (ODSL 2013).

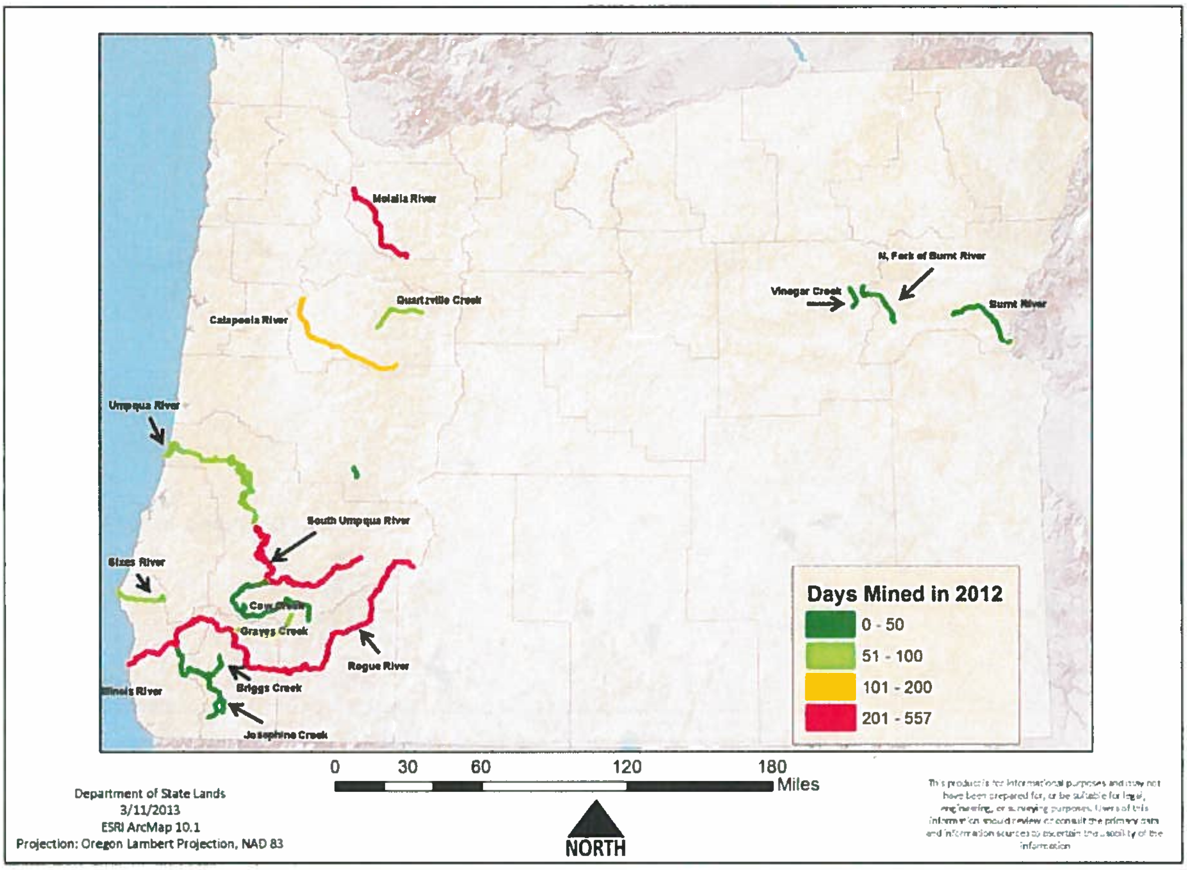

Figure 18. Reported data for number of days mined in 2012, as of March 4, 2013 (ODSL 2013).

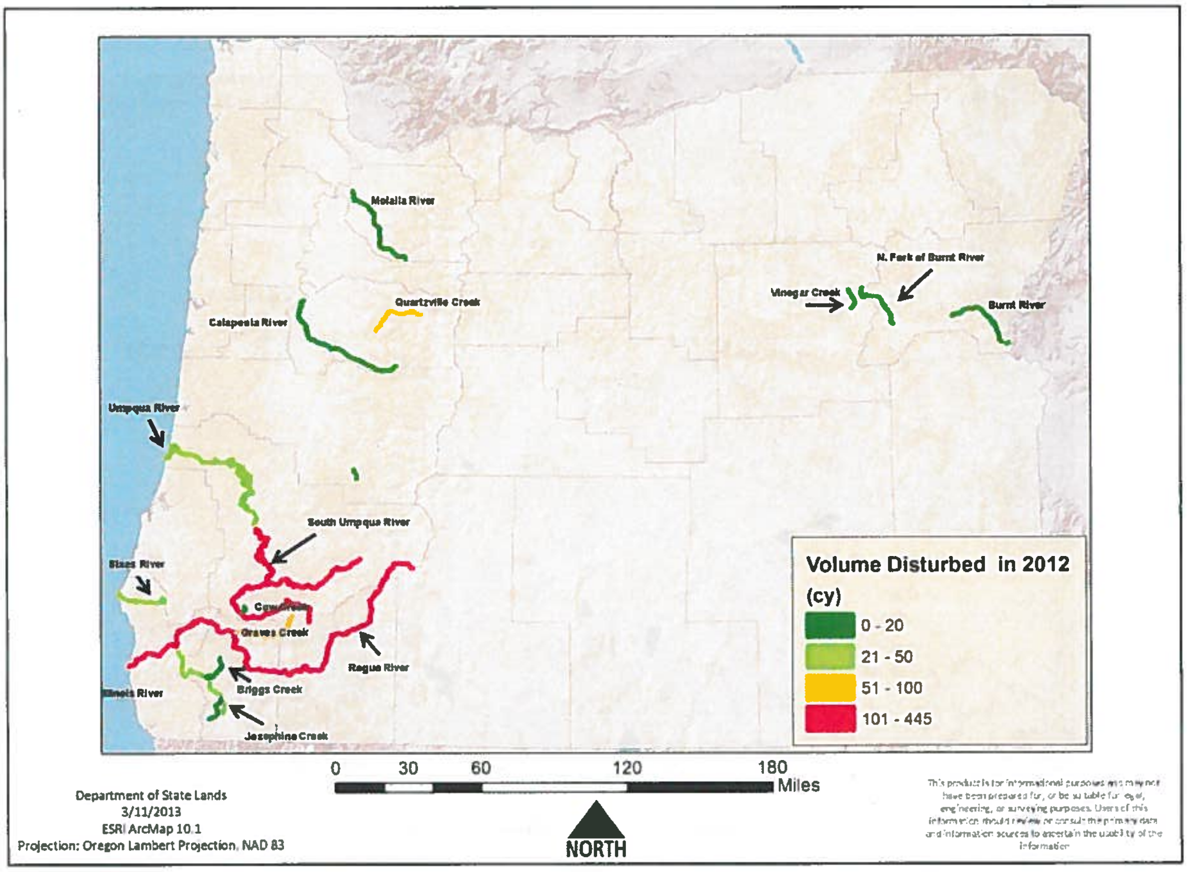

Figure 19. Reported data for amount of volume disturbed in 2012, as of March 4, 2013 (ODSL 2013).

Placer mining claims filed on the RRSNF, as recorded on May 8, 2013, and within NOI-basins were approximately 710 total; approximately 394 were located within 0.25 mile upstream of and within coho salmon designated critical habitat.[27] However, the actual number of people operating in streams on NFS lands within the RRSNF may be less since some people could maintain claims they do not actually mine. Twenty-two watersheds on the RRSNF had active filed placer claims and 75% of those claims were located on the Illinois River. Suction dredge mining also occurs on private lands and lands administered by the U.S. Bureau of Land Management (BLM) but our best estimate of activity is the data reported by ODEQ in 2014. In the 29 watersheds that are part of the NOI-level project action area, ODEQ issued 146 suction dredge permits in 2014, and of these, 125 (86%) were issued in the NOI-level action area (i.e., RRSNF lands with coho/CH and 0.25 mile upstream of coho/CH). For the SONCC coho salmon ESU, 67% of the ODEQ-issued permits in the NOI-level action area were on lands managed by the RRSNF while 11% were on lands managed by the BLM and 22% were on private land (USFS 2015). For the OC salmon ESU, 22% of the ODEQ-issued permits in the NOI-level action area were on lands managed by the RRSNF while 26% were on lands managed by the BLM and 52% were on

[27] E-mails from Susan Maiyo, RRSNF, to Michelle McMullin, NMFS (February 2, 2016 and February 9, 2016)(correcting errors in BA regarding the number of filed placer mining claims).

private land (USFS 2015). The subbasin with the greatest total number of 2014 ODEQ-issued permits was the Middle Rogue River (USFS 2015). Because the number of active filed placer claims is larger than the 2009-2012 NOIs and the 2014 ODEQ-issued suction dredge permits, we can only use the active filed placer claims as an indication of relative suction dredge and high banking activity and not as an absolute amount.

Each suction dredge operator, if properly following the conditions of their Oregon permits, is restricted in the amount of gravel they can move per season, in the amount of turbidity they can generate, the size of the equipment they can operate, and when they can operate. However, they can move boulders, logs, and habitat structure within the stream channel, decrease food items for juvenile coho salmon during the summer, entrain or pass small fish through the dredge, and create unstable tailings that coho salmon spawn on prior to redistribution by winter flows decreasing spawning success by scouring or washing away eggs. Lack of monitoring and small number of scientific studies regarding suction dredging provide little knowledge regarding long-term effects. Unintentional spills of fuel do occur, and many agencies, miners, and environmental organizations note that not all miners follow the conditions of Oregon permits (Bernell *et al.* 2003), which results in greater impacts including removal of habitat structure; destruction of riparian vegetation; bank erosion and destabilization; large amounts of sedimentation; damming of the channel, water diversions, fish passage obstructions, and associated temperature increases; and changes in channel morphology. Combined impacts from multiple dredges operating at once or in the same spot repeatedly have not been adequately studied (Bernell *et al.* 2003), but continual rearrangement of in-stream structure is likely to simplify channel form and reduce habitat complexity required for successful coho salmon rearing.

Between 2009 and 2012, an average of 23.6 and a maximum of 41 NOIs for suction dredging and/or high banking were submitted annually on NFS lands within the RRSNF. Based on a standard formula[28], the RRSNF estimated the area disturbed by mining per NOI.[29] For NOIs that did not report the volume of material disturbed, they assumed the maximum allowance of disturbance (i.e., approximately 25 cubic yards). They also determined whether the mining occurred in spawning/rearing habitat, rearing/migration habitat, or migration only habitat for coho salmon and determined the total amount of critical habitat within each watershed. Within each watershed, these NOIs annually affected only a small proportion of designated critical habitat, ranging from 0.005% to 0.148% per watershed (Table 16; for detailed NOI information, see Chapters IV, Sections C/D (Environmental Baseline) in USFS 2015). However, these figures may underestimate the number of people actually suction dredging or high banking within the RRSNF because some operators participating in these activities may not necessarily submit a

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[28] Standard formula used by the RRSNF to calculate the total surface area of disturbance for a maximum allowance per NOI of approximately 25 cubic yards = 15 feet (length) X 15 feet (width) X 3 feet (depth). This is based on what the RRSNF considers a typical average depth dredged by miners in streams in the RRSNF, which has also been used in other estimates of disturbance (ORAFS 2013). When a different amount of cubic yardage was reported for the NOI, the width and depth were held constant.

[29] NMFS does recognize that multiple studies report average dredge depths slightly greater than that estimated by the RRSNF (Hassler *et al.* 1986, Stern 1988, Somer and Hassler 1992). However, because none of these studies occurred in southwestern Oregon, NMFS defers to the professional expertise of specialists on the RRSNF for local knowledge.

NOI to the RRSNF.[30] Most NOI operations occurred in areas used by coho salmon for spawning and rearing.

Table 16. Proportion of critical habitat mined annually by NOIs 2009-2012 in each of the NOI-level project area watersheds.

Watershed	Total Critical Habitat within the watershed (miles)	Proportion of Critical Habitat in the watershed Annually Mined, by NOIs 2009-2012, based on an estimated stream length
Chetco River	155.4	0.025%
Elk River	58.6	0.005%
Althouse Creek	14.2	N/A
Briggs Creek	0.7	N/A
Deer Creek	56.4	0.005%
East Fork Illinois River	32.0	N/A
Indigo Creek	30.3	N/A
Josephine Creek – Illinois River	49.4	0.148%
Klondike Creek – Illinois River	42.7	N/A
Lawson Creek – Illinois River	20.8	N/A
Silver Creek	22.1	0.013%
Sucker Creek	29.8	0.006%
West Fork Illinois River	57.4	N/A
Lobster Creek	27.0	0.011%
Lower Rogue River	51.8	N/A
Lower Applegate River	81.3	N/A
Middle Applegate River	43.3	N/A
Upper Applegate River	30.2	0.028%
Hellgate Canyon – Rogue River	68.4	N/A
Shasta Costa Creek – Rogue River	22.1	N/A
Stair Creek – Rogue River	17.3	N/A
Pistol River	49.6	N/A
North Fork Smith River	55.8	0.006%
Bear Creek	86.7	N/A
Elk Creek	53.7	N/A
Little Butte Creek	78.0	N/A
Winchuck River	50.4	N/A
South Fork Coquille River	96.2*	0.005%*
Sixes River	67.5**	0.017%

*Critical habitat is not designated above Powers, Oregon, at RM 34, approximately four miles downstream of the RRSNF boundary in the South Fork Coquille River watershed. The RRSNF used distribution as a surrogate for critical habitat in this watershed. However, NMFS has estimated distribution to be approximately 131 miles and critical habitat to be approximately 75 miles and these are the values used for analysis in this opinion.[18]
**NMFS (2007) estimated approximately 58.4 miles of critical habitat for OC coho salmon in the Sixes River fifth-field watershed and this is the value used for analysis in this opinion.

[30] Under U.S. Forest Service mining regulations (36 CFR 228, subpart A), a NOI is required for any operations which might cause significant disturbance of surface resources; NOI submission is triggered by the operator's reasonable uncertainty as to the significance of the potential disturbance on surface resources. If the operator reasonably concludes that the proposed operations will not cause significant disturbance of National Forest System resources, the operator is not required to submit a notice of intent to operate.

Mercury and methylmercury are contaminants; methylmercury is a highly toxic and organic form of mercury that passes more easily into the brain. Methylmercury is efficiently transferred through the aquatic food web and concentrations increase with each additional step in the food chain in a process known as biomagnification. In this process, consumers retain and further concentrate much of the methylmercury of their prey; when this organism gets eaten it passes this greater concentration on to that consumer. This means that higher-level predators build up greater and more dangerous amounts of toxic materials than organisms lower on the food chain.

Nearly all mercury accumulated in fish tissue (95–99%) is in the form of methylmercury, although the percentage of methylmercury to total mercury in the muscle tissue increases as the fish ages (Bache *et al.* 1971, Bloom 1992). Methylmercury analysis costs two to three times more than total mercury analysis (EPA 2000) and many studies only analyze total mercury concentrations in fish, especially because the U.S. Environmental Protection Agency (EPA) recommends that total mercury be determined in fish contaminant monitoring programs so as to be most protective of human health. However, concentrations of mercury in fish are appropriate representations of methylmercury concentrations, although perhaps slight overestimates especially for younger or non-piscivorous fish like juvenile coho salmon. Piscivores eat other fish while invertivores eat insects; juvenile coho salmon in freshwater are invertivores.

From existing literature and largely based on sublethal endpoints, Beckvar *et al.* (2005) identified 0.2 ppm as a whole-body mercury tissue threshold, below which adverse effects in most juvenile and adult fish are unlikely. However, Alpers *et al.* (2008) noted that subtle behavioral effects may occur at lower concentrations. Sandhenreich and Weiner (2011) concluded that changes in biochemical processes, damage to cells and tissues, and reduced reproduction in fish occur at methylmercury concentrations of about 0.3-0.7 ppm wet weight in the whole body and about 0.5-1.2 ppm wet weight in axial muscle; correlations indicative of adverse effects in wild fishes have been reported for multiple field studies in which maximal tissue concentrations were less than 1.0 ppm wet weight (Webb *et al.* 2006, Moran *et al.* 2007, LaRose *et al.* 2008). Additionally, 0.1 ppm is the level deemed protective for fish-eating mammals (Peterson *et al.* 2002).

Peterson *et al.* (2002) sampled fish in Oregon to assess freshwater mercury contamination in fish tissue using whole-fish samples. Coho salmon were not sampled. Cutthroat trout only exceeded 0.1 parts per million (ppm) wet weight in an inferred 15% of the stream lengths where they occurred. The overall mean concentration for large invertivores was 0.055 ppm (SD 0.047). Mercury was also present in other fish species and piscivores (pikeminnow, largemouth bass, and smallmouth bass) had significantly higher mercury levels, up to five times higher than western Oregon invertivores.

Peterson *et al.* (2002) was a probability study of all of Oregon streams and rivers; therefore fish in the action area, including coho salmon, will also contain mercury as part of their baseline condition. Because most mercury in fish is assimilated through the food web, mercury and methylmercury are also present in macroinvertebrates as a baseline condition. Methylmercury concentrations have been documented in mayfly, stonefly, caddisfly, and dragonfly larvae (Slotton *et al.* 1997, Hall *et al.* 1998, Mason *et al.* 2000, Naimo *et al.* 2000, Murphy 2004, Chasar *et al.* 2009, Fleck *et al.* 2011). Bioaccumulation through the food chain is not linear;

larger and older piscivorous fish have greater accumulations than non-piscivorous fish. Oregon pikeminnow and bass of a size where they actively feed on fish had mean mercury concentrations of 0.284 ppm (SD 0.175; Peterson *et al.* 2002). The ODEQ sampled pikeminnow from the Rogue River, although only 5 valid individual tissue samples at each location, and these fish contained mercury concentrations with geometric means of 0.433 and 0.516 ppm wet weight (ODEQ 2012). The ODEQ did not include anadromous salmon in their mercury studies "because they spend limited time feeding in Oregon rivers or lakes and generally contain lower levels of mercury" (Matzke 2014). Although there are no records of mercury concentrations in coho salmon juveniles, we anticipate that baseline concentrations will be similar to those of cutthroat trout rather than the larger, resident, piscivorous fish like pikeminnow, because juvenile salmon in freshwater do not consume fish. Using information from peer-reviewed articles and limited existing data for non-coho salmon in the Rogue River, RRSNF hypothesized that baseline conditions for mercury concentrations in fish tissue of juvenile coho salmon in the Rogue River may be in the range of 0.12 to 0.21 ppm wet weight whole body.

There is limited information regarding mercury in Oregon estuaries, however a study was conducted in 1999 that sampled 15 estuaries, including the Rogue River estuary (Sigmon *et al.* 2006). Fish tissue maximum mercury concentrations were 0.054 ppm wet weight, with approximately 90% of all estuarine areas resulting in fish tissue concentrations less than 0.029 ppm (Sigmon *et al.* 2006). Sediment mercury concentrations were detected at all stations, ranging from 0.02 to 0.24 ppm, and 10% of all estuarine samples exceeded the mercury "Effects Range Low" (ERL) of 0.15 ppm; concentrations below the ERL value represent a range intended to estimate conditions in which effects would rarely be observed (Long *et al.* 1995). Mercury was also detected in estuarine sediments of the Rogue River, with one sample narrowly exceeding the ERL, which is representative of a range within which effects would occasionally occur (Long *et al.* 1995). Also in the Rogue River estuary, mercury was detected in shiner surf perch in 2001 and in Pacific staghorn sculpin in 2004, although no measurements were provided (Meyers 2011).

Mercury concentrations in fish from the San Francisco Bay-Delta are high (Lee *et al.* 2011) and mercury contamination in San Francisco Bay is at least partially from upstream historic hydraulic gold mining (Gehrke *et al.* 2011). Because the only confirmed spawning site for Southern DPS green sturgeon is in the Sacramento River (NMFS 2010), which flows into the San Francisco Bay, this may be problematic for Southern DPS green sturgeon individuals because they spend 1-3 years here prior to outmigration to estuaries in the action area. We do not have information for green sturgeon, nor do we know if white sturgeon are appropriate proxies for green sturgeon in terms of mercury concentrations, but samples of approximately 4.5-foot white sturgeon from San Francisco Bay average 0.28-0.31 ppm (Hunt et al. 2006, Gassel *et al.* 2006); however, green sturgeon may have relatively less exposure to contaminants due to their greater migratory behavior (71 FR 17757). Returning adult Chinook salmon (hatchery-raised) in San Francisco Bay have mean mercury concentrations of 0.08-0.09 ppm (Hunt et al. 2006, Gassel *et al.* 2006). The Smith River estuary in California is highly impacted by pesticides and fungicides used by lily bulb farms, including copper, but there is no information available regarding mercury concentrations.

Although atmospheric deposition and historical mercury mining accounts for some of the existing mercury concentrations found in fish, streams with a historical gold mining legacy, such as those on the RRSNF, also contain mercury in their sediments, because historically, miners commonly used mercury to separate gold from sediment (Slowey *et al.* 2005). Stream sediments contain legacy mercury, especially those areas in contact with bedrock or otherwise protected from mobilization during yearly high flows. When buried in sediment the mercury is relatively harmless. Conversely, disturbance of those areas containing legacy mercury remobilizes it into the aquatic environment where it can methylate and enter the food web, especially in downstream estuaries (Alpers *et al.* 2005, Lambertsson and Nilsson 2006, Evers *et al.* 2008, Merritt and Amirbahman 2008, Chen *et al.* 2009, Singer *et al.* 2013). However, some estuarine habitats are more conducive to methylmercury production than others (Eagles-Smith and Ackerman 2014) and demethylation also occurs; both production and degradation of methylmercury occur simultaneously (Lambertsson and Nilsson 2006, Hsu-Kim *et al.* 2013). The rate of methylation relative to demethylation determines the amount of methylmercury present in aquatic systems. Estuarine methylmercury can be found in the water column, in sediment, and in sediment pore waters.

As described in Section 2.2.1, coho salmon distribution within the action area can be highly variable, both spatially and temporally, especially within the SONCC ESU. Coho salmon are a highly migratory species and they are dependent on fluctuations in marine survival; although individuals may not be found in an area at a particular time, they may be present in that same area at another time. Although abundance is depressed, we expect coho salmon will be present in areas designated as critical habitat for at least some time during the duration of the proposed action. Additionally, coho salmon are also present on the RRSNF in the South Fork Coquille watershed even though critical habitat is not designated upstream of Powers, Oregon, at RM 34.

Currently there is only one fishery targeting wild coho salmon in the action area and that is the Coquille coho salmon fishery, managed under Amendment 13 of the Pacific Coast Salmon Management Plan (see Section 2.2.1).

Many formal consultations have been completed in the program-level action area. Effects from the various formal consultations are a mix of beneficial and negative effects. Some of the effects were one-time effects with a short-duration. Other effects have a long-term presence in the action area. Restoration actions, such as removal of major dams within the Rogue Basin, are likely to improve population abundance and productivity over the long-term. Overall, consultation aims to minimize the adverse effects of the projects, such that while there have been a lot of actions, those actions were conducted in a way that avoided severe, long-term negative effects on SONCC and OC coho salmon and their designated critical habitat, and on Southern DPS green sturgeon. In 2014, NMFS completed a consultation for BLM regarding their approval of a mining plan of operations for proposed production gold mining activities along 1,300 feet of Sucker Creek in the Illinois River subbasin. The proposed action would have excavated 2.6 acres in the adjacent riparian and upland areas and would have resulted in long-term water temperature increases for 1.2 miles of Sucker Creek and a reduction in wood recruitment resulting in decreased in-stream habitat complexity. In that consultation NMFS determined the effects would jeopardize SONCC coho salmon and adversely modify designated critical habitat; NMFS modified the proposed action with a reasonable and prudent alternative to minimize adverse effects, to avoid delaying or preventing the recovery of the SONCC coho salmon ESU, and to avoid precluding the survival of the ESU.

Additional restoration actions have been completed by the RRSNF and BLM in the NOI-level action area watersheds. Most recently, from 2013-2014, a total of 12 restoration projects were implemented including in-stream large wood, boulder and gravel placements, fish passage improvements, and non-native invasive plant control.[31] Other restorative actions in these watersheds included riparian plantings, in-stream gravel augmentation, and road/trail erosion control and decommissioning. Restoration actions may have short-term adverse effects, but generally result in long-term improvements to habitat condition and population abundance, productivity, and spatial structure.

While there has been substantial habitat degradation across all land ownerships, habitat in many U.S. Forest Service (USFS) headwater stream segments is generally in better condition than in the largely non-federal lower portions of tributaries (Quigley *et al.* 1996). The condition of aquatic habitats on federal lands varies from excellent in wilderness, roadless, and undeveloped areas to poor in areas heavily impacted by development and natural resources extraction. Because federal lands are generally forested and situated in upstream portions of watersheds, USFS lands now contain much of the highest quality aquatic habitat remaining in Oregon. USFS (2015) describes the environmental baseline of OC and SONCC coho salmon populations and of the 29 fifth-field watersheds where NOIs will be authorized. The RRSNF used data collected from stream surveys, water quality monitoring, queries of GIS databases, and watershed analyses, when available, to determine environmental baseline conditions, but in many cases data were not available and best professional judgment was used. The RRSNF rated environmental baseline conditions as "properly functioning" (PF), "functioning at risk" (FAR), or "not properly functioning" (NPF; NMFS 1996). Generally speaking, the rating describes whether the watershed provides functional habitat to support coho salmon with either low levels of impact or degraded habitat conditions (PF), moderate levels of impact or degraded habitat conditions (FAR), or has severe impacts and severe degraded habitat conditions (NPF). The indicators rated by the RRSNF are relevant to PCEs (OC coho salmon) and to essential features (SONCC coho salmon) of critical habitat[17] as described in Table 17. These ratings of the current functioning of critical habitat are the result of all past and present mining, road construction, logging, water withdrawal, urbanization, agriculture, wildfire (including the 2002 Biscuit Fire), fire suppression, restoration actions, and other actions affecting that indicator.

[31] E-mails from Scott Peets, U.S. Forest Service Region 6, to Michelle McMullin, NMFS (March 2 and 3, 2015) (providing a list of restoration projects implemented in the action area by the RRSNF and BLM).

Table 17. Crosswalk between critical habitat primary constituent elements/essential features and associated matrix pathway and indicators (MPI) for ESA-listed salmon species with designated or proposed critical habitat.

Primary Constituent Elements/ Essential Features - OC/SONCC coho salmon critical habitat	Associated MPI Pathways and Indicators rated by the RRSNF in Tables 18 and 19
Spawning and/or juvenile rearing habitat, as defined by water quality, water temperature, water quantity, substrate or spawning gravel	**Pathway:** water quality **Indicators:** temperature, chemical/nutrients, suspended sediment/turbidity **Pathway:** flow/hydrology **Indicators:** Change in peak/base flow, drainage network **Pathway:** habitat elements **Indicator:** substrate/sediment **Pathway:** watershed conditions **Indicators:** road density and location, riparian reserves, disturbance history, disturbance regime
Spawning and/or juvenile rearing habitat as defined by adequate water quantity and floodplain connectivity	**Pathway:** flow/hydrology **Indicators:** change in peak/base flow, drainage network **Pathway:** channel conditions and dynamics **Indicator:** floodplain connectivity **Pathway:** watershed conditions **Indicators:** road density and location, riparian reserves, disturbance history, disturbance regime
Spawning and/or juvenile rearing habitat as defined by adequate natural cover or cover/shelter, space, riparian vegetation, and forage/food	**Pathway:** habitat elements **Indicators:** large wood, pool frequency and quality, off-channel habitat, refugia **Pathway:** channel condition and dynamics **Indicators:** width depth ratio, stream bank, floodplain connectivity **Pathway:** water quality **Indicators:** temperature, chemical/nutrients, suspended sediment/turbidity **Pathway:** watershed conditions **Indicators:** riparian reserves, disturbance history, disturbance regime
Migration habitat as defined by habitat free of artificial obstructions or safe passage, and adequate water quality, water temperature, water quantity, water velocity, substrate, food, riparian vegetation, space, and natural cover or cover/shelter	**Pathway:** habitat access **Indicator:** physical barriers **Pathway:** water quality **Indicators:** temperature, chemical/nutrients, suspended sediment/turbidity **Pathway:** flow/hydrology **Indicator:** Change in peak/base flow **Pathway:** habitat elements **Indicator:** substrate/sediment, large wood, pool frequency and quality, off-channel habitat **Pathway:** watershed conditions **Indicators:** road density and location, riparian reserves, disturbance history, disturbance regime

Tables 18 and 19 summarize the environmental baselines of the 29 fifth-field watersheds with NOI-level project areas.

Table 18. Environmental baseline summary for OC coho salmon watersheds within the NOI-level project areas (USFS 2015, Table 16).[32]

ESU OC Coho Salmon population 5th Field watershed	% USFS Ownership	Pathways & Indicators *Codes*: PF = *Properly Functioning*; AR = *At Risk*; NPF = *Not Properly Functioning*																	
		Water quality			Habitat access/elements						Channel condition & dynamics			Flow/ hydrology		Watershed conditions			
		Temperature	Sediment/Turbidity	Chemical/Nutrients	Physical barriers	Substrate/Sediment	Large wood	Pool Freq. /Qual.	Off-Channel Habitat	Refugia	Width Depth Ratio	Stream bank	Floodplain	Peak/Base Flows	Drainage Network	Road Density & Loc.	Disturbance history	Riparian Reserves	Disturbance regime
Oregon Coast (OC) Coho Salmon ESU																			
1. Coquille - population																			
South Fork Coquille River watershed 1710030502	35	NPF	AR	PF	NPF	AR	AR	AR	AR	AR	NPF	AR	AR	AR	AR	AR	AR	AR	AR
2. Sixes - population																			
Sixes River watershed 1710030602	26	NPF	AR	PF	AR	AR	AR	AR	AR	AR	AR	AR	AR	AR	AR	AR	AR	AR	AR

Only one indicator (i.e., chemical/nutrients) rated as "properly functioning" for the two OC coho salmon watersheds. The majority of the remaining indicators rated as "at risk".

[32] The Lower Coquille River watershed is not included in this table.

Table 19. Environmental baseline summary for SONCC coho salmon watersheds within the NOI-level project areas (USFS 2015, Table 16).[33]

ESU SONCC Coho Salmon population 5th Field watershed	% USFS Ownership	Pathways & Indicators *Codes: PF = Properly Functioning; AR = At Risk; NPF = Not Properly Functioning*																	
		Water quality			Habitat access/elements						Channel condition & dynamics			Flow/ hydrology		Watershed conditions			
		Temperature	Sediment/Turbidity	Chemical/Nutrients	Physical barriers	Substrate/Sediment	Large wood	Pool Freq. /Qual.	Off-Channel Habitat	Refugia	Width Depth Ratio	Stream bank	Floodplain	Peak/Base Flows	Drainage Network	Road Density & Loc.	Disturbance history	Riparian Reserves	Disturbance regime
Southern Oregon/Northern California Coast (SONCC) Coho Salmon ESU																			
1. Chetco River - population																			
Chetco River watershed 1710031201	77	NPF	AR	PF	PF	AR	AR	AR	AR	AR	AR	AR	AR	AR	AR	AR	AR	AR	AR
2. Elk River - population																			
Elk River watershed 1710030603	76	NPF	AR	PF	PF	AR	AR	AR	AR	AR	AR	AR	AR	AR	AR	AR	AR	AR	AR
3. Illinois River – population																			
Althouse Creek watershed 1710031101	46	AR	PF	PF	PF	PF	NPF	NPF	NPF	AR	AR	PF	AR	AR	AR	AR	AR	AR	AR
Briggs Creek watershed 1710031107	95	NPF	PF	PF	PF	PF	AR	PF	PF	PF	AR	PF	AR	AR	AR	AR	PF	AR	AR
Deer Creek watershed 1710031105	11	NPF	NPF	PF	AR	AR	AR	PF	PF	NPF	PF	PF	AR	NPF	AR	AR	AR	AR	AR
EF Illinois River watershed 1710031103	63	NPF	AR	PF	AR	AR	NPF	NPF	AR	AR	AR	AR	AR	AR	AR	AR	AR	AR	AR
Indigo Creek watershed 1710031110	98	AR	PF	PF	PF	PF	PF	PF	PF	PF	PF	PF	PF	AR	AR	PF	PF	PF	PF
Josephine Creek-Illinois River watershed 1710031106	78	NPF	AR	PF	AR	AR	AR	AR	NPF	AR	AR	PF	AR	AR	AR	AR	AR	AR	AR
Klondike Creek-Illinois River watershed 1710031108	100	PF	PF	PF	PF	PF	PF	PF	PF	PF	PF	PF	PF	PF	PF	PF	PF	PF	PF
Lawson Creek-Illinois River 1710031111	94	AR	AR	AR	PF	PF	PF	PF	PF	PF	PF	AR	PF	AR	AR	AR	AR	AR	AR
Silver Creek watershed 1710031109	83	AR	AR	PF	PF	PF	PF	PF	PF	PF	PF	PF	PF	PF	AR	AR	PF	PF	PF

[33] The following watersheds are not included in this table: Lower Smith, Rogue River-Shady Cove, Rogue River-Gold Hill, Rogue River –Grants Pass, and Rogue River – Horseshoe Bend.

ESU SONCC Coho Salmon population 5th Field watershed	% USFS Ownership	Pathways & Indicators *Codes: PF = Properly Functioning; AR = At Risk; NPF = Not Properly Functioning*																	
		Water quality			Habitat access/elements						Channel condition & dynamics			Flow/ hydrology		Watershed conditions			
		Temperature	Sediment/Turbidity	Chemical/Nutrients	Physical barriers	Substrate/Sediment	Large wood	Pool Freq./Qual.	Off-Channel Habitat	Refugia	Width Depth Ratio	Stream bank	Floodplain	Peak/Base Flows	Drainage Network	Road Density & Loc.	Disturbance history	Riparian Reserves	Disturbance regime
Sucker watershed 1710031102	72	AR	AR	PF	AR	AR	NPF	NPF	AR	AR	AR	PF	PF	AR	AR	AR	AR	AR	AR
WF Illinois River watershed 1710031104	49	NPF	AR	PF	AR	AR	NPF	NPF	AR	AR	AR	AR	AR	AR	AR	AR	AR	AR	AR
Lower Rogue River - population																			
Lobster Creek watershed 1710031007	62	AR	AR	PF	PF	AR	AR	AR	AR	AR	PF	AR	AR	AR	AR	AR	AR	AR	AR
Rogue River watershed 1710031008	53	AR	AR	AR	AR	AR	AR	AR	PF	PF	PF	AR	PF	AR	AR	AR	AR	AR	AR
Middle Rogue/Applegate Rivers – population																			
Hellgate Canyon-Rogue River watershed 1710031002	32	AR	AR	PF	AR	AR	NPF	NPF	AR	AR	AR	AR	AR	AR	AR	AR	AR	AR	AR
Lower Applegate River watershed 1710030906	14	NPF	AR	PF	AR	AR	NPF	NPF	AR	AR	AR	PF	AR	AR	AR	AR	AR	AR	AR
Middle Applegate River watershed 1710030904	13	AR	AR	PF	AR	AR	NPF	NPF	NPF	NPF	AR	AR	AR	AR	AR	AR	AR	AR	AR
Shasta Costa Creek-Rogue River watershed 1710031006	96	AR	AR	AR	PF	AR	PF	AR	PF	PF	AR	AR	AR	AR	AR	AR	AR	AR	AR
Stair Creek-Rogue River watershed 1710031005	95	AR	AR	AR	PF	PF	PF	AR	AR	PF	PF	AR	PF	AR	PF	PF	PF	PF	PF
Upper Applegate River watershed 1710030902	52	NPF	AR	PF	PF	NPF	NPF	NPF	NPF	AR	AR	AR	NPF	NPF	AR	NPF	AR	AR	AR
1 Pistol River - population																			
Pistol River watershed 1710031204	53	NPF	NPF	PF	PF	AR	NPF	NPF	AR	AR	AR	AR	AR	AR	AR	AR	AR	AR	AR
2 Smith River - population																			
North Fork Smith River watershed 1801010101	99	PF	PF	PF	PF	PF	PF	PF	PF	PF	PF	PF	PF	PF	PF	PF	PF	AR	PF
3 Upper Rogue River - population																			
Bear Creek watershed 1710030801	9	NPF	NPF	NPF	NPF	NPF	NPF	NPF	NPF	NPF	NPF	NPF	NPF	NPF	NPF	NPF	NPF	NPF	NPF
Elk Creek 1710030705	34	NPF	AR	PF	NPF	AR	NPF	AR	NPF	NPF	NPF	PF	NPF	NPF	NPF	NPF	NPF	NPF	NPF

ESU SONCC Coho Salmon population 5th Field watershed	% USFS Ownership	Pathways & Indicators *Codes: PF = Properly Functioning; AR = At Risk; NPF = Not Properly Functioning*																	
		Water quality			Habitat access/elements						Channel condition & dynamics			Flow/ hydrology		Watershed conditions			
		Temperature	Sediment/Turbidity	Chemical/Nutrients	Physical barriers	Substrate/Sediment	Large wood	Pool Freq./Qual.	Off-Channel Habitat	Refugia	Width Depth Ratio	Stream bank	Floodplain	Peak/Base Flows	Drainage Network	Road Density & Loc.	Disturbance history	Riparian Reserves	Disturbance regime
Little Butte Creek 1710030708	25	NPF	AR	PF	NPF	AR	NPF	AR	NPF	NPF	NPF	NPF	NPF	NPF	NPF	NPF	NPF	NPF	NPF
4 Winchuck River - population																			
Winchuck River watershed 1710031202	72	AR	AR	PF	AR	AR	AR	AR	AR	AR	AR	AR	AR	AR	AR	AR	AR	AR	AR

Baseline conditions among the SONCC coho salmon watersheds vary widely. Only two watersheds, Klondike Creek – Illinois River and North Fork Smith River, rated as "properly functioning" for all indicators. These two watersheds also have the highest amounts of RRSNF land ownership at 100% and 99%. The Klondike Creek – Illinois River watershed also falls almost completely within the Kalmiopsis Wilderness Area. As such, all but 1.8 miles of coho salmon critical habitat in the watershed are withdrawn from mineral entry. The upper headwaters of the North Fork Smith River watershed are also in the Kalmiopsis Wilderness Area and the majority of the North Fork Smith River mainstem in Oregon is also withdrawn from mineral entry.

Bear Creek watershed is the only watershed rated as "not properly functioning" for all indicators. Only 9% of the watershed is owned by the RRSNF, which is the least amount of ownership per watershed. This watershed has the highest human population density in the action area. Approximately 8.1 miles of coho salmon critical habitat, in the East Fork Ashland Creek Resource Natural Area, are withdrawn from mineral entry.

Many streams within the action area in the RRSNF are water quality impaired for multiple pollutants, but temperature is the most common impairment (Table 20). The majority of impaired areas in the action area already have approved total maximum daily loads (TMDLs) to improve water quality, but other areas are in need of a TMDL and water quality management plan to address thermal impairments.

Table 20. ODEQ 303(d) list for Oregon waterbodies within National Forest System lands on the Rogue River-Siskiyou National Forest (USFS 2015, Table B-1). NMFS added additional information for the Lower Coquille mainstem and the 4 mainstem Rogue River watersheds outside of the NOI-level action areas (ODEQ 2010). No 303(d) information was found for the Smith River estuary in California.

Subbasin	Stream Name	Miles on RRSNF (miles)	River Mile Marker (miles)	Pollutant	Season	Listing Status
Applegate	**Lower Applegate watershed**					
	Waters Creek	1.89	2.4 to 4.3	Temperature	Summer	Cat 4A: Water quality limited, TMDL approved
	Upper Applegate watershed					
	Applegate River	2.99	0 to 46.8	Temperature	Summer	Cat 4A: Water quality limited, TMDL approved
	Beaver Creek	4.95	0 to 8.8	Biological Criteria	Year Around	Cat 4C: Water quality limited, not a pollutant
	Beaver Creek	4.95	0 to 8.8	Sedimentation	Undefined	Cat 4A: Water quality limited, TMDL approved
	Beaver Creek	2.50	0 to 3.5	Temperature	Summer	Cat 4A: Water quality limited, TMDL approved
	Palmer Creek	5.45	0 to 5.7	Temperature	Summer	Cat 4A: Water quality limited, TMDL approved
	Star Gulch	0.27	0 to 4.3	Temperature	Summer	Cat 4A: Water quality limited, TMDL approved
Chetco	**Chetco River watershed**					
	Boulder Creek	9.39	0 to 9.5	Temperature	Year Around	Cat 5: Water quality limited, 303(d) list, TMDL needed
	Chetco River	43.93	0 to 57.1	Temperature	Year Around	Cat 5: Water quality limited, 303(d) list, TMDL needed
	Chetco River	43.93	0 to 57.1	Biological Criteria	Year Around	Cat 5: Water quality limited, 303(d) list, TMDL needed
	Eagle Creek	5.44	0 to 6.8	Temperature	Year Around	Cat 5: Water quality limited, 303(d) list, TMDL needed
	Emily Creek	7.64	0 to 8.1	Temperature	Year Around	Cat 5: Water quality limited, 303(d) list, TMDL needed
	Pistol River watershed					
	East Fork Pistol River	4.52	0 to 4.6	Temperature	Year Around	Cat 5: Water quality limited, 303(d) list, TMDL needed
	North Fork Pistol River	0.98	0 to 2.8	Temperature	Year Around	Cat 5: Water quality limited, 303(d) list, TMDL needed
	Pistol River	7.22	0 to 19.8	Temperature	Year Around	Cat 5: Water quality limited, 303(d) list, TMDL needed
	Winchuck River watershed					

Subbasin	Stream Name	Miles on RRSNF (miles)	River Mile Marker (miles)	Pollutant	Season	Listing Status
	East Fork Winchuck R.	7.10	0 to 7.5	Biological Criteria	Year Around	Cat 5: Water quality limited, 303(d) list, TMDL needed
	East Fork Winchuck R.	7.10	0 to 7.5	Temperature	Year Around	Cat 5: Water quality limited, 303(d) list, TMDL needed
	Fourth of July Creek	4.58	0 to 4.6	Temperature	Year Around	Cat 5: Water quality limited, 303(d) list, TMDL needed
	Wheeler Creek	10.94	0 to 11	Temperature	Year Around	Cat 5: Water quality limited, 303(d) list, TMDL needed
	Winchuck River	2.18	0 to 11.1	Temperature	Year Around	Cat 5: Water quality limited, 303(d) list, TMDL needed
Illinois	**Althouse Creek watershed**					
	Althouse Creek	8.04	0 to 18	Temperature	Year Around	Cat 4A: Water quality limited, TMDL approved
	Althouse Creek	8.04	0 to 18	Biological Criteria	Year Around	Cat 5: Water quality limited, 303(d) list, TMDL needed
	Briggs Creek Watershed					
	Briggs Creek	14.65	0 to 15.5	Temperature	Year Around	Cat 4A: Water quality limited, TMDL approved
	Soldier Creek	2.48	2 to 4.5	Temperature	Summer	Cat 4A: Water quality limited, TMDL approved
	Soldier Creek	2.00	0 to 2	Temperature	Summer	Cat 4A: Water quality limited, TMDL approved
	Deer Creek Watershed					
	Anderson Creek	0.01	0 to 3.2	Temperature	Year Around	Cat 4A: Water quality limited, TMDL approved
	Deer Creek	1.90	0 to 17	Temperature	Year Around	Cat 4A: Water quality limited, TMDL approved
	Deer Creek	1.90	0 to 17	Temperature	October 15 - May 15	Cat 4A: Water quality limited, TMDL approved
	Squaw Creek	0.79	0 to 3	Temperature	Year Around	Cat 4A: Water quality limited, TMDL approved
	East Fork Illinois River watershed					
	East Fork Illinois River	0.59	0 to 14.4	Temperature	Year Around	Cat 4A: Water quality limited, TMDL approved
	Indigo Creek watershed					
	Indigo Creek	0.03	0 to 8.2	Temperature	Year Around	Cat 4A: Water quality limited, TMDL approved
	North Fork Indigo Creek	5.85	0 to 6	Temperature	Summer	Cat 4A: Water quality limited, TMDL approved
	Josephine Creek-Illinois River watershed					
	Canyon Creek	5.86	0 to 5.9	Temperature	Summer	Cat 4A: Water quality limited, TMDL approved
	Fall Creek	4.76	0 to 4.8	Temperature	Year Around	Cat 4A: Water quality limited, TMDL approved

Subbasin	Stream Name	Miles on RRSNF (miles)	River Mile Marker (miles)	Pollutant	Season	Listing Status
	Illinois River	22.61	0 to 56.1	Temperature	Year Around	Cat 4A: Water quality limited, TMDL approved
	Josephine Creek	12.29	0 to 12.4	Temperature	Summer	Cat 4A: Water quality limited, TMDL approved
	Little Sixmile Creek	1.21	0 to 1.2	Temperature	Summer	Cat 4A: Water quality limited, TMDL approved
	Rancherie Creek	4.85	0 to 5.2	Temperature	Summer	Cat 4A: Water quality limited, TMDL approved
	Sixmile Creek	5.17	0 to 5.2	Temperature	Year Around	Cat 4A: Water quality limited, TMDL approved
	South Fork Canyon Creek	2.36	0 to 2.4	Temperature	Summer	Cat 4A: Water quality limited, TMDL approved
	Klondike Creek watershed					
	Collier Creek	4.46	0 to 4.5	Temperature	Summer	Cat 4A: Water quality limited, TMDL approved
	Illinois River	22.61	0 to 56.1	Temperature	Year Around	Cat 4A: Water quality limited, TMDL approved
	Illinois River	22.61	0 to 56.1	Temperature	October 15 - May 15	Cat 4A: Water quality limited, TMDL approved
	Klondike Creek	7.28	0 to 7.4	Temperature	Summer	Cat 4A: Water quality limited, TMDL approved
	Panther Creek	2.59	0 to 2.6	Temperature	Year Around	Cat 4A: Water quality limited, TMDL approved
	Lawson Creek watershed					
	Illinois River	6.33	0 to 56.1	Temperature	Year Around	Cat 4A: Water quality limited, TMDL approved
	Lawson Creek	10.63	0 to 11.1	Temperature	Summer	Cat 4A: Water quality limited, TMDL approved
	Silver Creek watershed					
	Silver Creek	0.08	0 to 10.9	Temperature	Year Around	Cat 4A: Water quality limited, TMDL approved
	North Fork Silver Creek	6.80	0 to 7	Temperature	Summer	Cat 4A: Water quality limited, TMDL approved
	Silver Creek	10.68	0 to 10.9	Temperature	Year Around	Cat 4A: Water quality limited, TMDL approved
	South Fork Silver Creek	6.98	0 to 7	Temperature	Summer	Cat 4A: Water quality limited, TMDL approved
	Sucker Creek watershed					
	Sucker Creek	3.09	0 to 17.9	Temperature	Summer	TMDL approved
	Sucker Creek	10.24	11.7 to 26	Temperature	Summer	TMDL approved
	Sucker Creek	10.84	0 to 26	Temperature	Year Around	Cat 4A: Water quality limited, TMDL approved
	Sucker Creek	5.99	0 to 21.1	Temperature	October 15 - May 15	Cat 4A: Water quality limited, TMDL approved
	West Fork Illinois River watershed					

Subbasin	Stream Name	Miles on RRSNF (miles)	River Mile Marker (miles)	Pollutant	Season	Listing Status
	Rough & Ready Creek	3.80	0 to 6.1	Temperature	Year Around	Cat 4A: Water quality limited, TMDL approved
	South Fork Rough & Ready Creek	6.23	0 to 6.3	Temperature	Summer	Cat 4A: Water quality limited, TMDL approved
	West Fork Illinois River	2.10	0 to 17.3	Biological Criteria	Year Around	Cat 5: Water quality limited, 303(d) list, TMDL needed
	West Fork Illinois River	1.77	0 to 14.7	Temperature	Year Around	Cat 4A: Water quality limited, TMDL approved
	West Fork Illinois River	0.03	14.7 to 17	Temperature	Year Around	Cat 4A: Water quality limited, TMDL approved
	Whiskey Creek	3.85	0 to 4.2	Temperature	Summer	Cat 4A: Water quality limited, TMDL approved
Lower Rogue	**Lobster Creek watershed**					
	Lobster Creek	1.05	0 to 9.7	Temperature	Summer	TMDL approved
	Lobster Creek	0.01	0 to 9.7	Temperature	Summer	TMDL approved
	Lobster Creek	0.01	0 to 9.7	Temperature	Year Around	Cat 4A: Water quality limited, TMDL approved
	North Fork Lobster Creek	3.18	0 to 3.3	Temperature	Summer	TMDL approved
	South Fork Lobster Creek	3.63	0 to 3.7	Temperature	Summer	TMDL approved
	Rogue River watershed					
	Jim Hunt Creek	0.55	0 to 4.3	Biological Criteria	Year Around	Cat 5: Water quality limited, 303(d) list, TMDL needed
	Quosatana Creek	7.85	0 to 8.1	Temperature	Summer	Cat 4A: Water quality limited, TMDL approved
	Rogue River	16.01	0 to 124.8	Temperature	Year Around	Cat 4A: Water quality limited, TMDL approved
	Shasta Costa-Rogue River watershed					
	Foster Creek	4.52	0 to 5.2	Temperature	Summer	Cat 4A: Water quality limited, TMDL approved
	Rogue River	6.53	0 to 124.8	Temperature	Year Around	Cat 4A: Water quality limited, TMDL approved
	Rogue River	12.34	0 to 124.8	Temperature	Year Around	Cat 4A: Water quality limited, TMDL approved
	Shasta Costa Creek	13.08	0 to 13.4	Temperature	Year Around	Cat 4A: Water quality limited, TMDL approved
	Rogue River	12.34	0 to 124.8	Temperature	Year Around	Cat 4A: Water quality limited, TMDL approved
	Waters Creek	1.89	2.4 to 4.3	Temperature	Summer	Cat 4A: Water quality limited, TMDL approved

Subbasin	Stream Name	Miles on RRSNF (miles)	River Mile Marker (miles)	Pollutant	Season	Listing Status
Middle Rogue	**Bear Creek watershed**					
	Ashland Creek	0.56	0 to 5.4	Temperature	Year Around	Cat 4A: Water quality limited, TMDL approved
	Wagner Creek	0.38	6 to 7.4	Temperature	Summer	Cat 4A: Water quality limited, TMDL approved
Sixes	**Elk River watershed**					
	Bald Mountain Creek	1.17	0 to 2.3	Temperature	Summer	303(d)
	Elk River	15.77	0 to 29.9	Temperature	Year Around	Cat 5: Water quality limited, 303(d) list, TMDL needed
	Sunshine Creek	1.20	0 to 1.2	Biological Criteria	Year Around	Cat 5: Water quality limited, 303(d) list, TMDL needed
	Sixes River watershed					
	Sixes River	0.07	0 to 15.1	Biological Criteria	Year Around	Cat 5: Water quality limited, 303(d) list, TMDL needed
	Sixes River	2.45	15.1 to 30.1	Biological Criteria	Year Around	Cat 5: Water quality limited, 303(d) list, TMDL needed
	Sixes River	2.52	0 to 30.1	Temperature	Year Around	Cat 5: Water quality limited, 303(d) list, TMDL needed
Smith	**North Fork Smith River watershed**					
	North Fork Smith River	1.58	0 to 1.6	Temperature	Year around	Cat 5: Water quality limited, 303(d) list, TMDL needed
Coquille	**South Fork Coquille River watershed**					
	Johnson Creek	6.98	0 to 7.1	Temperature	Summer	TMDL approved
	Johnson Creek	6.98	0 to 7.1	Temperature	Year Around	Cat 4A: Water quality limited, TMDL approved
	Lake Creek	0.88	0 to 0.9	Biological Criteria	Year Around	Cat 5: Water quality limited, 303(d) list, TMDL needed
	Rock Creek	2.85	0 to 3	Temperature	Summer	TMDL approved
	Salmon Creek	0.24	0 to 9.2	Temperature	Summer	303(d)
	South Fork Coquille R.	13.65	0 to 51.9	Biological Criteria	Year Around	Cat 5: Water quality limited, 303(d) list, TMDL needed
	South Fork Coquille R.	4.64	53.4 to 61.9	Biological Criteria	Year Around	Cat 5: Water quality limited, 303(d) list, TMDL needed
	South Fork Coquille R.	10.25	18.1 to 47.1	Temperature	September 1 - June 15	Cat 5: Water quality limited, 303(d) list, TMDL needed

Subbasin	Stream Name	Miles on RRSNF (miles)	River Mile Marker (miles)	Pollutant	Season	Listing Status
	South Fork Coquille R.	19.20	18.1 to 61.9	Temperature	Year Around	Cat 5: Water quality limited, 303(d) list, TMDL needed
	South Fork Coquille R.	13.87	42.1 to 61.9	Temperature	Summer	TMDL approved
Upper Rogue	**Elk Creek watershed**					
	Bitter Lick Creek	7.06	0 to 8.6	Temperature	Summer	Cat 4A: Water quality limited, TMDL approved
	Bitter Lick Creek	7.06	0 to 8.6	Biological Criteria	Year Around	Cat 5: Water quality limited, 303(d) list, TMDL needed
	Sugarpine Creek	5.58	0 to 9.1	Temperature	Year Around	Cat 4A: Water quality limited, TMDL approved
	Sugarpine Creek	2.53	0 to 6	Temperature	October 15 - June 15	Cat 4A: Water quality limited, TMDL approved
	Little Butte Creek watershed					
	Dead Indian Creek	2.94	0 to 9.6	Temperature	Year Around	Cat 4A: Water quality limited, TMDL approved
	South Fork Little Butte Creek	4.62	0 to 16.4	Sedimentation	Undefined	303(d)
	South Fork Little Butte Creek	4.62	0 to 16.4	Temperature	Summer	Cat 4A: Water quality limited, TMDL approved
	South Fork Little Butte Creek	14.37	10.8 to 26.2	Temperature	Undefined	Cat 4A: Water quality limited, TMDL approved
Non-RRSNF watersheds included in the action area						
Coquille	Coquille River	N/A	4.2-35.6	Chlorophyll a	Summer	Cat 5: Water quality limited, 303(d) list, TMDL needed
	Coquille River	N/A	0-35.6	Dissolved Oxygen	January 1 – May 15	Cat 5: Water quality limited, 303(d) list, TMDL needed
	Coquille River	N/A	8-35.6	Dissolved Oxygen	Year Around (non-spawning)	Cat 4A: Water quality limited, TMDL approved
	Coquille River	N/A	21-35.3	Temperature	Summer	303(d)
Lower Rogue	Rogue River	N/A	68.3-94.9	pH	Summer	Cat 5: Water quality limited, 303(d) list, TMDL needed
Upper Rogue	Rogue River	N/A	132.2-156.8	pH	Summer	Cat 5: Water quality limited, 303(d) list, TMDL needed
Lower Rogue, Middle Rogue	Rogue River	N/A	33.8 – 131.8	Dissolved Oxygen	October 15 – May 15	Cat 5: Water quality limited, 303(d) list, TMDL needed

Climate change is an on-going process and the predicted changes on the aquatic environment relate to thermal and hydrologic regimes (Mantua *et al.* 2010). During 1895-2011, temperature in the Northwest warmed by approximately 0.7°C (Dalton *et al.* 2013) and stream flows in southwest Oregon have declined from 1953 to 2012 (Asarian and Walker 2016). The regional rate of sea level rise in the Pacific Northwest has been approximately 0.23 millimeters per year (Ruggiero *et al.* 2010). Annual mean precipitation has exhibited a slight trend in greater variability since 1970 (Dalton *et al.* 2013). For the Northwest, an increase in average annual air temperature of 1.8°C to 5.4°C is projected by 2070 to 2099 (compared to the period 1970 to 1999) with the largest increases projected during summer (Mote *et al.* 2014). A major hindrance in projecting salmon responses to climate change stems from the difficulty in translating projections of future air temperatures to stream temperatures (Crozier 2015). Additionally, summer precipitation is projected to decrease by as much as 30% by the end of the century, although only 10% on average, and this relatively small projected change will likely be masked by natural variability. The sensitivity of stream temperature and stream discharge to climate changes varies among watersheds due to natural and anthropogenic factors (Mantua *et al.* 2010).

Although climate change is not a key limiting threat for any of the SONCC coho salmon populations in the action area, some populations are likely to be more affected than others, and effects will vary throughout the SONCC ESU and within the action area (Table 21). Climate change is considered a threat for OC coho salmon and Stout *et al.* (2012) summarized potential climate change effects for the OC coho salmon ESU (see Section 2.2.1); we expect that the Sixes and Coquille River populations will be affected similarly to the coastal SONCC coho salmon populations. The majority of watersheds in the action area are hydrologically rain-dominated, although some watersheds do include areas within the transient snow zone. As a result, the majority of the action area is considered to be less sensitive to hydrological changes as a result of changing precipitation and temperature increases compared to other areas of the Pacific Northwest that have a greater proportion of snow-dominated areas (Elsner *et al.* 2010, Vano *et al.* 2015). Mantua *et al.* (2010) project that shifts to increasingly stressful thermal regimes for salmon in Washington will be greater in eastern Washington than in western Washington and we expect a similar result for Oregon. Still, increases in temperature and changes in precipitation patterns in the action area are expected, with greatest risk to juvenile summer rearing and smolt migration habitats (Table 21) and increased thermal stress for these life histories, including the potential for increasing the prevalence and virulence of fish diseases and parasites (see Section 2.2). Rain-dominated watersheds could also experience slightly greater stream flows during winter if average winter precipitation increases; however there is a large amount of variability and uncertainty present in hydrological models (MacArthur *et al.* 2012, Dalton *et al.* 2013). Climate change is also expected to have physical impacts along the coastal and estuarine areas of Oregon, ranging from increased erosion and inundation of low lying areas, to wetland loss and increased estuarine salinity; however, much of the coast in the action area is considered emergent with decreasing relative sea levels, due to tectonics, such that rises in sea level are unlikely to exceed tectonic uplift until late in the 21st century (Ruggiero *et al.* 2010). Adults of all SONCC and OC coho salmon populations are likely to be negatively affected by ocean acidification and changes in ocean conditions and prey availability (NMFS 2014). SDPS green sturgeon in the action area are likely to be affected less by climate change because they only use the estuaries and because they occupy a wide range of thermal regimes in coastal and marine environments, although their prey can be affected similarly by ocean acidification (NMFS 2015a).

ıd expected changes due to climate change for SONCC coho salmon populations (NMFS 2014).

Expected air temperature change over next 50 years	Precipitation Changes	Most At Risk Habitat	Most At Risk life history	Other
• Average summer increase >2.8°C • Average winter increase >1°C	Seasonal patterns may change	Juvenile rearing & smolt migratory	Fry and juveniles	
• Average summer increase >2°C • Average winter increase >1°C	Seasonal patterns may change	Juvenile rearing & smolt migratory	Juveniles and smolts	Van Kirk and Naman (2008) documented decreasing snow pack below 6,000 feet over the last 20 years in the Klamath Mountains. If this trend continues, the water supply will be affected in watersheds such as Deer, Grayback and Sucker creeks, and the upper East and West Fork Illinois rivers.
• Projected increase in July air temperature ranges from 1.5 to 3.0 °C • January temperatures are predicted to increase 1.0 to 1.5 °C		Juvenile rearing	Juveniles	Increasing temperatures will likely result in less snow accumulation throughout most of the Middle Rogue-Applegate subbasin, and the resulting decreased flow will directly diminish available habitat.
• Average summer increase up to 1.5°C • Average winter increase up to 1°C	Seasonal patterns may change	Juvenile rearing & smolt migratory	Juveniles, smolts, and adults	Vulnerability of the estuary and coast to sea level rise is moderate to high.

Population	Overall Threat Rank	Expected air temperature change over next 50 years	Precipitation Changes	Most At Risk Habitat	Most At Risk life history	Other
Smith	Medium	• Average summer increase up to 2°C • Average winter increase up to 1°C	Annual precipitation in this area is predicted to trend downward over the next century	Juvenile rearing & smolt migratory	Juveniles, smolts, and adults	• Snowpack in upper elevations of the basin will decrease with changes in temperature and precipitation. • The vulnerability of the estuary and coast to sea level rise is moderate to high in this population.
Elk	Medium	• Average summer increase by 0.0 – 0.5 °C at the coast and 1.5 to 2.0 °C in the eastern portion of the basin • Average winter increase of 0.5 to 1.0 °C at the coast and 1.0 to 1.5 °C in the interior			Juveniles, smolts, and adults	Sea level rise could expand the estuary and the footprint of tidal wetlands, which could potentially benefit coho salmon.
Winchuck	Low	• Average summer increase by < 0.5°C • Average winter increase between 0.5 and 1.5 °C			N/A	Sea level rise could expand the estuary and the footprint of tidal wetlands, which could potentially benefit coho salmon.
Pistol	Medium	• Average summer and winter increase up to 1 °C			Juveniles, smolts, and adults	The risk of sea level rise is low
Chetco	Medium	• Average summer increase up to 1.5 °C • Average winter increase up to 1 °C	Seasonal patterns may change		Juveniles, smolts, and adults	The vulnerability of the estuary and coast to sea level rise is moderate to high in this coastal population

The Illinois River subbasin was a location with considerable historical gold mining. Several watersheds in the Illinois did have intensive large-scale historical gold mining or were considered "rich" including Althouse Creek, Briggs Creek, East Fork Illinois River, Josephine Creek, Silver Creek, Sucker Creek. However, not all watersheds in the Illinois River subbasin were intensively mined, like Indigo Creek. Additionally, watersheds supporting the Middle Rogue/Applegate River population, including the Hellgate Canyon-Rogue River watershed and the Upper Applegate River watershed, also had a large amount of historical gold mining although the RRSNF land ownership in these watersheds is significantly lower. Although mining was identified as one of the activities responsible for the decline of SONCC coho salmon ESU at the time of listing (62 FR 24588), NMFS (2014) did not identify gold mining as a key limiting threat for recovery for any of the SONCC coho salmon populations in the action area (Table 12); nor does the proposed action include activities considered to be key limiting threats for recovery (i.e., agriculture, channelization/diking, dams/diversions, roads, timber harvest, or urban/residential/industrial development). Additionally, mining was only one of 11 activities responsible for the decline of the ESU (62 FR 24588). However, effects from gold mining are related to some of the key limiting stresses of the populations (Section 2.2.1) and the recovery plan did identify mining/gravel extraction as a very high or high threat to the Illinois River and Middle Rogue/Applegate River populations (NMFS 2014). Because historical gold mining frequently has lasting legacy effects on coho salmon habitat, we examine the baseline conditions of these watersheds in greater detail below.

Illinois River population watersheds with large amount of historical gold mining

The Althouse Creek watershed, one of the high value core coho salmon areas (Oregon Plan 2007), has 15 active placer claims[34] filed on the RRSNF in the NOI-level project action area but has had no NOI activity from 2009-2012 (Table 1). Historical large-scale intensive mining occurred and the legacy of historic mining on stream channels and valley topography is still evident in this watershed. It has five habitat indicators rated as "properly functioning", three habitat indicators rated as "not properly functioning," and the remainder rated "at risk" (Table 19). Land ownership by the RRSNF in this watershed is moderate at 46%. Prevalent land uses on federal lands include timber production, mining, and dispersed recreation. There are no mineral withdrawn areas within the Althouse Creek watershed. Additional limiting habitat conditions in the watershed include low summer stream flows resulting from domestic and agricultural diversions, high summer water temperatures, lack of instream large wood, lack of complex rearing habitat including side channels and beaver ponds, channelized stream segments, and migration barriers (USFS 2015). Althouse Creek drains a basin area of 29,593 acres of mountainous terrain, deeply dissected canyons, and wide alluvial valleys before emptying into the East Fork Illinois River. In 2014[35], ODEQ issued one suction dredge permit for the Althouse Creek watershed and it was located within the RRSNF NOI-level project area.

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[34] Claims that were noted as active and filed on May 8, 2013. The number and location of active filed claims can change on a daily basis. A filed mining claim is not a prerequisite for approval of a NOI. Typically fewer NOIs are submitted annually to the RRSNF for a watershed than the number of active filed claims (Table 1). Because the number of active filed placer claims is larger than either the 2009-2012 NOIs and the 2014 ODEQ issued suction dredge permits, we can only use the active filed placer claims as an indication of relative suction dredge and high banking activity and not an absolute amount.

[35] Prior to 2014, ODEQ applicants were not required to identify mining locations. Beginning in 2014, ODEQ asked applicants to identify a primary mining location although mining could also occur at additional locations.

The Briggs Creek watershed has only 5 active placer claims filed on the RRSNF in the NOI-level project action area and has had no NOI activity from 2009-2012 (Table 1). It has nine habitat indicators rated as "properly functioning", one habitat indicator rated as "not properly functioning," and the remainder rated "at risk" (Table 19). The watershed has a natural waterfall as a barrier at River Mile 0.7; coho salmon have not been observed above the falls in multiple sampling efforts (USFS 2015). Land ownership by the RRSNF in this watershed is very high at 95%. Prevalent land uses on federal lands include timber production, mining, dispersed and developed recreation, and fish and wildlife habitat. Briggs Creek is the most actively dredged watershed within the Illinois River subbasin; areas with the most activities are located upstream of coho salmon and in proximity to River Miles 9 and 11.5 (USFS 2015). Briggs Creek is highly entrenched in its lowest reach and is confined by topography; side channels, and winter refugia are absent in designated critical habitat due to the natural geomorphology. Although Briggs Creek is 303(d) listed for temperature (Table 20), the RRSNF has indicated that its mouth may provide some thermal refuge because Briggs Creek is colder than the Illinois River during the summer months (USFS 2015); this area would be included in the approximately 0.3 mile of coho salmon critical habitat withdrawn from mineral entry in the watershed at the confluence with the Illinois River. In 2014, ODEQ issued 14 suction dredge permits in the Briggs Creek watershed, including two for within the RRSNF NOI-level project area. The remaining 12 permits were also issued for areas within the RRSNF, but are located more than 0.25 mile upstream of critical habitat. This is the only watershed within the NOI-level project area and SONCC coho salmon that additional permits were issued for areas on the RRSNF outside of the NOI-level project area in 2014.[36]

The Deer Creek watershed has only 2 active placer claims filed on the RRSNF in the NOI-level project action area and has had relatively little NOI activity (Table 1) with only 0.005% of critical habitat annually disturbed by mining, according to NOIs from 2009-2012 (Table 16). BLM identified the most important historical placer mines in the watershed as being near the confluence with Illinois River and noted that the overall level of hydraulic gold mining was low (BLM 1997). The RRSNF identified five habitat indicators rated as "properly functioning", four habitat indicators rated as "not properly functioning," and the remainder rated "at risk" (Table 19). Land ownership by the RRSNF in this watershed is low at 11%. Prevalent land uses on federal lands include dispersed and developed recreation, and limited timber production. Approximately 0.3 mile of coho salmon critical habitat are withdrawn from mineral entry in the watershed at the confluence with the Illinois River. Additional limiting habitat conditions in the watershed include low summer stream flows resulting from agricultural diversions, lethal summer water temperatures, lack of instream large wood, lack of complex rearing habitat including side channels and beaver ponds, and channelized stream segments (USFS 2015). In 2014, ODEQ did not issue any suction dredge permits in the watershed.

The East Fork Illinois River watershed, one of the high value core coho salmon areas (Oregon Plan 2007), has approximately 19 active placer claims filed on the RRSNF in the NOI-level project action area, but has had no NOI activity from 2009-2012 (Table 1). Historical large-scale intensive mining occurred and the legacy of historic mining on stream channels and valley

[36] This also occurred once for OC coho salmon in the Sixes River watershed with one ODEQ permit issued within the NOI-level project area plus an additional 4 permits issued for areas within the RRSNF, but located more than 0.25 mile upstream of critical habitat.

topography is still evident in this watershed. It has one habitat indicator rated as "properly functioning", three habitat indicators rated as "not properly functioning," and the remainder rated "at risk" (Table 19). Land ownership by the RRSNF in this watershed is fairly high at 63%. Prevalent land uses on federal lands include timber production, mining, and dispersed recreation. There are no mineral withdrawn areas within the East Fork Illinois River watershed. Additional limiting habitat conditions in the watershed include low summer stream flows resulting from domestic and agricultural diversions, high summer water temperatures, lack of instream large wood, sedimentation particularly in granitic drainages, lack of complex rearing habitat including side channels and beaver ponds, channelized stream segments, migration barriers, and potentially competition from exotic species such as redside shiners (USFS 2015). In 2014, ODEQ issued 3 suction dredge permits in the East Fork Illinois River watershed, including one for within the RRSNF NOI-level project area; no other permits were issued for areas in the RRSNF. The other two permits were evenly distributed between private and BLM lands.

The Indigo Creek watershed has 13 active placer claims filed on the RRSNF in the NOI-level project action area, but has had no NOI activity from 2009-2012 (Table 1). It has 15 habitat indicators rated as "properly functioning" with the remainder rated "at risk" (Table 19). However, steep and confined geomorphology limit the watershed's productivity for coho salmon (NMFS 2014). Land ownership by the RRSNF in this watershed is very high at 98%. Prevalent land uses on federal lands include mining and dispersed recreation. Approximately 0.3 mile of coho salmon critical habitat are withdrawn from mineral entry in the watershed at the confluence with the Illinois River. In 2014, ODEQ did not issue any suction dredge permits in the watershed.

The Josephine Creek – Illinois River watershed, which has the largest number of active placer claims filed[34] on the RRSNF in the NOI-level project action area (130; Table 1) and the most historical large-scale intensive mining, has two habitat indicators rated as "properly functioning", two habitat indicators rated as "not properly functioning," and the remainder rated "at risk" (Table 19). It also has the highest proportion of annually disturbed critical habitat by mining according to NOIs from 2009-2012 (0.15%; Table 16). Land ownership by the RRSNF in this watershed is fairly high at 78%. Prevalent land uses on federal lands include mining, dispersed and developed recreation, and timber production. Within the watershed, the mainstem of the Illinois River is a "wild" river and approximately 14.4 miles of coho salmon critical habitat are withdrawn from mineral entry. The legacy of historic mining on stream channels and valley topography is still evident in this watershed. Some streams with critical habitat in this watershed have lethal temperatures during summer rearing and have too much scour for successful winter spawning. In general, streams within the watershed are confined, even in lower gradient reaches, and riparian areas were heavily affected by a large wildfire in 2002 (USFS 2015). In 2014, ODEQ issued 29 suction dredge permits for the Josephine Creek-Illinois River watershed and all were located within the RRSNF NOI-level project area.

The Klondike Creek-Illinois River watershed has no active placer claims filed on the RRSNF in the NOI-level project action area and has had no NOI activity from 2009-2012 (Table 1). RRSNF land ownership is 100% and the watershed is also almost completely contained within the Kalmiopsis Wilderness Area. As such, all but 1.8 miles of coho salmon critical habitat in the watershed are withdrawn from mineral entry. All 18 habitat indicators are rated as "properly functioning" (Table 19). This system drains a watershed area of approximately 67,124 acres of rugged dissected mountainous terrain, V-shaped colluvial canyons, incised bedrock gorges, and wide flat-bottomed alluviated canyons (USFS 2015). In 2014, ODEQ issued one suction dredge permit for the Klondike Creek-Illinois River watershed and it was located within the RRSNF NOI-level project area.

The Lawson Creek watershed has no active placer claims filed on the RRSNF in the NOI-level project action area and has had no NOI activity from 2009-2012 (Table 1). Lawson Creek drains a watershed area of approximately 25,000 acres of moderately to steeply sloped terrain before joining the Illinois River approximately 3.5 miles south of Agness, Oregon. It has eight habitat indicators rated as "properly functioning" with the remaining rated as "at risk" (Table 19). However, steep and confined geomorphology limit the watershed's productivity for coho salmon (NMFS 2014). Land ownership by the RRSNF in this watershed is very high at 94%. Prevalent land uses on federal lands include recreation, fishing, and timber harvest. Approximately 12.3 miles of coho salmon critical habitat in the watershed are withdrawn from mineral entry. Additional limiting factors include warm water in the lower reach of Lawson Creek. In 2014, ODEQ did not issue any suction dredge permits in the watershed.

The Silver Creek watershed has approximately 37 active placer claims filed on the RRSNF in the NOI-level project action area, but has had relatively little NOI activity (Table 1) with only 0.013% of critical habitat annually disturbed by mining, according to NOIs from 2009-2012 (Table 16). Silver Creek was also a historical gold mining stream. It has fourteen habitat indicators rated as "properly functioning", no habitat indicators rated as "not properly functioning," and the remainder rated "at risk" (Table 19). However, steep and confined geomorphology limit the watershed's productivity for coho salmon (NMFS 2014). Land ownership by the RRSNF in this watershed is high at 83%. Prevalent land uses on federal lands include timber production, mining, and dispersed recreation. Approximately 0.3 miles of coho salmon critical habitat are withdrawn from mineral entry in the watershed. Fish passage in the upper watershed is limited by a series of culverts; natural falls downstream are additional potential impediments to passage on the North Fork (NMFS 2014). In 2014, ODEQ did not issue any suction dredge permits in the watershed.

The Sucker Creek watershed, one of the high value core coho salmon areas (Oregon Plan 2007), has approximately 50 active placer claims filed on the RRSNF in the NOI-level project action area (Table 1), but has had relatively little NOI activity (Table 1) with only 0.006% of critical habitat annually disturbed by mining, according to NOIs from 2009-2012. Historical large-scale intensive mining occurred and the legacy of historic mining on stream channels and valley topography is still evident in this watershed. It has three habitat indicators rated as "properly functioning", two habitat indicators rated as "not properly functioning," and the remainder rated "at risk" (Table 19). Over 70% of the low-gradient high and very high potential coho salmon habitat is found on private lands in the Sucker Creek watershed (USFS 2007). Land ownership by the RRSNF in this watershed is fairly high at 72%. Prevalent land uses on federal lands include timber production, mining, and dispersed and developed recreation. There are no mineral withdrawn areas within the Sucker Creek watershed. Additional limiting habitat conditions in the watershed include low summer stream flows as a result of domestic and agricultural diversions, high summer water temperatures, lack of instream large wood, sedimentation particularly in granitic drainages, lack of complex rearing habitat including side channels and beaver ponds, channelized stream segments, migration barriers, and potentially competition from exotic species such as redside shiners (USFS 2015). Known impacts to Sucker Creek include mining, timber harvest, roads, and water withdrawals, and 303(d) listed parameters include temperature, habitat, and flow (USFS and ODEQ 1999). In 2014, ODEQ issued ten suction dredge permits in the Sucker Creek watershed, including six in areas within the RRSNF NOI-level project area; no other permits were issued on for areas in the RRSNF. The other four permits were issued for areas on BLM land.

The West Fork Illinois River watershed has 23 active placer claims filed on the RRSNF in the NOI-level project action area, but has had no NOI activity from 2009-2012 (Table 1). The West Fork Illinois River was historically mined, but not as much as other areas in the Illinois Valley. However, the legacy of hydraulic mining on stream channels and valley topography is still evident. It has one habitat indicator rated as "properly functioning", three habitat indicators rated as "not properly functioning," and the remainder rated "at risk" (Table 19). Land ownership by the RRSNF in this watershed is moderate at 49%. Prevalent land uses on federal lands include timber production, mining, and dispersed recreation. There are no mineral withdrawn areas within the West Fork Illinois River watershed. Additional limiting factors include low summer stream flows resulting from domestic and agricultural diversions, serpentine geology, high summer water temperatures, lack of instream large wood, lack of complex rearing habitat including side channels and beaver ponds, channelized stream segments, migration barriers, and potentially competition from exotic species such as redside shiners (USFS 2015). In 2014, ODEQ issued two suction dredge permits in the West Fork Illinois River watershed for areas on BLM land only.

Middle Rogue/Applegate River population watersheds with large amount of historical gold mining

The Hellgate Canyon-Rogue River watershed has 29 active placer claims filed on the RRSNF in the NOI-level project action area, but has had no NOI activity from 2009-2012 (Table 1). The watershed includes the Rogue River and tributaries from the Applegate River confluence downstream to Grave Creek. Land ownership by the RRSNF in this watershed is low at 32%. Prevalent land uses on federal lands include timber production, mining, and recreation. Historical mining occurred in the Galice and Taylor Creek drainages. In Galice Creek, gold mining frequently moved the stream channel and reduced the abundance of mature riparian forest stands (BLM 2011a). Only one habitat indicator is rated as "properly functioning", two habitat indicators rated as "not properly functioning," and the remainder rated "at risk" (Table 19). There are no mineral withdrawn areas within the watershed. Additional limiting factors include reduced habitat quality from riparian vegetation removal, residential and agricultural development, roads, channel widening, and water withdrawals (BLM 2011). BLM manages the Hellgate Recreation Area for recreational gold mining, but does not allow suction dredging in this area. In 2014, ODEQ issued seven suction dredge permits in the Hellgate Canyon-Rogue River watershed, including three in areas within the RRSNF NOI-level project area; no other permits were issued for areas in the RRSNF. The other four permits were issued for areas on BLM land.

The Upper Applegate River watershed has 17 active placer claims filed on the RRSNF in the NOI-level project action area, but has had relatively little NOI activity (Table 1) with only 0.028% of critical habitat annually disturbed by mining, according to NOIs from 2009-2012 (Table 16). Some streams in the watershed had intensive historical placer mining. Land ownership by the RRSNF in this watershed is moderate at 52%. The RRSNF identified two habitat indicators as "properly functioning", eight habitat indicators rated as "not properly functioning," and the remainder rated "at risk" (Table 19). Prevalent land uses on federal lands include timber production, mining, recreation, and grazing. Approximately 0.02 mile of coho salmon critical habitat are withdrawn from mineral entry in the watershed. The Applegate Dam is located in the upper reaches of watershed. In 2014, ODEQ issued 12 suction dredge permits in the Upper Applegate River watershed, including five in areas within the RRSNF NOI-level project area; no other permits were issued on for areas in the RRSNF. The other permits were issued for areas on private land (6) and on BLM land (1).

Additionally, there are four mainstem Rogue River field watersheds that are outside of the NOI-level project action area (see Section 1.4), but still within the action area. Two of these, the Rogue River-Shady Cove watershed (Upper Rogue River population) and Rogue River –Grants Pass watershed (Middle Rogue/Applegate River population), do not have mining as a known impact (BLM 2011b and c). The other two, the Rogue River-Gold Hill watershed (Upper Rogue River population) and the Rogue River – Horseshoe Bend watershed (Middle Rogue/Applegate River population), have a history of hydraulic and placer mining with some placer mining still ongoing and placer mining claims on file (BLM 2010, BLM 2011d). In 2014, ODEQ issued 1 suction dredge permit in the Rogue River-Shady Cove watershed located on State land, 19 suction dredge permits in the Rogue River –Grants Pass watershed located on both State (14) and private (5) lands, and 135 suction dredge permits in the Rogue River-Gold Hill watershed located on both State (112) and private (22) lands. None were issued for the Rogue River – Horseshoe Bend watershed. Therefore, the majority of the non-Federally managed mining activity in the action area occurs mainly for the Upper Rogue River population watersheds. Mining/gravel extraction is a medium threat to this population, mostly due to gravel mining (NMFS 2014).

With very limited exceptions, such as the Klondike Creek – Illinois River watershed and the North Fork Smith River watershed, we made the following assumptions regarding the environmental baseline conditions in specific areas where NOI operations will be carried out consistent with the proposed action: (1) NOI operations will occur at sites where the biological requirements of individual fish of ESA-listed species are not being fully met due, in part, to the presence of increased water temperatures, impaired water quality, habitat complexity, hydrology, and fish passage, floodplain fill, stream bank degradation, or degraded channel or riparian conditions, all of which are related to or are part of the habitat factors limiting the recovery of the species in that area, and (2) NOI operations will occur at sites where critical habitat PCEs (OC coho salmon) and essential features (SONCC coho salmon) are not fully functioning.

The proposed action is an ongoing action with no expiration date. Predicted increases in summer air temperature over the next 50 years range from 0.5°C to >2.8°C (Table 21). Because coho salmon are cold-blooded, water temperature determines their internal temperature, and thus their metabolic rate (Sauter *et al*. 2001). Metabolic rates of coho salmon increase as a function of temperature and, when water temperatures are high, most of an individual's assimilated energy may be required to maintain basic metabolic demand (McCullough *et al.* 2001). Increases in temperature as a result of climate change are expected in the action area in the long-term; therefore, baseline coho salmon metabolic rates are also likely to increase over the long-term. SDPS green sturgeon in the action area are likely to be less affected by climate change because they only use the estuaries and because they occupy a wide range of thermal regimes in coastal and marine environments, however their prey could be affected by ocean acidification (NMFS 2015a).

Many stream reaches in the action area are already impaired (i.e., >18°C) by elevated water temperatures (Table 20). Preferred rearing temperatures for juvenile coho salmon are 12-14°C (Spence *et al.* 1996). Lethal temperatures range from 24 to 30°C (McCullough 1999), but coho salmon can survive at high daily maximum temperatures if (1) high quality food is abundant, (2) thermal refugia are available, and (3) competitors or predators are few (NRC 2004). The majority of impaired areas in the action area already have approved TMDLs to improve water quality, but other areas are in need of a TMDL and water quality management plan to address thermal impairments (Table 20). In most areas with currently impaired water temperatures, predicted increases will not reach lethal temperatures, while some areas currently experience these for a short duration.

Increased water temperature can be detrimental to the survival of most life stages of coho salmon, but summer-rearing juveniles are the most likely to be affected by long-term elevated water temperatures. Elevated water temperature can result in increased levels of stress hormones in coho salmon, often resulting in mortality (Ligon *et al.* 1999). Increased water temperature, even at sublethal levels, can inhibit migration, reduce growth, stress fish, reduce reproductive success, inhibit smoltification, contribute to outbreaks of disease, and alter competitive dominance (Elliott 1981). Currently, the baseline condition of most individual fish in the action area is likely to be stressed, but with the ability to compensate. However, in the future as temperature increases, an individual's baseline ability to compensate for additional stressors may be reduced.

2.4 Effects of the Action

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

Under the administrative portion of this action, the RRSNF will evaluate each individual NOI to ensure that (a) the anticipated range of effects is within the range considered in this opinion; (b) the NOI operation is carried out consistent with the proposed conservation measures; (c) NOI and program level monitoring and reporting requirements are met; and (d) that the NOI location is outside of prohibited areas. Although that process will not, by itself, affect a listed species or critical habitat, it informs the effects analysis of suction dredging and high banking NOI operations within the RRSNF in Oregon and California. These procedures are a central part of the program and function to ensure that individual actions remain within the scope of effects considered here, and to ensure that the aggregate or program-level effects of those individual actions are also accounted.

The RRSNF will notify NMFS before authorizing each NOI. As an additional program-level check on the continuing effects of the action, the RRSNF and NMFS will meet at least annually to review implementation of this consultation and opportunities to improve conservation, or make the program overall more effective or efficient. The physical and chemical effects of each action on the environment will vary depending on the type of action being performed and location, but this discussion identifies a common set of effects related to suction dredging and high banking gold mining and associated activities. Activities that are authorized by the RRSNF using this opinion and completed according to the proposed conservation measures do not require further consultation. Activities that do not meet these criteria have a greater likelihood of adverse impacts to listed species and their habitats and require individual consultation.

2.4.1 Effects on the Environment

Suction dredge and high bank mining will occur below the OHW in streams, with suction dredges operating in the wetted stream perimeter and high banking on exposed gravel bars between the wetted stream and the toe of the stream bank. Occupancy and access will occur in riparian areas.

Operation of suction dredges alters stream ecosystems and results in excavation and scour of in-stream habitat, changes substrate composition, fills interstitial spaces, increases turbidity and suspended sediment, increases sedimentation, and destabilizes spawning gravels (Thomas 1985, Hassler *et al.* 1986, Harvey and Lisle 1998, Harvey and Lisle 1999, Somer and Hassler 1992). Some effects, including decreased riparian vegetation, destabilized stream banks, channel widening, and site damage and soil disturbance leading to erosion in riparian areas, can also result from dispersed camping and equipment deployment in riparian areas (Stern 1988, Kattelmann and Embury 1996, Prussian *et al.* 1999, Royer *et al.* 1999, Bernell *et al.* 2003, HWE 2011, USEPA 2012). Small streams are more vulnerable than large rivers (Harvey and Lisle 1998). Relatively intense declines in water clarity do occur temporarily during operation of the suction dredge, but these effects are often localized in proximity to the dredge, for some cases only evident for several feet downstream (Griffith and Andrews 1981, Prussian *et al.* 1999, Royer *et al.* 1999). Mining can also disturb mercury buried beneath the substrate, either from natural sources or a legacy from historical mining activity, allowing for re-suspension and transport to downstream areas where it has the potential to settle out in areas conducive to methylmercury production, with bioaccumulation and adverse effects to food webs and fish (Humphreys 2005, Fleck *et al.* 2011, Marvin-DiPasquale *et al.* 2011). Additional effects include stream bank undercutting, bank sluicing, stream channelization, and riparian vegetation damage (Hassler *et al.* 1986, Stern 1988). On the other hand, Bayley (2003) determined that cumulative effects from suction dredging on width-to-depth stream ratio or salmon densities could not be detected in the Illinois River subbasin. By comparing samples above and below mining, Huber and Blanchet (1992) concluded that several suction dredges (≤ 4-inch), operating simultaneously in the same drainage in Alaska, did not affect water quality.

Overall, scientific and technical literature report variable levels of effects from suction dredge mining. Some variability occurs due to differences in dredge size, stream substrate, or stream gradient. Other variability occurs due to greater or lower mining intensity. For example, for Somer and Hassler (1992) in California, suction dredge activity was low during their study because of high stream flow – 180% of the average water year. Studies also differ in position of dredging within the stream; some studied bank-to-bank dredging while others studied dredging that only occurred in one location. However, this wide range of reported stream characteristics, mining effort, and variable effects are appropriate for our analysis because under this programmatic opinion we expect that the RRSNF will authorize a wide range of suction dredging activity, in multiple streams of differing size and topography and experiencing a variety of hydrological conditions over multiple years.

NOI operations on the RRSNF are restricted by proposed conservation measures (PCMs) that avoid or minimize the potential adverse effects of the activity including activities in riparian areas. Effects avoided by PCMs include loss of riparian vegetation, loss of future wood recruitment into the streams, reduction of in-stream wood and associated pool habitat and natural cover, stream bank erosion, and water withdrawal (see PCMs #13, 14, 20, 36, 37, 44, and 49); therefore, the proposed action is not expected to cause these types of effects.

Effects minimized but not completely avoided by PCMs include increases in water temperature, decreases in stream bank stability, and direct effects to existing pools. Increases in water temperature are minimized due to prohibitions on removal of riparian vegetation such that canopy cover shading the stream will not be reduced. Also, PCMs (1) require buffers for high banking operations, (2) require in-water buffers of the stream's wetted perimeter for suction dredging, (3) prohibit removal of rocks or large wood from the wetted perimeter, (4) restrict movement of boulders to only those that can be moved without a motorized winch, (5) prohibit the filling of existing pools, (6) prohibit directing discharge from the sluice into the stream bank or diverting the stream channel into the stream bank, (7) prohibit certain activities during wet weather conditions, (8) restricts motorized access to existing roads and trails, (9) minimize soil erosion from occupancy by prohibiting the creation of new areas of exposed soil along stream banks and streams, and (10) require new camping areas and paths to be located away from streams and stream banks, all of which will minimize degradation and destabilization of stream banks and protect existing pools, such that the width depth ratio of streams is extremely unlikely to increase (i.e., streams will not get wider and shallower which would allow for greater water surface radiation and warmer stream temperatures). PCMs that minimize these effects include #s 16, 20, 25, 26, 30, 33, and 45-49. Furthermore, PCMs are also protective of small streams to the extent that suction dredging is prohibited in streams that are ≤6 feet wide and high banking is prohibited on streams ≤70 feet wide, unless the stream is completely dry and then high banking is allowed on streams > 30 feet wide (PCMs #25, 33). Overall, increased water temperature, decreased stream bank stability, and direct effects to existing pools are extremely unlikely to occur.

In the BA (USFS 2015), the RRSNF determined that suction dredging would create short-term benefits to water temperature by providing holes to intercept cool water seeping through the hyporheic zone; these holes could then act as cool water refugia during the summer months (Harvey and Lisle 1998). However, these holes are temporary because PCMs require the operator to fill each dredge hole before moving on to the next dredge location and to fill all holes before the end of the in-water work window (PCM #30). Additionally, the RRSNF has not mapped areas of hyporheic flow so there is uncertainty if localized decreases in water temperature in the dredge holes would occur. Overall, the probability of suction dredging producing temperature refugia is too unlikely to consider as an effect of the proposed action.

Despite application of the PCMs, some adverse effects on the environment are still likely to occur and these are discussed below.

2.4.1.1 Mining-related substrate disturbance

Although PCMs may limit overall disturbance, they will not prevent erosion and scouring of the stream bed by the suction dredge. Suction dredging typically disrupts the armored bed surface of the stream, associated with riffles and gravel bars, because miners prefer to target depositional layers at the bedrock interface where gold is likely to be present (Thomas 1985, Weber 1986, Somer and Hassler 1992). Riffles and gravel bars play important roles in the development and maintenance of geomorphic form and function, as well as stream ecology. In alluvial channels, riffles control channel profile and establish bed characteristics, sediment sorting, and pool formation; gravel bars are important for formation of scour pools, creation and destruction of floodplain surfaces, and variation in flow fields that create velocity refugia (HWE 2011).

The armored layer is a layer of interlocking coarse substrate materials that protects underlying finer sediments from scour and erosion during flow events; its disruption has the potential to destabilize the channel through further erosion (HWE 2011). A stream that is free to develop its own geometry evolves through time to develop a channel shape, dimensions, and planform pattern (i.e., morphology) that reflect a balance between the sediment and water inputs, the stream's relative energy and the dominant characteristics of the sediments forming the bed and banks. Undisturbed channel bottoms are frequently armored with a layer of larger gravels and cobbles that overlies mixtures of finer-grained substrate; nearly all gravel channels are mantled by an armored layer containing particles larger than the underlying sediment (Sullivan 1987, NOAA 2004). The armored layer stabilizes the stream bed and protects it from scour, erosion, and movement; it is more difficult to entrain because the particles are larger and are interlocked with other particles.

Harvey and Lisle (1998) reported on the potential for erosive effects of suction dredging near riffle crests, and how suction dredging at those locations can destabilize the entire riffle complex and the natural channel-forming processes. Dredging destabilizes streams because the activity excavates through the armored layer of the substrate (Brown *et al.* 1998). When armoring is disrupted, the exposed, finer sediments underneath are much more easily transported at lower flows, and sediment load is increased (Lagasse *et al.* 1980). As more material begins to move, the bed becomes less resistant and even the larger, coarser materials are transported. Diminished sediment sorting processes and armor layer disruption result in a less stable channel (NOAA 2004). Instability means that substrate and the stream bed is more susceptible to scour and erosion at lower flows and moves more frequently. Suction dredging can lead to development of breaks in channel slopes, or knickpoints in the channel profile that can then migrate upstream and cause further channel incision. Disturbed gravel bed streams will continue to rearrange bedload deposits until the channel morphology is harmonious with flow patterns (Brown *et al.* 1998).

Additionally, hand piling of substrate that is too large to fit through the intake nozzle creates areas of disproportionately greater-sized substrate materials (i.e., tailings). Deposited tailings are highly unstable, have a high potential for scour, and can mobilize under slight increases in stream discharge and velocity because they are unconsolidated and frequently deposited above the armor layer (Hassler *et al.* 1986, Stern 1988, Harvey and Lisle 1998, Harvey and Lisle 1999). Similarly, because high banking operations will occur below the OHW and because holes and tailing piles also result from high banking, high banking operations also disturb substrate. In-stream substrate disturbance also negatively affects aquatic macroinvertebrates; see Section 2.4.1.5 for more discussion.

In some areas, substrate disturbance can be short-term with recovery, while in other areas the impacts can persist. Geomorphic recovery is the concept that, following disturbance, a landform will return to its general form or trend through moderating physical and biological processes (HWE 2011). Recovery is dependent on winter flow and bankfull flow events. Dredging and high banking impacts (i.e., holes and tailing piles, disruption of the armored layer) that are not reset by a winter or bankfull flow event have increased potential for long-term impacts to stream geomorphic form and function (Harvey and Lisle 1999, HWE 2011). These long-term geomorphic effects are likely to be most evident in small channels and watersheds, along the margins of channels, downstream of dams, and in areas with a high concentration of dredging activity (HWE 2011).

However, in gravel- and cobble-bed channels like those in the action area, the bankfull stage establishes channel morphology and accomplishes the most sediment transport (Wolman and Miller 1960, Montgomery and Buffington 1998); the magnitude of the channel-forming discharge commonly lies between the mean annual discharge and the discharge that occurs once or twice every one to two years (Parker and Peterson 1980, Andrews 1980). Years in which the bankfull (dominant) discharge is met or exceeded will have a greater likelihood of transporting a larger sediment load, and thus potential for aggregate recharge, than years in which the flow is less than the bankfull discharge. Flow measurements from gauged rivers around the world show that the bankfull discharge has a recurrence interval on 1.5 years on average. This means in any given year there is a 67% chance that a bankfull discharge will occur (Vermont 2009). Therefore, suction dredging increases the rate of disturbance as well as the duration of channel instability, because suction dredging increases the frequency of disturbance to 100% annually.

On average, the probability of a bankfull discharge event not occurring in any given year is 33%. For ease of discussion, we will evaluate the probability of a bankfull discharge event occurring over a 2 year recurrence interval, rather than 1.5 years. There is an 89% chance that the bankfull discharge will occur during the time frame of 2 winters, or an 11% chance that it will not occur. Therefore, it is likely that a bankfull discharge will occur and the channel will begin to restabilize after suction dredging over a period of 2 winters. We believe this is an appropriate estimate because PCMs prevent suction dredging within 50 feet of riffle crests (#26a) and also prevent suction dredging in streams with a summer wetted width ≤ 6 feet (#25). Boulders and in-stream wood are elements that contribute to stream bed and stream channel integrity and provide substrate stability; PCMs preventing the use of motorized winches will limit the size of boulders that can be moved for both suction dredging and high banking and thus limit effects to smaller disturbances. For suction dredging, rocks cannot be removed from the wetted perimeter (PCM #26b) and PCMs also protect in-stream wood and the stream banks (PCM #13). The likelihood that disturbance from high banking will persist long-term is also reduced because high banking is restricted to below the OHW elevation and with a buffer from the stream toe and because high banking is prohibited on streams ≤70 feet wide, unless the stream is completely dry and then high banking is allowed on streams > 30 feet wide (PCM #33). The PCMs also require the NOI operator to backfill the dredge and high banking holes and spread the tailings to conform to the contours of the stream channel (PCMs #30, 31, 34, 35; however, because this does not re-establish the armor layer there is uncertainty whether this is a successful conservation measure because there are conflicting professional opinions which have not been thoroughly tested. Additionally, we do recognize that the recurrence interval is an average and that there are many streams in the action area. Therefore, due to annual and spatial variation, there are likely to be some years or streams where bankfull discharge will not occur during a period of two winters and disturbed substrates will not be stabilized within this time frame for all streams in the action area; conversely, there are likely to be some years or streams where recovery time will be less than 2 years. However, there are multiple PCMs that limit the amount and extent of substrate disturbance and thus, contribute to the likelihood that a bankfull event will redistribute substrate and initiate channel stability on a biennial basis.

Harvey and Lisle (1998) also suggested that duration of holes, tailing piles, and channel instability is likely to be greater for rivers and streams with flows controlled by impoundments designed to decrease peak flows and trap sediment. The mainstem of the Rogue River and the Upper Applegate River are the only streams in the action area with flow controlled by large dams for flood storage (William L. Jess dam and Applegate dam). However, these dams, especially the William L. Jess dam, are located at substantial distances upstream from any proposed mainstem NOI activities, with some exception for the Upper Applegate watershed (however, none of the 2009-2012 NOIs were located on the mainstem Applegate River). Therefore, impoundments are unlikely to affect the duration of suction dredge/high banking holes and tailing piles or channel instability for streams in the action area beyond what we estimated above.

Each NOI will have a relatively small extent of impact because a sediment deficit will not result from the proposed action (i.e., suction dredge mining will not remove gravels or other non-mineral substrates from the stream). The RRSNF estimated the cumulative linear distance of dredge hole(s) within each NOI operation to be 15 feet, by using a standard formula[28] based on the total amount of disturbance (i.e., <25 cy) allowed under PCM #17 and based on what the RRSNF considers a typical average depth dredged by miners in streams in the RRSNF.[29] They also determined the cumulative linear distance occupied by tailings to be 18 feet, based on a ratio of dredge hole area to pilings area as developed based on information documented in Stern (1988). We are uncertain how large a distance of stream channel will be destabilized but it is likely to be greater than 33 feet for each individual NOI-level project area. However, given that (1) the prohibitions on suction dredging limit the size of the largest hole that could be excavated, (2) NOI-operators are likely to dig multiple, smaller holes rather that one large hole, and (3) that multiple dredge holes will likely occur within 100 feet for each NOI (USFS 2015 Appendix F), we anticipate that the overall extent of destabilization will be approximately 400 feet which incorporates both the approximate stream length worked per NOI and the estimated distance of downstream sedimentation and substrate embeddedness (see Section 2.4.1.2). However, for analysis purposes, we will use a slightly larger estimate of 433 feet which would also account for the maximum dredge hole and piling area linear distance.

2.4.1.2 Suspended sediment, sedimentation, and substrate embeddedness

Suspended sediment and subsequent sedimentation and substrate embeddedness are likely to be short-term, episodic effects with application of the PCMs. Suction dredging tests in the South Yuba River using a 3-inch dredge increased the concentration of fine-grained sediments suspended in the water column despite the relatively low concentrations at the dredging location (Fleck *et al.* 2011). Suspended substrate emerges from the rear of the dredge and sediment deposition/sedimentation occurs downstream of the dredge location (Thomas 1985). Heavier substrates will settle out on the stream bed closer to the dredge while lighter particles and fines will remain suspended for some distance downstream until they also settle out (Harvey and Lisle 1998, Fleck *et al.* 2011). Suction dredging is only allowed during the in-water work windows (PCM #21) which are restricted to summer months when stream flows are low. Because suction dredging is done during the low flow period, the distance the sediment can immediately travel suspended in the water column is limited. However, future flow events will mobilize settled fines and sediment such that they will be continually redistributed and transported downstream; these events will occur during late fall, winter, and early spring. As stream flows increase due to increasing precipitation, the sediment deposited downstream of the dredge, sediments disturbed by high banking, and fine sediments will all be re-suspended and transported downstream, and over time will reach the estuaries. Due to the timing of these events and the presence of elevated levels of suspended materials from multiple other sources, measurable suspended sediment concentrations as a result of the proposed action are unlikely to occur during late fall, winter, and early spring. Additionally, suspended sediment concentrations in estuaries are generally high due to regularly occurring tidal flushing and the overall effects of transported fine sediment in estuaries will also be immeasurable.

Measurable, increased suspended sediment and fine sediment deposition rates downstream of suction dredges have been reported at multiple distances (Table 22) and decreasing rates are typically associated with increased downstream distance. Measurable, increased suspended sediment occurs only when suction dredging is occurring and for an ephemeral time immediately after. Measurable, increased sedimentation and substrate embeddedness are related to suspended sediment; they occur during suction dredging and persist afterward. It is likely that sedimentation and substrate embeddedness will be reset in between mining season during winter flows because fine sediments are easily moved by winter flows. However, there is a period of time between the end of the in-water mining season and prior to high water flow events where no or very little rainfall occurs.

Rainfall in the action area typically occurs mid- to late October, but stream flows typically do not increase substantially until November or December (Figure 20). Therefore, we expect that sedimentation and substrate embeddedness will persist until November or December, with some reasonable annual and spatial variation. Measurable suspended sediment and subsequent sedimentation and substrate embeddedness also negatively affect aquatic macroinvertebrates; see Section 2.4.1.5 for more discussion.

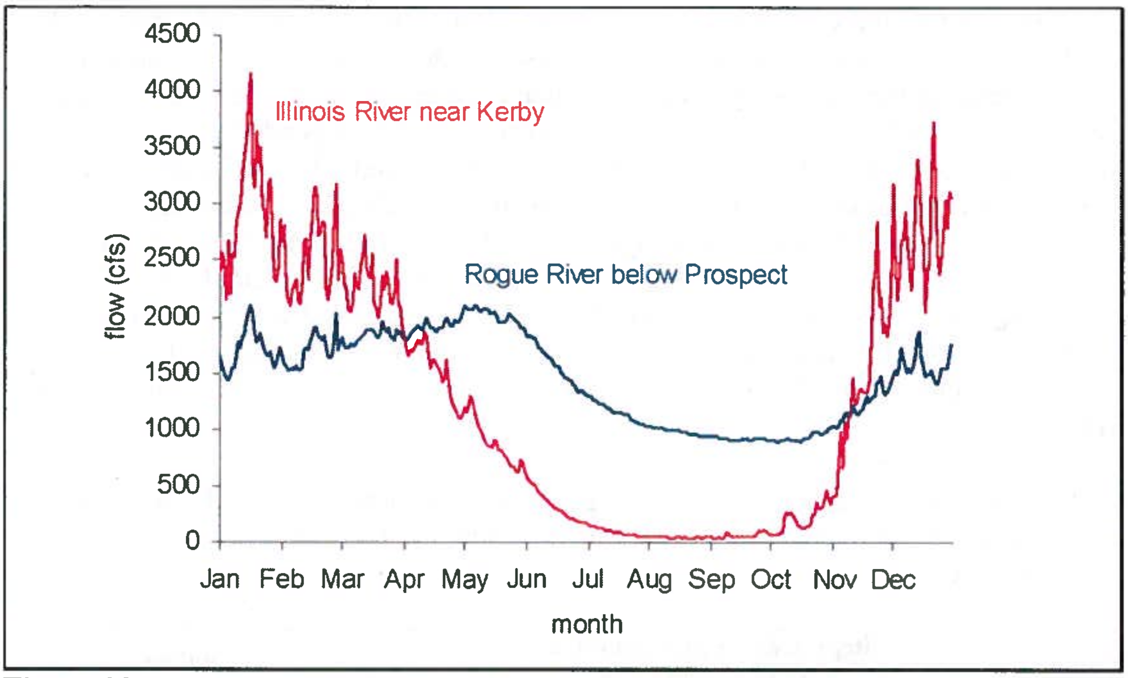

Figure 20. Daily average flows for the Illinois River, 1962-2007 (drainage area 380 square miles) and Rogue River, 1969-2007 (drainage area 379 square miles). Neither gage is located downstream of a major storage reservoir (Crown *et al.* 2008).

In 2015, ODEQ, for the first time, began requiring suction dredge operators to report turbidity monitoring as part of the 700PM permit. Reports were due February 28, 2016, however as of March 24, 2016, only 32% had been submitted. Therefore, at this time, we have no specific information on the length of visible turbidity plumes from suction dredging in Oregon and instead look to the best available information available in literature and reports. Using a 4-inch suction dredge, which is the maximum size dredge allowed under the PCMs, Somer and Hassler (1992) recorded increased sedimentation rates for greater than 370 feet downstream and increased turbidity[37] for 400 feet downstream. Turbidity effects caused by larger-sized dredges (i.e., 8-inch) returned to values measured upstream of the dredge at a distance of 525 feet downstream of the operating dredge (Prussian *et al.* 1999, Royer *et al.* 1999). Notably, they estimated that only 7% of the river's width was affected by the turbidity plume with the dredge operating approximately 23 feet from the stream bank. Thomas (1985) similarly observed that sediment deposited downstream of a suction dredge was not equally distributed across the stream. Stern (1988) noted that deposition was related to dredge position. In other circumstances,

[37] Turbidity, a measure of light transmission, is an alternative measure of suspended solids (USEPA 2012). Turbidity is a parameter that reflects the clarity of water and is measured by a turbidimeter that measures the amount of light scattered by a water sample. Suspended sediment/solids reflects the weight of suspended matter in a water sample and is determined through a standardized sample filtration, drying, and weighing procedure. The disadvantage of turbidity is that it may not accurately reflect the effect on salmonids because it is only an indicator of suspended sediment and not a direct measurement (Bash *et al.* 2001).

suspended sediment and sediment deposition caused by smaller sized dredges resulted in smaller downstream distances for recovery (Table 22). Harvey *et al.* (1982) reported that dredging in areas containing only sand and gravel caused virtually no change in turbidity as compared to dredging clay deposits and the stream bank, which resulted in very noticeable turbidity. While the literature has reported a large range in downstream suspended sediment and sedimentation rates, it does demonstrate the variability of effects which are dependent on stream hydrology and substrate composition in addition to dredge size. Turbidity and total suspended solid concentrations within suction dredging plumes are unlikely to exceed 50 nephelometric turbidity units (NTUs) and 340 milligrams per liter (mg/L), respectively (Table 23) and are unlikely to occur for more than 8 hours (PCM #19), although total daily operating time of a single operator is usually less, i.e., 2 to 5.6 hours (Hassler *et al.* 1986, CDFG 1994, Harvey and Lisle 1998, USFS 2013). Background concentrations of turbidity and total suspended sediment during suction dredging are typically very low value NTUs or mg/L due to normal water clarity in summer. Throughout Oregon, background turbidity during the summer is 1 NTU in most regions (Borok 2014).

Table 22. Downstream extent of suction dredge caused turbidity, suspended sediment, sediment deposition, or substrate embeddedness as reported from multiple sources.

Dredge size	Reported Downstream extent (Parameter measured)	Citation
2.5-inch	36 feet (sediment deposition) 97 feet (suspended sediment)	Thomas 1985
	3.3 feet (turbidity) None (turbidity)	Griffith and Andrews 1981
4-inch	400 feet (turbidity) >370 feet (suspended sediment)	Somer and Hassler 1992
	>160 feet (suspended sediment and turbidity)	Hassler *et al.* 1986
	>328 feet (total suspended solids and turbidity) 164 feet (substrate embeddedness)	Stern 1988
	>200 feet (total suspended solids and turbidity)	Johnson and Peterschmidt 2005
5-inch	>160 feet (suspended sediment and turbidity)	Hassler *et al.* 1986
5.9-inch	263 feet (turbidity)	Harvey 1986
6-inch	98 feet (turbidity and settleable solids) 197 - 394 feet (sedimentation rate)	Harvey *et al.* 1982
8-inch	525 feet (turbidity and total filterable solids)	Prussian *et al.* 1999, Royer *et al.* 1999
10-inch	492 feet (turbidity)	Wanty *et al.* 1997

Table 23. Maximum magnitude of suction dredge caused turbidity, suspended solids, or sediment deposition as reported from multiple sources. T= turbidity, measured in NTUs; SS = suspended solids, measured in mg/L; SD = sediment deposition, measured in grams per square meter per day or grams per trap.

Maximum Turbidity (NTU); Location	Maximum Suspended solids (mg/L); Location	Maximum Sediment Deposition; Location	Background or Control values			Citation (dredge size – inches)
			T (NTU)	SS (mg/L)	SD (see caption)	
2.2; 3.3 feet downstream 0.7; 3.3 feet downstream	N/A	N/A	1.6 0.8	N/A	N/A	Griffith & Andrews 1981 (2.5)
22; 10 feet downstream	1.6; 10 feet downstream	2,075 grams per square meter per day; 39 feet downstream	<2	0	50	Harvey *et al.* 1982 (6)
N/A; N/A	340; dredge outflow	40 grams per trap; dredge outflow	N/A	4.56	5	Thomas 1985 (2.5)
50; 33 feet downstream	N/A	N/A	4-5	N/A	N/A	Harvey 1986 (5.9)
20.5; 13 feet downstream 5.6; 13 feet downstream	244; 13 feet downstream 47.5; 13 feet downstream	42,366 grams per square meter per day; 29.5 feet 12,080 grams per square meter per day; 13 feet downstream	0.47 0.88	0 0.5	22 105	Hassler *et al.* 1986 (5) (4)
2.22; 33 feet downstream 1.81; 33 feet downstream	62.5; 33 feet downstream 274; 72 feet downstream	1,859 grams per square meter per day; 33 feet downstream 3,858 grams per square meter per day; 72 feet downstream 42,366 grams per square meter per day; 30 feet downstream 12,080 grams per square meter per day; 13 feet downstream	0.24 0.23	0 0	7 46 22 105	Stern 1988 (6)* (4) (5)* (4)
15; dredge outflow	N/A	1,711 grams per square meter; 131 feet downstream	---	N/A	23	Somer and Hassler 1992 (4)
19; 100 feet downstream	N/A	N/A	1.7	N/A	N/A	Wanty 1997 (10)
25; dredge outflow	46; dredge outflow	N/A	1	3	N/A	Prussian *et al.* 1999; Royer *et al.* 1999 (8)

Maximum Turbidity (NTU); Location	Maximum Suspended solids (mg/L); Location	Maximum Sediment Deposition; Location	Background or Control values			Citation (dredge size – inches)
			T (NTU)	SS (mg/L)	SD (see caption)	
12; 10 feet downstream	86; 10 feet downstream	N/A	0.8	10	N/A	Johnson and Peterschmidt 2005 (4)

* 2 dredges operating

Application of the PCMs, specifically restrictions imposed on intake nozzle diameter, engine horsepower, dredge spacing, limitations on the visible length of the downstream turbidity, limiting operations to certain daylight hours, maintaining buffers for stream banks, prohibiting waste water discharge from high banking, and protecting stream banks during wet weather conditions will all reduce the distance immediately traveled downstream by suspended sediment and its effects, as well as sedimentation and substrate embeddedness. Thus, it is reasonable to expect measurable downstream effects to occur for the length of the visible turbidity plume (Prussian *et al.* 1999). For the proposed action, the length of the visible turbidity plume is restricted to 300 feet by PCM #29. Therefore, it is reasonable to expect that there will be measurable effects from turbidity, suspended sediment, sedimentation, and substrate embeddedness for 300 feet downstream of an operating suction dredge during the in-water mining seasons with sedimentation and substrate embeddedness persisting until November or December, with some reasonable annual and spatial variation. However, these are temporary effects and sedimentation and substrate embeddedness will be reset in between mining seasons during winter flows. Although some sediments will continue to be transported farther, especially fine-grained sediments (i.e., silt-clay, < 0.063 mm; Fleck *et al.* 2011), because the plume will no longer be visible, any effects associated with water column-turbidity will be immeasurable at distances greater than 300 feet.

2.4.1.3 Methylmercury

Stream bed sediments in the action area are likely to contain mercury, as discussed above in Section 2.3, either as a legacy of historical gold mining or from naturally occurring deposits and mercury mining. Operators will not introduce new mercury to streams because PCM #12 prohibits the use of mercury or other chemical agents; however, existing mercury in the stream sediments will be disturbed and remobilized by mining operations, especially those that mine the sediments below the armored bed surface. Fleck *et al.* (2011) demonstrated an increase of mercury in the water column caused by using a 3-inch suction dredge in the South Yuba River and Humbug Creek, California, even though mercury was present only in low concentrations at the dredge sites. Although mercury, like gold, can remain captured in the sluice of the dredge, some proportion will be returned to the stream. A dredge efficiency test using a 4-inch dredge was performed on the South Fork of the American River, California, with results indicating that approximately 98% of dredged mercury was removed by the dredge (Humphreys 2005). Mercury not captured or released by the dredge was associated with fine-grained sediments, which typically have the highest mercury concentrations. Although there is some argument that this test underestimates the amount of mercury captured by the dredge due to the lack of "miners moss" in the sluice of the test dredge, it is important to note that the mercury concentration in the suspended sediment returned to the river by the dredge was 240 ppm. For context, California classifies mercury concentrations of 20 ppm as hazardous waste (Humphreys 2005). Therefore, even with the majority of mercury captured by the dredge, the amount of mercury mobilized in-stream by suction dredging can be environmentally relevant, however, there is no information available regarding the concentrations of mercury remobilized by mining operations on the RRSNF.

Concentrations of methylmercury, a toxic, organic form of mercury, appeared to be unaffected at the dredge location (Fleck *et al.* 2011). However, Fleck *et al.* (2011) concluded that disturbance of sediments by suction dredging would likely lead to enhanced mobilization of mercury to downstream environments. Elevated concentrations of mercury are associated with sediment particles, especially fine-grained sediments (i.e., silt-clay, < 0.063 mm; Hunerlach *et al.* 2004, Fleck *et al.* 2011, Marvin-DiPasquale *et al.* 2011). As discussed previously in Section 2.4.1.2, future flow events will mobilize settled fines and sediment from suction dredging and high banking such that they will be continually redistributed, transported downstream, and, over time, will reach the estuaries (Alpers *et al.* 2005, Gehrke *et al.* 2011). Marvin-DiPasquale *et al.* (2011), with laboratory experiments using sediments collected from the South Yuba River and Humbug Creek, demonstrated the potential for downstream sediments receiving the transported mercury to exhibit methylmercury production. Effects are dependent on the physical and chemical nature of the mobilized materials as well as that of the environmental conditions in the downstream depositional areas.

Methylation of inorganic "reactive" mercury (i.e., fraction of total mercury that is most readily converted to methylmercury by microbes) into methylmercury is a concern because of the toxic qualities of methylmercury. Methylmercury levels in aquatic systems are not always correlated with total mercury concentrations because methylation rates generally depend on the productivity of anaerobic microorganisms and the bioavailability of reactive inorganic mercury. Some studies suggest that the primary producers of methylmercury in freshwater and coastal aquatic environments are bacteria in anoxic zones, including benthic sediments, saturated soils, stratified water columns, and periphyton biofilms (Compeau and Bartha 1985, Davis *et al.* 2003, Hammerschmidt and Fitzgerald 2004, Heim *et al.* 2007, Evers et al. 2008, Chen *et al.* 2009, Hsu-Kim *et al.* 2013), while others consider photochemical reactions and redox potential to the be most important source in estuaries (Bratkic *et al.* 2013). Methylation typically occurs in environments with high organic content, low pH, low dissolved oxygen content, presence of sulfate or iron-reducing bacteria, and higher temperatures (Alpers *et al.* 2008, Ward *et al.* 2010), and the presence of wetlands (USEPA 1997). Many studies report a seasonal variation in estuarine methylmercury concentrations and methylation rates, with the highest values observed during times of highest water temperatures (Hammerschmidt and Fitzgerald 2004, Heyes *et al.* 2006, Lambertsson and Nilsson 2006, Canario *et al.* 2007, Heim *et al.* 2007, Bratkic *et al.* 2013). Therefore, summer is likely the time of highest estuarine methylmercury concentrations.

Although Alpers *et al.* (2008) also listed extensive seasonal floodplain inundation as an environmental condition conducive to methylation, this is typical of large fluctuations in prolonged inundation of off-channel wetland and marsh or other anoxic, organic habitat (i.e., Everglades, Amazon, boreal forests) which is uncommon in non-coastal southwest Oregon.

Furthermore, bioavailability is low for methylmercury transported to streams by episodic flood events (Ward *et al.* 2010). Given these conditions, we do not expect measurable amounts of methylation to occur in the freshwater streams and mainstem rivers within the RRSNF and downstream because conditions favorable to methylation are typically associated with reservoirs, lakes, and wetlands. Also, the Yuba River experiments suggests that main channel depositional zones are not very conducive for methylmercury production (Marvin-DiPasquale *et al.* 2011) and Peterson *et al.* (2002) estimated that low pH/high dissolved organic carbon streams are very rare in Oregon. Other studies have also determined that in-stream benthic methylmercury production is minimal (Brigham *et al.* 2009, Chasar *et al.* 2009, Marvin-DiPasquale *et al.* 2009).

However, although there are no reservoirs located downstream of suction dredging locations, mobilized fines and sediments transporting the mercury that are continually redistributed and transported downstream will eventually settle out when reaching the estuaries and their tidally-influenced areas. Currently, there is no information available to estimate how much mercury must be remobilized and transported to cause measurable increases in estuary methylmercury concentrations, although Fleck *et al.* (2011) estimated that the amount of dredging needed to equal long-term downstream accumulation rates was unlikely to occur. Demethylation, which often occurs simultaneously with methylation and often by the same microorganisms and other pathways, also plays a role in the amount of estuary methylmercury concentrations.

Under the proposed action, the Rogue River and the Chetco River will have the greatest amount of mining activity. Therefore, because it is reasonable that depositional areas will be areas favorable to methylmercury production, we examine the environmental conditions of these two estuaries in terms of depositional areas for remobilized mercury. Although other estuaries are likely to contain depositional areas favorable for methylmercury, the low amounts of mining activity proposed in these systems (i.e., nine or fewer NOIs per year) are extremely unlikely to cause measurable increases in estuarine methylmercury concentrations.

Rogue River estuary. The estuary of the Rogue River is topographically constrained (Figure 21) making it one of the smallest in Oregon (Hicks 2005, Hicks *et al.* 2008). It has a total estuary area (i.e., marine, estuarine, and tidal riverine habitats) of 2.77 square kilometers and is geomorphologically-classified as a highly river-dominated drowned river mouth estuary (Lee and Brown 2009). Even during low flows, tidal flushing is more rapid than in most Oregon estuaries due to the large volume of incoming freshwater and the short distance from head of tide to mouth (Ratti 1979). In general, the Rogue estuary follows the shape of the river channel and it lacks large bay or slough subsystems with associated broad intertidal areas and reduced currents that are typical of the larger drowned river estuaries on the northern Oregon coast (Ratti 1979).

The Rogue River estuary is river flow dominated (Hicks 2005). During high river flows, incoming freshwater volume is several times greater than the tidal prism. Even summer flows produce an incoming freshwater volume nearly as large as the tidal prism, which is unusual for most estuaries in Oregon (Ratti 1979).When river flows are high, most river-born sediment is transported beyond the mouth to the ocean (Ratti 1979). Estuarine deposition increases in summer and early fall although there are strong currents throughout the year (Hicks *et al.* 2008). Salinity intrusion in the estuary is very limited due to the steep river gradient and the high volume of river discharge, with the exception of summer because of lower freshwater inputs (Hicks *et al.* 2008).

Bricker *et al.* (2007), based on limited available data, determined the overall eutrophic condition of the Rogue River estuary to be moderate-low, although they noted more information is needed to adequately characterize the estuary. A search of ODEQ's 2010 water quality database and integrated report yielded the following results for conditions affecting methylmercury production for the Rogue River estuary:

- *Dissolved oxygen:* Attaining[38] No Action estuarine water (year-round)
- *pH:* Attaining No Action from river mile 0 to 27.2 (year-round)
- *Temperature:* Water-quality limited from river mile 0 to 124.8; Total Maximum Daily Load approved (year-round)

Figure 21. The Rogue River estuary (Hicks 2005).

[38] "Attaining" means that water quality standards are being met; in terms of dissolved oxygen and pH specifically, "for 10 or more samples, greater than 90% of the samples meet the appropriate criterion or for 5 to 9 samples there are no exceedances of the appropriate criteria" (Urbanowicz 2011).

In summary, there are few areas in the Rogue River estuary where deposition of remobilized mercury is likely to occur because of the estuary's small size, the strong river currents, and simplification from man-made alterations. Furthermore, although listed for elevated water temperatures, it is unlikely that these few areas have environmental conditions favorable to the production of methylmercury because the estuary appears to lack excess organic material and does not have low dissolved oxygen or low pH. Production of methylmercury may also be limited by the lack of mercury because although mercury has been detected in estuarine sediments of the Rogue River it has typically only been measured in low amounts (see Section 2.3). However, because available data is limited and because a large amount of suction dredging and high banking will be authorized annually (up to 255 NOIs), it is possible that some methylmercury production could occur in the Rogue River estuary but, based on the best available information, we expect only very minor amounts.

Chetco River estuary. The Chetco River estuary is similar to the Rogue River estuary in many ways. It is another one of Oregon's smallest estuaries at 0.72 square kilometers and is also geomorphologically-classified as a highly river-dominated drowned river mouth estuary (Lee and Brown 2009). The estuary has also been highly modified by jetties, marinas, and a dike (Ratti and Kraeg 1979).

Also like the Rogue River estuary, the steep gradient of the Chetco River severely restricts the extent of tides and the mountainous terrain limits the size of the estuary (Ratti and Kraeg 1979). Further development of the Port of Brookings involved the filling of the only major shallow area in the estuary, a shallow lagoon south of the jetty. However, 18 of the 25 wetlands identified in the subbasin are associated with the estuary (approximately 93 acres; Maguire 2001b).

According to Maguire (2001b), the estuary is deficient in oxygen in summer although ODEQ's status ranks it as Attaining No Action for dissolved oxygen and pH (ODEQ 2010). ODEQ (2010) also lists it as water quality limited for elevated water temperatures year-round, with an approved Total Maximal Daily Load. Elevated pH values (>8.5) have been detected in the boat basin during summer (South Coast Watershed Council unknown date). The Chetco River estuary is strongly influenced by seasonal fluctuations in river discharge. During high winter flows, heavy loads of suspended sand and gravel are flushed into the ocean, but as flows decrease in the spring, shoaling rapidly occurs at the mouth of the boat basin and in the entrance of the dredge channel. The annual decrease in river flow also allows accumulation of a thin layer of silt and clay over the gravel base in the upper estuary. As the rainy season begins and river flow increases, this surface layer of mud is quickly flushed from the estuary (Ratti and Kraeg 1979). Below the Highway 101 Bridge, the estuary is mostly subtidal, while above Highway 101 it does contain more intertidal habitat, including the seasonally flooded cobble/gravel flats along the banks. The summer intertidal habitats are predominantly gravel shores covered by algae and fine sediments, but there are two small mud/sand flats removed from the main flow of the river. One of these is Snug Harbor, a small slough on the north bank that is used as a boat moorage. The second intertidal mud-sand flat is just upstream of the Highway 101 Bridge on the south shore below a small intertidal gravel marsh. Increased organic material from decaying algae is present in the summer (South Coast Watershed Council unknown date).

Like the Rogue River estuary, there are few areas in the Chetco River estuary where deposition of remobilized mercury is likely to occur because of the estuary's small size, the strong river currents, and simplification from man-made alterations. Although the Chetco River estuary may be more susceptible to low dissolved oxygen and high organic content during summer, which are environmental conditions favorable to the production of methylmercury, a much smaller amount of suction dredging and high banking will occur in the Chetco River, with just 15 NOIs authorized per year. Therefore we also expect only very minor amounts of methylmercury production in the Chetco River estuary as a result of the proposed action.

2.4.1.4 Unintentional chemical contamination

Suction dredges and high banking equipment require the use of fuel, oil, and other lubricants, which are petroleum-based contaminants containing polycyclic aromatic hydrocarbons (PAHs). These contaminants may also be used while camping and in vehicles using existing fords. Fuel is also stored on-site. Equipment is operated within the wetted perimeter of the stream for suction dredging (and also for vehicles fording streams) and in the dry area below the OHW elevation, but above the wetted perimeter, for high banking. Thus, there is a potential for introduction of toxic contaminants into the stream or adjacent riparian areas from accidental spills, improper storage, or mechanical failure. In addition to negatively affecting water quality, these contaminants can also negatively affect aquatic macroinvertebrates; see Section 2.4.1.5 for more discussion.

However, operators are required to maintain all suction dredging equipment such that equipment will not release petroleum products; discharge of oil, grease, and fuel is prohibited (PCM #24a, b). Operators are also required to keep suction dredging equipment surfaces free of oil and grease (PCM#24c). The large majority of suction dredges will be refueled while floating in the stream, although some suction dredges may have a detachable fuel tank such that fueling could occur onshore and away from the stream. However, dredges are required to be located adjacent to the stream bank during fueling to prevent fuel from being carried out into the stream (PCM#24d). With proper application of PCM #24f, use of a funnel or spout and absorbable material will minimize leaks during fueling. Only a small amount of fuel will be present in the container (PCM #24e) so that when an accidental spill does occur during fueling, less than 2 gallons will be spilled at a time. Required daily inspections are a preventative measure designed to catch malfunctions or leaks before they occur and use of an available spill kit will reduce the overall extent of in-stream contamination (PDC #24c, g). Additionally, PCM #11 requires a 100-foot buffer distance for fuel storage and use of impermeable, spill-proof containers. When site conditions do not allow for a 100-foot buffer, a containment system must be used that will completely accommodate the full volume of all contaminants without overtopping or leaking. Although application of PCMs for suction dredging will minimize the risk of accidental spills or equipment malfunction, especially in-stream spills, they are still likely to occur. However, PCMs will reduce the extent and magnitude of contamination when they occur. PCMs also require the operator to contact and notify both ODEQ and the RRSNF, as well require the operator to remove and properly dispose of all contaminated materials including saturated soils.

Camping also has the potential to introduce other contaminants including trash, human waste, and soap. However, these additional contaminants from camping are unlikely to enter streams or rivers in measurable quantities due to requirements to (1) locate all new camping areas away from streams, (2) removal all trash, litter or other items from NOI sites, (3) keep all human waste more than 200 feet away from streams, and (4) clear camp sites and any materials associated with camp sites within seven days of the end of suction dredging or high banking operations (PCMs #45, 46, 48).

2.4.1.5 Forage reduction

Sedimentation/substrate embeddedness and chemical contamination, discussed above, are likely to contribute to temporary decreases of aquatic macroinvertebrates (Neff 1985, Bjornn and Reiser 1991, Suttle *et al.* 2004). Additionally, suction dredging itself can directly cause localized and temporary reductions of macroinvertebrates; reductions are likely due to removal from substrate disturbance, and potentially subsequent predation (Thomas 1985, Hassler *et al.* 1986, Somer and Hassler 1992, HWE 2011) because mortality and injury of macroinvertebrates passing through a small suction dredge (i.e., 3-inch) has been reported to be low (< 1%, Griffith and Andrews 1981; 7.4%, Lewis 1962, as cited in Thomas 1985). Downstream decreases in macroinvertebrates are most likely associated with sediment deposition and substrate embeddedness below the suction dredge (Harvey *et al.* 1982, Stern 1988). Royer *et al.* (1999) reported that macroinvertebrate abundance and diversity was substantially reduced for approximately 30 feet downstream of an 8-inch suction dredge, with values returning to reference site levels by approximately 260 feet downstream of the dredge. Similarly, Harvey (1986) saw decreased abundance approximately 32 feet downstream with recovery occurring by 197 feet downstream. In other studies, there were no downstream decreases in mean macroinvertebrate abundance or diversity indices due to suction dredging even with deeper dredge holes; however, some functional feeding groups did decrease below dredging sites or were more abundant above dredging sites, while other groups had the reverse pattern (Thomas 1985, Hassler *et al.* 1986, Somer and Hassler 1992).

Aquatic macroinvertebrates (e.g., larval insects, obligate aquatic insects, mollusks, crustaceans) recolonize disturbed areas by drifting, crawling, swimming, or flying in from adjacent areas. The time required for recolonizing aquatic invertebrates to reach pre-disturbance abundance levels and equilibrium is related to the spatial scale of their initial habitat loss, the persistence of the excluding or disturbing mechanism, the size of adjacent or remnant invertebrate populations (i.e., potential colonizers), the season in which the disturbance is taking place, and the life history characteristics of the invertebrate species (Mackay 1992). In the harsh climates of Alaska, macroinvertebrate abundance and diversity following suction dredging recovered within one year (Prussian *et al.* 1999, Royer *et al.* 1999). Actual recolonization could have occurred sooner as these results are not based on consistent monitoring but on when the investigators returned to the site. Shorter macroinvertebrate recolonization times (i.e., 30-45 days) have been reported and these may be more representative of streams in southwest Oregon (Griffith and Andrews 1981, Thomas 1985, Harvey 1986). Displacement of macroinvertebrates from substrate moved during suction dredging will temporarily increase their abundance in the downstream drift, but their overall abundance at the NOI site will decrease until recolonization occurs, likely within a few months because the summer-fall mining in-stream mining season coincides with high levels of invertebrate activity. Additionally, as discussed previously, we expect that sedimentation and substrate embeddedness will be temporary, persisting only until November or December, also allowing for recolonization of these temporary impacted areas.

Petroleum-based contaminants (such as fuel and oil) contain PAHs, which are acutely toxic to aquatic organisms, including aquatic macroinvertebrates at high levels of exposure and cause sublethal adverse effects on aquatic organisms at lower concentrations (Heintz *et al.* 1999, Heintz *et al.* 2000, Incardona *et al.* 2004, Incardona *et al.* 2005, Incardona *et al.* 2006). Sublethal effects are those that are not directly or immediately lethal, but are detrimental and have some probability of leading to eventual death via behavioral or physiological disruption. Resident benthic macroinvertebrates will be exposed to PAHs through their diet and direct contact with the sediment (Neff 1985). PAHs may bioaccumulate in aquatic invertebrates within these benthic communities (Varanasi *et al.* 1985, Meador *et al.* 1995). When death occurs, most foraging reductions will likely be short-term because adjacent macroinvertebrate populations will quickly recolonize the disturbed substrate as the summer-fall in-stream mining coincides with high levels of invertebrate activity. Therefore, unintentional chemical contamination will temporarily decrease macroinvertebrate abundance at the NOI site, likely for a few months, until recolonization occurs. Bioaccumulated PAHs will reduce the quality and value of surviving macroinvertebrates as forage items.

2.4.1.6 Effects on off-channel habitat

Off-channel habitat is unlikely to be directly disturbed by mining operations either due to the size of these habitat features or because they have a lack of flowing water during the in-stream work windows. Most streams on the RRSNF have steeper gradients and are moderately entrenched or confined by topography. PCMs are protective of small streams to the extent that suction dredging is prohibited in streams that are ≤6 feet wide and high banking is prohibited on streams ≤70 feet wide at the OHW elevation due to required buffers (PCMs #25, 33), which would include most existing side channels on the RRSNF; dry channels would need to be greater than 30 feet wide before high banking could occur in order to maintain the 15-foot buffers required to protect the stream bank toes. However, it is possible that suction dredging on main stem could affect off-channel habitats as suspended sediment flows downstream with the potential to flow into a side channel and deposit. Effects from suspended sediment and sediment deposition in off-channel habitat is unlikely to be measurable because the majority of suspended sediment will travel within the primary flow path in the channel thalweg and remain in the mainstem channels. Effects on off-channel habitat are unlikely.

2.4.2 Effects on OC and SONCC Coho Salmon

As noted above, each NOI will be completed as proposed with full application of PCMs. Each NOI is likely to have the following effects on individual fish at the site and reach scale. The nature of these effects will be similar between NOIs because (1) each NOI is based on a similar set of underlying activities that are limited by the same PCMs and (2) the individual salmon ESUs have relatively similar life history requirements and behaviors.

2.4.2.1 Exposure

The proximity of coho salmon to any NOI operations and resultant effects that could injure or kill them will be minimized, but not prevented, by the PCMs. The PCMs prohibit willful entrainment of coho salmon, require avoidance of redds and adult salmon, and require in-water operations to follow the Oregon guidelines for timing of in-water work to protect fish and wildlife resources (ODFW 2008 or newest version) and to follow CDFW suction dredge use restrictions[5] (PCMs #21 and 32). Furthermore, settling ponds or excavated work areas between the wetted stream and the stream bank created by high banking are also limited to the ODFW and CDFW timing guidelines (ODFW 2008, CDFW 2012[5], or newest versions, as relevant), as is vehicle use of existing fords (PCMs # 33a and 39).

In general, the Oregon guidelines for timing of in-water work are primarily based on the vulnerable life stages of salmon and steelhead populations, although the actual timing of each run varies from year to year according to environmental conditions. As a result, the Oregon in-water work window guidelines do allow for overlap between NOI operations and coho salmon presence, as listed below (ODFW 2003a,b,c,d).

- Juvenile coho salmon rear year-round in Oregon streams in the action area and will be exposed directly to NOI operations.
- Spawning, egg incubation, and fry emergence will all occur outside of the Oregon in-water work window guidelines; therefore these life history stages will not be exposed to direct effects of suction dredging and high banking but may be affected indirectly by effects persisting once the Oregon in-water work windows have closed. High banking is prohibited when spawning coho salmon or redds are present (PCM #33c).
- Most smolts will outmigrate prior to the Oregon in-water work windows, with the exception of smolts in two areas: (1) Illinois River and (2) tributaries to the Rogue River upstream of the town of Marial.
    - In the Illinois River, outmigration extends to the end of June while the in-water work window opens on June 15, for a two week overlap. There are 188 NOIs proposed annually for the Illinois River.
    - For tributaries to the Rogue River upstream of the town of Marial, outmigration extends to mid-July while the in-water work window begins on June 15, for an overlap of one month. There are 49 NOIs proposed annually for these tributaries.[39] Based on available smolt trap data the RRSNF estimated that ≤5% of the outmigrating smolts from these tributaries would be affected.
    - In the mainstem Rogue River, up to 14% of the outmigration is likely to occur between June 15 and July 15 according to Savage Rapids dam smolt migration data (ODFW 1991, Cramer and Pellissier 1998, Pellissier and Cramer 2001, Pellissier and Cramer 2002).
    - Peak migration typically ends by May 30 (Figure 22). However, all of the data are for the mainstem Rogue River (i.e., Savage Rapids Dam) or tributaries to the upper Rogue River (Little Butte Creek, Bear Creek, and Elk Creek) and Applegate River (Slate Creek).

[39] E-mail from Susan Maiyo, RRSNF, to Michelle McMullin, NMFS (April 10, 2015) (clarifying the annual number of NOIs for tributaries to the Rogue River upstream of the town of Marial).

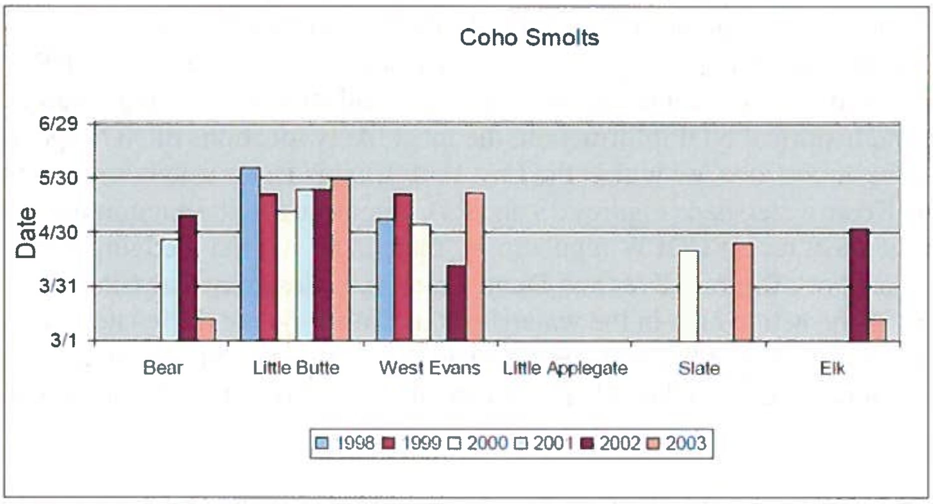

Figure 22. Date of peak migration weeks for coho salmon smolts at six ODFW trap sites in the Upper Rogue River and Applegate River for 1998-2003 (Vogt 2003).

- Most adults migrating upstream will only be present after the Oregon in-water work windows, with the exception of adults in three areas: (1) tributaries to the Rogue River downstream of the town of Marial, (2) tributaries to the Rogue River upstream of the town of Marial and, (3) Coquille River and tributaries.
  - Returning adult coho salmon, especially for the SONCC population, are sometimes stalled in their river entry due to a typical lack of rainfall and sufficient stream flow in the fall and early winter (Lestelle 2007). According to the RRSNF, fall freshets generally occur in October such that upstream migration is delayed until then. However, there will be some years where overlap does occur due to variation in precipitation.
  - For tributaries to the Rogue River downstream of the town of Marial, adult upstream migration begins in mid-August while the Oregon in-water work window closes on September 30. Adults migrating upstream in these areas could overlap with NOI operations for 1.5 months.
  - For tributaries to the Rogue River upstream of the town of Marial and the Coquille River and its tributaries, adult upstream migration begins at the beginning of September while the Oregon in-water work window closes on September 15. Adults migrating upstream in these areas could overlap with NOI operations for approximately 15 days.
  - The overlap between suction dredging operations and adult coho salmon will be minimized because suction dredging activity must stop when adults are present (PCM #21b).
  - The overlap between high banking operations and eggs and spawning adults will be minimized because high banking is prohibited in the presence of spawners and redds (PCM #33c).

California is currently under a suction dredge moratorium. It is reasonable to assume that this will change at some point in the future. As there is no expiration date for the proposed action considered in this biological opinion, it is reasonable to assume that the RRSNF will authorize NOIs for California when the moratorium ends and suction dredging resumes. Based on existing claim and historical NOI information, the most likely locations of NOI operations in California within the action area are within the East Fork Illinois River watershed and the West Fork Illinois River watershed (Figures 23 and 24). According to the suction dredge use classifications under the most recent CDFW regulations,[5] there is no suction dredging allowed in the mainstems of the East Fork Illinois River and Dunn Creek (i.e., designated as Class A). All other rivers and streams in the action area in the watersheds in California are designated as Class F or H. Class F streams are below 4,000 feet in elevation and are only open to suction dredging from July 1 through September 30. Class H streams are above 4,000 feet in elevation and are open year-round.

California NOIs are only likely to be submitted for locations on Class A and F streams because California tributaries in the action area (i.e., with coho salmon and designated critical habitat or within 0.25 miles) do not occur at elevations above 4,000 feet.[40] Only high banking operations would occur on Class A streams and overlap of these activities with coho salmon presence is the same as that discussed for Oregon. For Class F streams with the July 1 – September 30 timing there will not be an overlap between suction dredge operations and outmigrating smolts or upstream migrating adults in the Illinois River, based on ODFW run timing. Overlap of high banking operations with coho salmon presence for Class F streams would be the same as previously described.

[40] E-mail from Susan Maiyo, RRSNF, to Michelle McMullin, NMFS (April 9, 2015) (clarifying elevation of action area streams in California).

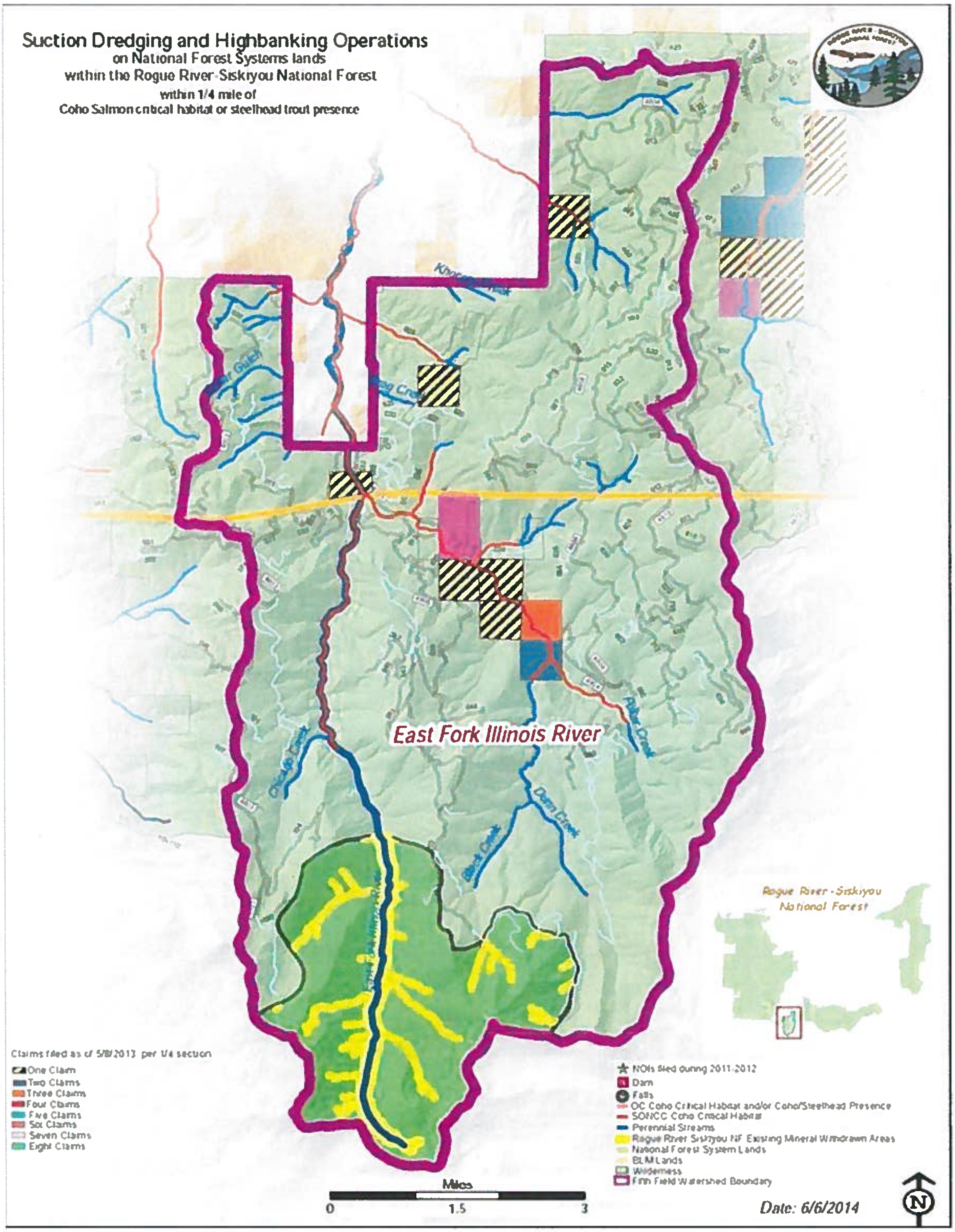

Figure 23. The East Fork Illinois watershed on National Forest System lands in the Rogue River-Siskiyou National Forest including mineral withdrawn areas, and coho salmon critical habitat and active placer mining claims with 0.25 mile of coho salmon critical habitat.

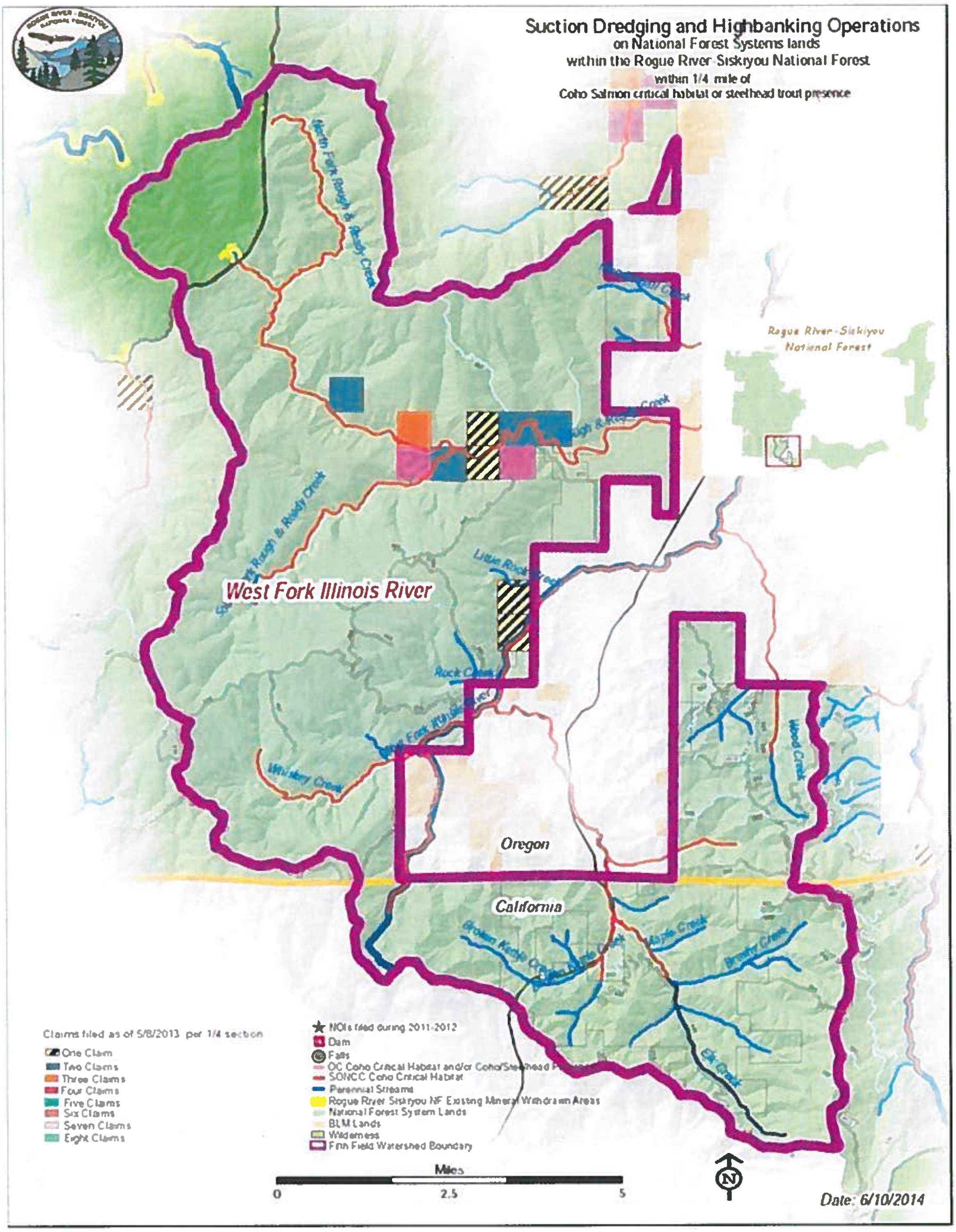

Figure 24. The West Fork Illinois watershed on National Forest System lands in the Rogue River-Siskiyou National Forest including mineral withdrawn areas, and coho salmon critical habitat and active placer mining claims with 0.25 mile of coho salmon critical habitat.

In summary, only coho salmon rearing juveniles, smolts, and migrating adults will be exposed to suction dredging and high banking operations. Camping and access are directly linked to suction dredging and high banking so only coho salmon rearing juveniles, smolts, and migrating adults will be exposed to these activities. However, in some streams and in some years, spawning adults, redds, and eggs will be exposed to indirect effects that persist following NOI operations. These include effects from substrate disturbance and sedimentation/substrate embeddedness.

For effects occurring in the estuaries, only coho salmon smolts, adults, and any juveniles exhibiting alternative life histories in estuaries will be exposed; refer to Section 2.4.2.5 for greater detail.

2.4.2.2 Suction dredge or operator interactions with individual fish (dredge entrainment, impingement, trampling, and disturbance)

In Section 2.4.2.1, we determined that there would be an overlap between suction dredging and some life histories of coho salmon, including rearing juveniles, outmigrating smolts, and migrating adults. Eggs will not be exposed to suction dredging under the proposed action. Suction dredging occurs in the water and, as the name implies, pulls water and sediment from the stream to run through sluice, and returns water and tailings to the stream. Fish can also be pulled from the stream and passed through the dredge via the nozzle or be impinged on the pump screen. NOI operators are also working in the water to operate their suction dredge and fish may be accidentally stepped on or trampled by a NOI operator, leading to injury or death; similar effects will also occur for vehicles crossing streams at fords. These activities may also disturb fish and disrupt their essential behaviors of feeding, rearing, sheltering, and migrating. Displacement of individual fish may be caused if fish choose to move to another location to avoid these activities or if tailings are deposited on their preferred stream location forcing them to move to another location; displaced individuals are subject to increased predation, increased competition with other juveniles, and a reduction in feeding due to a less favorable feeding position. Small juveniles are also likely to be startled by the noise of the suction dredge (HWE 2011). These effects are caused by in-water activities as a result of the interaction between the fish and the suction dredge or operator; therefore high banking, camping, and access will not cause these effects on coho salmon.

It is unlikely that adult coho salmon will be entrained, impinged, trampled, or displaced because their exposure is minimized by the requirements to stop suction dredging operations if adult salmon are encountered (PCM #32b). There is no similar requirement when encountering rearing juveniles or outmigrating smolts, therefore suction dredging will occur in streams with rearing and outmigrating juveniles. Although pump intakes (Figure 2: location of the screen is described by A) are required to be screened (PCM #23b), this will not prevent impingement of some juvenile coho salmon; juveniles impinged on the screen will be injured or will die. As the willful entrainment of coho salmon is prohibited (PCM#32c), juveniles or smolts may only be accidently pulled into the dredge through the nozzle (Figure 2: location of the nozzle is described by D). However, the risk of accidental entrainment via the dredge nozzle will be reduced by prohibiting operations outside of daylight hours, and specifically from 5 p.m. through 9 a.m. (PCM #19), because fish will be more visible during daylight. Because newly emerged and very small juvenile coho salmon (i.e., those approximately less 50 mm) seek slower velocity water, they frequently move to areas along the stream's edge because velocities there are minimal (Hartman 1965, Sullivan et al. 1987), and juvenile coho salmon retain their association with the shoreline throughout the summer (Lestelle 2007). Thus, the risk of accidental entrainment is reduced because removal of material or operation of a dredge nozzle is prohibited within three feet of the stream edge for any water level (PCM #25), effectively protecting juveniles using the stream margins. However, trampling can still occur as operators enter and exit the stream because juveniles may hide in the interstitial spaces of gravel and cobbles underfoot, especially in absence of large wood. Juveniles stepped on by NOI operators while hiding beneath gravel and cobbles will be injured or will die; similar effects will also occur for vehicles crossing streams at fords.

Entrainment of juveniles by the dredge nozzle is dependent on the strength of the suction at the nozzle and the size and burst swimming speed of the juvenile is a factor in its ability to avoid entrainment. Burst swimming is important in predator avoidance and food capture; it is a fish's maximum velocity, can only be sustained for a short period (<20 seconds), and results in fatigue or greatly reduced performance (Beamish 1978). After using its burst swimming speed, an individual needs rest to recover (Lee *et al.* 2003) and is vulnerable during this recovery period. Therefore, if a juvenile salmon uses its burst speed to avoid entrainment or in an attempt to avoid entrainment, it is susceptible to additional entrainment or predation while it is recovering. Taylor and McPhail (1985) determined a maximum burst speed of 3.4 feet per second (fps) for wild coho salmon juveniles approximately 2.1 inches in length.

HWE (2011) estimated that flow velocities at the intake of a 4-inch suction dredge nozzle are approximately 3.8 fps. Their estimated velocities for nozzles ≤ four inches are listed in Table 24. The highest estimated velocity (4.5 fps) was for a 3-inch nozzle and the lowest estimated velocity (3.3 fps) was for the 2.5-inch nozzle. Flow velocity decreases with increased distance from the nozzle. Based on the burst speed information from Taylor and McPhail (1985), coho salmon juveniles would likely be able to avoid accidental entrainment by the 2.5-inch nozzle but not by the other nozzle sizes.

Table 24. Intake flow velocities and length of fish vulnerable to those velocities, as reported by HWE (2011). Values for intake flow velocities were estimated by using estimated suction dredge production values for dredges with nozzle sizes ≤ 4 inches.

Dredge Nozzle size (inches)	Flow velocity (fps)	Length of fish vulnerable to entrainment (inches)
2	4.1	≤5.4
2.5	3.3	≤4.4
3	4.5	≤6.1
4	3.8	≤5.1

HWE (2011) also estimated burst swimming speed as a function of fish length to identify vulnerability to flow velocity at dredge nozzle intakes. Based on their results, juvenile coho salmon would need to be greater than 6.1 inches in length to avoid entrainment by the nozzle sizes allowed under the proposed action (Table 24). The RRSNF used ODFW smolt trap data (Vogt 2003) to estimate that the average size of juvenile coho salmon outmigrants ranges from 3.0 – 5.3 inches in length for the peak week of downstream migration. Therefore, smolts and younger juveniles would be susceptible to entrainment by the dredge.

Hassler *et al.* (1986) did not observe any incidents of entrainment in suction dredges. However, a small number of juvenile rainbow trout did pass through a dredge in California (Harvey 1982). Although not experimentally tested, Harvey (1982) did not observe any immediate negative effects for the small number of juvenile rainbow trout entrained. Griffith and Andrews (1981) used a 3-inch suction dredge in southeastern Idaho streams to assess the ability of early life stages of trout to survive entrainment. Hatchery rainbow trout sac fry, defined as 3 days post-hatch, experienced 83% mortality compared to 9% mortality in the control groups. Brook trout juveniles, ranging from 1.6-2.3 inches in length or 5.3 – 6 inches in length, were also passed through the dredge and then observed for 48 hours; none of these fish died. However, no long-term observations were conducted to assess for delayed mortalities. Also, fish exiting the dredge are likely to be disoriented and susceptible to increased predation.

Based on the information presented above, we determine that juvenile rearing coho salmon and coho salmon outmigrants in the action area will be susceptible to accidental entrainment, impingement, trampling, and disturbance. Appropriate application of PCMs by NOI operators will minimize the risk, but not eliminate it. Impinged and trampled individuals are likely to be injured or die. Small juveniles entrained in the dredge will be injured and may even die if they still have their yolk sacs; older juveniles will likely survive their entrainment but are susceptible to injury or increased predation. Disturbed and displaced juveniles are subject to increased predation, increased competition with other juveniles, and a reduction in feeding due to a less favorable feeding position. These effects will occur within the length of stream channel worked in annually, which is approximately 100 feet per NOI, as determined by the RRSNF using professional experience.

Effects on individuals will worsen through the duration of the proposed action as stream temperatures increase as predicted in the next 50 years due to climate change because they will have a reduced ability to compensate for these additional stressors. However, current global climate change models are not precise enough to know specifically when this will occur.

2.4.2.3 Mining-related substrate disturbance

Redd construction on unstable tailings. Coho salmon are dependent on a stable stream bed for reproduction. Spawning gravel patches collect in riffle locations because pool maintenance processes effectively sort incoming sediment into discrete patches located near riffle crests; salmonids select gravel substrate in shallow water with intra-gravel flows, typically the crests of riffles, to bury their fertilized eggs (NOAA 2004). Because salmon deposit and bury eggs in a gravel nest the stream bed must be stable for the duration of incubation. Movement of the stream bed during this time will damage or destroy eggs and embryos. Stream beds destabilized by suction dredging and high banking are likely to move, causing damage to or destroying eggs and embryos. Because the entire stream bed becomes unstable even areas downstream or, to a lesser extent upstream, move. Therefore, although there may not be a direct overlap between suction dredging or high banking and spawning substrate, some spawning substrate will still be temporarily disturbed by these activities. As discussed in Section 2.4.1.1, geomorphic recovery of destabilized channels is dependent on the occurrence of a bankfull event; there is an 89% chance that the bankfull discharge will occur during the time frame of 2 winters, or an 11% chance that it will not occur. Therefore, it is likely that a bankfull discharge will occur and the channel will begin to restabilize and recover after suction dredging and high banking over a period of 2 winters.

Additionally, there is a period of time between the end of the in-water mining season and prior to high water flow events where the mining tailings and substrate remain disturbed, even after filling the holes and spreading the tailings, because no or very little rainfall occurs. Fall spawning salmonids, such as coho salmon, will use these disturbed tailings for redd construction (Harvey and Lisle 1999). These mining tailings are highly unstable, have a high potential for scour, and can mobilize under slight increases in stream discharge and velocity because they are unconsolidated and are frequently deposited above the armor layer (Thomas 1985, Hassler *et al.* 1986, Stern 1988, Harvey and Lisle 1998, Harvey and Lisle 1999), or are in an area destabilized by a disrupted armor layer. Redds on tailings are likely to be damaged or destroyed because the period of maximum scour usually overlaps with the embryo incubation and development period for Chinook salmon and coho salmon (Lisle and Lewis 1992, Harvey and Lisle 1999). Harvey and Lisle (1999) examined scour of Chinook redds on dredge tailings compared to scour of redds on undisturbed substrates and measured greater net and maximum scour for redds on dredge tailings. Variations in measurements occurred from between-year discharge differences and interannual variability in scour in streams in the action area is also expected. However, others studies reported that Chinook salmon did not spawn on dredge tailing piles (Hassler *et al.* 1986, Stern 1988).

Rainfall in the action area typically occurs mid- to late October, but stream flows typically do not increase substantially until November or December (Figure 20, Section 2.4.1.2). Therefore, we expect the substrate will remain unconsolidated and unstable, at minimum, from the end of the in-water window (i.e., September 15 or September 30) until November or December, with some reasonable annual and spatial variation, although as described above the instability may remain for a period of 2 winters. In southwest Oregon, coho salmon frequently begin spawning in October, before significant rain and stream discharge events occur. As a result, some coho salmon may create redds and deposit eggs in unconsolidated mining tailings. However, NOI operators are required to maintain a 50-foot distance from spawning habitat areas (PCM #26a). The proposed conservation measures specifically note these areas as being located at a pool tail crest which is also defined as the head of a riffle or a riffle crest (Kappesser 2002). Riffle heads/crests are preferred locations for the construction of salmon redds (HWE 2011). Therefore, direct overlap of suction dredging and spawning gravels in most areas is unlikely, but some adult salmon may spawn in dredge tailings. Even so, in Section 2.4.1.1, we estimated that the overall extent of channel destabilization for an individual NOI-level project area would be approximately 433 feet such that some spawning substrate will still be temporarily destabilized by suction dredging. Overall, it is reasonable to expect that some coho salmon will use unstable dredge tailings or destabilized channel areas for redd construction and egg deposition and that some redds will be scoured resulting in mortality of eggs and embryos. Therefore, reproductive success of some spawning coho salmon will be reduced, up to a period of two years, at each NOI-level project area.

Stranding in dredge holes. Dace, suckers, and juvenile steelhead were observed feeding and resting in Canyon Creek dredge holes (Hassler *et al.* 1986). Freese (1980) observed a small spring-run Chinook salmon holding in a dredge-created hole on Canyon Creek and Harvey (1986) observed resident rainbow trout occupying dredge holes. Stern (1988) observed a summer-run steelhead at the upper end of a 98 foot-long pool while a dredge was operating at the lower end. Some fish relocated to dredge holes after their original pool was reduced by dredging (Harvey 1986). Filling of existing pools is prohibited (PCM # 30c).

Dredge holes will be temporary because holes are required to be filled by the NOI operator before moving to a new hole and all holes must be filled by the end of the in-water work window to avoid long-term effects from substrate disturbance and adverse effects on stream bed and channel geomorphology (PCM #30a and b). Therefore, dredge holes will only be available while rearing juveniles, outmigrating smolts, and migrating adults are present.

Although we are not aware of any reports of observed stranding of fish in dredge holes from the scientific literature, creation of dredge holes during the summer does pose a risk of stranding for juvenile coho salmon (R2 Resource Consultants 2006). Stream flows and wetted area decrease throughout the summer due to lack of rain, which is the normal precipitation pattern in southwest Oregon. Therefore, dredge holes created early in the mining season could eventually become dewatered or cut off from flowing water portions of the stream when flows recede later in the year. Although suction dredge operators are required to fill dredge holes before moving to a new work site (PCM #30a), it is possible that a NOI operator may work one hole for an extended period of time. However, suction dredge operators are prohibited from dredging or removing material within three feet of the lateral stream edge of the existing water level at that time, including at the edges of gravel bars or under any overhanging banks (PCM #25). Therefore, the risk of stranding is minimized because dredge holes will not be located at the immediate edge of the stream, which is the location typically first subject to dewatering. This allows for the existence of a dredge hole for some time before it would be in danger of dewatering or being cut off from flowing water. Additionally, NOI operators are also prohibited from reducing the total wetted area of a stream (PCM #14b). Overall, with proper application of the PCMs, it is extremely unlikely that juveniles or migrating adults will be stranded in dredge holes.

2.4.2.4 Suspended sediment, sedimentation, and substrate embeddedness

Effects of sedimentation and substrate embeddedness on spawning adults, redds, eggs, embryos, and emerging fry. Spawning adults, redds, eggs, embryos, and emerging fry will not be directly exposed to suction dredging and suspended sediment. However, increased sedimentation and substrate embeddedness downstream of suction dredges could result in decreases in available spawning areas. As discussed in Section 2.4.1.2, it is reasonable to expect that there will be measurable effects from sediment deposition and substrate embeddedness for 300 feet downstream of a suction dredge. Although suction dredge operators are required to maintain a 50-foot distance from spawning habitat areas (PCM #26a), this distance is insufficient to avoid downstream adverse effects on spawning adults, redds, eggs, embryos, and emerging fry from sedimentation and substrate embeddedness (Table 22). Areas immediately below the operating suction dredge will have the greatest amount of sediment deposition because decreasing sedimentation rates are typically associated with increased downstream distance; however, coarser sediments are deposited nearest the dredge site and finer sediments travel farther downstream (Thomas 1985).

In redds, eggs undergo incubation and hatching with emergence of fry; survival to emergence is related to flow conditions and substrate. Embedded substrate clogs interstitial spaces, reduces intergravel velocities, and reduces dissolved oxygen concentrations in redds, which are all detrimental to successful egg survival, hatching, and fry emergence. Embedded substrate also makes it more difficult for fish to dig redds (Cedarholm *et al.* 1997). As a result, spawning coho salmon are likely to avoid dredged areas when choosing redd sites, thus substrate embeddedness could result in a decrease in available spawning habitat. Spawning females can remove deposited fine sediment when creating redds and burying eggs (Lisle and Lewis 1992) but we expect that in some situations, the extent of degradation will be more than a spawning female can sufficiently reverse. Eggs deposited in subpar or degraded incubation conditions have reduced growth and survival, increased mortality of embryos and emerging fry, and adverse effects on the timing and size of emerging fry (Chapman 1988, Lisle and Lewis 1992). Salmon that survive incubation in redds, but emerge later and smaller than other fry, appear to be weaker, less dominant, and less capable of maintaining their position in the environment (Mason and Chapman 1965). Substrate embeddedness may be dissipated by fall rains and stream discharge events, but as discussed in Section 2.4.1.2 we don't expect these events to occur until approximately November or December, with some expected annual and spatial variation. Therefore, in some years and in some streams, we expect there will be an overlap between residual sedimentation and substrate embeddedness from suction dredging and spawning coho salmon, with adverse effects on reproductive success as well as reduced growth, reduced survival, and increased mortality of coho salmon eggs, embryos, and emerging fry.

<u>Effects of suspended sediment, sedimentation, and substrate embeddedness on migrating adults</u>. In Section 2.4.2.1, we determined that there would be an overlap between suction dredging and migrating adults. It is unlikely that migrating adult coho salmon will be measurably affected by suspended sediment or sedimentation and substrate embeddedness because their exposure is minimized by the requirements to stop suction dredging operations if adult salmon are encountered (PCM #32b). It is possible that some NOI operators will not immediately realize an adult coho salmon is present, but because visible turbidity is not allowed to cover the entire wetted perimeter of a stream (PCM #29b), adult migrants are likely to be able to avoid the sediment plume by moving laterally and/or swimming around it. Any delay in upstream migration is likely to be temporary or not more than eight hours (PCM #19). Because adult coho salmon primarily rely on energy accumulated prior to their upstream migration, they either do not feed during their upstream migration (McMahon 1983, Cooke *et al.* 2011, Hughes *et al.* 2014) or greatly reduce their food intake (Garner *et al.* 2009 and 2010). Overall, it is unlikely that migrating adult coho salmon will experience reduced feeding as a result of sediment deposition/substrate embeddedness or a meaningful delay in migration as a result of suspended sediment.

<u>Effects of suspended sediment, sedimentation, and substrate embeddedness on juveniles</u>. Suction dredging and downstream suspended sediment, sedimentation, and substrate embeddedness will also occur in streams when rearing and outmigrating juveniles are present. It is likely that rearing and outmigrating juveniles will experience reduced feeding as a result of sedimentation/substrate embeddedness and temporarily decreased macroinvertebrate abundances; see Section 2.4.2.7 for more discussion.

High levels of suspended sediment can be lethal to salmonids; lower levels can cause chronic sublethal effects including loss or reduction of foraging capability, reduced growth, reduced resistance to disease, reduced respiratory ability, increased stress, and interference with cues necessary for homing and migration (Bash *et al.* 2001). Sublethal effects (such as olfactory effects) are those that are not directly or immediately lethal, but are detrimental and have some probability of leading to eventual death via behavioral or physiological disruption. Chronic exposure to elevated suspended sediment concentrations can cause physiological stress responses that can increase maintenance energy and reduce feeding and growth (Lloyd 1987, Servizi and Martens 1991). Increased fine sediment load is also detrimental to rearing salmon because introducing suspended particulate matter interferes with feeding and territorial behavior (Berg and Northcote 1985). Some juveniles use turbidity plumes for cover to reduce risk of predation where other cover is lacking (Bisson and Bilby 1982).

Of key importance in considering the detrimental effects of suspended sediment on juvenile coho salmon are the frequency and duration of the exposure, as well as the concentration. Sublethal effects of short-term exposure (i.e., hours to weeks) of juvenile coho salmon to suspended sediment occur at approximately 20 NTU in laboratory settings (Robertson *et al.* 2006). Increases in suspended sediment concentrations as low as 30 NTU can result in reduced prey capture success or gill flaring for juvenile coho salmon exposed to turbidity pulses for periods as short as four hours (Berg and Northcote 1985). Other negative behavioral responses can include changes in territorial behavior, alarm reactions with downstream displacement and increased predation and competition, avoidance behavior, decreased feeding, and reduced growth (Noggle 1978, Berg 1983, Lloyd 1987, Newcombe and Jensen 1996, Bash *et al.* 2001, Robertson *et al.* 2006).

Maximum suspended solid concentrations in suction dredging plumes are expected to range from 1.6 mg/L to 340 mg/L, or up to 50 NTU (Table 23). Although reports have estimated average dredge operation to be 2-5.6 hours per day, PCM #19 allows suction dredging operation for 8 hours per day, and operations could occur daily for some time at an NOI site. These concentrations and daily exposure durations are less than what have been reported to cause direct mortality of coho salmon juveniles (Newcombe and Jensen 1996). However, the sublethal effects described above (i.e., increased predation, decreased feeding, reduced growth) are expected for rearing and migrating juvenile coho salmon based on estimated duration and concentrations of suspended sediment. It is likely that sublethal effects will be limited to localized occurrences for individuals because large continuous plumes will be prevented by (1) restricting the length of the visible plume to 300 feet, (2) restricting the width of the plume such that it cannot cover the entire wetted width of a stream, (3) requiring a minimum of 500 feet between operating suction dredges, and (4) prohibiting plumes from multiple dredges from overlapping (PCMs #27, 29a,b,e).

In summary, it is unlikely that migrating adult coho salmon will experience reduced feeding as a result of sediment deposition/substrate embeddedness and decreased macroinvertebrate abundances or a meaningful delay in migration as a result of suspended sediment. However, the following adverse effects will occur on other coho salmon life history stages:

- In some years and in some streams we expect there will be an overlap between residual sedimentation and substrate embeddedness from suction dredging and spawning coho salmon, with adverse effects on reproductive success as well as reduced growth, reduced survival, and increased mortality of coho salmon eggs, embryos, and emerging fry.
- Rearing and outmigrating juveniles will experience reduced feeding as a result of sedimentation/substrate embeddedness and temporarily decreased macroinvertebrate abundances; see Section 2.4.2.7 for more discussion.
- Rearing and outmigrating juvenile coho salmon will experience increased predation, decreased feeding, and reduced growth from suspended sediment.

Effects on individuals will worsen through the duration of the proposed action as stream temperatures increase as predicted due to climate change because they will have a reduced ability to compensate for these additional stressors. However, current global climate change models are not precise enough to know specifically when this will occur.

2.4.2.5 Methylmercury

As noted in Section 2.3, nearly all (95-99%) mercury accumulated in fish tissue is methylmercury (Grieb *et al.* 1990, Bloom 1992, Hammerschmidt *et al.* 1999, Peterson *et al.* 2007), a highly toxic compound that readily crosses biological membranes, accumulates in exposed organisms, and biomagnifies to high concentrations in fish atop aquatic food webs (Wiener *et al.* 2003, Scheuhammer *et al.* 2007). Methylmercury can enter estuarine food webs through either benthic or water column pathways via accumulation in primary producers or other base organisms (Chen *et al.* 2009). Wild fish obtain methylmercury mostly from food, with dietary routes accounting for approximately 90% of total uptake. Fish eliminate methylmercury very slowly (Trudel and Rasmussen 1997, Van Walleghem *et al.* 2007) and methylmercury accumulates in fish to concentrations that exceed surface water concentrations by as much as 106 to 107 fold (Wiener *et al.* 2003). Sandhenreich and Weiner (2011) concluded that the principal effects of methylmercury on North American freshwater fish populations at existing exposure levels are depressed reproduction and sublethal damage to tissues; these effects have been observed in multiple species of freshwater fish at tissue concentrations well below 1.0 ppm wet weight. Because methylmercury effects are often manifested as neurological impairment, effects may not be readily detected in the wild.

Methylmercury primarily exerts its toxic effect on the central nervous system, resulting in reduced coordination, behavioral abnormalities, and cellular damage to the brain, including lesions and nerve demyelination (loss of protective coating around nerve synapsis). Methylmercury also accumulates in olfactory rosettes and in nerves, axons, and Schwann cells (Baatrup and Doving 1990). Mela *et al.* (2007) also suggested that methylmercury causes oxidative stress, which contributes to the development of necrotic tissues. Thus, effects of methylmercury on fish are not limited to neurotoxicity, but also include histological changes in the spleen, kidney, liver, and gonads. Oxidative stress-mediated damage has been associated with cancer, chronic inflammation, cardiovascular disease, and stroke in humans (Farina *et al.* 2011). Additional effects on fish related to mercury include altered sex hormone expression (Friedmann *et al.* 2002, Drevnick and Sandheinrich 2003), reduced spawning success and reproductive output (Hammerschmidt *et al.* 2002, Drevnick and Sandheinrich 2003), reduced gonadosomatic indices and testicular atrophy (Friedmann *et al.* 1996), liver necrosis (de Oliveira *et al.* 2002), altered predator avoidance behavior (Webber and Haines 2003), and altered gene expression (Moran *et al.* 2007). Chronic outcomes of toxicity are reproductive effects, developmental effects, hormonal effects, behavioral effects, and disease, resulting in population effects of reduced survival and reduced reproductive success. Many responses can be delayed and not appear until long after the initial exposure (Weis 2009). As noted in Section 2.3, 0.2 ppm has been identified as a whole-body threshold, below which adverse effects in most juvenile and adult fish are unlikely, although subtle behavioral effects may occur at lower concentrations. Adverse effects on biochemical processes, damage to cells and tissues, and reduced reproduction in fish occur at concentrations of about 0.3-0.7 ppm wet weight in the whole body and about 0.5-1.2 ppm wet weight in axial muscle.

Under the proposed action, only the Rogue River (up to 259 NOIs annually) and the Chetco River (up to 17 NOIs annually) will have enough mining activity to cause measurable increases in estuarine methylmercury concentrations (see Section 2.4.1.3). However, we determined that only minor amounts of methylmercury are likely to be produced in these estuaries, primarily because there are few areas where deposition of remobilized mercury is likely to occur due to the estuaries' small size, strong river currents, and habitat simplification from man-made alterations; for these same reasons, environmental conditions favorable for methylation are also limited in the Rogue and Chetco River estuaries. Non-salmonid fish species sampled in the Rogue River estuary have small concentrations of methylmercury accumulation, but $\leq$ 0.054 ppm (see Section 2.3).

Rogue River estuary. Juvenile coho salmon prefer intertidal habitat while in estuaries (Bottom et al. 2005) because of their high productivity. The primary limiting factor for salmonids in the Rogue River estuary is the availability of shallow, off-channel habitats (Hicks *et al.* 2008). Channelization and diking has greatly altered the estuary; nearly all of the tidal wetlands have been channelized or diked and are no longer available to coho salmon (Figure 25, NMFS 2014). Development of the boat basin and marina along the south side of the river eliminated valuable tidal wetlands that provided off-channel habitat for coho salmon rearing and holding. In the lower seven miles of the Rogue River, levees and dikes have also been constructed to protect residential or commercial property, decreasing summer and winter coho salmon juvenile rearing habitat, and disconnecting the river from its floodplain (NMFS 2014). The total area of the summer estuary has decreased from 910 acres in 1870 to 880 acres in 1970 (loss of 3%) and the tidal wetland area has decreased from 74 acres to 44 acres (loss of 41%; Good 2000). However, there are a few intertidal areas that do remain and these are areas where fish rear and congregate (Hicks 2005).

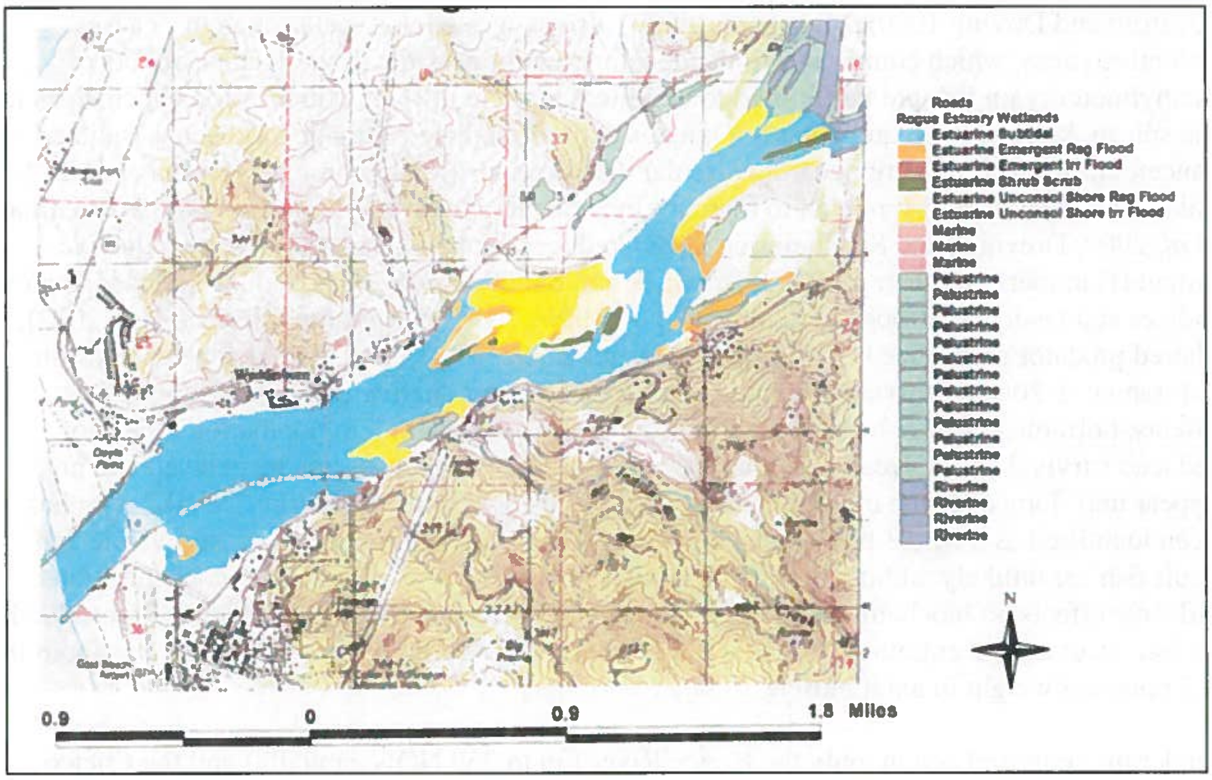

Figure 25. Wetlands of the Rogue River estuary (Hicks 2005).

Hicks (2005) listed seven intertidal areas remaining between the Pacific Ocean and river mile 2.2. For example, one area is a small tideland area along the north shore near the Coast Guard dock. It is the only undiked shoreland remaining in the marine subsystem, and the shore forms a cove that is protected from swift channel currents (Hicks 2005). Another major intertidal area is also located on the north shore at Mail Boat Point, the tip of a larger island where juvenile salmon and cutthroat congregate (Hicks 2005). Another intertidal area is along the eastern edge of the spit that forms inside the jetties, and is also out of the main current. On the south shore at river mile 1.5, Snag Patch Slough is the most densely vegetated marsh in the estuary and provides excellent habitat for juvenile fish, terrestrial wildlife. It is likely that these intertidal areas listed by Hicks (2005) are the last remaining slow-water habitats and where deposition of remobilized mercury would occur. Overall, although the Rogue River estuary has been altered, conditions still support successful migration and saltwater acclimation of salmonids (Hicks *et al.* 2008).

Chetco River estuary. Much of what was once estuarine rearing habitat for juvenile coho salmon no longer serves this function in the Chetco River estuary (Massingill 2001). Levee construction disconnected wetlands and streams that were vital coho salmon habitat, and also changed the salinity and other water quality parameters by altering the tidal exchange (NMFS 2014). There are only two remaining areas that are likely to be juvenile rearing areas: (1) Snug Harbor, a small slough on the north bank that is used as a boat moorage and (2) an intertidal mud-sand flat just upstream of the Highway 101 Bridge on the south shore below a small intertidal gravel marsh.

Exposure of and effects on spawning adults, eggs, embryos, migrating adults, and alternative life history strategies with extended estuarine residence times. Due to the overall limited habitat availability as described above, it is unlikely that the Rogue River and Chetco River estuaries contain many areas with appropriate environmental conditions for extended rearing of fry and parr in summer or fall, or support other alternative life history strategies with extended estuarine residence times. Additionally, the estuaries are not used for spawning. Therefore these life history stages (i.e., spawning adults, eggs, embryos) will not be exposed to increased methylmercury in the estuary resulting from remobilization and transport of mercury by suction dredging or high banking. Adult coho salmon pass through the estuary without feeding (McMahon 1983, Cooke *et al.* 2011, Hughes *et al.* 2014) or greatly reduce their feeding (Garner *et al.* 2009 and 2010). Therefore, they are unlikely to bioaccumulate large amounts of methylmercury or will likely be exposed to methylmercury only through the water, which is a minor pathway of uptake, and unlikely to result in adverse effects.

Exposure of outmigrating juveniles. Smolts are present in the estuaries in the spring and early summer, prior to the occurrence of the warmest water temperatures and potentially also prior to the highest methylation rates and methylmercury concentrations. A comparison of 1945 and 1975 fish scales from Chinook salmon indicate that juvenile Chinook salmon spent much less time rearing in the Rogue River estuary in 1975 than they did in 1945 (Ratti 1979). Coho salmon are potentially affected by altered estuarine conditions in a similar manner. While the Rogue River estuary has not been studied with respect to juvenile coho salmon use, it is believed that smolts reside in the saltwater interface area for an average of 14 days (NMFS 2011). However, this was based on a study in a tributary to the Coos Bay estuary, which is much larger (approximately 54.9 square kilometers), has longer flushing times, and contains a greater amount of complex and productive habitat, including large areas of seagrass and tidal marsh, although, like other estuaries, these too have decreased over time (Roye 1979). Therefore, 14 days of smolt residence in the Rogue River estuary is likely to be a high estimate, with the majority of coho salmon smolts spending shorter amounts of time. Juvenile coho salmon do begin to eat fish in the estuaries such that they are increasing their exposure via a higher trophic level, however they are not a top consumer or apex predator.

Juvenile fish exposure in the Chetco River estuary is likely to be similar to that of the Rogue River estuary based on similar reduction in estuarine rearing habitat and geomorphic features. Unlike the Rogue River estuary, the Chetco River estuary temporarily accumulates a thin layer of silt and clay over the gravel base in the upper estuary. These finer particles provide a substrate for burrowing benthic organisms, and thus play an important role in increasing food supply but also increases the potential for consumption of contaminated prey during this period (see section 2.4.1.3). However, there will be far less mining activity in the Chetco River and thus far less disturbance of mobilization of mercury into the estuary such that this difference in estuarine environmental condition is unlikely to result in greater exposure of outmigrating juveniles in the Chetco River estuary.

Therefore, juvenile coho salmon outmigrants, although feeding heavily in the estuaries on various prey items including larval and juvenile fishes, are only exposed for a small amount of time as outmigrants and, due to their seasonal presence, it is unlikely they are exposed to the highest occurring methylmercury concentrations. Baseline concentrations of mercury in juvenile coho salmon outmigrants could be approximately 0.05 – 0.2 ppm wet weight whole body (see Section 2.3) such that adverse effects in most juvenile and adult fish from methylmercury are unlikely (Beckvar *et al.* 2005). It is also below the methylmercury estimates for changes in biochemical processes, damage to cells and tissues, and reduced reproduction (i.e., 0.3-0.7 ppm wet weight whole body; Sandhenreich and Weiner 2011), but only a small increase, approximately 0.01 – 0.1 ppm, would be necessary to reach these amounts.

Effects on outmigrating juveniles. Juvenile coho salmon outmigrants are likely to bioaccumulate some additional methylmercury in both estuaries. However, given the uncertainty of the estimated baseline concentrations of methylmercury in smolts, the lack of knowledge regarding the bioaccumulation rate for coho salmon in Oregon estuaries, and the lack of understanding regarding how much mercury must be remobilized and transported to the estuary to cause a measurable increase in methylmercury concentrations, it is impossible to quantify whether juvenile coho salmon outmigrants will experience adverse effects (i.e., we cannot predict a specific numeric value of increased methylmercury to determine whether that increase would result in adverse effects). Also, based on our analysis, we are unable to attribute any measurable increased methylmercury concentrations in the estuaries solely to mercury remobilized by the proposed action due to mercury contributed by other sources including atmospheric deposition.

Yet, there is sufficient information to qualitatively determine that the proposed action does contribute to methylmercury production in the estuaries by providing a source of mercury loading. Therefore, some individuals will bioaccumulate sufficient methylmercury to increase their overall concentrations to a level where they will experience adverse effects given the inherent variability in (1) individual baseline contaminant concentrations, (2) time spent in the estuaries, (3) methylmercury levels in individual prey items, and (4) individual consumption rates.

To address some of the uncertainties regarding methylmercury and coho salmon in the Rogue and Chetco River estuaries, we reviewed an article regarding methylmercury concentrations in juvenile Chinook salmon rearing in California. In the Yolo River Bypass in California, which is a flood control channel and the primary floodplain for the Sacramento River and for several other tributaries to the San Francisco estuary (Henery *et al.* 2010), a sample of 199 individual juvenile Chinook salmon hatchery-raised outmigrants recorded only 2 individuals (approximately 1%) with a whole-body tissue wet weight greater than the threshold-effect level identified by Beckvar *et al.* (2005); the exceedance of the two individuals was only by a small amount. Henery *et al.* (2010) also reported that methylmercury accumulation was greater for individuals rearing in the Yolo Bypass floodplain than for those rearing in the Sacramento River. The Yolo Bypass has a large floodplain, large amounts of historical legacy gold mining and mercury mining occurred upstream, the presence of contemporary urban mercury contributions, and sampled juvenile Chinook salmon resided in the Yolo Bypass area for at least 30 days (Henery *et al.* 2010). Therefore, we would expect that the juvenile Chinook salmon from the Yolo Bypass would have greater bioaccumulation of methylmercury and greater methylmercury concentrations because the Yolo River floodplain likely has more favorable environmental conditions for methylation and the juvenile Chinook salmon likely had a longer exposure time, compared to coho salmon outmigrants in the Rogue and Chetco estuaries.

We have determined that the majority of individuals will likely be exposed to only minor increases in methylmercury concentrations because sediment containing mercury is flushed through these small estuaries by strong and dominant river currents, reducing the amount available for methylation, and because environmental conditions favorable for methylation are limited, reducing the productivity of the methylating organisms. The likelihood of accruing the methylmercury concentrations necessary for adverse effects is further reduced, by the seasonal presence of outmigrating smolts. Furthermore, only 1% sampled juvenile Chinook salmon in a California study had methylmercury concentrations greater than the threshold level for which adverse effects are likely. For these reasons, it is highly unlikely that a large number of outmigrating coho salmon will bioaccumulate a sufficient amount of additional methylmercury for sublethal effects or injury to occur; therefore the majority of juvenile coho salmon outmigrants (approximately ≤1%) will not experience neurological impairment or other additional negative effects on behavior, development, or reproduction or reduce their overall survival and fitness during their short exposure in the Rogue River and Chetco River estuaries.

2.4.2.6 Unintentional chemical contamination

Petroleum-based contaminants (such as fuel and oil) contain PAHs, which are acutely toxic to listed fish species and other aquatic organisms at high levels of exposure and cause sublethal adverse effects on aquatic organisms at lower concentrations (Heintz *et al.* 1999, Heintz *et al.* 2000, Incardona *et al.* 2004, Incardona *et al.* 2005, Incardona *et al.* 2006). Resident benthic macroinvertebrates will be exposed to PAHs through their diet and direct contact with the sediment (Neff 1985). PAHs may bioaccumulate in aquatic invertebrates within these benthic communities (Varanasi *et al.* 1985, Meador *et al.* 1995), making benthic macroinvertebrates a source of PAHs for salmonids. Coho salmon prey include benthic invertebrates; therefore, coho salmon are indirectly exposed to PAHs through the food web. In Section 2.4.2.1, we determined that there would be an overlap between suction dredging and some life histories of coho salmon, including rearing juveniles, outmigrating smolts, and migrating adults. Therefore, rearing juveniles, outmigrating smolts, and migrating adults would also be exposed directly to any accidental in-stream spills. Although application of PCMs for suction dredging will minimize the risk of accidental spills or equipment malfunction, especially in-stream spills, they are still likely to occur. While many PAHs do not significantly bioaccumulate in vertebrates, some of the heavier PAH compounds with toxic metabolites may persist and are known to cause sublethal effects to fish in laboratory studies (National Toxicology Program 2014) and field studies (Moore and Myers 1994, Myers *et al.* 1998a, 1998b). The greatest risk of accidental spills is from suction dredging and vehicles using existing fords. Unintentional chemical contamination from accidental spills or equipment malfunction is likely to injure rearing juveniles or reduce their feeding and growth, increase their disease susceptibility, and decrease their survival and fitness. However, PCMs will reduce the extent and magnitude of contamination when they occur, such that these will be localized effects affecting only a small number of individuals. Migrating coho salmon, both adults and juvenile outmigrants in addition to having a shorter duration of potential exposure, are highly mobile and are likely to avoid localized and temporary contamination events with only a slight delay in migration and no resulting long term effect on health or survival. However, outmigrating juvenile coho salmon will also accumulate PAHs through their diet, with similar effects as described above for rearing coho salmon, although to a lesser extent due to their shorter exposure duration.

Effects on individuals will worsen through the duration of the proposed action as stream temperatures increase as predicted due to climate change because they will have a reduced ability to compensate for these additional stressors. However, current global climate change models are not precise enough to know specifically when this will occur.

2.4.2.7 Forage reduction

Temporary decreases of benthic aquatic macroinvertebrates will occur due to mining-related substrate disturbance and channel destabilization, sedimentation/substrate embeddedness, and unintentional chemical contamination. The benthic invertebrate populations within each NOI project area will be reduced until disturbed substrates are recolonized. Furthermore, frequent and multiple NOI activities will likely slow the development of a healthy benthic community. As a result, we expect that negative effects to benthic productivity and availability of prey items will last at least a few months. Decreased prey abundance can affect juvenile growth rates and increase susceptibility to predation, competition, and disease (Bash *et al.* 2001). Additionally, smaller coho salmon juveniles have lower over-winter survival rates than larger fish (Quinn and Peterson 1996). Because prey abundance will be reduced during summer juvenile rearing, some rearing juveniles will experience reduced feeding, growth, and overall survival. A smaller number of outmigrating juveniles will also be affected, although to a lesser extent because their exposure will be for a shorter duration.

Effects on individuals will worsen through the duration of the proposed action as stream temperatures increase as predicted due to climate change because they will have a reduced ability to compensate for these additional stressors. However, current global climate change models are not precise enough to know specifically when this will occur.

2.4.2.8 Summary of effects on OC and SONCC coho salmon

Many effects, especially for certain life history stages, will be prevented by prohibiting suction dredge or operator interactions with individual fish; other PCMs will only minimize these effects. Spawning, egg incubation, and fry emergence will all occur outside of the in-water work window guidelines (PCM #21); therefore these life history stages will not be exposed to direct interactions with suction dredges or operators. Additionally, suction dredging activity must stop when adults are present (PCM #21b, 32b), high banking is prohibited when spawning coho salmon or redds are present (PCM #33), and settling ponds or excavated work areas between the wetted stream and the stream bank created by high banking are also limited to the in-water work guidelines, as is vehicle use of existing fords (PCMs #33, 39).

Dredge entrainment will occur because suction dredging happens when rearing and outmigrating juvenile coho salmon are present, but PCMs will serve to minimize exposure of these life history stages. The PCMs prohibit willful entrainment of coho salmon (#32c); therefore, juveniles or smolts may only be accidently pulled into the dredge through the nozzle. Because fish will be more visible during daylight, the risk of accidental entrainment via the dredge nozzle is further reduced by prohibiting operations outside of daylight hours, and specifically from 5 p.m. through 9 a.m. (PCM #19). Juveniles, including the smallest and least mobile, are effectively protected from accidental entrainment because removal of material or operation of a dredge nozzle is prohibited within three feet of the stream edge for any water level (PCM #25). Pumping or diverting of water from the streams for high banking is prohibited (PCM #37c) and a buffer is required between high banking and the wetted stream perimeter (PCM #33), such that high banking will not occur immediately adjacent to fish.

Other effects avoided by PCMs include loss of riparian vegetation, loss of future wood recruitment into the streams, reduction of in-stream wood and associated pool habitat and natural cover, stream bank erosion, and water withdrawal (see PCMs #13, 14, 20, 36, 37, 44, and 49). Additionally, increased water temperature, decreased stream bank stability, direct effects to existing pools, and effects on off-channel habitat are extremely unlikely to occur (see PCMs # 16, 20, 25, 26, 30, 33, and 45-49). Furthermore, PCMs are also protective of small streams to the extent that suction dredging is prohibited in streams that are ≤6 feet wide and high banking is prohibited on streams ≤70 feet wide, unless the stream is completely dry and then high banking is allowed on streams > 30 feet wide (PCMs #25, 33).

Additionally, PCMs will limit overall amount of substrate disturbance (PCM #17) which is also related to forage and methylmercury effects; will reduce the distance immediately traveled downstream by suspended sediment and its effects, as well as sedimentation and substrate embeddedness (PCMs #19, 29); and will reduce the extent and magnitude of contamination when spills occur as well as the frequency of spills (PCMs #11, 12, 24, 28, 38). Therefore, although there will be adverse effects on coho salmon, PCMs serve to prevent or minimize many effects. Adverse effects of the action are summarized in outline form below.

- *Suction dredge or operator interactions with individual fish - dredge entrainment, impingement, trampling, and disturbance*

    - Rearing and outmigrating juvenile coho salmon in the action area will be susceptible to accidental entrainment, impingement, trampling, and disturbance. Appropriate application of PCMs by NOI operators will minimize the risk, but not eliminate it. Impinged and trampled individuals are likely to be injured or die. Small juveniles entrained in the dredge will be injured and may die if they still have their yolk sacs; older juveniles will likely survive their entrainment but are susceptible to injury or increased predation. Disturbed and displaced juveniles are subject to increased predation, increased competition with other juveniles, and a reduction in feeding due to a less favorable feeding position.

- *Mining-related substrate disturbance - Redd construction on unstable tailings*
    - Some spawning coho salmon will use unstable dredge tailings or destabilized channel areas for redd construction and egg deposition with scour of some redds resulting in mortality of eggs and embryos and reduced reproductive success of some spawning coho salmon up to a period of two years at each NOI-level project area.

- *Suspended sediment, sedimentation, and substrate embeddedness*
    - In some years and in some streams, there will be an overlap between residual sedimentation and substrate embeddedness from suction dredging and spawning coho salmon, with decreases in available spawning areas and reduced reproductive success.
    - In some years and in some streams, sedimentation and substrate embeddedness will reduce growth, reduce survival, and increased mortality of coho salmon eggs, embryos, and emerging fry when suction dredging occurs within 300 feet upstream of spawning habitat.
    - Rearing and outmigrating juvenile coho salmon will experience reduced feeding as a result of sedimentation/substrate embeddedness and temporarily decreased macroinvertebrate abundances; see Forage reduction for more discussion.
    - Rearing and outmigrating juvenile coho salmon will experience increased predation, decreased feeding, and reduced growth from suspended sediment.

- *Methylmercury in Rogue River and Chetco River estuaries*
    - A small number (approximately ≤1%) of annually outmigrating juvenile coho salmon will bioaccumulate sufficient methylmercury to experience adverse effects including neurological impairment; other additional negative effects on behavior, development, or reproduction; or a reduction in overall survival and fitness.

- *Unintentional chemical contamination*
    - Some rearing juvenile coho salmon will experience injury or a reduction in feeding and growth, an increase in disease susceptibility, and a decrease in survival and fitness due to unintentional chemical contamination from accidental spills or equipment malfunction.

  - A smaller number of outmigrating juvenile coho salmon will also experience a reduction in feeding and growth, an increase in disease susceptibility, and a decrease in survival and fitness, although to a lesser extent because their exposure will be for a shorter duration.

- *Forage reduction*
  - Some rearing juvenile coho salmon will experience reduced feeding, growth, and overall survival.
  - A smaller number of outmigrating juvenile coho salmon will also experience reduced feeding, growth, and overall survival, although to a lesser extent because their exposure will be for a shorter duration.

Overall, the RRSNF (USFS 2015, Appendix F) estimated that the linear distance for each NOI-level project area extent of effects (i.e., excluding estuarine effects) would be approximately 433 feet by using a standard formula[28] based on the maximum allowance per NOI of approximately 25 cubic yards and based on what the RRSNF considers a typical average depth dredged by miners in streams in the RRSNF.[29] This distance includes (1) an approximate stream length worked per NOI (100 feet), (2) the cumulative linear distance of the dredge holes within each NOI operation based on the total amount of disturbance (i.e., 25 cy) allowed under PCM #17 (15 feet), (3) the cumulative linear distance estimated to be occupied by tailings (18 feet), based on a ratio of dredge hole area to pilings area as developed based on information documented in Stern (1988), and (4) the visible turbidity plume allowed under PCM #29 (300 feet). Given our analysis of the effects on the environment and species above, in consideration with application of the PCMs, we concur that this is an appropriate approximation of the environmental extent of effects for each individual NOI-level project area. Therefore, the total maximum linear distance of stream affected by the proposed action in each watershed is 433 feet multiplied by the number of annual NOIs in that watershed. We also determined that this is an appropriate estimate for the length of approximate channel destabilization at each NOI-level project area. Summing the watershed totals within each population provides the overall extent of effects for each population annually, excluding estuarine effects. We will also evaluate the temporal duration of channel instability under multiple scenarios: (1) 100% of NOI operators will return to the same location in year 2, (2) 100% of NOI operators will move to a new location in year 2, or (3) 50% of the NOI operators will return to the same location in year 2 while 50% will move to a new location. These scenarios are necessary because we lack sufficient historical information to detect trends or patterns in NOI operator behavior; we predict that Scenario 3 will be more typical of what occurs in future years.

Some effects, including those from dredge entrainment, impingement, trampling, and disturbance; suspended sediment, unintentional chemical contamination; and forage reduction will worsen throughout the duration of the proposed action as stream temperatures increase as predicted due to climate change because they will have a reduced ability to compensate for these additional stressors. However, current global climate change models are not precise enough to know specifically when this will occur.

2.4.2.8.1 Extent of effects on OC coho salmon

The RRSNF will only authorize 15 NOIs annually within the range of OC coho salmon. This includes individuals of two populations: (1) Coquille River and (2) Sixes River. The linear annual extent of temporary effects of the proposed action at the NOI-level project area for these populations will be approximately 0.57 or 0.66 mile (Table 25); this would also account for the scenario where 100% of the miners return to the same location in year 2 and thus no new channel instability is likely to occur (i.e., Scenario 1). The maximum linear annual extent of temporary effects of the proposed action at the NOI-level project area would be twice the length in Table 25 which is approximately 1.14 or 1.32 miles, if all NOI operators move to a new location in year 2 (i.e., Scenario 2); however, channel instability is the only effect expected to have up to a 2 year duration and channel instability will only have adverse effects on spawning adults, eggs, and embryos. If half of the NOI operators return to the same location in year 2, while half move to a new location (i.e., Scenario 3), the linear extent of temporary effects of the proposed action at the NOI-level project area for the Coquille and Sixes River populations would be approximately 0.86 or 0.99 mile. This area affected constitutes only a small amount of the overall extent of the Coquille and Sixes OC coho salmon populations (Figures 4 and 5). The RRSNF is only approximately 35% of the South Fork Coquille River watershed and the watershed is one of five watersheds in the subbasin, with the population distributed in all five watersheds (approximately 550 miles[41]). Although the Sixes River population is only distributed in one watershed, it is distributed over approximately 58.4 miles and the RRSNF is only approximately 26% of the watershed. The NOI-level project area habitat effects are either very temporary or, in terms of channel instability, recovery will begin within 2 winters for most NOI-level project areas. Most effects will occur only during the summer mining season, although some effects (i.e., substrate embeddedness, forage reduction) will extend past the summer mining season, but even these effects are temporary. Additive effects (see discussion in Section 2.4.2.8.2 below) are also unlikely to occur for OC coho salmon (or will only occur for a very small number of individuals) because of the small number of proposed NOIs and thus reduced potential for exposure. Due to the low level of proposed mining activity in the Coquille and Sixes Rivers we are not expecting that the amount of mercury remobilized by mining and transported to the estuary will measurably increase methylmercury concentrations or cause adverse effects on OC coho salmon.

[41] E-mail from Barbara Seekins, NMFS, to Michelle McMullin, NMFS (January 6, 2014)(providing estimates for approximate coho salmon distribution in the Coquille subbasin, by fifth-field watershed). Estimates for distribution were derived from two data sets that were not generated from the same hydrography layers. NMFS used a 2010 data set for critical habitat and then added areas of coho salmon distribution that exceeded critical habitat from the second data set.

Table 25. Approximate linear extent of annual stream disturbance of cumulative NOI-level project areas for OC coho salmon populations. Scenario 1: 100% of NOI operators will return to the same location in year 2. Scenario 2: 100% of NOI operators will move to a new location in year 2 (channel instability is the only effect expected to have up to a 2 year duration).

Population	Annual NOIs	Scenario 1: Approximate linear extent of stream disturbance (miles) of cumulative NOI – level project areas	Scenario 2: Maximum approximate linear extent of stream disturbance (miles) of cumulative NOI – level project areas (channel instability only)
Coquille	8	0.66	1.32
Sixes	7	0.57	1.14

2.4.2.8.2 Extent of effects on SONCC coho salmon

The RRSNF will authorize 292 NOIs annually within the range of SONCC coho salmon. This includes individuals of 9 populations: (1) Elk River, (2) Lower Rogue River, (3) Illinois River, (4) Middle Rogue/Applegate Rivers, (5) Upper Rogue River, (6) Pistol River, (7) Chetco River, (8) Winchuck River, and (9) Smith River. For Scenario 1, which estimates that 100% of the miners will return to the same location in year 2, and thus no new channel instability is likely to occur, the linear annual extent of temporary effects of the proposed action at the NOI-level project area for these populations will range from approximately 0.41 mile up to 15.4 miles (Table 26), with additional adverse effects also occurring in the Rogue and Chetco River estuaries. The maximum linear annual extent of temporary effects of the proposed action at the NOI-level project area would be twice the length, or range from approximately 0.82 mile up to 30.8 miles, if all NOI operators move to a new location in year 2 (i.e., Scenario 2); however, channel instability is the only effect expected to have up to a 2 year duration and channel instability will only have adverse effects on spawning adults, eggs, and embryos. If half of the NOI operators return to the same location in year 2, while half move to a new location (i.e., Scenario 3), the linear extent of temporary effects of the proposed action at the NOI-level project area for the populations would range from approximately 1.2 to 23.1 miles. The NOI-level project area habitat effects are either very temporary or, in terms of channel instability, recovery will begin within 2 winters for most NOI-level project areas. Most effects will occur only during the summer mining season, although some effects (i.e., substrate embeddedness, forage reduction) will extend past the summer mining season, but even these effects are temporary.

Table 26. Approximate linear extent of annual stream disturbance of cumulative NOI-level project areas for SONCC coho salmon populations. Scenario 1: 100% of NOI operators will return to the same location in year 2. Scenario 2: 100% of NOI operators will move to a new location in year 2 (channel instability is the only effect expected to have up to a 2 year duration).

Population	Annual NOIs	Scenario 1: Approximate inear extent of stream disturbance (miles) of cumulative NOI – level project areas	Scenario 2: Maximum approximate linear extent of stream disturbance (miles) of cumulative NOI – level project areas (channel instability only)
Elk	5	0.41	0.82
Lower Rogue	12	0.98	1.96
Illinois	188	15.4	30.8
Middle Rogue/ Applegate	44	3.6	7.2
Upper Rogue	15	1.23	2.5
Pistol	5	0.41	0.82
Chetco	17	1.39	2.8
Winchuck	5	0.41	0.82
Smith	5	0.41	0.82

Most mining sites affected by the proposed action are likely to be widely distributed across the action area and small compared with the total habitat area. Furthermore, effects on riparian vegetation and riparian forests are avoided by implementation of PCMs. This is important because degraded riparian forest conditions are a key limiting stress for the Illinois River and Middle Rogue/Applegate River populations (Table 12), the 2 populations with the largest amount of proposed mining activity. The second key limiting stress for both the Illinois River and Middle Rogue/Applegate River populations, altered hydrologic function, will not be affected by the proposed action. Effects on multiple very high or high stresses for the Illinois and Middle Rogue/Applegate River populations will either be temporary (i.e., lack of floodplain and channel structure, impaired water quality), not adverse (i.e., barriers, impaired mainstem conditions), or not applicable (i.e., altered sediment supply). Additional adverse effects from exposure to increased methylmercury will also occur in limited and localized areas within the Rogue River and Chetco River estuaries (i.e., impaired estuary conditions), but only a small number of outmigrating juveniles (approximately ≤1%) are likely to be adversely affected.

An individual may be exposed to mining activities multiple times during its life and it may be exposed to more than one activity. Although death is an outcome for some individuals, sublethal effects are also likely to occur. The primary responses of multiple exposures would be a short-term reduction in feeding (rearing and outmigrants) which could contribute to reduced growth, reduced overwinter survival (rearing juveniles only), reduced ocean survival, and/or reduced fitness/spawning success as an adult. Other responses could be injury or an increase in disease susceptibility with the same resulting outcome. All SONCC coho salmon individuals could have three potential exposures with resulting adverse effects, although rearing juveniles could experience more than one exposure during that mining season. These potential exposure periods would occur during year 1[42] as eggs, embryos, and emerging fry, during year 1.5 as rearing juveniles, and during year 3 as spawning adults. Individuals within the Illinois, Upper Rogue, Middle Rogue/Applegate, Lower Rogue, and Chetco River populations would also have a fourth potential exposure as smolts in the estuary and some individuals in the Illinois, Middle Rogue/Applegate (only in the Hellgate Canyon – Rogue River fifth-field watershed), and Upper Rogue River populations would have a fifth potential exposure as smolts in the NOI-level project area, although overlap is limited and peak outmigration ends prior to the start of the in-water work window.

For example, an individual may be exposed as an egg, embryo, or emergent fry and, if it survives initial exposure, it could be exposed to proposed mining operations during the following season as a rearing juvenile, resulting in death or sublethal effects including reduced growth, injury or increased disease susceptibility, all of which have the potential to affect ocean survival. Upon its return from the ocean, an individual could be exposed once again as a spawning adult, with effects on reproductive success. For some populations (Illinois, Middle Rogue/Applegate, Upper Rogue), individuals could also be exposed again during a second mining season for a shorter duration as an outmigrant and again in the estuaries, as would individuals in the Chetco and Lower Rogue River populations. However, it is difficult to say how many individuals will be exposed multiple times but, the potential for exposure at some life history stages is limited by the PCMs and is discussed below.

Because the willful entrainment of coho salmon is prohibited (PCM #32c), juveniles or smolts may only be accidently pulled into the dredge through the nozzle. Risk of accidental entrainment during year 1.5 and 2 via the dredge nozzle is further reduced by prohibiting operations outside of daylight hours, and specifically from 5 p.m. through 9 a.m. (PCM #19), because fish will be more visible during daylight. Additionally, removal of material or operation of a dredge nozzle is prohibited within three feet of the stream edge for any water level (PCM #25) which protects the smallest and youngest juveniles frequently using habitat along the stream's edges. During the summer, rearing juveniles are increasingly mobile, which further reduces the probability and duration of multiple exposures during year 1.5. For year 2, the duration of smolts in any one location is limited as they focus on downstream migration which reduces exposure to temporary water quality effects and reduced forage; their greater mobility also reduces entrainment and impingement, in addition to reducing exposure to suspended sediment and unintentional chemical contamination. Additionally overlap between mining activities and smolts is limited and peak outmigration ends prior to the start of the in-water work window.

Because large continuous suspended sediment plumes will be prevented by restricting the length of the visible plume to 300 feet, restricting the width of the plume such that it cannot cover the entire wetted width of a stream, requiring a minimum of 500 feet between operating suction dredges, and prohibiting plumes from multiple dredges from overlapping (PCMs #27, 29a,b,e), it is likely that exposure and sublethal effects will be limited to localized occurrences for rearing juveniles during year 1.5. Similarly, PCMs will reduce the extent and magnitude of contamination when it occurs, by storing fuels and other chemicals away from the streams or in

[42] For the discussion regarding multiple exposures of an individual over multiple life history stages: for each cohort/generation, year 1 = Eggs, embryos, and emerging fry; year 1.5 = rearing juveniles within the same year; year 2 = smolts the following year; year 3 = adults returning the following year.

containment systems (PCM #11) and by requiring daily equipment inspections and maintenance, not carrying fuel out into the stream, transferring a limited amount of fuel during refueling, and using of spill protection equipment (PCM #24), such that these will be localized effects exposing only a small number of rearing juveniles during year 1.5.

For those outmigrating smolts with the potential for exposure to increased methylmercury in the Rogue and Chetco River estuaries during year 2, only a limited number of individuals (approximately ≤1%) are likely to bioaccumulate a sufficient amount of additional methylmercury for sublethal effects or injury to occur, because only minor amounts of methylmercury are likely to be produced in these estuaries and resulting from variability in individual baseline contaminant loads, time spent in the estuaries, levels of methylmercury in individual prey items, and variable consumption rates. Furthermore, there is some evidence that suggests methylation rates are higher in summer due to higher water temperatures and such that most outmigrants will be not exposed during the highest methylmercury concentrations, further limiting the overall amount of methylmercury bioaccumulation.

In some watersheds, NOI operators return to the same NOI-level project area for multiple and consecutive years or multiple but non-consecutive years, but do not in other watersheds, based on the 2009-2012 NOIs. For areas with a small amount of proposed annual NOIs and mining operations, additive effects as a result of the proposed action are highly unlikely to occur (or will only occur for a very small number of individuals) because of the small amount of disturbed habitat and thus reduced potential for exposure. Therefore, additive effects on individuals are unlikely to occur for individuals or will only occur for a very minor number of individuals in the Elk, Lower Rogue, Upper Rogue, Pistol, Chetco, Winchuck, and Smith River populations and are unlikely to further affect the viability or recovery potential of these populations.

Bayley (2003) described "a first analysis of existing data which accounts for cumulative effects of suction dredge mining, early hydraulic mining, and other activities as reflected by land-use on measures of fish populations and habitat in the Illinois subbasin" and also stated "that at the scales occupied by fish populations, localized disturbances caused by suction dredge mining would need a strong cumulative intensity of many operations to have a measurable effect". Because the questions posed by the authors relate to the proposed action and were asked for a subbasin contained within the action area, we did evaluate this report. However, the scale of analysis of the report was on a gross level whereas the factors influencing coho salmon habitat and microhabitat occur at a much finer level. We recognize that this report is "best available information" but due to shortcomings of the report we do not rely overmuch on only this report because it is not a structured controlled experiment and because the legacy of historical hydraulic mining appears to swamp or flood recent effects

The majority of disturbance and the most exposure of individuals will occur for the Illinois River population; although 15.4 miles up to 30.8 miles of freshwater stream will be disturbed in the Illinois subbasin, there are approximately 355 miles of critical habitat in the subbasin (USFS 2015). Additionally, channel instability is the only effect expected to expose individuals for 30.8 miles, is the only effect to have up to a 2 year duration, and will only have adverse effects on spawning adults, eggs, and embryos. The other population with a large amount of proposed mining activity (i.e., 44 NOIs) is the Middle Rogue/Applegate River population. Therefore, individuals could be at a higher risk of additive effects from multiple exposures for these two populations.

Middle Rogue/Applegate River population. As noted earlier, all SONCC coho salmon individuals, including those in the Middle Rogue/Applegate River population, could have three potential exposures with resulting adverse effects, although rearing juveniles could experience more than one exposure during the mining season. These potential exposure periods would occur during year 1 as eggs, embryos, and emerging fry, during year 1.5 as rearing juveniles, and during year 3 as spawning adults. For individuals in the Middle Rogue/Applegate River population, there is also a potential for a fourth exposure with resulting adverse effects for outmigrating smolts in the Rogue River estuary during year 2. Additionally, some Middle Rogue/Applegate River individuals, in the Hellgate Canyon-Rogue River fifth-field watershed only, would also have a potential for a fifth exposure between outmigrating smolts and proposed suction dredge mining operations, also during year 2, because the in-water work window begins on June 15 and smolts are outmigrating through July 15, for an overlap of one month. However, peak migration ends May 30 (ODFW 2003c), limiting the number of individuals exposed to a small proportion of those in the watershed, and an even smaller proportion of the population overall. Furthermore, there are 15 NOIs proposed for this watershed but all are located in the tributaries only, because the mainstem Rogue River is outside of the RRSNF. In the remainder of the Middle Rogue/Applegate River population there is no freshwater overlap between proposed suction dredge mining operations and outmigrating smolts because the in-water work window does not begin until July 1 in the Applegate River watersheds and July 15 for the Shasta Costa Creek – Rogue River and Stair Creek – Rogue River watersheds, with smolt outmigration ending on June 30. Nor are outmigrating smolts exposed to additional proposed suction dredge operations on the mainstem Rogue during their travel to the ocean because the Rogue River mainstem is either not located on the RRSNF or because it is mineral withdrawn. Unfortunately for this analysis, with the exception of the Upper Applegate River watershed, there were no NOIs between 2009-2012 for this population to examine distribution or frequency of NOIs; for the Upper Applegate River watershed there was a maximum of 2 NOIs per year, and NOIs did not occur in consecutive years, rather they occurred every other year. Although there is a moderate amount of NOIs proposed for this population, approximately only 7.2 miles of freshwater stream reaches will have temporary habitat effects from mining operations and these are distributed over approximately 375 miles of habitat (Table 26, Scenario 2), such that the total amount of affected habitat is small in relation to the distribution of the population (i.e., approximately 2%). These NOI-level project area habitat effects are either very temporary or, in terms of channel instability, recovery will begin within 2 winters, for most NOI-level project areas. Furthermore, PCMs limit the opportunity for multiple exposures by an individual during years 1 and 1.5, and only a small proportion of the population will overlap with mining operations during year 2. Environmental conditions limit further exposure in the estuaries during year 2. Therefore, additive effects are likely to occur for only a very minor number of individuals in the Middle Rogue/Applegate River population and are unlikely to further affect the viability or recovery potential of this population.

Illinois River population. As noted earlier, all SONCC coho salmon individuals, including those in the Illinois River population, could have three potential exposures with resulting adverse effects, although rearing juveniles could experience more than one exposure during the mining season. These potential exposure periods would occur during year 1 as eggs, embryos, and emerging fry, during year 1.5 as rearing juveniles, and during year 3 as spawning adults. For individuals in the Illinois River population, there is also a potential for a fourth exposure with resulting adverse effects for outmigrating smolts in the Rogue River estuary during year 2. Additionally, Illinois River individuals would also have a potential for a fifth exposure between outmigrating smolts and proposed suction dredge mining operations, also during year 2, because the in-water work window begins on June 15 and smolts are outmigrating through June 30, for an overlap of two weeks. However, peak migration ends May 30 (ODFW 2003d), limiting the number of individuals exposed to a small proportion of those in the watershed, and an even smaller proportion of the population overall. Nor are outmigrating smolts from the Illinois River exposed to additional proposed suction dredge operations on the mainstem Rogue during their travel to the ocean because the Rogue River mainstem is mineral withdrawn. Unfortunately for this analysis, for most watersheds in this population (i.e., 7 of 11), there were no NOIs during 2009-2012 to examine distribution or frequency of NOIs and for two watersheds there was only one NOI in each during 2009-2012. For the remaining two watersheds, NOIs tended to occur for single years only (74% of 14 NOI locations in the Josephine Creek-Illinois River watershed) or occurred for consecutive years in the same location (2010 and 2011 in the Sucker Creek watershed at a single NOI location). Although there are a large number of NOIs proposed for this population annually, the total amount of affected habitat is small in relation to the distribution of the population (i.e., 30.8 miles of 355 miles, or 8.7%). Additionally, these NOI-level project area habitat effects are either very temporary or, in terms of channel instability, recovery will begin within 2 winters, for most NOI-level project areas. Furthermore, PCMs limit the opportunity for multiple exposures by an individual during years 1 and 1.5, and only a small proportion of the population will overlap with mining operations during year 2. Environmental conditions limit further exposure in the estuaries during year 2. Therefore, additive effects are likely to occur for only a small number of individuals in the Illinois River population and are unlikely to further affect the viability or recovery potential of this population.

Gold mining, although not a key limiting threat and therefore not considered to be the most pressing factor limiting recovery of SONCC coho salmon populations, is a very high threat for the Illinois River population and a high threat for the Middle Rogue/Applegate River and the Chetco River populations (NMFS 2014). The location of mining contributes to the severity of the threat to coho salmon because gold mining on federal lands often occurs on those lower gradient stream reaches that are located just upstream of private lands; these reaches are very important to coho salmon and they represent the best low gradient habitat available (NMFS 2014). Although suction dredging was specifically considered by NMFS (2014) for these populations, another type of motorized mining – riparian placer mining using heavy equipment above the OHW – was also considered in the recovery plan as both types are common on Federal lands in southwest Oregon; gravel mining was also included in the same threat category. These other types of mining typically remove large amounts of substrate from the stream or leave them perched on the on the floodplain with long-term effects on channel complexity and morphology.

Effects identified in the recovery plan from placer mining and suction dredging include the rearrangement or destabilization of substrate and subsequent changes to macroinvertebrate assemblages (NMFS 2014). Recovery actions related to suction dredge and riparian placer mining include assessing the impacts of suction dredging, developing suction dredging regulations that minimize or prevent impacts, considering special closed areas, closed seasons, and considering regulations specific to moderate and high IP streams (NMFS 2014). The RRSNF developed PCMs as part of the proposed action which serve to reduce identified threats and minimize further degradation of key limiting stresses (see Section 2.2.2.1, Table 12). For example, some effects, especially for certain life history stages, will be prevented by prohibiting suction dredge or operator interactions with individual fish (see PCMs #21, 32b, 33, 39); other PCMs will minimize these effects for other life history stages (see PCMs #19, 25, 32c, 33, 37c). Other effects avoided by PCMs include loss of riparian vegetation, loss of future wood recruitment into the streams, reduction of in-stream wood and associated pool habitat and natural cover, stream bank erosion, and water withdrawal (see PCMs #13, 14, 20, 36, 37, 44, 49). Additionally, increased water temperature, decreased stream bank stability, direct effects to existing pools, and effects on off-channel habitat are extremely unlikely to occur (see PCMs #16, 20, 25, 26, 30, 33, 45-49). PCMs will limit overall amount of substrate disturbance and destabilization (PCM #17) which is also related to forage and methylmercury effects; will reduce the distance immediately traveled downstream by suspended sediment and its effects, as well as sedimentation and substrate embeddedness (PCMs #19, 29); and will reduce the extent and magnitude of contamination when spills occur as well as the frequency of spills (PCMs #11, 12, 24, 28, 38).

Additionally, many high IP streams in the action area will not be affected by NOI activities. For example, in the Chetco River, all high IP habitat on the RRSNF is mineral withdrawn and will not be affected by the proposed action; an additional 35.6 miles of medium IP habitat is also mineral withdrawn. Furthermore, the RRSNF is only proposing a limited amount of annual NOI activity for the Chetco River population with 15 NOIs. For the Illinois River population, there is no high IP habitat on the RRSNF in 8 of the 11 watersheds where the RRSNF will authorize NOIs. For the remaining watersheds, approximately 3.6 miles of high IP habitat are available for NOI activity and most habitat effects from the proposed action are either very temporary or will be reset during the winter due to PCMs; annual NOI activity in these watersheds are limited to ≤25 NOIs per watershed. For the Middle Rogue/Applegate River population, the RRSNF will only authorize NOIs for high IP areas in 2 of the 6 watersheds; approximately 9.5 miles of high IP habitat are available for NOI activity, mostly in the Hellgate Canyon-Rogue River watershed which is limited to 15 annual NOIs. Most habitat effects from the proposed action are either very temporary or, in terms of channel instability, recovery will begin within 2 winters, for most NOI-level project areas due to PCMs. Overall, PCMs as part of the proposed action prevent adverse effects or limit the scale and duration of adverse effects.

2.4.3 Effects on Southern DPS Green Sturgeon

2.4.3.1 Exposure and effects of methylmercury

Only green sturgeon subadults and adults will be present in the estuaries and they will only be exposed to effects from methylmercury. Details of the effects of the proposed action regarding methylmercury were described in Sections 2.4.1.3 and 2.4.2.5. Compared to juvenile outmigrating coho salmon, green sturgeon are likely to have longer periods of exposure to increased methylmercury in the estuaries. However, abundance of Southern DPS green sturgeon using the action area estuaries during the summer months has not been studied, and consequently is unknown.

Green sturgeon can spend up to five months in estuaries along Oregon and Washington. Reproductive maturity typically occurs at ages of 14-16 years (Israel and Klimley 2008). They are also a long-lived species with maximum ages of 60-70 years (Moyle 2002), meaning that a single individual could return to estuaries in the action area annually for decades. Therefore, they can be chronically exposed and may be susceptible to methylmercury toxicity. Uptake of methylmercury may be enhanced by their benthic feeding orientation (Webb *et al.* 2006, Israel and Klimley 2008), although some studies suggest that methylmercury concentrations are higher in more pelagic feeding species than in benthic feeders (Chen *et al.* 2009). Sturgeon are highly adapted for feeding on benthic animals; callianassid shrimp, neomysid shrimp, amphipods, sand lance, anchovies, and clams are known prey items for green sturgeon (Moyle 2002). Shallow pits in intertidal areas are indicative of digging and predation by green sturgeon on burrowing shrimp such as *Neotrypaea* sp and *Upogebia pugettensis* (Dumbauld *et al.* 2008).

However, there is limited understanding of the effects of bioaccumulated methylmercury for adult and subadult green sturgeon (Israel and Klimley 2008). Lee *et al.* (2011) demonstrated higher mortalities and lower growth rates for juvenile green sturgeon exposed to concentrations of dietary methylmercury; kidney and liver abnormalities were observed after eight weeks and green sturgeon appear to be more susceptible than white sturgeon (Lee *et al.* 2012). We are uncertain if subadults and adults have greater tolerance than juveniles. However, allocation of an individual's energy to repair damage caused by methylmercury is likely to reduce growth or alter behaviors necessary for feeding or reproduction. In Section 2.4.1.3, we determined that the 2 estuaries of river systems with the highest amounts of mining under the proposed action have very limited depositional areas suitable for methylation of mercury; it is possible that some estuarine methylmercury production could occur in these two estuaries, but based on the best available information we expect only very minor amounts. Given the uncertainty of the estimated baseline concentrations, the lack of knowledge regarding the bioaccumulation rate for adult and subadult green sturgeon in Oregon estuaries, and the lack of understanding regarding how much mercury must be remobilized and transported to the estuary to cause a significant increase in methylmercury concentrations, it is impossible to quantify whether green sturgeon will experience adverse effects (i.e., we cannot predict a specific numeric value of increased methylmercury to determine whether that increase would result in adverse effects). Also, based on our analysis, we are unable to attribute any measurable increased methylmercury concentrations in the estuaries solely to mercury remobilized by the proposed action. But there is sufficient information to qualitatively determine that the proposed action does contribute to methylmercury production in the estuaries and to bioaccumulation of methylmercury in adult and subadult green sturgeon based on their extended residency, annual visitations, and feeding methods. Even if Southern DPS green sturgeon only spend a limited amount of time during the summer in these estuaries, it is possible that a single individual could return to these estuaries annually for decades resulting in chronic exposure and potentially elevated concentrations. Mercury concentrations in fish from the natal estuary are high, demonstrating early exposure and potentially high concentrations as a baseline condition. Therefore, some individuals are likely to bioaccumulate enough methylmercury in the estuaries that, when combined with their baseline contaminant load, will be likely to experience adverse effects including neurological and reproductive impairments, or reduce their overall survival and fitness. These adverse effects will only occur in the Rogue and Chetco River estuaries.

2.4.4 Effects on Designated Critical Habitat for OC and SONCC coho salmon

As noted above, each NOI will be completed as proposed with full application of PCMs. Each NOI is likely to have the following effects on individual fish at the site and reach scale. These effects will vary somewhat in degree between NOIs because of differences in the scope of activities at each site, and in the current condition/functioning of PCEs (OC coho salmon) or essential features (SONCC coho salmon) and the factors responsible for those conditions. However, the nature of these effects will be similar between NOIs because each NOI is based on a similar set of underlying activities that are limited by the same PCMs and because the PCEs or essential features and conservation needs identified for each species are also essentially the same. No individual project is likely to have any effect on PCEs or essential features that is greater than the full range of effects summarized here.

2.4.4.1 Summary of the effects of the action on OC coho salmon critical habitat PCEs

1. Freshwater spawning sites
    a. *Substrate.* Mining tailings are highly unstable, have a high potential for scour, and can mobilize under slight increases in stream discharge and velocity because they are unconsolidated and frequently deposited above the armor layer (Thomas 1985, Hassler *et al.* 1986, Stern 1988, Harvey and Lisle 1998, Harvey and Lisle 1999). These characteristics degrade spawning substrate and mining activities will create unstable tailings that will be present when some OC coho salmon spawn. However, NOI operators are required to maintain a 50-foot distance from spawning habitat areas (PCM #26a). The proposed conservation measures specifically note these areas as being located at a pool tail crest which is also defined as the head of a riffle or a riffle crest (Kappesser 2002). Riffle heads/crests are preferred locations for the construction of salmon redds (HWE 2011). Therefore, direct overlap of suction dredging and spawning gravels in most areas is highly unlikely; even so, in Section 2.4.1.1, we estimated that the overall extent of channel destabilization for an individual NOI-level project area would be approximately 433 feet such that some spawning substrate will still be temporarily destabilized by suction dredging. We also estimated that there is an 89% chance that the bankfull discharge will occur during the time frame of 2 winters, or an 11% chance that it will not occur. Therefore, it is likely that a bankfull discharge will occur and the channel will begin to restabilize after suction dredging over a period of 2 winters. We believe these are appropriate estimates because PCMs prevent suction dredging within 50 feet of riffle crests (#26a) and also prevent suction dredging in streams with a summer wetted width ≤ 6 feet (#25). Additionally, the PCMs limit disturbance of the stream substrate such that only disturbance of up to 25 cubic yards will occur for each NOI (PCM #17) and NOI operators are required to fill the dredge hole and high banking holes and spread the tailings to conform to the contours of the stream channel (see

PCMs #30, 31, 34, 35). PCMs preventing the use of motorized winches will limit the size of boulders that can be moved for both suction dredging and high banking and thus limit effects to smaller disturbances. For suction dredging, rocks cannot be removed from the wetted perimeter (PCM #26b) and PCMs also protect in-stream wood and the stream banks (PCM #13); boulders and in-stream wood are elements that contribute to stream bed and stream channel integrity and provide substrate stability.

Substrate embeddedness downstream of suction dredges can result in temporary decreases in available spawning areas because embedded substrate makes it more difficult for fish to dig redds, clogs interstitial spaces, reduces intergravel velocities, and reduces dissolved oxygen concentrations in the redd. Areas immediately below the operating suction dredge will have the greatest amount of deposition and substrate embeddedness because decreasing sedimentation rates are typically associated with increased downstream distance; however, coarser sediments are deposited nearest the dredge site and finer sediments travel farther downstream (Thomas 1985). Measurable sedimentation is limited to 300 feet by the PCMs and PCMs also limit the amount of suspended sediment by prohibiting overlap of visible turbidity plumes from multiple dredges and prohibiting the plume from covering the entire wetted stream area (PCM #29). Although suction dredge operators are required to maintain a 50-foot distance from spawning habitat areas (PCM #26a), this distance is insufficient to avoid downstream adverse effects because measurable sedimentation will likely occur for a downstream distance of 300 feet for each NOI. However, these are temporary effects because sedimentation and substrate embeddedness will be reset in between mining seasons during winter flows.

b. *Water quality*. As described above, substrate embeddedness can reduce dissolved oxygen conditions in redds.
c. *Water quantity*. The proposed action will not affect the overall quantity of water in the action area.

2. <u>Freshwater rearing sites</u>
    a. *Floodplain connectivity*. The proposed action will not adversely affect the connection between streams and their floodplains or off-channel habitats because (1) there will not be a reduction in in-stream wood or a loss of future wood recruitment into streams, (2) effects on stream bank stability are minimized by multiple PCMs (see PCMs #16, 20, 25, 26, 30, 33, and 45-49), (3) the proposed action will not affect water quantity, and (4) NOI operators are required to fill dredge holes and high banking holes and spread the tailings to conform to the contours of the stream channel (see PCMs #30, 31, 34, 35).
    b. *Forage*. Sedimentation/substrate embeddedness and chemical contamination are likely to contribute to temporary reductions of aquatic macroinvertebrate abundance and diversity (Neff 1985, Bjornn and Reiser 1991, Suttle 2004). Additionally, suction dredging itself will directly cause localized and temporary reductions of macroinvertebrates, although PCMs do limit the overall amount disturbance of the stream substrate (PCM #17). Suction dredging and downstream sedimentation/substrate embeddedness will occur in streams when juveniles are

rearing, although it is limited to 300 feet by the PCMs and PCMs also limit it by prohibiting overlap of visible turbidity plumes from multiple dredges and prohibiting the plume from covering the entire wetted stream area (PCM #29). Forage for rearing juveniles will also be reduced by unintentional chemical contamination from suction dredging and vehicles using existing fords, however, PCMs will reduce the extent and magnitude of contamination when they occur, such that these will be localized effects (PCMs #11, 24). Entrainment of macroinvertebrates from substrate moved during suction dredging will temporarily increase their abundance in the downstream drift, but their overall abundance at the NOI site will decrease until recolonization occurs, likely within a few months because the summer-fall mining in-stream mining season coincides with high levels of invertebrate activity. Additionally, as discussed previously, we expect that sedimentation/substrate embeddedness will be temporary, persisting only until November or December, also allowing for recolonization of these temporary impacted areas.

c. *Natural cover.* Because there are prohibitions on riparian vegetation removal (PCMs #13b, 36, 44, and 48), the proposed action will not affect riparian vegetation or future wood recruitment into streams. The proposed action will not reduce in-stream wood. NOI operators are also prohibited from filling existing pools (PCM #30c), removing or disturbing boulders or embedded wood, plants and other habitat structure from stream banks (PCM #13b, c), and cutting, moving, or destabilizing in-stream woody debris including rootwads, stumps or logs (PCM #13d). Movement of boulders is restricted to those that can be moved without motorized winches or other motorized equipment (PCM #16). Because of multiple PCMs, effects to natural cover will not occur. Some juveniles could use turbidity plumes for cover where other cover is lacking (Bisson and Bilby 1982).

d. *Water quality.* Water quality of rearing habitat at the NOI sites will be temporarily and locally degraded by suspended sediment and unintentional chemical contamination. Suspended sediment is limited to 300 feet by the PCMs and PCMs also limit the amount of suspended sediment by prohibiting overlap of visible turbidity plumes from multiple dredges and prohibiting the plume from covering the entire wetted stream area (PCM #29). PCMs will also reduce the extent and magnitude of unintentional chemical contaminations, such that they will be localized effects when they occur (PCMS #11, 24).

e. *Water quantity.* The proposed action will not affect the overall quantity of water in the action area.

3. <u>Freshwater migration</u>

a. *Free of artificial obstruction.* Delays in adult upstream passage from suspended sediment or unintentional chemical contamination are unlikely to occur because adults are highly mobile with the ability to avoid these localized and temporary effects, because visible turbidity is not allowed to cover the entire wetted perimeter of a stream (PCM #29b), and because NOI operators are required to stop suction dredging operations if adult salmon are encountered (PCM #32b). In the event upstream passage was impeded, it is likely to only be temporarily impeded with no meaningful migration delays. Similarly, outmigrating juveniles are also likely to avoid localized and temporary water quality degradation events with only a slight delay in migration due to their mobility, although there is no requirement to stop suction dredging operations when they are present.

It is unlikely that migrating adult coho salmon will be entrained, impinged, trampled, or displaced because their exposure is minimized by the requirements to stop suction dredging operations if adult salmon are encountered (PCM #32b). There is no similar requirement when encountering juveniles, therefore suction dredging will occur in streams with rearing and outmigrating smolts. As discussed in Section 2.4.2.2, flow velocities at the intake of suction dredge nozzles > 2.5 inches are sufficient to entrain outmigrating smolts and impede freshwater migration via entrainment or attempting to avoid entrainment. However, because the willful entrainment of coho salmon is prohibited (PCM#32c), smolts may only be accidently pulled into the dredge.

b. *Natural cover.* As described above for freshwater rearing.
c. *Water quality.* As described above for freshwater rearing areas.
d. *Water quantity.* The proposed action will not affect the overall quantity of water in the action area.

4. Estuarine areas
   a. *Forage.* Because of the low amounts of mining occurring in the Coquille River and Sixes River it is extremely unlikely that sufficient amounts of mercury will be remobilized and transported downstream to the estuaries to measurably increase methylmercury production in these estuaries. Therefore, the proposed action is unlikely to negatively affect forage items or food webs in estuarine areas.
   b. *Free of artificial obstruction.* The proposed action will not affect passage in estuarine areas.
   c. *Natural cover.* The proposed action will not affect the quality or quantity of natural cover in estuarine areas.
   d. *Salinity.* The proposed action will not affect salinity.
   e. *Water quality.* Because wild fish obtain methylmercury mostly from food, rather than from the water, it is unlikely that the water quality PCE will be measurably affected by methylmercury in the estuaries.
   f. *Water quantity.* The proposed action will not affect the quantity of water in the action area.
5. Nearshore marine areas – These PCEs do not occur in the action area.

All OC coho salmon watersheds that are expected to be disturbed annually by temporary effects from the proposed action at the NOI-level project area will have ≤2% of critical habitat affected annually (Table 27), which is too small to negatively affect the function or value of critical habitat at the fifth-field scale. Based on the 2009-2012 NOIs, NOI operators in the South Fork Coquille River and Sixes River watershed tend to return to the same NOI-level project area for multiple and consecutive years. However, the NOI-level project area habitat effects are either very temporary or, in terms of channel instability, recovery will begin within 2 winters for most NOI-level project areas.

Table 27. Approximate linear extent of annual stream disturbance of cumulative NOI-level project areas for OC coho salmon watersheds. Scenario 1: 100% of NOI operators will return to the same location in year 2. Scenario 2: 100% of NOI operators will move to a new location in year 2 (channel instability is the only effect expected to have up to a 2 year duration).

Population	Watershed (5th Field)	Number of annual NOI permissible per watershed	Scenario 1: Approximate Linear Disturbance (feet)	Scenario 1: Approximate Percent of Critical Habitat Disturbed	Scenario 2: Maximum Approximate Linear Disturbance (feet)	Scenario 2: Maximum Approximate Percent of Critical Habitat Disturbed
Coquille	South Fork Coquille	8	3,464	0.9%	6,928	1.7%
Sixes	Sixes	7	3,031	1.0%	6,062	2%

Most effects on critical habitat will occur only during the summer mining season, although some effects on PCEs (i.e., substrate effects from substrate embeddedness, effects on water quality conditions in redds, effects on forage) will extend past the summer mining season, but even these effects will be temporary because of the PCMs. For example, restrictions imposed on intake nozzle diameter, engine horsepower, dredge spacing, limitations on the visible length of the downstream turbidity, limiting operations to certain daylight hours, maintaining buffers for stream banks and lateral edges of the wetted stream, and prohibiting waste water discharge from high banking will all reduce the distance immediately traveled downstream by suspended sediment, its effects, and its duration, as well as sedimentation and substrate embeddedness. Additionally, it is likely that a bankfull discharge will occur and the channel will begin to restabilize after suction dredging over a period of 2 winters. As a result, habitat effects on sedimentation, substrate embeddedness, and forage are effectively reset in between mining seasons for the majority of reaches, with some spatial and temporal variation. In terms of channel instability, recovery will begin within 2 winters for most NOI-level project areas; additionally there will not be a complete loss of critical habitat because channel instability only adversely affects PCEs related to spawning. Forage communities will recover, spawning gravels will be available, and habitat will persist on annual to biennial basis for most NOI-level project areas. Therefore, it is unlikely that multiple actions within the same watershed will have an adverse effect on the function of PCEs or the conservation value of critical habitat for the South Fork Coquille River or Sixes River watersheds. Although the current condition of critical habitat is not fully functional for conservation, the proposed action will not preclude or significantly delay the natural trajectory of PCE development.

2.4.4.2 Summary of the effects of the action on SONCC coho salmon critical habitat essential features

1. Spawning and juvenile rearing areas
   a. *Cover/Shelter.* Because there are prohibitions on riparian vegetation removal (PCMs #13b, 36, 44, and 48), the proposed action will not affect riparian vegetation or future wood recruitment into streams. The proposed action will not reduce in-stream wood. NOI operators are also prohibited from filling existing

pools (PCM #30c), removing or disturbing boulders or embedded wood, plants and other habitat structure from stream banks (PCM #13b, c), cutting, moving , or destabilizing in-stream woody debris including rootwads, stumps or logs (PCM #13d). Movement of boulders is restricted to those that can be moved without motorized winches or other motorized equipment (PCM #16). Because of multiple PCMs, effects to natural cover will not occur. Some juveniles could use turbidity plumes for cover where other cover is lacking (Bisson and Bilby 1982).

b. *Food (juvenile rearing).* Sedimentation/substrate embeddedness and unintentional chemical contamination are likely to contribute to temporary reductions of aquatic macroinvertebrate abundance and diversity (Neff 1985, Bjornn and Reiser 1991, Suttle 2004). Additionally, suction dredging itself will directly cause localized and temporary reductions of macroinvertebrates, although PCMs do limit the overall amount disturbance of the stream substrate (PCM #17). Suction dredging and downstream sedimentation/substrate embeddedness will occur in streams when juveniles are rearing, although suspended sediment and sedimentation it is limited to 300 feet by the PCMs and also limit it by prohibiting overlap of visible turbidity plumes from multiple dredges and prohibiting the plume from covering the entire wetted stream area (PCM #29). Forage for rearing juveniles will also be reduced by unintentional chemical contamination from suction dredging and vehicles using existing fords, however, PCMs will reduce the extent and magnitude of contamination when they occur, such that these will be localized effects (PCMS #11, 24). Entrainment of macroinvertebrates from substrate moved during suction dredging will temporarily increase their abundance in the downstream drift, but their overall abundance at the NOI site will decrease until recolonization occurs, likely within a few months because the summer-fall mining in-stream mining season coincides with high levels of invertebrate activity. Additionally, as discussed previously, we expect that sedimentation/substrate embeddedness will be temporary, persisting only until November or December, also allowing for recolonization of these temporary impacted areas.

c. *Riparian vegetation.* The proposed action will not affect riparian vegetation because there are prohibitions on riparian vegetation removal (PCMs #13b, 36, 44, and 48).

d. *Space.* Suitable space is a function of stream flow, channel morphology, gradient, and in-stream habitat (Bjornn and Reiser 1991). Overall, PCMs minimize the overall amount of disturbance per NOI (PCM #17). With the exception of interstitial spaces, it is unlikely that the proposed action will reduce space in rearing habitat because multiple PCMs are protective of channel morphology, existing pools, in-stream wood, and future wood recruitment into streams. Effects to space in spawning areas will be minimized by the requirement to conduct all suction dredging 50 feet away from spawning areas (PCM #26a), however NOI operations are likely to temporarily increase substrate embeddedness and reduce availability of interstitial spaces for up to 300 feet downstream. Therefore, in some years and in some streams we expect there will be a decrease in space for spawning and rearing habitats because there will be an overlap between residual substrate embeddedness from suction dredging and spawning areas. Also see spawning gravel.

e. *Spawning gravel.* Mining tailings are highly unstable, have a high potential for scour, and can mobilize under slight increases in stream discharge and velocity because they are unconsolidated and frequently deposited above the armor layer (Thomas 1985, Hassler *et al.* 1986, Stern 1988, Harvey and Lisle 1998, Harvey and Lisle 1999). These characteristics degrade spawning substrate and mining activities will create unstable tailings that will be present when some OC coho salmon spawn. However, NOI operators are required to maintain a 50-foot distance from spawning habitat areas (PCM #26a). The proposed conservation measures specifically note these areas as being located at a pool tail crest which is also defined as the head of a riffle or a riffle crest (Kappesser 2002). Riffle heads are preferred locations for the construction of salmon redds (HWE 2011). Therefore, direct overlap of suction dredging and spawning gravels in most areas is highly unlikely; even so, in Section 2.4.1.1, we estimated that the overall extent of channel destabilization for an individual NOI-level project area would be approximately 433 feet such that some spawning substrate will still be temporarily destabilized by suction dredging. We also estimated that there is an 89% chance that the bankfull discharge will occur during the time frame of 2 winters, or an 11% chance that it will not occur. Therefore, it is likely that a bankfull discharge will occur and the channel will begin to restabilize after suction dredging over a period of 2 winters. We believe these are appropriate estimates because PCMs prevent suction dredging within 50 feet of riffle crests (#26a) and also prevent suction dredging in streams with a summer wetted width ≤ 6 feet (#25). Additionally, the PCMs limit disturbance of the stream substrate such that only disturbance of up to 25 cubic yards will occur for each NOI (PCM #17) and NOI operators are required to fill the dredge hole and high banking holes and spread the tailings to conform to the contours of the stream channel (see PCMs #30, 31, 34, 35). PCMs preventing the use of motorized winches will limit the size of boulders that can be moved for both suction dredging and high banking and thus limit effects to smaller disturbances. For suction dredging, rocks cannot be removed from the wetted perimeter (PCM #26b) and PCMs also protect in-stream wood and the stream banks (PCM #13); boulders and in-stream wood are elements that contribute to stream bed and stream channel integrity and provide substrate stability.

Substrate embeddedness downstream of suction dredges can result in temporary decreases in available spawning areas because embedded substrate also makes it more difficult for fish to dig redds, clogs interstitial spaces, reduces intergravel velocities, and reduces dissolved oxygen concentrations in the redd. Areas immediately below the operating suction dredge will have the greatest amount of deposition and substrate embeddedness because decreasing sedimentation rates are typically associated with increased downstream distance; however, coarser sediments are deposited nearest the dredge site and finer sediments travel farther downstream (Thomas 1985). Measurable sedimentation is limited to 300 feet by the PCMs and PCMs also limit the amount of suspended sediment by prohibiting overlap of visible turbidity plumes from multiple dredges and prohibiting the plume from covering the entire wetted stream area (PCM #29). Although suction dredge operators are required to maintain a 50-foot distance from spawning habitat areas (PCM #26a), this distance is insufficient to avoid downstream adverse effects because measurable sedimentation will likely occur for a downstream distance of 300 feet for each NOI. However, these are temporary effects because sedimentation and substrate embeddedness will be reset in between mining seasons during winter flows.

f. *Water quality.* As described above, sedimentation and substrate embeddedness can reduce dissolved oxygen conditions in redds. Additionally, water quality of rearing habitat at the NOI sites will be temporarily and locally degraded by suspended sediment and unintentional chemical contamination. Suspended sediment is limited to 300 feet by the PCMs and PCMs also limit the amount of suspended sediment by prohibiting overlap of visible turbidity plumes from multiple dredges and prohibiting the plume from covering the entire wetted stream area (PCM #29). PCMs will also reduce the extent and magnitude of unintentional chemical contamination episodes, such that these will be localized effects when they occur (PCMS #11, 24).

g. *Water quantity.* The proposed action will not affect the overall quantity of water in the action area.

2. <u>Adult and juvenile migration corridors</u>

   a. *Cover/Shelter.* As described above for spawning and juvenile rearing areas. Additionally, the proposed action will not affect the quality or quantity of natural cover in estuarine migration areas.

   b. *Food (juvenile).* As described above for spawning and juvenile rearing areas. Additionally, in the Rogue and Chetco River estuaries there is likely to be only very minor increases in methylmercury production primarily due to unsuitable environmental conditions. Although methylmercury negatively affects food webs it is unlikely to reduce the availability of forage for coho salmon. However, the quality of those forage items will decrease due to the potential for methylmercury bioaccumulation. Other systems in the action area for SONCC coho salmon will only have low amounts of mining and also have environmental conditions unsuitable for methylation such that forage and food webs are unlikely to be negatively affected.

   c. *Riparian vegetation.* The proposed action will not affect riparian vegetation because there are prohibitions on riparian vegetation removal (PCMs #13b, 36, 44, and 48).

   d. *Safe passage.* Delays in adult upstream passage from suspended sediment or unintentional chemical contamination are unlikely to occur because adults are highly mobile with the ability to avoid these localized and temporary effects, because visible turbidity is not allowed to cover the entire wetted perimeter of a stream (PCM #29b), and because NOI operators are required to stop suction dredging operations if adult salmon are encountered (PCM #32b). In the event upstream passage was impeded, it is likely to only be temporarily impeded with no meaningful migration delays. Similarly, outmigrating juveniles are also likely to avoid localized and temporary water quality degradation events with only a slight delay in migration due to their mobility, although there is no requirement to stop suction dredging operations when they are present. The proposed action will not affect passage in estuarine areas.

It is unlikely that migrating adult coho salmon will be entrained, impinged, trampled, or displaced because their exposure is minimized by the requirements to stop suction dredging operations if adult salmon are encountered (PCM #32b). There is no similar requirement when encountering juveniles, therefore suction dredging will occur in streams with rearing and outmigrating smolts. As discussed in Section 2.4.2.2, flow velocities at the intake of suction dredge nozzles > 2.5 inches are sufficient to entrain outmigrating smolts and impede freshwater migration via entrainment or attempting to avoid entrainment. However, because the willful entrainment of coho salmon is prohibited (PCM#32c), smolts may only be accidently pulled into the dredge.

e. *Space.* Available space for migration habitat is dependent on water volume and depth, in addition to area, because migrating salmon need a corridor sufficiently deep enough for travel and deep pools for holding and resting. It is unlikely that the proposed action will reduce space for migration because multiple PCMs are protective of channel morphology, existing pools, in-stream wood, and future wood recruitment into streams.
f. *Substrate.* There will be temporary measurable effects from sediment deposition and substrate embeddedness for 300 feet downstream of an operating suction dredge during the in-water mining season. However, these are temporary effects because sedimentation and substrate embeddedness will be reset in between mining seasons during winter flows. Also see effects on food above.
g. *Water quality.* Water quality of migration habitat at the NOI sites will be temporarily and locally degraded by suspended sediment and unintentional chemical contamination. Suspended sediment is limited to 300 feet by the PCMs and PCMs also limit the amount of suspended sediment by prohibiting overlap of visible turbidity plumes from multiple dredges and prohibiting the plume from covering the entire wetted stream area (PCM #29). PCMs will also reduce the extent and magnitude of unintentional chemical contamination episodes, such that these will be localized effects when they occur (PCMs #11, 24). Because wild fish obtain methylmercury mostly from food, rather than from the water, it is unlikely that the water quality PCE for adult and juvenile migration corridors will be measurably affected by methylmercury in the estuaries.
h. *Water quantity.* The proposed action will not affect the overall quantity of water in the action area.
i. *Water temperature.* Increases in water temperature are unlikely due to prohibitions on removal of riparian vegetation such that canopy cover shading the stream will not be reduced. Also, PCMs (1) require buffers for high banking operations, (2) require in-water buffers of the stream's wetted perimeter for suction dredging, (3) prohibit removal of rocks or large wood from the wetted perimeter, (4) restrict movement of boulders to only those that can be moved without a motorized winch, (5) prohibit the filling of existing pools, (6) prohibit directing discharge from the sluice into the stream bank or diverting the stream channel into the stream bank, (7) prohibit certain activities during wet weather

conditions, (8) restricts motorized access to existing roads and trails, (9) minimize soil erosion from occupancy by prohibiting the creation of new areas of exposed soil along stream banks and streams, and (10) require new camping areas and paths to be located away from streams and stream banks, all of which will minimize degradation and destabilization of stream banks and protect existing pools, such that the width depth ratio of streams is extremely unlikely to increase (i.e., streams will not get wider and shallower which would allow for greater water surface radiation and warmer stream temperatures). PCMs that minimize these effects include #s 16, 20, 25, 26, 30, 33, and 45-49.

j. *Water velocity*. As discussed above in water temperature, application of multiple PCMs will minimize degradation and destabilization of stream banks and protect existing pools, such that the width depth ratio of streams is extremely unlikely to increase(i.e., streams will not get wider and shallower which would allow for increased water velocity). As a result, water velocity will not be affected by the proposed action.

3. Areas for growth and development to adulthood (ocean areas) - These essential features do not occur in the action area.

As discussed earlier under OC coho salmon critical habitat, the NOI-level project area habitat effects are temporary. Most effects on critical habitat will occur only during the summer mining season, although some effects on essential features (i.e., substrate and space effects from substrate embeddedness, effects on water quality conditions in redds, effects on food)) will extend past the summer mining season; but even these effects are temporary because of the proposed conservation measures. For example, restrictions imposed on intake nozzle diameter, engine horsepower, dredge spacing, limitations on the visible length of the downstream turbidity, limiting operations to certain daylight hours, maintaining buffers for stream banks and lateral edges of the wetted stream, and prohibiting waste water discharge from high banking will all reduce the distance immediately traveled downstream by suspended sediment, its effects, and its duration, as well as sedimentation and substrate embeddedness. Additionally, it is likely that a bankfull discharge will occur and the channel will begin to restabilize after suction dredging over a period of 2 winters. As a result, habitat effects on sedimentation, substrate embeddedness, and forage are effectively reset in between mining seasons for the majority of reaches, with some spatial and temporal variation. In terms of channel instability, recovery will begin within 2 winters for most NOI-level project areas; additionally there will not be a complete loss of critical habitat because channel instability will only adversely affect essential features related to spawning. Forage communities will recover, spawning gravels will be available, and habitat will persist on annual to biennial basis for most NOI-level project areas.

The percent of SONCC coho salmon critical habitat by watershed that is expected to be disturbed annually by temporary effects of the proposed action at the NOI-level project area ranges from 0.5% up to 100%, but 11 watersheds will only have approximately <2% of critical habitat affected annually (Table 28). For these watersheds, it is unlikely that multiple actions within the same watershed will have an adverse effect on the function of essential features or the conservation value of critical habitat at the NOI-level action area or watershed units because at least 98% of available critical habitat will be unaffected. For another 9 watersheds approximately < 5% of critical habitat will be affected annually and for another 2 watersheds approximately

<10% of critical habitat will be affected annually (Table 28); for these 11 watersheds, it is unlikely that multiple actions within the same watershed will have an adverse effect on the function of essential features or the conservation value of critical habitat at the NOI-level action area or watershed units because at least 90% of available critical habitat will be unaffected and because effects are either very temporary or, in terms of channel instability, recovery will begin within 2 winters for most NOI-level project areas; additionally there will not be a complete loss of critical habitat because channel instability will only adversely affect essential features related to spawning. Therefore, for these 22 watersheds, although the current condition of critical habitat is not fully functional for conservation, the proposed action will not preclude or significantly delay the natural trajectory of essential feature development.

However, there are 5 watersheds in the Illinois River that warrant additional analysis due to their higher affected percentages of critical habitat (i.e., >10%): (1) Briggs Creek, (2) Josephine Creek – Illinois River, (3) Althouse Creek, (4) Silver Creek, and (5) Sucker Creek.

Briggs Creek watershed. Briggs Creek watershed has a high affected percentage of critical habitat because there are only 0.7 mile of critical habitat in the watershed due to naturally-occurring waterfalls (NMFS 2014) and all is within the RRSNF (USFS 2015). All of the critical habitat is located in the lowermost portion of the watershed, at the confluence with the Illinois River; the lowermost 0.3 miles are withdrawn from mineral entry. Briggs Creek is the most actively dredged watershed within the Illinois subbasin, although most mining activity occurs more than 0.25 miles above critical habitat. Critical habitat in Briggs Creek watershed does not contribute significantly to the Illinois River population primarily because it is a steep boulder canyon. Briggs Creek is highly entrenched in its lowest reach and is confined by topography; side channels and winter refugia are absent in designated critical habitat due to the natural geomorphology. Therefore, it is unlikely the proposed action will have an adverse effect on the function of essential features or the conservation value of critical habitat within the Briggs Creek unit, and although the current condition of critical habitat is not fully functional for conservation in this watershed, the proposed action will not preclude or significantly delay the natural trajectory of essential feature development. Additionally, the proposed action will not measurably affect the habitat indicator considered as "not properly functioning" or the eight habitat indicators considered "at risk" as identified in Section 2.3. Although 303(d) listed for temperature (Table 20), the RRSNF has indicated that its mouth may provide some thermal refuge because Briggs Creek is colder than the Illinois River during the summer months (USFS 2015); the majority of critical habitat that would likely serve as potential thermal refugia would not be adversely affected by the proposed action due to mineral withdrawal.

Table 28. Approximate linear extent of annual stream disturbance of cumulative NOI-level project areas for SONCC coho salmon watersheds. Scenario 1: 100% of NOI operators will return to the same location in year 2. Scenario 2: 100% of NOI operators will move to a new location in year 2 (channel instability is the only effect expected to have up to a 2 year duration).

Population	Watershed (5th Field)	Number of annual NOI permissible per watershed	Scenario 1: Approximate Linear Disturbance (feet)	Scenario 1: Approximate Percent of Critical Habitat Disturbed	Scenario 2: Maximum Approximate Linear Disturbance (feet)	Scenario 2: Maximum Approximate Percent of Critical Habitat Disturbed
Elk River	Elk River	5	2,165	0.7%	4,330	1.4%
Lower Rogue River	Lobster Creek	7	3,031	2.1%	6,062	4.2%
	Rogue River	5	2,165	0.8%	4,330	1.6%
Illinois River	**Althouse Creek**	15	6,495	**8.7%**	**12,990**	**17.3%**
	Briggs Creek	5	2,165	**58.6%**	3,696[43]	**>100%**
	Deer Creek	5	2,165	0.7%	4,330	1.4%
	East Fork Illinois River	19	8,227	4.9%	16,454	9.7%
	Indigo Creek	13	5,629	3.5%	11,258	7.0%
	Josephine Ck. Illinois River	65	28,145	**10.8%**	**56,290**	**21.6%**
	Klondike Ck. Illinois River	5	2,165	1.0%	4,330	1.9%
	Lawson Ck. Illinois River	5	2,165	2.0%	4,330	3.9%
	Silver Creek	19	8,227	**7.1%**	**16,454**	**14.1%**
	Sucker Creek	25	10,825	**6.9%**	**21,650**	**13.4%**
	West Fork Illinois River	12	5,196	1.7%	10,392	3.4%
Middle Rogue/ Applegate Rivers	Hellgate Canyon-Rogue River	15	6,495	1.8%	12,990	3.6%
	Lower Applegate River	5	2,165	0.5%	4,330	1.0%

[43] There are only 3,696 feet of designated critical habitat in the watershed and all is located in the RRSNF; approximately 1,580 feet (0.3 mile) is mineral withdrawn such that approximately 2,110 feet is the maximum linear amount that is can be disturbed. Therefore, Scenario 2 overestimates the maximum linear amount of critical habitat disturbed by the proposed action.

Watershed (5th Field)	Number of annual NOI permissible per watershed	Scenario 1: Approximate Linear Disturbance (feet)	Scenario 1: Approximate Percent of Critical Habitat Disturbed	Scenario 2: Maximum Approximate Linear Disturbance (feet)	Scenario 2: Maximum Approximate Percent of Critical Habitat Disturbed
dle Applegate River	5	1,000[44]	0.4%	1,000[44]	0.4%
sta Costa Ck.-Rogue River	5	2,165	1.9%	4,330	3.7%
r Creek-Rogue River	5	2,165	2.4%	4,330	4.7%
er Applegate River	9	3,897	2.4%	7,794	4.9%
r Creek	5	2,165	0.5%	4,330	0.9%
Creek	5	2,165	0.8%	4,330	1.5%
e Butte Creek	5	2,165	0.5%	4,330	1.1%
ol River	5	2,165	0.8%	4,330	1.6%
tco River	17	7,361	0.9%	14,722	1.8%
chuck River	5	2,165	0.8%	4,330	1.6%
th Fork Smith River	5	2,165	0.7%	4,330	1.5%

Josephine Creek - Illinois River watershed. This watershed will have the most mining activity. The reach of mainstem Josephine Creek on the RRSNF is moderately to completely entrenched and/or confined by topography; side channels are not a common feature due to the natural topography, geology, and geomorphology and cold water refugia is largely absent. The SONCC Recovery Plan (NMFS 2014) states that Josephine Creek is unsuitable for coho salmon due to serpentine soils with sparse riparian conditions likely resulting in warm stream temperatures. This is because serpentine soils, or ultramafic geology, support only plant species tolerant of infertile soil conditions and plant growth is typically stunted. Water temperature is one of the indicators rated as "not properly functioning" in the watershed, with severe impacts and severe degraded habitat conditions. Thus, the biological requirements of coho salmon in the mainstem Josephine Creek are likely not being met. Coho salmon juveniles have not been detected in the mainstem Josephine Creek and its tributaries such as Days Gulch and Canyon Creek in multiple snorkel censuses between the 1980s and 2010s, however, in other tributaries to the Illinois River in the watershed, small numbers of juveniles have been found in their lower reaches. Therefore, it is unlikely that the habitat in the mainstem Josephine Creek contributes significantly to the conservation value of critical habitat within the watershed or to the Illinois River population. However, as abundance of SONCC coho salmon and the Illinois River population increases, coho salmon may become infrequently distributed in the mainstem Josephine Creek as other areas become fully seeded. The majority of active placer claims and the majority of 2009-2012 NOIs are in the mainstem Josephine Creek and its tributaries; although NOIs may be submitted throughout the watershed, it is probable that the majority of future mining will continue to occur in these same areas (i.e., mainstem Josephine Creek and its tributaries, Figure 26).

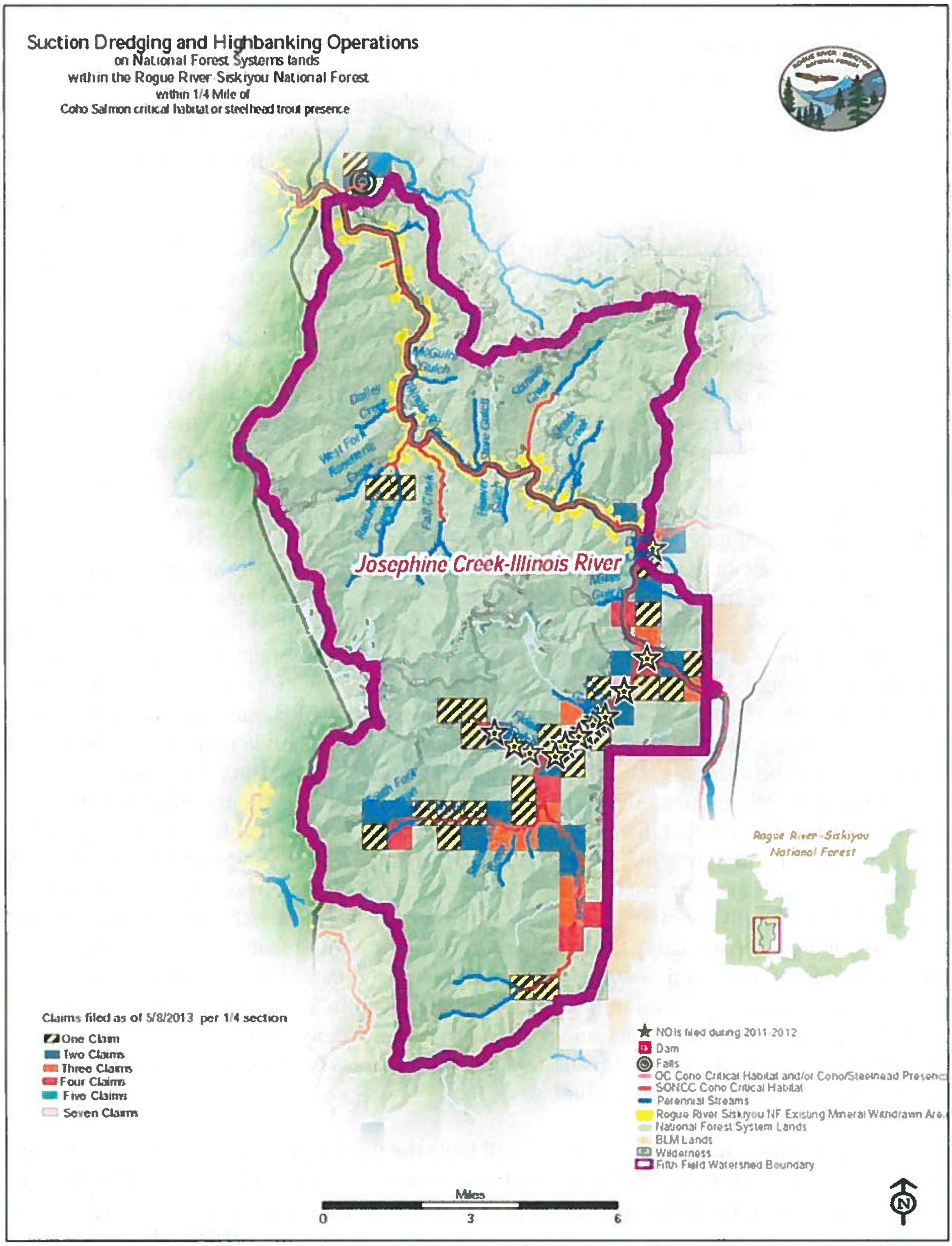

Figure 26. The Josephine Creek - Illinois River watershed on National Forest System lands in the Rogue River-Siskiyou National Forest including mineral withdrawn areas, and coho salmon critical habitat, 2011-2012 NOIs, and active mining placer claims with 0.25 mile of coho salmon critical habitat.

The total amount of critical habitat in the Josephine Creek - Illinois River watershed is 49.4 miles; 37.7 miles are within the RRSNF. The mainstem Illinois River in this watershed and 0.25 mile of its tributaries, for a total of 14.4 miles of critical habitat, are withdrawn from mineral entry because it is designated a Wild River under the Wild and Scenic Rivers Act (Figure 26). Based on the 2009-2012 NOIs, most NOIs were filed for one year only at a given location (71%); only 4 NOIs were submitted for multiple years at the same location and only one of those was for consecutive years.

For Scenario 1, which estimates that 100% of the miners will return to the same location in year 2, and thus no new channel instability is likely to occur, the linear annual extent of temporary effects of the proposed action at the NOI-level project area for watershed is approximately 28,145 feet, or 5.3 miles (Table 28). If half of the NOI operators return to the same location in year 2, while half move to a new location (i.e., Scenario 3), the linear extent of temporary effects of the proposed action at the NOI-level project area for the watershed would be 42,218 feet. The maximum linear annual extent of temporary effects of the proposed action at the NOI-level project area would be twice the length of Scenario 1, or approximately 56,290 feet if all NOI operators move to a new location in year 2 (i.e., Scenario 2; Table 28); however, channel instability is the only effect expected to have up to a 2 year duration and there will not be a complete loss of critical habitat because channel instability will only adversely affect essential features related to spawning. Most other effects will occur only during the summer mining season, although some effects (i.e., substrate and space effects from substrate embeddedness, effects on water quality conditions in redds, effects on food) will extend past the summer mining season, but even these effects are temporary such that these essential features would only have an extent of effects described by Scenario 1. Overall, it is unlikely the proposed action will have an adverse effect on the function of essential features or the conservation value of critical habitat within the Josephine Creek – Illinois River unit because approximately a minimum 78% of critical habitat will be available, all effects on critical habitat are temporary, 50% of the maximum linear length of affected critical habitat (i.e., Scenario 2) will only affect essential features for spawning such that there is not a complete loss of critical habitat for the extended duration, rearing and migrating habitat will persist on an annual basis, and spawning habitat will persist on a biennial basis for most NOI-level project areas. Although the current condition of critical habitat is not fully functional for conservation in this watershed, the proposed action will not preclude or significantly delay the natural trajectory of essential feature development. Additionally, the proposed action will not measurably affect either of the habitat indicators considered as "not properly functioning" as identified in Section 2.3; of the 14 habitat indicators considered "at risk" the proposed action is only likely to negatively affect suspended sediment/turbidity and substrate/sedimentation and these effects on the essential features of critical habitat will be localized and temporary.

Althouse Creek watershed. This watershed will have the third highest amount of critical habitat affected (Table 28). Unfortunately for this analysis, there were no NOIs between 2009-2012 for this watershed to examine distribution or frequency of NOIs. The total amount of critical habitat in the Althouse Creek watershed is 14.2 miles; 3.7 miles are within the RRSNF. There are no mineral withdrawn areas in this watershed.

For Scenario 1, which estimates that 100% of the miners will return to the same location in year 2, and thus no new channel instability is likely to occur, the linear annual extent of temporary effects of the proposed action at the NOI-level project area for watershed is approximately 6,495 feet, or 1.2 miles (Table 28). If half of the NOI operators return to the same location in year 2, while half move to a new location (i.e., Scenario 3), the linear extent of temporary effects of the proposed action at the NOI-level project area for the watershed would be 9,743 feet. The maximum linear annual extent of temporary effects of the proposed action at the NOI-level project area would be twice the length of Scenario 1, or approximately 12,990 feet if all NOI operators move to a new location in year 2 (i.e., Scenario 2; Table 28). Overall, it is unlikely the proposed action will have an adverse effect on the function of essential features or the conservation value of critical habitat within the Althouse Creek unit because approximately a minimum of 82% of critical habitat will be available, all effects on critical habitat are temporary, 50% of the maximum linear length of affected critical habitat (i.e., Scenario 2) will only affect essential features for spawning such that there is not a complete loss of critical habitat for the extended duration, rearing and migrating habitat will persist on an annual basis, and spawning habitat will persist on a biennial basis for most NOI-level project areas. Although the current condition of critical habitat is not fully functional for conservation in this watershed, the proposed action will not preclude or significantly delay the natural trajectory of essential feature development. Additionally, the proposed action will not measurably affect the habitat indicators considered as "not properly functioning" or the ten habitat indicators considered "at risk" as identified in Section 2.3. The proposed action is also unlikely to contribute to the additional limiting habitat conditions identified by USFS (2015). Therefore, the proposed action is unlikely to appreciably reduce the recovery timeframe for properly functioning habitat conditions in Althouse Creek unit.

Silver Creek watershed. This watershed will have the fourth highest amount of critical habitat affected (Table 28). The SONCC Recovery Plan (NMFS 2014) states that Silver Creek is likely too steep and confined for coho salmon to flourish. Unfortunately for this analysis, there was only one NOI between 2009-2012 for this watershed which does not allow us to examine the distribution or frequency of NOIs. The total amount of critical habitat in the Silver Creek watershed is 22.1 miles, all of which are within the RRSNF. There are 0.3 mile of mineral withdrawn areas in this watershed.

For Scenario 1, which estimates that 100% of the miners will return to the same location in year 2, and thus no new channel instability is likely to occur, the linear annual extent of temporary effects of the proposed action at the NOI-level project area for watershed is approximately 8,227 feet, or 1.6 miles (Table 28). If half of the NOI operators return to the same location in year 2, while half move to a new location (i.e., Scenario 3), the linear extent of temporary effects of the proposed action at the NOI-level project area for the watershed would be approximately 12,341 feet. The maximum linear annual extent of temporary effects of the proposed action at the NOI-level project area would be twice the length of Scenario 1, or approximately 16,454 feet if all NOI operators move to a new location in year 2 (i.e., Scenario 2; Table 28). Overall, it is unlikely the proposed action will have an adverse effect on the function of essential features or the conservation value of critical habitat within the Silver Creek unit because approximately a minimum of 85% of critical habitat will be available, all effects on critical habitat are temporary, 50% of the maximum linear length of affected critical habitat (i.e., Scenario 2) will only affect essential features for spawning such that there is not a complete loss of critical habitat for the extended duration, rearing and migrating habitat will persist on an annual basis, and spawning habitat will persist on a biennial basis for most NOI-level project areas. Although the current condition of critical habitat is not fully functional for conservation in this watershed, the proposed action will not preclude or significantly delay the natural trajectory of essential feature development. Additionally, of the four habitat indicators considered "at risk" as identified in Section 2.3, the proposed action is only likely to negatively affect suspended sediment/turbidity and substrate/sedimentation and these effects on the essential features of critical habitat will be localized and temporary. The proposed action is unlikely to negatively affect the additional limiting habitat conditions identified by the USFS (2015). Therefore, the proposed is unlikely to appreciably reduce the recovery timeframe for properly functioning habitat conditions in the Silver Creek unit.

Sucker Creek watershed. This watershed will have the fifth highest amount of critical habitat affected (Table 28). Sucker Creek is one of the highest producers of coho salmon in the Illinois subbasin and in the greater Rogue basin, however, overall productivity is limited by the lack of suitable summer and winter juvenile rearing habitat in alluvial valley reaches that are substantially altered by agricultural activities and often dewatered. The total amount of critical habitat in the Sucker Creek watershed is 29.8 miles; 12.1 miles are within the RRSNF. There are no mineral withdrawn areas in this watershed.

For Scenario 1, which estimates that 100% of the miners will return to the same location in year 2, and thus no new channel instability is likely to occur, the linear annual extent of temporary effects of the proposed action at the NOI-level project area for watershed is approximately 10,825 feet, or 2.1 miles (Table 28). If half of the NOI operators return to the same location in year 2, while half move to a new location (i.e., Scenario 3), the linear extent of temporary effects of the proposed action at the NOI-level project area for the watershed would be 16,238 feet. The maximum linear annual extent of temporary effects of the proposed action at the NOI-level project area would be twice the length of Scenario 1, or approximately 21,650 feet if all NOI operators move to a new location in year 2 (i.e., Scenario 2; Table 28). Overall, it is unlikely the proposed action will have an adverse effect on the function of essential features or the conservation value of critical habitat within the Sucker Creek unit because approximately a minimum of 86% of critical habitat will be available, all effects on critical habitat are temporary, 50% of the maximum linear length of affected critical habitat (i.e., Scenario 2) will only affect essential features for spawning such that there is not a complete loss of critical habitat for the extended duration, rearing and migrating habitat will persist on an annual basis, and spawning habitat will persist on a biennial basis for most NOI-level project areas. Although the current condition of critical habitat is not fully functional for conservation in this watershed, the proposed action will not preclude or significantly delay the natural trajectory of essential feature development. Additionally, the proposed action will not affect either of the habitat indicators considered as "not properly function" as identified in Section 2.3; of the 13 habitat indicators considered to be "at risk" the proposed action is only likely to negatively affect suspended sediment/turbidity and substrate/sedimentation and these effects on the essential features of critical habitat will be localized and temporary. Of the additional limiting habitat conditions identified by the USFS (2015), the proposed action is only likely to negatively affect sedimentation and, as noted above, these effects on the essential features of critical habitat will also be localized and temporary. Therefore, the proposed action is unlikely to appreciably reduce the recovery timeframe for properly functioning habitat conditions in the Sucker Creek unit.

For the estuary components of the Lower Rogue River watershed and the Chetco River watershed, we determined that only very minor increases of methylmercury production were likely to occur, primarily because there are few areas where deposition of remobilized mercury is likely to occur due to the estuaries' small size, strong river currents, and habitat simplification from man-made alterations. For these same reasons, environmental conditions favorable for methylation are also limited in the Rogue and Chetco River estuaries. Therefore, we do not expect that measurable changes in overall estuary function are likely to occur from the proposed action. As a result, the proposed action is unlikely to appreciably reduce the recovery timeframe for properly functioning habitat conditions in these 2 watersheds or have an adverse effect on the function of essential features or the conservation value of critical habitat in the Lower Rogue River or Chetco River units.

2.5 Cumulative Effects

"Cumulative effects" are those effects of future state or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation (50 CFR 402.02). Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the ESA.

Some continuing non-Federal activities are reasonably certain to contribute to climate effects within the action area. However, it is difficult if not impossible to distinguish between the action area's future environmental conditions caused by global climate change that are properly part of the environmental baseline versus cumulative effects. Therefore, all relevant future climate-related environmental conditions in the action area are described in the Environmental Baseline section.

The contribution of non-Federal activities to the current condition of ESA-listed species and designated critical habitats within the program-level action area was described in the Status of the Species and Critical Habitats and Environmental Baseline sections. Among those activities were agriculture, road construction, urban/residential/industrial development, dams/diversions, forest management, sand/gravel mining, water development, and some forms of gold mining. Those actions were driven by a combination of economic conditions that characterized traditional natural resource-based industries and general resource demands associated with settlement of local and regional population centers.

Resource-based industries caused many long-lasting environmental changes that harmed ESA-listed species and their critical habitats, such as state-wide loss or degradation of stream channel morphology, spawning substrates, instream roughness and cover, estuarine rearing habitats, wetlands, riparian areas, water quality (e.g., temperature, sediment, dissolved oxygen, contaminants), fish passage, and habitat refugia. Those changes reduced the ability of populations of ESA-listed species to sustain themselves in the natural environment by altering or interfering with their behavior in ways that reduce their survival throughout their life cycle. The environmental changes also reduced the quality and function of critical habitat PCEs and essential features that are necessary for successful spawning, production of offspring, and migratory access necessary for adult fish to swim upstream to reach spawning areas and for juvenile fish to proceed downstream and reach the ocean. Although resource-based industrial activity will continue within the action area and will continue to have an influence on environmental conditions in the action area for the indefinite future, industry standards for resource protection have greatly increased since the days of historical gold mining, and future standards are likely to further reduce the intensity and severity of those ongoing effects. This is evidenced by the extensive conservation measures included with the proposed action, but which were unknown or in uncommon use until even a few years ago.

Additionally, growth in the size and standard of living of the local and regional human populations in Oregon is increasing. The percentage increase in population growth may provide the best estimate of general resource demands because as local human populations grow, so does the overall consumption of local and regional natural resources. In the action area, Jackson County has the largest population (210,287) and Curry County has the smallest (22,335). Between 2010 and 2014, population growth rate in the action area ranged from an increase of 3.5% in Jackson County and a decrease of 0.9% in Coos County.[45] Future growth rates are expected to be similar as the factors affecting growth are unlikely to drastically change soon. Adverse effects of non-Federal actions driven by population density are likely to continue in the future.

In the action area, mining practices not subject to Federal approval will continue to be regulated by the State of Oregon. Increased oversight has recently reduced the number of 700PM general permits authorized annually and improved natural resources protections and enforcement abilities with the most recently revised general permit. Ongoing State legislature activities highlight the continued public concerns regarding effects of mining on the State's natural resources, including ESA-listed species and their critical habitat. Specifically, as a result of legislature, ODEQ made changes to their suction dredging requirements during the 2014 and 2015 mining season including increasing the distance between motorized equipment to 500 feet, restricting the hours of operation to 9am through 5pm, implementing a prohibition against leaving equipment unattended within the wetted perimeter, and adding a $150 surcharge, all of which contribute to minimizing negative effects or the magnitude of negative effects. More recently, a 5-year moratorium was imposed, beginning January 2, 2016, that reduces the number of streams that are open to motorized suction dredge mining and also prohibits removal or disturbance of vegetation resulting from motorized placer mining activities within 300 feet of most waterways in a manner that may impact water quality. Future State legislation is anticipated.

Oregon's land use laws and progressive policies related to long-range planning will help to limit future impacts by non-Federal actions by ensuring that concern for a healthy economy that generates jobs and business opportunities is balanced by concern for protection of farms, forests, rivers, streams and natural areas (Metro 2011). As we continue to learn more about the unanticipated and far-reaching effects of many non-Federal actions, reduced economic

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[45] U.S. Census Bureau, State and County Quickfacts, Douglas County. Any county available http://quickfacts.census.gov/qfd/. (Last Accessed May 2015).

dependence on traditional resource-based industries has been associated with growing public appreciation for the economic benefits of river restoration, and growing demand for the cultural amenities that river restoration provides. Additionally, coastal Oregon communities are increasingly supportive of local fisherman, fostering a growing desire to accomplish the recovery needs of ESA-listed species. Thus, many non-Federal actions have become responsive to the recovery needs of ESA-listed species and include efforts to ensure that resource-based industries adopt improved practices to avoid, minimize, or offset their future adverse impacts. Larger population centers, like Medford in Jackson County, may also partly offset the adverse effects of their resource demands with more river restoration projects designed to provide ecosystem-based cultural amenities.

Overall, the adverse effects of resource-based industries in the action area are likely to continue in the future, although their net adverse effect is likely to decline slowly as beneficial effects spread from the adoption of industry-wide standards for more protective management practices. In the near-term the overall amount of suction dredging on non-Federal land will be significantly reduced because of the moratorium. The amount of activity post-moratorium is uncertain, but the trend prior to the moratorium was a decrease in the overall number of ODEQ-issued permits. For the 29 watersheds that are part of the NOI-level project action area, 86% of the 2014 ODEQ-issued permits were issued for the NOI-level project action area (USFS 2015). Although the ODEQ-issued permits were valid for other locations, it does provide an expectation that the primary mining areas in the NOI-watersheds are not on private, state, or BLM lands. ODEQ also issued suction dredge permits for 2014 in three of the four mainstem Rogue River watersheds that are part of the action area, but are not areas where the RRSNF is proposing to authorize NOIs; the majority of 2014 ODEQ permits were issued within the Rogue River-Gold Hill watershed (135), with far fewer issued in the Rogue River –Grants Pass watershed (19) and in the Rogue River-Shady Cove watershed (1). Therefore, the majority of the non-Federally managed mining activity in the action area mainly affects the Upper Rogue River population.

For the SONCC coho salmon ESU, the pattern of more ODEQ-issued permits occurring for the NOI-level project action area compared to other lands is similar. Therefore, we do not expect that primary mining areas are located on private, State, or BLM lands. However, for the OC coho salmon ESU, the pattern is reversed with 22% of the ODEQ-issued permits in the NOI-level action area for lands managed by the RRSNF while 26% were on lands managed by the BLM and 52% were on private land (USFS 2015). In 2014, ODEQ-issued a total of 21 permits for the Coquille River population and issued 37 for the Sixes River subbasin. For the Coquille River, 15 of the ODEQ-issued permits were for the South Fork Coquille watershed with 9 within the NOI-level project action area and 6 on private land; an additional 6 were located elsewhere within the subbasin. For the Sixes River, 5 of the ODEQ-issued permits were within the RRSNF but only 1 was for the NOI-level project action area. Of the remaining 31 ODEQ-issued permits, 19 were on private land and 13 were on lands administered by BLM. We expect similar distributions across the action area post-moratorium. Additionally, the SONCC coho salmon recovery plan and the proposed OC coho salmon recovery plan both recommend gold mining improvements for the action area.

Suction dredge gold mining and many other activities described in Section 2.3 are ongoing and will continue into the future. Effects of these ongoing and future activities were described in

Status of the Species and Critical Habitats and Environmental Baseline sections, but as discussed above, are expected to improve because of improved regulations and enforcement. However, despite improving practices, and while widespread degradation of aquatic habitat associated with intense natural resource extraction is no longer common, ongoing and future land management actions are likely to continue to have a depressive effect on aquatic habitat quality. As a result, recovery of aquatic habitat is likely to be slow in most areas and cumulative effects are likely to have a neutral to negative impact on population abundance trends and the quality of critical habitat PCEs and essential features.

2.6 Integration and Synthesis

The Integration and Synthesis section is the final step in our assessment of the risk posed to species and critical habitat as a result of implementing the proposed action. In this section, we add the effects of the action (Section 2.4) to the environmental baseline (Section 2.3) and the cumulative effects (Section 2.5), taking into account the status of the species and critical habitat (section 2.2), to formulate the agency's biological opinion as to whether the proposed action is likely to: (1) reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing its numbers, reproduction, or distribution; or (2) directly or indirectly alter habitat to an extent that appreciably diminishes the value of designated or proposed critical habitat for the conservation of the species.

Critical habitat PCEs (OC coho salmon) and essential features (SONCC coho salmon) are not fully functioning. The environmental baseline currently exposes ESA-listed fish in the area to changes in stream channel morphology, degradation of spawning substrates, reduced in-stream roughness and cover, low summer stream flows resulting from domestic and agricultural diversions, loss and degradation of estuarine rearing habitats, loss of wetlands, loss and degradation of riparian areas, water quality (e.g., temperature, sediment, dissolved oxygen, contaminants) degradation, blocked fish passage, and loss of habitat refugia. These stressors, as well as those from climate change, already exist and must be factored in addition to any adverse effects produced by the proposed action. Major factors limiting recovery of the ESA-listed fish considered in this opinion include degraded stream complexity, lack of floodplain and channel structure, reduced recruitment of wood to streams, degraded riparian forest conditions, increased fine substrate sediment, altered sediment supply, loss of beaver dams, increased water temperature, impaired water quality, reduced stream flow, altered hydrologic function (timing of volume of water flow), loss of wetlands and estuarine habitat, impaired estuary/mainstem function, fish passage barriers, effects of global climate change, periodic reduction in marine productivity, increased disease/predation/competition, fishery-related effects, and hatchery-related effects.

As described in Section 2.5, the cumulative effects of non-Federal actions that are reasonably certain to occur within the action area are variable across the program action area. Population growth rates across the action area are also variable, with moderate increases in the more urbanized areas and decreases in the rural and remote areas. In rural areas, there will also be continued resource extraction. However, in Oregon, many non-Federal actions have become responsive to the recovery needs of ESA-listed species and include efforts to ensure that resource-based industries adopt improved practices to avoid, minimize, or offset their future adverse impacts. The State of Oregon recently reduced the number of 700PM general permits authorized annually for suction dredging and improved natural resources protections and enforcement abilities with the most recently revised general permit; a temporary moratorium on motorized suction dredge mining has also been recently instituted. Therefore, the cumulative effects described above will continue, although with some improvement; they are expected to continue to have a neutral to negative impact on population abundance trends and the quality of critical habitat PCEs and essential features, but will not preclude or significantly delay recovery. The effects of climate change are expected to be negative, but are not well predicted for any particular locale and thus are difficult to factor.

The sections below will describe how the proposed action affects several of these limiting factors in addition to population viability criteria and the recovery for each affected species or DPS. Considering limiting factors in our analysis is an approach to look at the effects in a way that is meaningful to population viability. Although we consider effects on all necessary habitat, actions that worsen limiting factors would be likely to significantly reduce population viability and delay or prevent recovery. Similarly, actions that worsen population viability increase the likelihood of jeopardizing the continued existence of a listed species or adversely modifying designated critical habitat. Additionally if a Federal action is helping to implement recovery actions or recovery strategies found in a recovery plan, that action is less likely to jeopardize the species or adversely modify its critical habitat (Will Stelle, NMFS, memo sent to West Coast Region staff, NMFS, February 1, 2016, regarding integrating recovery and regulatory work).

Overall, the proposed action only allows a specific set of activities and is further limited by PCMs tailored to avoid or minimize direct and indirect adverse effects of those activities. Administrative PCMs function to ensure that individual actions remain within the scope of effects considered here, and to ensure that the aggregate or program-level effects of those individual actions are also accounted. The mandatory Operations PCMs serve to limit direct lethal effects on listed fish to those in-stream activities at the NOI-level project area that are fundamental to the purpose of the proposed action.

2.6.1 Effects on Species

To assess the short-term impacts on VSP criteria for coho salmon, especially abundance and productivity, we assessed the extent of habitat effects because we are unable to directly quantify the number of fish affected. In this case, for each NOI-level project area, the extent of effects includes the area affected by mining, access, and occupancy. We also evaluate the expected effects of methylmercury in the downstream estuaries via mercury remobilization from mining activities; although methylmercury persists in the environment and enters the food web, and as such we consider it a long-term impact, it is also linked to the amount of mining-related substrate disturbance.

2.6.1.1 OC coho salmon

The RRSNF will only authorize 15 NOIs annually within the range of OC coho salmon. This includes individuals of two populations.

Population Viability. The OC coho salmon ESU is at moderate risk of extinction but the recent risk trend is stable and improving (Stout *et al.* 2012, NWFSC 2015). Adverse effects on OC coho salmon individuals in the Coquille and Sixes River populations reasonably expected from the proposed action include:

- Interactions with dredges and operators (death, injury, increased predation, increased competition, or a reduction in feeding and growth of rearing juveniles)
- Mining-related substrate disturbance, up to a period of two years at each NOI-level project area (mortality of eggs and embryos and reduced reproductive success of spawning adults)
- Suspended sediment, sedimentation, and substrate embeddedness (increased predation, decreased feeding, and reduced growth and survival of rearing juveniles)
- Sedimentation and substrate embeddedness (reduced spawning success of adults; death, injury, or reduced growth and survival of eggs, embryos, and emerging fry)
- Unintentional chemical contamination (injury, reduced feeding and growth, increased disease susceptibility, and decreased survival and fitness of rearing juveniles)
- Forage reduction (reduced feeding, growth, and overall survival of rearing juveniles)

Due to the low level of mining activity in the Coquille and Sixes Rivers we are not expecting that the amount of mercury remobilized by mining and transported to the estuary will measurably increase methylmercury concentrations or cause adverse effects on OC coho salmon. The maximum linear annual extent of effects of the proposed action at the NOI-level project area for these populations will be approximately 1.14 or 1.32 miles (Table 25). This area affected constitutes only a small amount of the overall extent of the Coquille and Sixes OC coho salmon populations (Figures 4 and 5). The RRSNF is only approximately 35% of the South Fork Coquille River watershed and the watershed is one of five watersheds in the subbasin, with the population distributed in all five watersheds (approximately 550 miles). Although the Sixes River population is only distributed in one watershed, it is distributed over approximately 58.4 miles and the RRSNF is only approximately 26% of the watershed. The NOI-level project area habitat effects are either very temporary or, in terms of channel instability, recovery will begin within 2 winters for most NOI-level project areas. Most effects will occur only during the summer mining season, although some effects (i.e., substrate embeddedness, forage reduction) will extend past the summer mining season, but even these effects are temporary.

An individual may be exposed as an egg, embryo, or emergent fry and, if it survives initial exposure, it could be exposed to proposed mining operations during the following season as a rearing juvenile, resulting in death or sublethal effects including reduced growth, injury or increased disease susceptibility, all of which have the potential to affect ocean survival. Upon its return from the ocean, an individual could be exposed once again as a spawning adult, with effects on reproductive success. The potential for exposure at some life history stages is limited by the PCMs and additive effects for individuals (i.e., multiple exposures at differing life history stages) in the OC coho salmon populations are also limited by the small amount of annual activity. Therefore, adverse effects may injure or kill a small number of OC coho salmon each year, but that amount will be too few to meaningfully change OC coho salmon abundance, productivity, distribution or diversity for either population.

Limiting Factors. Some of the habitat-related effects from the proposed action are related to the primary and secondary limiting factors of the Coquille and Sixes River populations (Section 2.2), primarily impaired water quality. Although occurring annually, the NOI-level project area habitat effects (i.e., substrate disturbance, suspended sediment, sedimentation/substrate embeddedness, chemical contamination, and forage reduction) will either be localized, very temporary or, in terms of channel instability, will begin recovery within 2 winters for most NOI-level project areas. Most effects will occur only during the summer mining season, although some effects (i.e., disturbed substrate, forage reduction) will extend past the summer mining season, but even these effects are temporary. Forage communities will recover, rearing and migration habitat will persist on an annual basis, and spawning gravels will persist on a biennial basis for most NOI-level project areas. In the Environmental Baseline (Section 2.3), temperature, physical barriers and width/depth ratios were determined to be not properly functioning; the proposed action will not affect these environmental conditions or will only have very minimal negative effects on these environmental conditions. Additionally, due to the low level of mining activity in the Coquille and Sixes Rivers, we are not expecting that the amount of mercury remobilized by mining and transported to the estuary will measurably increase methylmercury concentrations or cause adverse effects on estuary function. Therefore, for each population, the proposed action will not meaningfully change the limiting factors or other degraded environmental conditions; therefore, effects from the proposed action will be so small and affect so few fish that changes to abundance and productivity will not occur.

Recovery. For recovery of the OC Coho ESU, the Coquille and the Sixes River populations are both independent populations within the Mid-South Coast biogeographic stratum (Section 2.2.1, Table 4). The Coquille River population has a slight, positive trend in abundance and has a high certainty of population persistence. The Sixes River population has a slight, negative trend in abundance and diversity levels still remain low for the Sixes River population, although productivity and distribution scores have increased (NWFSC 2015). A recommended recovery action for both the Sixes and Coquille River populations is to improve gold suction dredge regulations to minimize or prevent impacts to OC coho salmon (NMFS 2015b). Therefore, PCMs included as part of the proposed action could be considered a first step toward a recommended recovery action for both populations. Overall, PCMs as part of the proposed action limit the scale and duration of adverse effects such that recovery is not precluded. The proposed action will not result in a measurable decrease in population-scale abundance or productivity, nor will it change the extinction risk of either population. As a result, the consequences of the proposed action are also unlikely to reduce the species' probability of recovering or hinder the goals, strategies, and recommended actions laid out in the proposed recovery plan.

Cumulative effects of non-Federal actions that are reasonably certain to occur within the action area are variable across the program action area, as described in Section 2.5, but we expect they will have a neutral to negative effect on population abundance trends on limiting factors for the Coquille and Sixes River populations. As noted in Sections 2.2 and 2.3, climate change is likely to affect the OC coho salmon populations considered in this opinion, and their habitat in the action area, because temperatures are expected to increase over the next 50 years, by <0.5°C to 1.5°C. These effects are expected to be negative because coho salmon baseline metabolic rates are also likely to increase over the long-term; however, current global climate change models are not precise enough to know specifically when this will occur. Additionally, adults of OC coho salmon populations are likely to be negatively affected by ocean acidification and changes in ocean conditions and prey availability. Therefore, we expect a slight negative trend on limiting factors over the long-term from climate change, the timing and extent of which is now too uncertain to sufficiently anticipate when such change would affect the extent or significance of this action's effects on the listed OC coho salmon ESU.

Given the above, the proposed action will not be likely to meaningfully change the limiting factors or other degraded environmental conditions, will have no discernible effect on population abundance, productivity, distribution or diversity, and will not impede recovery of the OC Coho ESU. Therefore the proposed action will not appreciably reduce the likelihood of both the survival and recovery of the OC coho salmon ESU.

2.6.1.2 SONCC coho salmon

The RRSNF will authorize 296 NOIs annually within the range of SONCC coho salmon. This includes individuals of 9 populations: (1) Elk River, (2) Lower Rogue River, (3) Illinois River, (4) Middle Rogue/Applegate Rivers, (5) Upper Rogue River, (6) Pistol River, (7) Chetco River, (8) Winchuck River, and (9) Smith River.

Population Viability. The SONCC coho salmon ESU is currently not viable and the most recent status report determined the original listing status remains appropriate (NMFS 2014, NMFS 2016b). Adverse effects on SONCC coho salmon individuals reasonably expected from the proposed action include:

- Interactions with dredges and operators (death, injury, increased predation, increased competition, or a reduction in feeding and growth of rearing juveniles of all populations and smolts in the Illinois River, Middle Rogue and Applegate Rivers, and the Upper Rogue River populations)
- Mining-related substrate disturbance, up to a period of two years at each NOI-level project area (mortality of eggs and embryos and reduced reproductive success of some spawning adults)
- Suspended sediment, sedimentation, and substrate embeddedness (increased predation, decreased feeding, and reduced growth and survival of rearing juveniles of all populations and smolts in the Illinois River, Middle Rogue and Applegate Rivers, and the Upper Rogue River populations)
- Sedimentation and substrate embeddedness (reduced spawning success of adults; death, injury, or reduced growth and survival of eggs, embryos, and emerging fry)
- Unintentional chemical contamination (injury, reduced feeding and growth, increased disease susceptibility, and decreased survival and fitness of rearing juveniles of all populations and smolts in the Illinois River, Middle Rogue and Applegate Rivers, and the Upper Rogue River populations)
- Methylmercury (reduced survival and fitness of smolts in the Chetco and four Rogue River populations).
- Forage reduction (reduced feeding, growth, and overall survival of rearing juveniles of all populations and of smolts in the Illinois River, Middle Rogue and Applegate Rivers, and the Upper Rogue River populations)

The maximum linear annual extent of effects of the proposed action at the NOI-level project area for these populations will range from approximately 0.82 miles for one population up to approximately 30.8 miles for another (Table 26), with additional adverse effects also occurring in the Rogue and Chetco River estuaries. This area affected constitutes only a small to moderate amount of the overall extent of the 9 affected populations. Although there are a large number of NOIs proposed for the Illinois River population annually, the total amount of affected habitat is small in relation to the distribution of the population (i.e., 30.8 miles of 355 miles, or 8.7%).

An individual may be exposed as an egg, embryo, or emergent fry and, if it survives initial exposure, it could be exposed to proposed mining operations during the following season as a rearing juvenile, resulting in death or sublethal effects including reduced growth, injury or increased disease susceptibility, all of which have the potential to affect ocean survival. Upon its return from the ocean, an individual could be exposed once again as a spawning adult, with effects on reproductive success. For some populations (i.e., Illinois, Middle Rogue/Applegate, Upper Rogue), individuals could also be exposed again during a second mining season for a shorter duration as an outmigrant and again in the estuaries, as would individuals in the Chetco and Lower Rogue River populations. However, for those outmigrating smolts with the potential for exposure to increased methylmercury in the Rogue and Chetco River estuaries during year 2, only a limited number of individuals (approximately ≤1%) are likely to bioaccumulate a sufficient amount of additional methylmercury for sublethal effects or injury to occur; this is because only minor amounts of methylmercury are likely to be produced in these estuaries and as a result of variability in individual baseline contaminant loads, time spent in the estuaries, levels of methylmercury in individual prey items, and variable consumption rates. The potential for exposure at some life history stages is limited by the PCMs. Additionally, for areas with a small amount of proposed annual NOIs and mining operations, additive effects (i.e., multiple exposures at differing life history stages) as a result of the proposed action are highly unlikely to occur (or will only occur for a very small number of individuals) because of the small amount of disturbed habitat and thus reduced potential for exposure. This is particularly true for seven of the nine populations: Elk, Lower Rogue, Upper Rogue, Pistol, Chetco, Winchuck, and Smith River populations.

Legacy hydraulic gold mining played a large role in the poor status of Illinois and Middle Rogue/Applegate Rivers populations today (Section 2.3). However, multiple miles in each subbasin are currently withdrawn from mineral entry, including areas on the RRSNF within the action area (approximately 68.5 miles for the Illinois population and approximately 26.7 miles for the Middle Rogue/Applegate Rivers population). Also, not all watersheds in these populations were intensively mined in the past. Suction dredge mining under ODEQ regulations, prior to the moratorium, resulted in the movement of boulders, logs, and habitat structure within the stream channel, a decrease in food items for juvenile coho salmon during the summer, entrainment or passage of small fish through the dredge, and creation unstable tailings that coho salmon spawn on prior to redistribution by winter flows decreasing spawning success by scouring or washing away eggs. The RRSNF proposed action includes PCMs which serve to prevent or minimize some of these effects such that exposure of listed fish will be minimized and habitat effects related to NOI activities will be temporary or, in terms of channel instability, recovery will begin within 2 winters, for most NOI-level project. Additionally, NOI activities under the proposed action are likely to be widely distributed throughout these subbasins.

Therefore, it is unlikely that more than a small number of individuals will be exposed multiple times during their life, even for these populations, because of the relatively limited amount of habitat disturbed on an annual basis.

For these reasons, adverse effects from the proposed action are likely to injure or kill a small number of SONCC coho salmon each year, but that amount will be too few to meaningfully change SONCC coho salmon abundance, productivity, distribution or diversity for any population.

Limiting Factors. Although mining was identified as one of activities responsible for the decline of SONCC coho salmon ESU at the time of listing (62 FR 24588), NMFS (2014) did not identify gold mining as a key limiting threat for any of the SONCC coho salmon populations in the action area (Table 12); nor does the proposed action include activities considered to be key limiting threats (i.e., agriculture, channelization/diking, dams/diversions, roads, timber harvest, or urban/residential/industrial development). Additionally, mining was only one of 11 activities responsible for the decline of the ESU. However, effects from gold mining are related to some of the key limiting stresses of the populations (Section 2.2.1), primarily impaired water quality, channel structure, and impaired estuary function (Table 29). Specifically, NMFS (2014) identified the rearrangement or destabilization of substrate and subsequent changes to macroinvertebrate assemblages as effects from suction dredging. Furthermore, NMFS (2014) identified impaired estuary function as a key limiting stress for only one population in the action area, the Smith River; due to the low level of mining activity in the Smith River, we are not expecting that the amount of mercury remobilized by mining and transported to the estuary will measurably increase methylmercury concentrations or cause adverse effects on estuary function.

Table 29. Population viability criteria and key limiting stresses for SONCC coho salmon populations affected by the proposed action.

Population	Extinction Risk	Population Role	Key Limiting Stresses
Elk	High	Independent - Core	• Lack of Floodplain and Channel Structure • Impaired Water Quality
Lower Rogue	High	Independent - Non-Core1	• Lack of Floodplain and Channel Structure • Impaired Water Quality
Illinois	High	Independent - Core	• Altered Hydrologic Function • Degraded Riparian Forest Conditions
Middle Rogue/ Applegate	High	Independent - Non-Core1	• Degraded Riparian Forest Conditions Altered Hydrologic Function
Upper Rogue	Moderate	Independent - Core	• Altered Hydrologic Function • Impaired Water Quality
Pistol	N/A	Dependent	• Lack of Floodplain and Channel Structure • Degraded Riparian Forest Conditions
Chetco	High	Independent - Core	• Lack of Floodplain and Channel Structure • Degraded Riparian Forest Conditions
Winchuck	High	Independent - Non-Core1	• Lack of Floodplain and Channel Structure • Impaired Water Quality
Smith	High	Independent - Core	• Impaired Estuary/Mainstem Function • Lack of Floodplain and Channel Structure

However, as part of the proposed action, the RRSNF developed PCMs which serve to reduce effects on key limiting stresses. For example, any effects, especially for certain life history stages, will be prevented by prohibiting suction dredge or operator interactions with individual fish (see PCMs #21, 32b, 33, 39); other PCMs will minimize these effects for other life history stages (see PCMs #19, 25, 32c, 33, 37c). Other effects avoided by PCMs include loss of riparian vegetation, loss of future wood recruitment into the streams, reduction of in-stream wood and associated pool habitat and natural cover, stream bank erosion, and water withdrawal (see PCMs #13, 14, 20, 36, 37, 44, 49). Additionally, increased water temperature, decreased stream bank stability, direct effects to existing pools, and effects on off-channel habitat are extremely unlikely to occur (see PCMs #16, 20, 25, 26, 30, 33, 45-49). PCMs will limit overall amount of substrate disturbance (PCM #17) which is also related to forage and methylmercury effects; will reduce the distance immediately traveled downstream by suspended sediment and its effects, as well as sedimentation and substrate embeddedness (PCMs #19, 29); and will reduce the extent and magnitude of contamination when spills occur as well as the frequency of spills (PCMs #11, 12, 24, 28, 38). PCMs directly target the key limiting stresses of impaired water quality and avoid long-term effects to floodplain structure, channel structure, and riparian forest conditions.

Due to the PCMs, the NOI-level project area habitat effects (i.e., substrate disturbance, suspended sediment, sedimentation/substrate embeddedness, chemical contamination, and forage reduction) will either be localized, very temporary or, in terms of channel instability, recovery will begin within 2 winters, for most NOI-level project areas. Most effects will occur only during the summer mining season, although some effects (i.e., disturbed substrate, forage reduction) will extend past the summer mining season, but even these effects are temporary. Forage communities will recover, spawning gravels will be available, and habitat will persist on annual to biennial basis for most NOI-level project areas. Therefore, the proposed action will not perpetuate or contribute to the intense and severe long-term effects of mining that resulted in the identification of mining as one of activities responsible for the decline of SONCC coho salmon ESU at the time of listing.

Recovery. With the exception of the Pistol River population, affected populations are considered independent populations for SONCC coho salmon ESU recovery. Five populations have been identified as having core roles in the ESU and these all have a high extinction risk (Table 29; NMFS 2014). One of the recovery actions recommended by NMFS (2014), for both the Illinois River population and the Middle Rogue/Applegate River population, is to develop suction dredging regulations that minimize or prevent impacts to SONCC coho salmon; the five areas in the Illinois River specifically identified by the recovery plan as areas in the most immediate need for habitat restoration and threat reduction include Althouse Creek and Sucker Creek. Therefore, PCMs included as part of the proposed action could be considered a first step toward a recovery action for the Illinois River and Middle Rogue/Applegate River populations. Overall, PCMs as part of the proposed action limit the scale and duration of adverse effects such that recovery is not precluded. The proposed action will not result in a measurable decrease in population-scale abundance or productivity, nor will it change the extinction risk for any of the affected populations. As a result, the consequences of the proposed action are also unlikely to reduce the species' probability of recovering or hinder the goals, strategies, and recommended actions laid out in the recovery plan.

Cumulative effects of non-Federal actions that are reasonably certain to occur within the action area are variable across the program action area, as described in Section 2.5, but we expect they will have a neutral to negative effect on population abundance trends and on limiting factors for the SONCC coho salmon populations. As noted in Sections 2.2 and 2.3, climate change is likely to affect the SONCC coho salmon populations considered in this opinion, and their habitat in the action area, because temperatures are expected to increase over the next 50 years, by <0.5°C to >2.8°C. These effects are expected to be negative because coho salmon baseline metabolic rates are also likely to increase over the long-term; however, current global climate change models are not precise enough to know specifically when this will occur. Additionally, adults of SONCC coho salmon populations are likely to be negatively affected by ocean acidification and changes in ocean conditions and prey availability. Therefore, we expect a slight negative trend on limiting factors over the long-term from climate change, with some populations likely to be more affected than others, the timing and extent of which, at this time, is too uncertain to sufficiently anticipate when such change would affect the extent or significance of this action's effects on the listed SONCC coho salmon ESU.

Given the above, the proposed action will not be likely to meaningfully change the limiting factors or other degraded environmental conditions and will have no discernible effect on population viability, and will not impede recovery of the SONCC coho ESU. Therefore the proposed action will not appreciably reduce the likelihood of both the survival and recovery of the SONCC coho ESU.

2.6.1.3 Southern DPS green sturgeon

The recovery team for the threatened Southern DPS of green sturgeon has not completed a population analysis to determine adequacy of the estuarine action area for meeting the needs of green sturgeon. Although commonly observed in estuaries of non-natal rivers along the Oregon coast, the timing and distribution of estuarine use are poorly understood. Elements of the proposed action that adversely affect Southern DPS green sturgeon is the production of methylmercury in the estuaries from mercury resuspended and washed to the estuary from the NOI mining.

Green sturgeon that use the estuaries in the action area are likely to be only a small portion of Southern DPS green sturgeon. Nonetheless, they are important to the abundance, productivity, diversity and spatial structure of the DPS as a whole. However, the proposed action will not reduce the risk to any of the viability criteria for green sturgeon and therefore does not reduce the likelihood of recovery of the Southern DPS of green sturgeon.

Green sturgeon in the action area occupy a wide range of thermal regimes in coastal and marine environments. Additionally they only use the estuaries, where predicted changes in temperature over the next 50 years from climate change are small. However their prey could be affected by ocean acidification. Therefore, we expect a slight negative trend over the long-term from climate change, the timing and extent of which is currently too uncertain to sufficiently anticipate when such change would affect the extent or significance of this action's effects on the listed DPS. Cumulative effects are likely to have a neutral to negative impact on population abundance trends.

Forage for Southern DPS green sturgeon in the Chetco and Rogue River will be degraded in the long-term by minor increases in methylmercury concentrations. There are few areas with suitable environmental conditions for methylation, and forage effects are likely to be limited to these few areas. Because green sturgeon are highly adapted for feeding on benthic animals, benthic prey items, including burrowing shrimp, amphipods, and clams in areas of methylmercury production will be the primary source of methylmercury uptake by Southern DPS green sturgeon. Because affected forage items will be limited to a few small areas within the estuaries, it is unlikely that the proposed action will meaningfully affect the estuarine habitat quality limiting factor for Southern DPS green sturgeon.

Although there are studies of effects of methylmercury for juvenile green sturgeon, there is limited understanding of the effects of bioaccumulated methylmercuy for adult and subadult green sturgeon, which are the life history stages affected in the Chetco and Rogue River estuaries. However, only a few Southern DPS green sturgeon individuals are likely to consistently use these estuaries for extended periods of time such that only a few individuals are likely to bioaccumulate enough methylmercury in the estuaries that, when combined with their baseline contaminant load, will be likely to experience adverse effects including neurological and reproductive impairments, or reduce their overall survival and fitness. As a result, the proposed action will not result in a meaningful change to abundance and productivity and will not affect diversity or spatial structure of Southern DPS green sturgeon.

Given the above, the proposed action will not be likely to meaningfully change the limiting factors or other degraded environmental conditions and will have no discernible effect on green sturgeon abundance, productivity, distribution or diversity, and will not delay or impede recovery. Therefore the proposed action will not appreciably reduce the likelihood of both the survival and recovery of the Southern DPS of green sturgeon.

2.6.2 Effects on Critical Habitat

2.6.2.1 OC coho salmon critical habitat

Critical habitat in the two Coquille River watersheds has important conservation value to the ESU as spawning and rearing habitat and as a critical migration corridor (Section 2.2.2); critical habitat in the Sixes River also has important conservation value to the ESU. Gold mining has not been identified by NMFS CHART (NMFS 2007) as a key management activity affecting critical habitat in watersheds in the action area (Table 15), nor does the proposed action include any of the key management activities considered to be one of the (i.e., agriculture, forestry, grazing, irrigation impoundment, sand/gravel mining).

The intensity and severity of environmental effects for each NOI will be comprehensively minimized by targeted PCMs. However, the proposed action will adversely affect the substrate, forage, water quality, and free of artificial obstruction (juvenile) PCEs temporarily, but there will not be long-term adverse effects on any of the PCEs for OC coho salmon. Therefore, the intensity of the predicted effects within the NOI-level action area, in terms of the total condition and function of critical habitat PCEs after each NOI is completed, and the severity of the effects, given the recovery rate for those same PCEs, are such that the condition and function of PCEs and the conservation value of critical habitat are likely to be only impaired for a short time due to actions authorized under this opinion. This is because the NOI-level project area habitat effects are either very temporary or, in terms of channel instability, recovery will begin within 2 winters for most NOI-level project areas. Most effects will occur only during the summer mining season, although some effects (i.e., substrate embeddedness, forage reduction) will extend past the summer mining season, but even these effects are temporary. Furthermore, ≤2% of critical habitat for OC coho salmon will be temporarily affected annually in these watersheds (Table 27). Thus, for all OC coho salmon watersheds in the action area, it is unlikely that multiple actions within the same watershed will have an adverse effect on the function of PCEs or the conservation value of critical habitat at the NOI-level action area or watershed units because at least 98% of available critical habitat will be unaffected. Although the current condition of critical habitat is not fully functional for conservation, the proposed action will not preclude or significantly delay the natural trajectory of PCE development.

Cumulative effects, as described in Section 2.5, are likely to have a neutral to negative impact on the quality and function of critical habitat PCEs over time and will not appreciably affect the conservation value of the fifth-field watersheds in the action area. Climate change, as noted in Sections 2.2 and 2.3, is expected to increase temperatures by approximately <0.5°C to 1.5°C over the next 50 years. Ocean acidification and changes in ocean conditions are also likely to negatively affect prey availability for adults. Therefore, we expect a slight negative trend for water quality and forage PCEs over the long-term from climate change, the timing and extent of which, at this time, is too uncertain to sufficiently anticipate when such change would affect the extent or significance of this action's effects on critical habitat.

Even when cumulative effects and climate change are included, the proposed action's effects will not appreciably reduce the condition, quality or function of PCEs in the critical habitat within the action area. There will be some localized and mostly temporary degradation of critical habitat PCEs, but these minor alterations will not appreciably diminish the conservation value. Additionally, although the current condition of critical habitat is not fully functional for conservation, the recovery timeframe for properly functioning habitat conditions in these watersheds is unlikely to be precluded or delayed. Hence, the proposed action is not likely to appreciably diminish the value of critical habitat for the OC coho ESU's conservation.

2.6.2.2 SONCC coho salmon critical habitat

Baseline conditions among the SONCC watersheds vary widely (Section 2.2.2). For the most part, the conservation value of this portion of the designated critical habitat is high and the proposed action, as a whole, will cause temporary habitat alterations because the intensity and severity of environmental effects for each NOI will be comprehensively minimized by targeted PCMs. However, the proposed action will adversely affect the food, space, spawning gravel, water quality, and safe passage (juvenile migration corridors) aspects, but, with the exception of estuarine food, there will not be long-term adverse effects on any of the essential features for SONCC coho salmon.

Because we only expect very minor increases of methylmercury production in the Rogue and Chetco River estuaries, it is unlikely that methylmercury will adversely affect the estuarine food web or overall estuarine function for any of the SONCC coho salmon watershed units. Additionally, the intensity of the predicted effects within the NOI-level action area after each NOI is completed, and the limited severity of the effects, given the recovery rate for those same essential features, are such that these alterations are not likely to reduce function of essential features of designated critical habitat or its conservation value for the SONCC coho salmon ESU. This is because the NOI-level project area habitat effects are either very temporary or, in terms of channel instability, recovery will begin within 2 winters for most NOI-level project areas; additionally there will not be a complete loss of critical habitat because channel instability will only adversely affects PCEs and essential features related to spawning. Most effects will occur only during the summer mining season, although some effects (i.e., substrate and space effects from substrate embeddedness, effects on water quality conditions in redds, effects on food) will extend past the summer mining season, but even these effects are temporary.

Furthermore, 11 watersheds will have approximately ≤2% of critical habitat affected annually (Table 28). For these watersheds, it is unlikely that multiple actions within the same watershed will have an adverse effect on the function of essential features or the conservation value of critical habitat at the NOI-level action area or watershed units because at least 98% of available critical habitat will be unaffected. For another 9 watersheds approximately < 5% of critical habitat will be affected annually and for another 2 watersheds approximately <10% of critical habitat will be affected annually (Table 28); for these 11 watersheds, it is unlikely that multiple actions within the same watershed will have an adverse effect on the function of essential features or the conservation value of critical habitat at the NOI-level action area or watershed units because at least 90% of available critical habitat will be unaffected. Thus, for most SONCC coho salmon watersheds, it is unlikely that multiple actions within the same watershed will cause adverse habitat alterations likely to appreciably diminish the function of essential features or the conservation value of designated critical habitat because at least 90-98% of available critical habitat will be unaffected. Therefore, for these 22 watersheds, although the current condition of critical habitat is not fully functional for conservation, the proposed action will not preclude or significantly delay the natural trajectory of essential feature development.

We examined the remaining 5 watersheds individually due to their higher affected percentages of critical habitat (i.e., >10%) and, for site specific reasons, also concluded that the proposed action will not result in habitat alterations that conceivably would significantly delay the natural trajectory of essential feature development (Section 2.4.4).

Cumulative effects, as described in Section 2.5, are likely to have a neutral to negative impact on the quality and function of critical habitat PCEs over time and will not appreciably affect the conservation value of the fifth-field watersheds in the action area. Climate change, as noted in Sections 2.2 and 2.3, is expected to increase temperatures by approximately <0.5°C to >2.8°C over the next 50 years; ocean acidification and changes in ocean conditions are also likely to negatively affect prey availability for adults. Therefore, we expect a slight negative trend for water temperature, water quality, and food critical habitat essential features over the long-term from climate change, the timing and extent of which, at this time, is too uncertain to sufficiently anticipate when such change would affect the extent or significance of this action's effects on critical habitat.

Even when cumulative effects and climate change are included, the proposed action's effects will not appreciably reduce the condition, quality or function of essential features in the critical habitat within the action area. There will be some localized and mostly temporary adverse alteration of habitat features, but these minor alterations will not appreciably diminish the habitat's conservation value. Additionally, although the current condition of critical habitat is not fully functional for conservation, the recovery timeframe for properly functioning habitat conditions in these watersheds is unlikely to be precluded or delayed. Hence, the proposed action is not likely to appreciably diminish the value of critical habitat for the SONCC coho ESU's conservation.

2.6.3 Summary

For all the reasons described in the preceding paragraphs of this section, the proposed action will not appreciably reduce the likelihood of both survival and recovery of the species in the wild for OC coho salmon or SONCC coho salmon by reducing its numbers, reproduction or distribution nor will the proposed action appreciably diminish the value of designated critical habitat for the conservation of the listed species. Additionally, the proposed action will not appreciably reduce the likelihood of both survival and recovery of the DPS in the wild for southern green sturgeon by reducing its numbers, reproduction or distribution.

2.7 Conclusion

After reviewing and analyzing the current status of the listed species and critical habitat, the environmental baseline within the action area, the effects of the proposed action, any effects of interrelated and interdependent activities, and cumulative effects, it is NMFS' biological opinion that the proposed action is not likely to jeopardize the continued existence of OC coho salmon, SONCC coho salmon, and Southern DPS green sturgeon or destroy or adversely modify designated critical habitat for OC coho salmon and SONCC coho salmon.

2.8 Incidental Take Statement

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

2.8.1 Amount or Extent of Take

NOI activities that will be authorized each year under this opinion will take place beside and within aquatic habitats that are reasonably certain to be occupied by individuals of OC coho salmon and SONCC coho salmon. As described below, each NOI operation is likely to cause incidental take of OC coho salmon, SONCC coho salmon, or Southern DPS green sturgeon. For coho salmon, juvenile life stages are the most likely to be affected, although eggs/embryos/emerging fry and adults will sometimes also be exposed and affected. For Southern DPS green sturgeon, only adults and sub-adults will be exposed.

In the biological opinion, we determined that incidental take would include (1) harm and harassment of rearing and outmigrating juvenile coho salmon from interactions with dredges and operators, (2) harm of spawning adult coho salmon, eggs, embryos, and emerging fry from redd construction on unstable tailings, channel destabilization, and sedimentation/substrate embeddedness, (3) harm of rearing and outmigrating juvenile coho salmon from suspended sediment, sedimentation/substrate embeddedness, unintentional chemical contamination, and forage reduction, and (4) harm of outmigrating juvenile coho salmon and green sturgeon adults and subadults from feeding on forage organisms contaminated with methylmercury.

Accurately quantifying the number of fish taken by the interaction between fish and the suction dredge or operator (take #1 above) is not possible. Many of the NOI areas are too deep and velocities are too great to allow observation of injured or killed fish. Observation would also add significant additional stress and risk of injury to these fish. In such cases, we use a take surrogate or take indicator that rationally reflects the incidental take caused by the proposed action. Additionally, take caused by habitat-related pathways (take #2-4 above) cannot be accurately quantified as a number of fish because the relationship between habitat conditions and the distribution and abundance of those individuals in the action area are affected by habitat quality, competition, predation, and the interaction of processes that influence genetic, population, and environmental characteristics. These biotic and environmental processes interact in ways that may be random or directional, and may operate across far broader temporal and spatial scales than are affected by projects that will be completed under the proposed program. Thus, the distribution and abundance of fish within the program action area cannot be attributed entirely to habitat conditions, nor can we precisely predict the number of fish that are reasonably certain to be injured or killed if their habitat is modified or degraded by actions that will be completed under the proposed program. Also, there is no practical way to observe or count the number of individuals exposed and harmed without adding significant additional stress or injury. Therefore, for the best available indicators for the extent of incidental take caused by the proposed action, we have identified two rational indicators: (a) the amount of substrate disturbed annually per watershed by mining and (b) the maximum extent of the visible turbidity plume and frequency of exceedances. These also constitute the most practical and feasible indicators to measure.

The amount of substrate disturbed annually per watershed by mining has a rational connection to the interaction between the fish and the suction dredge or operator because it is directly related to the amount of time the dredge and operator are in the water working. It also is directly proportional to the amount of unstable tailings, channel destabilization, substrate disturbance, sedimentation/substrate embeddedness, unintentional chemical contamination, forage reduction, and methylmercury because these effects are related to the overall extent of mining activities. The amount of substrate disturbed annually per watershed by mining is limited to the number of NOIs in each. NOIs authorized by the RRSNF are distributed by watershed as proposed in Table 1. Therefore, using the maximum amount of volume allowed to be disturbed per NOI, we have assigned take to individual ESUs (coho salmon only) and watersheds, by multiplying the number of NOIs proposed to be authorized by 25 cy (Table 30). This amount of take is not coextensive with the proposed action which is the number of NOIs authorized by the RRSNF. The extent of take will be exceeded if more volume is disturbed than allowed per watershed. If this extent of take is exceeded, reinitiation will be warranted. The RRSNF can annually track the amount of substrate proposed to be disturbed annually per watershed as they notify NMFS, by submitting individual NOI Action Implementation Reports (Appendix B), and thus this extent of take indicator will function as a valid reinitiation trigger.

The maximum extent of visible turbidity is correlated with the potential for harm caused by suspended sediment. Suspended sediment is proportional to the water quality impairment that the proposed action will cause and the distance of visibility is proportional both to the size of the disturbance and to the width of the wetted stream (Rosetta 2005). Thus, it is also proportional to the amount of time the suction dredge is operated and the disturbed substrate. The length of the visible turbidity plume is limited to 300 feet by the proposed conservation measures (PCM #29), however the maximum length is not coextensive with the proposed action, because not all NOI operators will create a visible turbidity plume that is 300 feet long and it is not the intent of the operator to create this turbidity plume. Because ODEQ has not previously required reporting of turbidity monitoring results, we do not have specific information on the frequency of turbidity plume exceedances, however, exceedances can be evaluated and adjusted through active management on an annual basis, as needed. A small number of exceedances (5) in any one watershed would result in effects consistent with those analyzed in this opinion. However, more than a small number of exceedances in any one watershed may result in effects beyond those considered in our analysis. Therefore, for this programmatic opinion, the frequency of annual visible turbidity plume exceedances is five per watershed. The extent of take will be exceeded if more than five visible turbidity plumes exceed 300 feet annually in any one watershed. If this extent of take is exceeded, reintiation will be warranted. NOI operators will be required to notify the RRSNF of any exceedances within 48 hours of the exceedance (Term and Condition #2). Thus, the RRSNF will be able to track exceedances shortly after occurrence. Additionally, notification of all exceedances will be through submittal of individual NOI Action Completion Reports (Appendix C) and in the Annual Operations Report. Because the programmatic biological opinion is for multiple mining seasons, this extent of take indicator will function as a valid reinitation trigger.

Table 30. Extent of take indicator by watershed, using the authorized annual amount of substrate disturbance for suction dredging and high banking on National Forest System Lands within the Rogue River-Siskiyou National Forest in Oregon and California.

Subbasin (4th field)	Species	Watershed (5th field)	No. of annual NOI permissible per watershed	Extent of take (cubic yard of volume disturbed annually)
Smith	SONCC	North Fork Smith River 1801010101	5	125
Chetco	GS, SONCC	Chetco River1710031201	17	425
	SONCC	Pistol River 1710031204	5	125
	SONCC	Winchuck River 1710031207	5	125
Sixes	SONCC	Elk River 1710030603	5	125
	OC	Sixes River 1710030602	7	175
Illinois	GS, SONCC	Althouse Creek 1710031101	15	375
	GS, SONCC	Briggs Creek 1710031107	5	125
	GS, SONCC	Deer Creek 1710031105	5	125
	GS, SONCC	East Fork Illinois River 1710031103	19	475
	GS, SONCC	Indigo Creek 1710031110	13	325
	GS, SONCC	Josephine Creek-Illinois River 1710031106	65	1,625
	GS, SONCC	Klondike Creek-Illinois River 1710031108	1	25
	GS, SONCC	Lawson Creek-Illinois River 1710031111	5	125
	GS, SONCC	Silver Creek 1710031109	19	475
	GS, SONCC	Sucker Creek 1710031102	25	625
	GS, SONCC	West Fork Illinois River 1710031104	12	300
Lower Rogue	GS, SONCC	Lobster Creek 1710031007	7	175
	GS, SONCC	Rogue River 1710031008	5	125
	GS, SONCC	Hellgate Canyon-Rogue River 1710031002	15	375
	GS, SONCC	Shasta Costa Creek-Rogue River1710031006	5	125
	GS, SONCC	Stair Creek-Rogue River 1710031005	5	125
Applegate	GS, SONCC	Lower Applegate River 1710030906	5	125
	GS, SONCC	Middle Applegate River 1710030904	5	125
	GS, SONCC	Upper Applegate River 1710030902	9	225
Middle Rogue	GS, SONCC	Bear Creek 1710030801	5	125
Upper Rogue	GS, SONCC	Elk Creek 1710030705	5	125
	GS, SONCC	Little Butte Creek 1710030708	5	125
Coquille	OC	South Fork Coquille River 1710030502	8	200

Species Summary

OC coho salmon. Harm and harassment will only occur for OC coho salmon in 2 watersheds, the South Fork Coquille River and the Sixes River. The overall extent of take is 375 cy disturbed annually, distributed among the 2 watersheds as described in Table 30. The overall extent of take from suspended sediment is 5 exceedances of the visible turbidity plume in any one watershed within the OC coho salmon ESU.

SONCC coho salmon. Harm and harassment will occur for SONCC coho salmon in 27 watersheds. The overall extent of take is 7,300 cy disturbed annually, distributed among the watersheds as described in Table 30. The overall extent of take from suspended sediment is 5 exceedances of the visible turbidity plume in any one watershed within the SONCC coho salmon ESU.

Southern DPS green sturgeon. Harm will only occur for Southern DPS green sturgeon using the Rogue River and Chetco River estuaries. The overall extent of take is 6,800 cy for the Chetco River (425 cy) and for the Rogue River and its tributaries (6,375 cy), distributed among watersheds as described in Table 30.

2.8.2 Effect of the Take

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

2.8.3 Reasonable and Prudent Measures

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

The following measures are necessary and appropriate to minimize the impact of incidental take of listed species from the proposed program.

The RRSNF shall:

1. Minimize incidental take from interactions between fish and dredges/operators; substrate disturbance, including unstable tailings and channel destabilization; suspended sediment, sedimentation, and substrate embeddedness; chemical contamination; forage reduction; and methylmercury due to authorizing NOIs by ensuring that all NOIs are implemented with the conservation measures described in the proposed action and analyzed in this opinion, as relevant.
2. Minimize the likelihood of incidental take from suspended sediment, sedimentation, and substrate embeddedness by ensuring NOI operators implement observations of visible turbidity plumes.
3. Minimize the likelihood of incidental take resulting from unintentional chemical contamination.
4. Ensure completion of a comprehensive notification, monitoring, and reporting program regarding all NOIs authorized by the RRSNF to confirm that the take exemption for the proposed action is not exceeded, and that the terms and conditions in this incidental take statement are effective in minimizing incidental take.

2.8.4 Terms and Conditions

The terms and conditions described below are non-discretionary, and the RRSNF must comply with them in order to implement the reasonable and prudent measures (50 CFR 402.14). The RRSNF has a continuing duty to monitor the impacts of incidental take and must report the progress of the action and its impact on the species as specified in this incidental take statement (50 CFR 402.14). If the entity to whom a term and condition is directed does not comply with the following terms and conditions, protective coverage for the proposed action would likely lapse.

1. The following term and condition implements reasonable and prudent measure 1 (conservation measures):
    a. The RRSNF will only administer NOIs consistent with proposed conservation measures #1 through #9.
    b. The RRSNF will only authorize NOIs consistent with proposed conservation measures #10 through #41 and #44 through #49.

2. The following term and condition implements reasonable and prudent measure 2 (visible turbidity plumes):
    a. The RRSNF shall ensure that NOI operators will complete and record the following water quality observations to ensure that visible turbidity plumes do not extend past 300 feet downstream.
        i. At a relatively undisturbed area upstream (and upcurrent) from the suction dredge, the NOI operator(s) (or assistant) will take a visual turbidity observation daily before beginning suction dredge activities for each operating dredge and every four hours (or more often as necessary) during suction dredging. Observations must occur during daylight hours only. Record the observation, location, and time before monitoring at the downstream point.
        ii. The NOI operator(s) (or assistant) will take a visual turbidity observation daily during suction dredge operation 300 feet downstream (and upcurrent) every four hours (or more often as necessary), for a minimum of one downstream observation during operation per day for each operating dredge. Record the downstream observation, location, and time. The NOI operator should use a handheld range finder to flag a visual landmark, a 300 foot length of polypropylene rope with a float attached to the back end of the dredge, or similar tool to measure the downstream distance.
        iii. The NOI operator will compare the upstream and downstream observations. The NOI operator(s) must record their observations in a monitoring log that is legible and available to the RRSNF and the NMFS. The NOI operator(s) must also record the time of day for each observation and the tool/method used to measure the downstream distance.
            1. If more turbidity is visible 300 feet downstream of the dredge than at the upstream location, the activity must be modified, curtailed, or stopped immediately to reduce pollution.

a. The NOI operator will record what actions were taken and record any modifications to operations to prevent future exceedances.
b. The NOI operator will record the length and duration of the exceedance.
c. Within 48 hours, the NOI operator will notify the RRSNF that an exceedance of the 300-foot visible turbidity plume occurred and include information from a and b.

3. The following term and condition implements reasonable and prudent measure 3 (unintentional chemical contamination):
   a. The RRSNF shall ensure that the NOI operator(s) will use oil absorbent material and an American National Standards Institute (ANSI) or Underwriters Laboratories (ULI) approved safety container and self-closing nozzle when refueling suction dredges and high bankers to prevent possible contamination of streams and dry stream substrate.

4. The following term and condition implements reasonable and prudent measure 4 (notification, monitoring, and reporting):
   a. The RRSNF shall implement the following:
      i. <u>Pre-notification</u>. The RRSNF will notify NMFS of a proposed NOI 14 days prior to suction dredging and/or high banking operations, by submitting a completed electronic **NOI Action Implementation Report** via e-mail. This information is necessary for NMFS to be able to maintain its Public Consultation Tracking System and to confirm that proposed activities are within the scope of the attached opinion. E-mail directions are included in Appendix A and the **NOI Action Implementation** form is included in Appendix B.
      ii. <u>Monitoring</u>.
         1. The RRSNF shall ensure that NOI operators complete record keeping as described in proposed conservation measures #40 and #41.
         2. The RRSNF will implement proposed conservation measures #42 and #43.
            a. As part of its duties under proposed conservation measures #42 through #43, the RRSNF will also observe and record NOI operator compliance with Term & Conditions 2 and 3 (including the number of any exceedances of the visible turbidity plume length per watershed), and with all proposed conservation measures. Observations of non-compliance by NOI operators will be recorded by the RRSNF along with any corrective actions taken by the RRSNF or NOI operator.
         3. The RRSNF will track the occurrence of exceedances of the 300-foot visible turbidity plume as reported to them by the NOI operators. The RRSNF will notify NMFS within 48 hours if 5

exceedances occur in any one watershed within one operating season. As part of the notification the RRSNF will include information from Term and Condition 2.a.iii for the exceedances.

iii. NOI Completion Reports. The RRSNF will provide NMFS a completed NOI Action Completion Report for each NOI authorized, by submitting a completed electronic **NOI Action Completion Report**, according to the instructions in proposed conservation measure #7. E-mail directions are included in Appendix A and the **NOI Action Completion Report** is included in Appendix C.

iv. Coordinated Development and Updates of Notification and Completion Report Forms. RRSNF Level 1 fish biologist(s) and mineral administrator will work with NMFS programmatic staff lead to finalize the two electronic forms noted in 4ai and 4aiii above. The RRSNF and NMFS staff will use the forms included in Appendices B and C as a starting point. The RRSNF and NMFS must finalize these forms for the first in-water work season within 45 days after transmittal of the attached opinion (If opinion is transmitted during the first in-water work season or just before, the NOI Action Implementation Form provided in Appendix B will be used in its current form). The RRSNF and NMFS staff will coordinate to update the forms as needed.

v. Annual Operations Report. The RRSNF will submit an annual report to NMFS by February 15 by e-mail each year that describes the RRSNF's efforts in implementing the authorization of suction dredging and high banking NOIs as described in proposed conservation measure #8, including the number of any exceedances of the visible turbidity plume length by watershed. This information is needed by NMFS to ensure that the extent of incidental take is not exceeded for the proposed action. The RRSNF will also include observations recorded during implementation of proposed conservation measures #42, as required in conservation measure #43. The RRSNF and NMFS staff will coordinate development of the annual operation report and content as needed.

vi. Annual Coordination Meeting. The RRSNF will meet with NMFS by March 31 of each year, as described in proposed conservation measure #9. The RRSNF and NMFS will also include the newest regional climate change information as part of the meeting and discussion.

b. Failure to provide timely reporting may constitute a modification of the proposed action that has an effect to listed species or critical habitat that was not considered in the biological opinion and thus may require reinitiation of this consultation.

2.9 Conservation Recommendations

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

- The RRSNF personnel approving NOIs should maintain current expertise on State regulations, including all prohibited areas, and on revised versions of State permits and general authorizations to ensure proper implementation of conservation measures and adherence to State laws. The RRSNF personnel should also ensure NOIs are not located within new State prohibited areas (for example, see ODEQ 2015 Reissued 700-PM general permit requirements, Schedule A, Discharge Limitations#6, page 7) and new requirements are included prior to authorization.
- NMFS suggests that the RRSNF follow priority actions identified in the SONCC coho salmon recovery plan and consider closing areas to suction dredging through identification of areas with mercury "hot spots" and developing a suction dredging and high banking management plan for these areas to further recovery of this species. The RRSNF should also evaluate concentrations of mercury mobilized in-stream by suction dredging to evaluate the potential for freshwater toxicity, beginning with areas with the highest amount mining activities.
- To further inform future actions, NMFS suggests that the RRSNF develop a monitoring strategy to assess whether filling suction dredge holes is a successful conservation measure in minimizing substrate disturbance and unstable tailings and in minimizing effects on stream bed and channel geomorphology. Important variables to in development of a monitoring plan include stream gradient, bankfull width, type of stream reach (i.e., source, transport, or depositional), hydrologic regime, overall extent of disturbed substrate, and depth of disturbed substrate. We also suggest including an assessment of the overlap between redds and mined areas and the degree of resulting redd scour.
- To address existing thermal impairments and future temperature increases from climate change, the RRSNF should:
    - identify and map areas of thermal refugia within the NOI watersheds,
    - consider prohibiting suction dredging in thermal refuge areas or implement other measures for protection of coho salmon from disturbance during periods of high temperatures (one example is to follow the lead of recreational fishing suspension during warm periods), and
    - continue to work with ODEQ and other stakeholders in those areas within the action area that are in need of a TMDL and water quality management plan.

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

2.10 Reinitiation of Consultation

This concludes formal consultation for Programmatic Suction Dredging and High Banking Notice of Intent Operations on National Forest System Lands within the Rogue River-Siskiyou National Forest in Oregon and California.

As 50 CFR 402.16 states, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained or is authorized by law and if: (1) the amount or extent of incidental taking specified in the incidental take statement is exceeded, (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion, (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in this opinion, or (4) a new species is listed or critical habitat designated that may be affected by the action.

Reinitiation of this consultation could be triggered by new information concerning climate change-caused water temperature increases in action area rivers and streams occupied by NMFS listed fish species. However, current global climate change models are not precise enough to know specifically when this will occur.

2.11 "Not Likely to Adversely Affect" Determinations

The applicable standard to find that a proposed action is NLAA listed species or critical habitat is that all of the effects of the action are expected to be discountable, insignificant, or completely beneficial.[46] Discountable effects cannot be reasonably expected to occur. Insignificant effects are so mild that the effect cannot be meaningfully measured, detected, or evaluated. Beneficial effects are contemporaneous positive effects without any adverse effect to the listed species or critical habitat, even if the long-term effects are beneficial. We do not anticipate the proposed action will take Southern DPS Pacific eulachon. There is no designated critical habitat for eulachon in the action area.

The proposed action and the action area for this consultation are described in the Introduction to this document (Sections 1.3 and 1.4). Eulachon adults, eggs, and larvae, where present, will only be in the estuaries and the first few miles of the river. Because most RRSNF land ownership in the action area is not in these areas, eulachon are extremely unlikely to be exposed to NOI-level project area effects. Thus they only have the potential to be exposed to effects from methylmercury. Eggs are deposited in freshwater, so only adults and larvae will be exposed to methylmercury. Currently, it is unknown if eulachon are spawning in the Coquille, Elk, Pistol, or Winchuck Rivers, and they are rarely present in the Sixes, Rogue, Chetco, and Smith Rivers (Monaco *et al.* 1990, Willson *et al.* 2006, Gustafson *et al.* 2010). Run timing and duration frequently vary interannually.

Details of the effects of the proposed action regarding increased methylmercury concentration in estuaries were described in Section 2.4. In general, we determined that the proposed action was extremely unlikely to cause measurable increases in estuarine methylmercury concentrations in the Elk River, Pistol River, Smith River, Winchuck River, Sixes River, or Coquille River estuaries due to the low amount of mining operations annually. For the Rogue River and Chetco River estuaries, we determined that only minor amounts of increased methylmercury are likely occur in these estuaries, primarily because there are few areas where deposition of remobilized

[46] U.S Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS). 1998. Endangered Species Act Consultation Handbook: Procedures for Conducting Section 7 Consultations and Conferences. March, 1998. Final. pp. 315.

mercury is likely to occur due to the estuaries' small size, strong river currents, and habitat simplification from man-made alterations; for these same reasons, environmental conditions favorable for methylation are also limited in the Rogue and Chetco River estuaries.

As described in Section 2.3, methylmercury is efficiently transferred through the aquatic food web and concentrations increase with each additional step in the food chain in a process known as biomagnification; higher-level predators build up greater and more dangerous amounts of toxic materials than animals lower on the food chain.

It is unknown how long eulachon larvae are present in the estuaries but they are dispersed by estuarine and ocean currents. Because they are very small and weak swimmers they may be flushed through very quickly in simplified environmental conditions. However, there is some evidence that larvae may be retained by estuarine circulation for weeks or perhaps months (Hay and McCarter 2000, McCarter and Hay 1999, 2003, Beacham *et al.* 2005, Moody and Pitcher 2010), but are probably not present for more than five months according to sampling conducted in the Columbia River (Ward 2002). Eulachon larvae and postlarvae are at very low levels in the estuarine food web. Additionally, they feed on organisms at even lower levels of the estuarine food web including phytoplankton, copepods and eggs, mysids, barnacle larvae, worm larvae, and eulachon larvae (WDFW and ODFW 2001). Therefore, because eulachon larvae will only be exposed to immeasurable or minor increases in estuarine methylmercury and because they are eating prey items located lower in the food web, eulachon larvae are only likely to acquire immeasurable amounts of methylmercury and it is unlikely that they will experience neurotoxic effects or developmental effects as a result of methylmercury bioaccumulation or biomagnification.

There is also little information about eulachon adults during their migration and spawning, although their freshwater residence is believed to be short (i.e., four to ten days, Spangler *et al.* 2003; four to 20 days, Lewis *et al.* 2002). Most adult eulachon are semelparous, or spawn once and then die, meaning that eulachon will be exposed to methylmercury in the estuaries only once as adults. Like salmon, eulachon probably hold in brackish water for physiological changes that allow for survival in freshwater; because eulachon dentition is much reduced they probably stop feeding as they approach their spawning rivers and resorb minerals in teeth to assist with reproductive development (Hay and McCarter 2000). Lewis *et al.* (2002) detected eulachon in the Kemano estuary for 5 days in 1997 prior to river entry. Because of their lack of feeding during their spawning migration (WDFW and ODFW 2001), or reduced feeding, and their short duration in the action area, adult eulachon are extremely unlikely to bioaccumulate measurable amounts of methylmercury or experience neurotoxic effects as a result of methylmercury bioaccumulation.

Effects to all life histories of Southern DPS eulachon exposed to minor amounts of increased methylmercury concentration in estuaries will be insignificant because they are eating prey items that are unlikely to appreciably biomagnify methylmercury (larvae), and because of their short-term presence in the estuary during which they either cease or reduce feeding (adults). Based on this analysis, the proposed action is not likely to adversely affect Southern DPS eulachon.

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

Section 305(b) of the MSA directs Federal agencies to consult with NMFS on all actions or proposed actions that may adversely affect EFH. The MSA (section 3) defines EFH as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." Adverse effect means any impact that reduces quality or quantity of EFH, and may include direct or indirect physical, chemical, or biological alteration of the waters or substrate and loss of (or injury to) benthic organisms, prey species and their habitat, and other ecosystem components, if such modifications reduce the quality or quantity of EFH. Adverse effects on EFH may result from actions occurring within EFH or outside of it and may include site-specific or EFH-wide impacts, including individual, cumulative, or synergistic consequences of actions (50 CFR 600.810). Section 305(b) also requires NMFS to recommend measures that can be taken by the action agency to conserve EFH.

This analysis is based, in part, on the EFH assessment provided by the RRSNF and descriptions of EFH for Pacific coast groundfish (PFMC 2005), coastal pelagic species (PFMC 1998), and Pacific coast salmon (PFMC 2014) contained in the fishery management plans developed by the Pacific Fishery Management Council and approved by the Secretary of Commerce.

3.1 Essential Fish Habitat Affected by the Project

The PFMC described and identified EFH for groundfish, coastal pelagic species, and Pacific coast salmon. 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 groundfish, coastal pelagic species, and Pacific Coast salmon.

3.2 Adverse Effects on Essential Fish Habitat

The effects of the action, as proposed, on EFH are similar to those described above in the ESA portion of this document (section 2.4). The habitat requirements (i.e., EFH) for the MSA-managed species in the freshwater project area are similar to those of the ESA-listed species. Estuarine EFH use by groundfish and coastal pelagic species is typically longer and includes more susceptible life history stages than that of the ESA-listed species. Estuarine EFH use by Pacific Coast salmon other than the ESA-listed coho salmon is also typically longer.

Based on information provided by the action agency and the analysis of effects presented in the ESA portion of this document (Section 2.4), we conclude that the proposed action will have the following adverse effects on EFH designated for Pacific Coast salmon in freshwater where NOI activities will occur, including spawning habitat designated as habitat areas of particular concern (HAPCs). Pacific salmon, groundfish, and coastal pelagic species will also be adversely affected in estuaries, including estuarine areas designated as HAPCs where minor increases in methylmercury concentrations will occur.

1. Freshwater EFH quantity and quality, including salmon spawning habitat HAPC, will be temporarily reduced by substrate disturbance, channel destabilization, and

sedimentation/substrate embeddedness at the NOI-level project area. NOI-level project area habitat effects are either very temporary or, in terms of channel instability, recovery will begin within 2 winters for most NOI-level project areas.

2. Freshwater EFH quality will also be temporarily reduced due to short-term increases in suspended sediment and unintentional chemical contamination at the NOI-level project area and by temporary increases of water velocities at the nozzle intakes of suction dredges.
3. Freshwater forage will have a short-term decrease in availability due to suction dredging, substrate disturbance, suspended sediment, sedimentation/substrate embeddedness, and unintentional chemical contamination at the NOI-level project area.
4. Estuarine EFH quality, including the estuarine area HAPC and forage quality, will be degraded by minor increases in methylmercury increases in the Rogue River and Chetco River estuaries. Greater effects are possible for EFH for groundfish and coastal pelagic species due to exposure occurring in spawning and rearing habitats. Greater effects are also possible for EFH for Chinook salmon, groundfish, and coastal pelagic species due to longer exposure.

3.3 Essential Fish Habitat Conservation Recommendations

1. The RRSNF should minimize adverse effects on freshwater EFH quantity and quality, including spawning habitat HAPC, and on estuarine EFH quality, including the estuarine area HAPC, and on forage, by
    a. only administering NOIs consistent with proposed conservation measures #1 through #9,
    b. only authorizing NOIs consistent with proposed conservation measures #10 through #41 and #44 through #49,
    c. ensuring NOI operator(s) complete and record water quality observations as described in Term and Condition 2 from the accompanying opinion
    d. ensuring NOI operator(s) use oil absorbent material and an ANSI or ULI approved safety container and self-closing nozzle when refueling suction dredges and high bankers to prevent possible contamination of streams and dry stream substrate.
2. The RRSNF should ensure completion of a comprehensive notification, monitoring, and reporting program regarding all NOIs authorized by the RRSNF to confirm that effects on freshwater EFH quantity and quality, including spawning habitat HAPC, and on estuarine EFH quality, including the estuarine area HAPC, and on forage are being minimized as described in Term and Condition 4 from the accompanying opinion.
3. The RRSNF should minimize adverse effects on estuarine EFH quality, including the estuarine area HAPC and forage quality, by identifying areas of mercury "hot spots" and developing a suction dredging and high banking management plan for these areas, beginning with areas with the highest amount of mining activities.
4. The RRSNF should consider the avoidance of mineral mining in waters, riparian areas, or flood plains of streams containing or influencing salmon spawning and rearing habitats (PFMC 2014).
5. To contribute to the restoration of or the maintenance of properly functioning salmon habitat and conserve EFH, the RRSNF should continue to assess the cumulative effects of

past and proposed mineral extraction activities and use the assessment in planning for future mining operations (PFMC 2014).

Fully implementing these EFH conservation recommendations would protect, by avoiding or minimizing the adverse effects described in Section 3.2, above, approximately 1,367 acres of designated EFH for Pacific Coast salmon, including approximately 862.5 acres for Pacific coast groundfish and coastal pelagic species.

3.4 Statutory Response Requirement

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

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

3.5 Supplemental Consultation

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

4. DATA QUALITY ACT DOCUMENTATION AND PRE-DISSEMINATION REVIEW

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

4.1 Utility

Utility principally refers to ensuring that the information contained in this consultation is helpful, serviceable, and beneficial to the intended users. The intended user of this opinion is the Rogue River-Siskiyou National Forest. Other interested users could include miners submitting a NOI. Individual copies of this opinion were provided to the Rogue River-Siskiyou National Forest, U.S. Forest Service. The format and naming adheres to conventional standards for style.

4.2 Integrity

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

4.3 Objectivity

Information Product Category: Natural Resource Plan

Standards: This consultation and supporting documents are clear, concise, complete, and unbiased; and were developed using commonly accepted scientific research methods. They adhere to published standards including the NMFS ESA Consultation Handbook, ESA regulations, 50 CFR 402.01 et seq., and the MSA implementing regulations regarding EFH, 50 CFR 600.

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

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

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

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6. APPENDICES

APPENDIX A

E-MAIL DIRECTIONS FOR SUBMITTING NOI (NOTICE OF INTENT) ACTION IMPLEMENTATION FORM AND NOI COMPLETION REPORT

SUCTION DREDGING NOI PROGRAMMATIC ROGUE RIVER – SISKIYOU NATIONAL FOREST (RRSNF)

The RRSNF will submit a completed NOI Action Implementation Form (Appendix B) by e-mail to the National Marine Fisheries Service (NMFS) for **each** NOI 14 days prior to prior to suction dredging and/or high banking operations. The RRSNF will submit only **one** NOI Action Implementation Form per **e-mail** to NMFS using the e-mail notification guidelines below.

Following completion of NOI operations, the RRSNF will also submit a completed NOI Action Completion Report (Appendix C) by e-mail to NMFS. The RRSNF will submit only **one** NOI Action Completion Report per **e-mail** to NMFS using the e-mail notification guidelines below.

The guidelines below are relevant to the e-mails for both forms in Appendix B and C, especially as to how to fill in the subject line of the e-mail.

E-MAIL NOTIFICATION GUIDELINES

The **RRSNF suction dredging and highbanking NOI** programmatic consultation e-mail box (oregongold@noaa.gov) is to be used for NOI actions submitted to NMFS by the RRSNF for formal consultation (50 CFR § 402.14) under this programmatic consultation.

The U.S. Forest Service must ensure the final NOI Action Implementation Form for each NOI is being submitted to avoid multiple submittals and withdrawals. In rare occurrences, a withdrawal may be necessary and unavoidable. In a withdrawal situation, please specify in the e-mail subject line that the NOI is being "withdrawn". There is no form for a withdrawal — simply state the reason for the withdrawal and submit to the NMFS e-mail box, following the e-mail titling conventions (see next page). If a previously-withdrawn notification is resubmitted later, the resubmittal will be regarded as a new action notification.

An automatic reply will be sent upon receipt, but no other communication will be sent from the programmatic e-mail box; this box is used for **Incoming Only**. All other pre-decisional communication should be conducted **outside** the use of the oregongold@noaa.gov e-mail.

E-mail "Subject Line" Titling Conventions

In the subject line of the e-mail (see below for requirements), clearly identify the information as stated in numbers 1-7 below. Use caution when entering the necessary information in the subject line. **If these titling conventions are not used, the e-mail will not be accepted.**

Ensure that you clearly identify the following **E-mail "Subject Line" Titling** requirements:

1. Start the title with: *RRSNF Suction Dredging & High Banking NOI Programmatic Consultation*
2. Following by stating the specific submittal category (select the appropriate category:, *Action Notification, Action Completion or Withdrawal*);
3. Continue with the *U.S. Forest Service NOI/IWEB#*
4. Continue with *Stream Name with River Mile*;
5. Continue with NOI operator *Name*;
6. Continue with *Applicant Name* (you may use last name only, or **commonly used** abbreviations);
7. Finish with *County*.

Example of "Subject Line" Titling Requirements
RRSNF Suction Dredging & High Banking NOI Programmatic Consultation Specific Submittal Category, U.S. Forest Service NOI/IWEB#, Stream Name with River Mile, NOI operator Name, Applicant Name, County

Example of "Subject Line" Titling with Submittal Categories: Below are examples of the three different types of Submittal Categories "Subject Line" format:

Action Notification - *Subject Line Example*
RRSNF Suction Dredging and High Banking NOI Programmatic Consultation *_Action Notification, #XXXXXX, Sucker Creek_RM 2.8, Jack Pot, Doe, Josephine*

Action Completion- *Subject Line Example*
RRSNF Suction Dredging and High Banking NOI Programmatic Consultation *_Action Completion, #XXXXX, Sucker Creek_RM 2.8, Jack Pot, Doe, Josephine*

Withdrawal - *Subject Line Example*
RRSNF Suction Dredging and High Banking NOI Programmatic Consultation *_Withdrawal, #XXXXX, Sucker Creek_RM 2.8, Jack Pot, Doe, Josephine*

Appendix B

NOI (NOTICE OF INTENT) ACTION *IMPLEMENTATION* FORM

SUCTION DREDGING AND HIGH BANKING NOI PROGRAMMATIC
ROGUE RIVER – SISKIYOU NATIONAL FOREST (RRSNF)

NOI Electronic Notification to NMFS. The U.S. Forest Service (USFS) proposes to notify NMFS of a new NOI by submitting a completed electronic NOI Action Implementation Form via e-mail to oregongold@noaa.gov adhering to the NOI e-mail guidelines in Appendix A.

Action Implementation Form Guidelines. Complete the shaded areas below in the NOI Action Implementation Form in its entirety. Provide enough information for NMFS to determine the effects of the action and whether the NOI fits the RRSNF Suction Dredging and High Banking NOI Programmatic biological opinion criteria and Terms and Conditions. Attach additional pages if necessary.

DATE OF REQUEST:				NMFS Tracking #:	WCR-2015-2182		
TYPE OF REQUEST:	☐ NOI ACTION NOTIFICATION						
Statutory Authority:	☐ ESA & EFH COMBINED			☐ ESA ONLY		☐ EFH ONLY	
LEAD ACTION AGENCY:	USDA FOREST SERVICE, ROGUE RIVER-SISKIYOU NATIONAL FOREST						
U.S. Forest Service Contact:				**USFS NOI/IWEB#:**			
Applicant Name:				**Additional NOI operator Name(s):**			
Stream Name w/ River Mile:				**State:**		**County:**	
Is Highbanking proposed?				**Has another NOI previously been filed at this location?**			
6th Field Hydrologic Unit Code (HUC):				**6th Field HUC Name:**			
Township/Range/ Section:				**Latitude & Longitude**			
Proposed Start Date:				**Proposed End Date:**			
Total Linear Stream Distance of NOI location:		**Total Stream Distance (feet) Proposed:**		**Total Max. Stream Area (sq. feet) Proposed:**		**Total Cubic Yards Proposed:**	

	Spawning (Yes, No)	**Rearing (Winter, Summer, No)**	**Migration (Yes, No)**
Coho Habitat Use			
Chinook Habitat Use			

Does a vehicle need to cross a stream to access the NOI site?	
Proposed Mining Operation Description (attach additional page if needed)	

NMFS Species/Critical Habitat Present in Action Area. *Identify the species and ESA critical/EFH habitat found in the action area (includes NOI-level project area and estuarine areas):*

ESA Species:
- ☐ Oregon Coast coho salmon
- ☐ Southern Oregon/Northern California coho salmon
- ☐ Southern DPS green sturgeon
- ☐ Southern DPS eulachon

EFH Species:
- ☐ Salmon, Chinook
- ☐ Salmon, coho
- ☐ Coastal Pelagics
- ☐ Groundfish

ESA Critical Habitat:
- ☐ Oregon Coast coho salmon
- ☐ Southern Oregon/Northern California coho salmon

Terms and Conditions. Check each box for the following Conservation Measures and/or Terms and Conditions from the biological opinion that are included in the NOI authorized for the proposed action. Select the boxes below that apply for the type of NOI operation(s) being requested.
Note: Numbers in parentheses below parallel the numbers in the BO Conservation Measures narrative.

Administrative (*pertains to suction dredging and highbanking operations)*
- ☐ Required State** & Federal permits (4)
- ☐ Action Completion Report Required (7)
- ☐ NOI location prohibitions (3)

Operations (*pertains to suction dredging and highbanking operations)*
- ☐ ODEQ permit and ODSL general authorization/permit in possession (10) **
- ☐ Storage of fuel, lubricants, and other hazardous chemicals (11 and Term & Condition #3)
- ☐ Prohibition on use of mercury, cyanide, or other chemical agents (12)
- ☐ Protection of vegetation, wood, streambanks,[β] and other habitat (13)
- ☐ Prohibition on dams or other passage barriers (14)
- ☐ Protection of existing infrastructure (15)
- ☐ General equipment restrictions (16)
- ☐ <25 cubic yards annually (17)
- ☐ Invasive species (18)
- ☐ Daylight hours only (19)
- ☐ Wet weather periods (20)

<u>Operations</u> <u>*(suction dredging only)*</u>

- ☐ Work windows & run timing (21)
- ☐ One suction dredge per person (22)
- ☐ Suction dredge intake size/screening/horsepower requirements (23)
- ☐ Suction dredge maintenance and fueling (24)
- ☐ Lateral edge buffer (25)
- ☐ Habitat protection (26)
- ☐ Minimum suction dredge spacing (27)
- ☐ Other equipment restrictions (28)
- ☐ Extent of visible turbidity (29 and Terms and Conditions #2 and #4)
- ☐ Suction dredge holes (30)
- ☐ Suction dredge piles (31)
- ☐ Redds or spawning fish/willful entrainment (32)

<u>Operations</u> <u>*(highbanking only)*</u>

- ☐ Below ordinary high water level (33)
- ☐ High banking holes (34)
- ☐ High banking tailings (35)
- ☐ Riparian vegetation protection (36)
- ☐ Prohibition on water diversion (37)
- ☐ Wastewater restrictions (38)
- ☐ Vehicle use of existing fords (39)

<u>Record Keeping</u>

- ☐ Suction dredging (40 and Term & Condition #2)
- ☐ High banking (41)

<u>U.S. Forest Service Monitoring</u> <u>*(pertains to suction dredging and/or highbanking operations)*</u>

- ☐ In-season inspection (42)
    - ☐ 75% of suction dredging NOIs
    - ☐ 100% of high banking NOIs
- ☐ Post-season inspection: 100% of all NOIs (42)

<u>Camping & Occupancy</u> <u>*(pertains to suction dredging and highbanking operations)*</u>

- ☐ Woody material (44)
- ☐ Human waste, trash, and litter (45)
- ☐ Clearing of camp sites within 7 days of the end of suction dredging season (46)
- ☐ Motorized access (47)
- ☐ Minimize riparian area disturbance (48)
- ☐ Wet weather conditions (49)

** CA currently has a moratorium on suction dredging and is not issuing permits for this technique. To the extent that conditions for suction dredging may conflict among these proposed conservation measure and California rules, the most stringent condition would be applied to the NOI Authorization.

[β] Stream bank means that land immediately adjacent to and which slopes toward the bed of a watercourse and which is necessary to maintain the integrity of a watercourse. The bank is extended to the crest of the slope or the first definable break in slope lying generally parallel to the watercourse.

APPENDIX C

NOI (NOTICE OF INTENT) ACTION *COMPLETION* REPORT

SUCTION DREDGING AND HIGH BANKING NOI PROGRAMMATIC
ROGUE RIVER – SISKIYOU NATIONAL FOREST (RRSNF)

The *NOI operator* shall complete the shaded areas below and submit this report to the U.S. Forest Service (USFS) mineral administrator within 30 days of completing all suction dredging or highbanking as part of a NOI completed action under the RRSNF Suction Dredging and High Banking NOI Programmatic Biological Opinion.

The *USFS mineral administrator* shall submit this completed report to the National Marine Fisheries Service (NMFS) via e-mail to oregongold@noaa.gov adhering to the NOI e-mail guidelines in Appendix A upon receipt from the NOI operator, and no later than 60 days following the end of Oregon Department of Fish and Wildlife (ODFW) in-water work schedule (Timing of In-water work to Protect Fish & Wildlife Resources, 2008 or newest version) or the California Department of Fish and Wildlife (CDFW) in-water work schedule (California Code of Regulations, Title 14, section 228; California Fish and Game Code sections 5653 and 5653.9, 2012 or newest version). The NOI operator and the RRSNF can share information to complete the report.

U.S. Forest Service Contact:		**USFS NOI/IWEB#:**	
Stream Name w/River Mile:		**NOI operator(s)**	
NOI Claim Name, if applicable:		**Did High banking occur?**	
Dates of all suction dredging:		**Dates of all high banking:**	
Total Maximum Linear Stream Distance Suction Dredged:		**Total Maximum Stream Area (sq. ft.) Suction Dredged:**	
Estimated volume of material mined (cubic yards)	*Suction Dredge:*	*High banking:*	
Size of Suction Dredge Nozzle intake (inches):		**Horsepower Rating of Suction Dredge:**	
Were any salmon observed during suction dredging?		**Were all suction dredge tailing piles raked and dredge holes filled?**	
Were any salmon impinged by the pump intake or passed through the suction dredge?		**If yes, how many; # coho injured; # coho mortalities.**	
Was mercury observed in the suction dredge?			

Average depth of mining	

Include with this Form as an Attachment the following information:

1. Date of U.S. Forest Service post-mining visit.
2. Photos of habitat conditions after mining.
3. Log of NOI operator(s) daily turbidity observations
4. Observations of non-compliance with conservation measures or terms and conditions.
5. Actions taken by RRSNF or NOI operator to address observations of non-compliance with conservation measures or terms and conditions.
6. A summary of any turbidity exceedance, contaminant release, and correction efforts. A copy of the Oregon Department of Environmental Quality NPDES 700PM General Permit for Suction Dredge Mining Monitoring Record (Log) and Annual Report (700PM-R1 form) will suffice to meet turbidity exceedance summary.